Duluth Campus

Industrial Engineering B.S.I.E.

UMD Mechanical/Industrial Engineering

Swenson College of Science and Engineering

- Program Type: Baccalaureate
- Requirements for this program are current for Fall 2015
- Required credits to graduate with this degree: 129 to 132
- Required credits within the major: 117 to 120
- Degree: Bachelor of Science in Industrial Engineering

The mission of the bachelor of science in industrial engineering program is to deliver a hands-on, laboratory-intensive undergraduate education that provides students with the tools and skills to excel in the profession as they pursue lifelong learning and make positive contributions to society. With an emphasis on integrated systems and a strategic partnership with Lulea University of Technology in Sweden, the B.S.I.E. program offers unique opportunities for study abroad, undergraduate research, and technical electives to develop an enhanced global perspective.

The educational objectives of the industrial engineering program are to produce graduates who are able to:

1. Solve industrial engineering problems by applying contemporary engineering tools to propose and implement effective solutions.

2. Design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and energy.

3. Contribute as informed, ethical, and responsible members of the engineering profession and society as a whole.

4. Continue lifelong professional development throughout their career.

5. Collaborate and communicate effectively with others as a member or leader of an engineering or multidisciplinary team in an international setting.

Industrial engineering integrates topics from manufacturing, management, service, and traditional design. Industrial engineers are proficient in the design, improvement, and management of complex systems of people, materials, equipment, and energy. They study and adapt product designs and the associated plant facilities to optimize production, while considering economic, technical, and human factors.

The curriculum rounds out the learning experience by providing skills in the mathematical and physical sciences, economics, composition, and humanities and social sciences.

The industrial engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

The industrial and systems engineering concentration emphasizes the overall perspective of people and productivity in any type of system, including manufacturing, service, health care, transportation, communication, and agriculture. The international engineering concentration offers a unique opportunity to study engineering in another culture; space is limited. Courses are taught in English and opportunities for travel and externally-focused projects abound. This concentration requires a senior year exchange with the Department of Materials and Manufacturing Engineering at Lulea University of Technology in Sweden and provides students with the opportunity to experience engineering in the global community.

Honors Requirements: To graduate with department honors, a student must graduate with a 3.40 GPA, be an active member of Tau Beta Pi or a professional engineering society (ASME, ASSE, IIE, MSPE, SME or SWE), and be nominated by a department faculty member.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

Freshman and transfer students students are usually admitted to pre-major status before admission to this major

Freshman, sophomores, and transfer students may declare an IE major and be admitted to lower division status. Admission to upper division B.S.I.E. program is competitive and based on performance in lower division courses and space availability. To be considered, students must complete the MIE Application to Upper Division. The following requirements must be met:

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1. Completion of the following courses or their transfer equivalents:
- WRIT 1120
- CS 1121 or 1411 or 1511 or 2121
- ENGR 1222
- CE 2017
- ME 2105
- MATH 3280

2. A minimum cumulative University of Minnesota, Duluth GPA of 2.50

Applicants not meeting these requirements may be admitted to the upper division B.S.I.E. program on a space-available basis with priority determined by cumulative University of Minnesota, Duluth GPA.

For information about University of Minnesota admission requirements, visit the Office of Admissions website.

General Requirements

The Board of Regents, on recommendation of the faculty, grants degrees from the University of Minnesota. Requirements for an undergraduate degree from University of Minnesota Duluth include the following:

1. Students must meet all course and credit requirements of the departments and colleges or schools in which they are enrolled including an advanced writing course. Students seeking two degrees must fulfill the requirements of both degrees. However, two degrees cannot be awarded for the same major.
2. Students must complete all requirements of the Liberal Education Program.
3. Students must complete a minimum of 120 semester credits.
4. At least 30 of the last 60 degree credits earned immediately before graduation must be awarded by UMD.
5. Students must complete at least half of their courses at the 3xxx-level and higher at UMD. Study-abroad credits earned through courses taught by UM faculty and at institutions with which UMD has international exchange programs may be used to fulfill this requirement.
6. If a minor is required, students must take at least three upper division credits in their minor field from UMD.
7. The minimum cumulative UM GPA required for graduation will be 2.00 and will include only University of Minnesota coursework. A minimum UM GPA of 2.00 is required in each UMD undergraduate major and minor. No academic unit may impose higher grade point standards to graduate.
8. Diploma, transcripts, and certification will be withheld until all financial obligations to the University have been met.

