Elementary Education

See Department of Teacher Education

Engineering (ENGR)

Bennett (chair), Jalkio, Kumar, Zimmerman; Cottles, Frohrib, Jaedike, Sparrow, Walker
Faculty from other departments and adjunct faculty from industry teach specialized courses.

The University of St. Thomas offers three tracks in engineering:

- A program in mechanical engineering
- A dual degree program in mechanical engineering and business
- A pre-engineering program.

Engineering

The bachelor of science in mechanical engineering (B.S.M.E.) is an applied engineering program, blending theory and research with practical engineering fundamentals. The program is academically rigorous, following Accreditation Board for Engineering and Technology (ABET) guidelines and complemented with a full liberal arts curriculum. (Application for ABET accreditation will be made in 2000.)

The mechanical engineering curriculum combines the study of basic sciences, general engineering, design engineering and mechanical engineering with the study of the liberal arts. Emphasis is placed on applied engineering.

The curriculum provides for a foundation in: theoretical and applied mechanics, materials, electrical-electronic fundamentals, computer-aided design, automation systems, thermodynamics heat transfer/fluid flow, manufacturing processes and practical design.

Students graduating with a major in mechanical engineering will meet the program objectives and outcomes designed to exceed the requirements of ABET's *Engineering Criteria 2000*. These are a comprehensive set of criteria designed to provide graduates with the technical, ethical, attitudinal and communications skills required to be a productive contributor to society and to aggressively seek life-long learning experiences.

These program objectives and outcomes are designed to provide the graduate with a foundation for clear thinking and expression in a balanced liberal arts educational program. They will demonstrate competence in a variety of skills that enhance their ability to solve problems in diverse ways to meet the needs of the community through their work and in their lives, as agents of change in the world of the future. Graduates will also develop teamwork and communication skills while gaining a comprehensive understanding of the design and engineering system.

Graduates will be prepared for direct entry into an engineering position in industry or for advanced study in graduate school.

The dual degree program in Mechanical Engineering and General Business Management is designed for students with an interest in both engineering and business. The program combines the applied engineering concepts of mechanical engineering with knowledge of the financial, marketing and management disciplines of the business program. Students in this dual program will have skills to prepare them for a wide variety of opportunities in industry or advanced graduate education. The dual degree program requires approximately five years to complete.

Dual Degree in Mechanical Engineering (B.S.M.E.) and General Business Management (B.A.)

150 Introduction to Engineering I (0 credit)
151 Introduction to Engineering II (1 credit)
171 Engineering Graphics
220 Engineering Mechanics I
221 Engineering Mechanics II
320 Machine Design and Synthesis
350 Electrical Engineering Principles
360 Manufacturing Processes
370 Engineering Materials
381 Thermodynamics
382 Heat Transfer and Fluid Flow
410 Control Systems and Automation
480 Engineering Design Clinic I
481 Engineering Design Clinic II

Plus:
eight credits of ENGR electives

Plus:

ACCT	205	Introduction to Accounting
BUS	200	Community Service (0 credit)
BUS	201	Ethics and Practice: Foundations of Business
FINC	321	Financial Management
MGMT	301	Management of Organizations and Processes
MGMT	480	Integrative Issues of Businesses and Organizations
MKTG	300	Principles of Marketing

Plus one of:

BLAW	301	Legal Environment of Business
BLAW	303	International Business Law

Allied requirements

CHEM	111	General Chemistry
COMM	105	Communications in the Workplace
ECON	251	Principles of Macroeconomics
ECON	252	Principles of Microeconomics
MATH	113	Calculus I
MATH	114	Calculus II
MATH	200	Multi-Variable Calculus
MATH	210	Linear Algebra and Differential Equations
MATH	303	Statistics for the Applied Sciences
PHYS	111	Introduction to Classical Physics I
PHYS	112	Introduction to Classical Physics II
QMCS	230	Software Design Using the JAVA Language

Pre-Engineering

See Affiliated Programs

Major in Mechanical Engineering (B.S.M.E.)

150	Introduction to Engineering I (0 credit)
151	Introduction to Engineering II (1 credit)
171	Engineering Graphics
220	Engineering Mechanics I
221	Engineering Mechanics II
320	Machine Design and Synthesis
350	Introduction to Electronics
360	Manufacturing Processes
370	Engineering Materials
381	Thermodynamics
382	Heat Transfer and Fluid Flow
410	Control Systems and Automation
480	Engineering Design Clinic I
481	Engineering Design Clinic II

Plus eight credits from the following:

225	Kinematics and Mechanism Design (2 credits)
351	Electronic Instrumentation and Control Laboratory
385	Thermal Design (2 credits)
390	Packaging Fundamentals
420	Rapid Product Realization
430	Applications of Thermodynamics
440	Design with Plastics
450	Vibration and Control Theory
460	Engineering Economics and Project Management
470	Fundamentals of Mechatronic Engineering I
498	Individual Study

Allied Requirements

CHEM	111	General Chemistry I
MATH	113	Calculus I
MATH	114	Calculus II
MATH	200	Multi-Variable Calculus
MATH	210	Linear Algebra and Differential Equations

MATH 303 Statistics for the Applied Sciences
PHYS 111 Introduction to Classical Physics I
PHYS 112 Introduction to Classical Physics II
QMCS 230 Software Design Using the JAVA Language

Minor in Engineering

150 Introduction to Engineering I (0 credit)
151 Introduction to Engineering II (1 credit)
171 Engineering Graphics
360 Manufacturing Processes

Plus eight credits from the following:
220 Engineering Mechanics I
221 Engineering Mechanics II
300 Manufacturing Management Systems
320 Machine Design and Synthesis
350 Introduction to Electronics
370 Engineering Materials
381 Thermodynamics
382 Heat Transfer and Fluid Flow
410 Control Systems and Automation

150 Introduction to Engineering I **0 credit**
This course introduces students to engineering fields, practicing engineers and hands-on engineering work. As they become acquainted with engineering occupations and experience their potential for creativity and fun, students will understand the value and applications of the required curriculum and be motivated and stimulated to pursue further engineering studies. Offered in fall semester.

151 Introduction to Engineering Design II **1 credit**
A continuation of ENGR 150, introduction to engineering, this course focuses on design as the central activity of engineering. Students learn a disciplined approach to design through case studies and open ended design experiences. Offered in spring semester.
Prerequisite: 150

171 Engineering Graphics
Students will learn to read blueprints and working drawings and become familiar with computer-aided design (CAD) terminology and technology. Topics include the elements of drafting, including: the use of CAD software; principles of projection; and introductory methods of representation and constructive geometry, working drawings, conventions and standards.

220 Engineering Mechanics I
This fundamental course addresses the essential engineering principles of statics, dynamics and deformable body mechanics. Offered in fall semester.
Prerequisites: MATH 114 and PHYS 111 (or concurrent registration in PHYS 111)

221 Engineering Mechanics II
Continuation of 220. Offered in spring semester.
Prerequisite: 220

225 Kinematics and Mechanism Design **2 credits**
Analysis and design of linkages and other mechanisms including geometry of motion and force distributions. Computer aided analysis and design tools are used as well as mathematical techniques. Offered in J-term.
Prerequisite: 220

295, 296, 297, 298 Topics
The subject matter of these courses, announced in the annual *Class Schedule,* will vary from year to year, but will not duplicate existing courses. See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

300 Manufacturing Management Systems I
Introduces engineering students to the basic management and economic concepts useful to practicing engineers working in manufacturing settings. This course covers basic principles of management, work design, work measurement, incentive plans, managing for quality, statistical quality control, manufacturing cost concepts and engineering economics. Offered in fall semester.
Prerequisite: MATH 303 or permission of instructor

310 Manufacturing Management Systems II
Introduces engineering students to manufacturing strategy and its relationship to the design of facilities, production systems and systems of management, planning and control. This course covers manufacturing strategy, basic types of production systems (such as job shop and assembly line), facility location, facility layout, materials handling systems, material management, inventory control, production planning and control, material requirements planning, the Just-In-Time philosophy, capacity planning and project management.
Prerequisite: 300 or consent of instructor

320 Machine Design and Synthesis
Machines are designed to transmit motion and energy between two sites and convert motion from one from to another. This course will develop the students creative skills in conceptualizing machines to met performance criteria. Machine designs will require the understanding and use of machine elements such as springs, screws, bearings and gears. The student will participate in concept feasibility evaluation as a method of understanding component operational principles and failure modes.
Prerequisite: ENGR 221

350 Introduction to Electronics (PHYS 260)
This course provides scientists and engineers with a background in electronics and electronic instrumentation. Topics include DC and AC circuit analysis, frequency response, filters, feedback. operational amplifiers, semiconductor devices, power supplies, oscillators, logic gates, codes for numbers and symbols, combinational and sequential digital logic design, timing, transducers, and analog-digital conversion. The course consists of lecture, demonstration, discussion, and laboratory.
Prerequisite: A minimum grade of C- in Physics 112

351 Electronic Instrumentation and Control Laboratory
Provides an understanding of the fundamentals of electrical engineering. The course covers principles and applications of transducers, instrumentation systems, amplifiers and signal conditioners, impedance matching, frequency, time response and elementary feedback systems.
Prerequisite: 350

360 Manufacturing Processes
Provides an understanding of the fundamental technologies of manufacturing processes. This course covers such basic principles of manufacturing processes as casting, heat treating, metal cutting, plastic molding and continuous processes. Offered in spring semester.

370 Engineering Materials
An introduction to materials and their properties. This course introduces students to the fundamentals of materials theory, properties and applications. Topics include properties and applications of metals, polymers, ceramics and composite materials. The course emphasizes characteristics of materials in manufacturing operations and service, including open-ended design issues. Offered in spring semester.
Prerequisites: CHEM 111 and PHYS 111

381 Thermodynamics
A study of thermal and mechanical energy and their applications to technology. First law of thermodynamics (energy conservation); second law of thermodynamics (restrictions on energy transformations). Thermophysical properties of substances. Power producing devices and heat pumping devices. Humidity, dew point and other characteristics of non-reacting mixtures. Reacting mixtures (combustion of fuels).
Prerequisites: PHYS 112 and MATH 114

382 Heat Transfer and Fluid Flow
Modes of heat transfer: convection, conduction, and radiation. Coupling of convective heat transfer with fluid flow. Fundamentals of fluid flow: statics, boundary layers, pipe flows, pressure drop, and friction factor. Convective heat transfer at external surfaces and internal surfaces. Fluid-to-fluid heat exchangers and their design. Conduction in solids of various shapes; use of heat-conducting fins to improve the performance of heat exchangers. Radiation heat transfer between surfaces.
Prerequisite: 381

385 Thermal Design **2 credits**
Design of systems where the transfer of heat and/or the attainment of specific temperature levels are critical to the function of the system. Applications include heat exchangers, thermal climate control devices and a focused case study. Offered in J-term.
Prerequisite: 382

390 Packaging Fundamentals
Provides the student with firsthand knowledge of packaging principles and processes as they apply to the manufacturing operation. The course covers the functions of packaging, major materials used in packaging and their

properties and package-forming processes. Students will do hands-on work in package assembly and produce a computer-designed package as part of their lab work.
Prerequisite: Junior standing or consent of instructor

410 Control Systems and Automation
An introduction to the scope of control systems in manufacturing and their implementation. The course focuses on analog and binary control loop theory, the use of transforms (Laplace and Z) to describe and solve analog control systems, and the use of Boolean algebra to describe and solve binary control systems. Simulation is emphasized as an important tool for plant design, layout and optimizing manufacturing methods.
Prerequisites: 350 and MATH 210

420 Rapid Product Realization
Provides a basic understanding of computer-aided design and manufacturing (CAD/CAM) systems in modern manufacturing operations. Topics covered include solid modeling, computer simulation, and implementation of CAD/CAM systems.
Prerequisites: 171 and junior standing

430 Applications of Thermodynamics
Introduction to principle industrial applications of thermodynamics. The course will cover theory of operation and design considerations of these systems as well as examples of thermodynamic engineering design. Topics include heating, ventilation, and air conditioning systems (HVAC), engines, and turbomachinery.
Prerequisite: 382

440 Design with Plastics
The student will learn about the most common plastic compositions in industry along with their respective applications; understand the difference between injection and vacuum molding and what to look for using either; be able to match plastics with molding technology; learn about environmental and recycling issues surrounding the plastics industry.
Prerequisites: 171 and 370

450 Vibration and Control Theory
This course offers fundamentals in the theory of vibrations and control of mechanical systems. The topics related to vibration include undamped and damped free vibration, forced vibration or continuous systems. The topics related to control theory include modeling of dynamic systems (mechanical, electrical, hydraulic, pneumatic and thermal), analysis of continuous time and discrete time systems, feedback control systems, and graphical design methods.
Prerequisite: 410

460 Engineering Economics and Project Management
A practical look at the daily activities (including cost analysis and scheduling) and challenges of project managers in an engineering setting. Significant time will be devoted to personnel related topics such as conflict resolution, time management and leadership.

470 Fundamentals of Mechatronic Engineering I
Introduction to basic electronic devices and microprocessor systems for measurements and control; electronic circuits; amplifiers; filters; logic gates and sequential logic applications: A/D and D/A conversion and interfacing; transducers; controllers; motors and actuators; microprocessor fundamentals and programming; data acquisition and feedback control.
Prerequisite: 410

475, 476, 477, 478 Experiential Learning
See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

480 Engineering Design Clinic I
Serves as the first capstone course. Student design teams, under the direction of a faculty coordinator, will develop engineering solutions to practical, open-ended design projects conceived to demonstrate the value of prior basic science and engineering courses. Ethical, social, economic and safety issues in engineering practice will be considered as well.
Prerequisites: Senior standing and permission of instructor

481 Engineering Design Clinic II
The final capstone course for the application of previously learned engineering principles to the solution of real problems in an actual industrial setting. Student design teams will work under the direction of faculty advisers and industry liaisons. Opportunity will be provided for objective formulation, analysis, synthesis and evaluation of alternative solutions.
Prerequisite: 480

483, 484, 485, 486 Seminar
See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

487, 488, 489, 490 Topics
The subject matter of these courses, announced in the annual *Class Schedule*, will vary from year to year, but will not duplicate existing courses. See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

491, 492, 493, 494 Research
See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

495, 496, 497, 498 Individual Study
See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

English (ENGL)

Mikolajczak (chair), An, Bellamy, Callaway, Chowdhury, Clermont-Ferrand, Craft-Fairchild, Erdrich, Foy, Jordan, Larson, MacKenzie, May, L. Miller, R. Miller, O'Connor, O'Reilley, Otto, Piorkowski, Powell, Redshaw, Reichardt, Ringnalda, Scheiber, Scheurer, Warren, Wellisch

The aims of the department are to:

- help students gain mature skills in thinking, reading and writing;
- extend to all interested students, regardless of their major, the opportunity for the self-enrichment which a study of language and literature affords;
- provide students with a solid foundation for graduate study in English and other professional fields such as the law, the teaching of English in secondary and middle schools, and all careers that place heavy emphasis on analysis and communication.

To attain these goals, the major and minor programs outlined below focus on the different methodologies and approaches to the study of language, literature and writing while allowing students to pursue areas of particular interest.

The Department of English offers three emphases. They appear below in order of restrictiveness, from the least to the most.

1. The general major that allows students to take a variety of literature courses and to incorporate writing and cultural studies into their programs;
2. The writing emphasis that takes students through a graduated sequence of writing coursees (200/300/400) built upon a foundation of literature courses. Students seeking this major should plan a schedule that allows for a 400-level course so as to get the best advantage of the program;
3. The Minnesota teacher licensure program in Communication Arts and Literature that prepares students for teaching elementary, middle, and secondary school. This program requires courses in linguistics, literature, writing, and writing pedagogy. It requires, therefore, early and careful planning. Students completing this program may complete a major in English.

Students graduating with a major in English will be able to write thoughtfully about literature and life, in forms that range from engaged responses, to close readings of primary texts, to critical papers using secondary sources. They will understand and practice writing as a process that involves substantial revision and be able to reflect thoughtfully upon the writing process that works best for them. They will demonstrate broad knowledge of American and British literature.

All students majoring in English must take a minimum of sixteen credits in English courses at the 200-level or above at St. Thomas.

All students minoring in English must take a minimum of eight credits in English courses at the 200-level or above at St. Thomas.

The department offers courses for non-majors to fulfill the Literature and Writing component of the core curriculum.

English Honor Society
Sigma Tau Delta, the national English honor society, formed a chapter at St. Thomas in 1988. The honor society brings together students and faculty with a love of literature, language and writing; it sponsors a variety of scholarships, holds regional and national conventions, and provides a forum for both creative and critical writing. Students who have a grade point average of at least 3.0 in English courses, rank at least in the highest 35 percent of their class in general scholarship, and who have completed at least three semesters of college are eligible to apply for membership.

Major in English

111 Critical Reading and Writing I: Fiction and Nonfiction Prose
112 Critical Reading and Writing II: Drama and Poetry
Qualified students may substitute 190 plus an additional upper-level course for 111 and 112
380 Issues in English Studies