Program Requirements

1. Students must be accepted to the upper division BSIE program and either the Industrial and System Engineering or International Engineering sub-plan and must be in good academic standing.

BSIE upper division students placed on academic probation will also be removed from upper division BSIE status and will not be readmitted to BSIE upper division until they achieve good academic standing with the University.

Program Sub-plans

Students are required to complete one of the following sub-plans.

Industrial and Systems Engineering Program

The industrial and systems engineering concentration emphasizes the overall perspective of people and productivity in any type of system, including manufacturing, service, health care, transportation, communication, and agriculture. Concentration electives allow students to study systems of interest to them.

Industrial and Systems Engineering Core Courses (49 cr)

Required courses include fundamental material in engineering science, engineering management, industrial engineering, and mechanical engineering. Concepts are delivered in lecture and reinforced in lab experiences.

EMGT 4110 - Engineering Professionalism and Practice (2.0 cr)
ENGR 1210 - Introduction to Engineering (2.0 cr)
ENGR 1222 - Introduction to Solid Modeling (2.0 cr)
IE 3115 - Operations Research (4.0 cr)
IE 3122 - Materials Engineering Laboratory (2.0 cr)
IE 3125 - Engineering Economic Analysis [SOC SCI] (3.0 cr)

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IE 3130 - Materials Processing Engineering (3.0 cr)
IE 3140 - Human Factors and Ergonomic Design (3.0 cr)
IE 3222 - Occupational Systems Laboratory (2.0 cr)
IE 4010 - Six Sigma Quality Control (3.0 cr)
IE 4020 - Lean Production Management (3.0 cr)
IE 4115 - Facility Planning and Simulation (4.0 cr)
IE 4222 - Systems Integration Laboratory (2.0 cr)
IE 4230 - Systems Integration (3.0 cr)
IE 4255 - Multidisciplinary Senior Design (4.0 cr)
IE 4993 - Industrial Engineering Seminar (1.0 cr)
ME 2105 - Introduction to Material Science for Engineers (3.0 cr)
ME 2226 - Dynamics (3.0 cr)

Industrial and Systems Engineering Electives (3 cr)

These courses help an industrial engineer develop systems skills in technical areas. (Cannot count credits from other requirement categories.)

Take 3 or more credit(s) from the following:

- IE 4495 - Special Topics: (Various Titles to be Assigned) (1.0 - 4.0 cr)
- IE 5305 - Supply Chain Management (3.0 cr)
- IE 5315 *{Inactive}*(3.0 cr)
- IE 5325 - Advanced Engineering Economics (3.0 cr)
- IE 5335 *{Inactive}*(3.0 cr)

Computer Science Electives (3 cr)

Take 1 or more course(s) from the following:

- CS 1121 - Introduction to Programming in Visual BASIC.NET [LE CAT, LOGIC & QR] (3.0 cr)
- CS 1411 - Introduction to Programming in Matlab (4.0 cr)
- CS 1511 - Computer Science I [LE CAT] (5.0 cr)
- CS 1581 - Honors: Computer Science I [LE CAT] (5.0 cr)
- CS 2121 *{Inactive}*[LE CAT, LOGIC & QR] (3.0 cr)

Additional Electives (9 cr)

(Cannot count credits from other requirement categories.)

Take 3 or more course(s) totaling 9 or more credit(s) from the following:

- CHE 2111 - Material and Energy Balances (3.0 cr)
- CS 1521 - Computer Science II (5.0 cr)
- EE 1315 - Digital Logic (4.0 cr)
- EE 2111 - Linear Systems and Signal Analysis (4.0 cr)
- EE 2212 - Electronics I (4.0 cr)
- EE 2325 - Microprocessor Systems (4.0 cr)
- EE 3151 - Control Systems (4.0 cr)
- EE 5995 - Special Topics: (Various Titles to be Assigned) (1.0 - 3.0 cr)
- IE 4196 - Cooperative Education I (1.0 cr)
- IE 4296 - Cooperative Education II (2.0 cr)
- IE 4491 - Independent Study (1.0 - 4.0 cr)
- IE 4495 - Special Topics: (Various Titles to be Assigned) (1.0 - 4.0 cr)
- IE 4993 - Industrial Engineering Seminar (1.0 cr)
- IE 5305 - Supply Chain Management (3.0 cr)
- IE 5315 *{Inactive}*(3.0 cr)
- IE 5325 - Advanced Engineering Economics (3.0 cr)
- IE 5335 *{Inactive}*(3.0 cr)
- IE 5991 - Independent Study in Industrial Engineering (1.0 - 4.0 cr)
- MATH 3298 - Calculus III (4.0 cr)
- MATH 3355 - Discrete Mathematics (4.0 cr)
- ME 2211 - Thermodynamics [SUSTAIN] (3.0 cr)
- ME 3010 - Fundamentals of Machining and Manufacturing (3.0 cr)
- ME 3140 - System Dynamics and Control (3.0 cr)
- ME 4135 - Robotics and Controls (3.0 cr)
- ME 4145 - CAD/CAM (4.0 cr)
- ME 4175 - Machine Design (3.0 cr)
- ME 4365 - Global Sustainability Experience in Design/Manufacturing in Africa (3.0 cr)
- ME 4495 - Special Topics: (Various Titles to be Assigned) (1.0 - 4.0 cr)
- ME 5315 - Nondestructive Evaluation of Engineering Materials (3.0 cr)
- ME 5325 - Sustainable Energy System (3.0 cr)
- MGTS 4472 - Entrepreneurship (3.0 cr)
- STAT 5411 - Analysis of Variance (3.0 cr)
- STAT 5511 - Regression Analysis (3.0 cr)
- ME 3111 - Fluid Mechanics (3.0 cr)

or CHE 3111 - Fluid Mechanics (3.0 cr)

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Courses From Other Programs (53 cr)

These courses help engineers develop a foundation of mathematics, sciences, economics, statistics, and communication skills.

Business

BLAW 2001 - The Legal Environment [LE CAT8, HUMANITIES] (3.0 cr)

Communication

COMM 1112 - Public Speaking [LE CAT, COMM & LAN] (3.0 cr)

Chemistry

CHEM 1153 - General Chemistry I [LE CAT, NAT SCI] (4.0 cr)
CHEM 1154 - General Chemistry Lab I [LE CAT, NAT SCI] (1.0 cr)

Economics

ECON 1022 - Principles of Economics: Macro [LE CAT, SOC SCI] (3.0 cr)
or ECON 1023 - Principles of Economics: Micro [LE CAT, SOC SCI] (3.0 cr)

Engineering

CE 2017 - Engineering Mechanics: Statics and Mechanics of Materials (5.0 cr)
EE 2006 - Electrical Circuit Analysis (4.0 cr)

Mathematics

MATH 1296 - Calculus I [LE CAT, LOGIC & QR] (5.0 cr)
or MATH 1596 *{Inactive}*[LE CAT2, LOGIC & QR] (5.0 cr)
MATH 1297 - Calculus II [LOGIC & QR] (5.0 cr)
or MATH 1597 *{Inactive}*[LOGIC & QR] (5.0 cr)
MATH 3280 - Differential Equations with Linear Algebra (4.0 cr)
STAT 3411 - Engineering Statistics (3.0 cr)

Physics I

PHYS 2013 - General Physics I [LE CAT, NAT SCI] (4.0 cr)
or PHYS 2017 - Honors: General Physics I [NAT SCI] (4.0 cr)
PHYS 2014 - General Physics Lab I [NAT SCI] (1.0 cr)

Physics II

PHYS 2015 - General Physics II (4.0 cr)
PHYS 2016 - General Physics Lab II (1.0 cr)

Writing

WRIT 3130 is preferred
Take 1 or more course(s) from the following:
- WRIT 3130 - Advanced Writing: Engineering (3.0 cr)
- WRIT 3150 - Advanced Writing: Science (3.0 cr)
- WRIT 3180 - Honors: Advanced Writing (3.0 cr)

International Engineering

The international engineering concentration offers a unique opportunity to study engineering in another culture. Space is limited. Courses are taught in English, and opportunities for travel and externally-focused projects abound.

Final Project: Students taking the senior year at Lulea University of Technology must take its equivalent capstone design course.

International Engineering Core Courses (33 cr)

Required courses include fundamental material in engineering science, industrial engineering, and mechanical engineering. Courses in Sweden build on these fundamentals, frequently in the context of significant projects.

ENGR 1210 - Introduction to Engineering (2.0 cr)
ENGR 1222 - Introduction to Solid Modeling (2.0 cr)
IE 3115 - Operations Research (4.0 cr)
IE 3122 - Materials Engineering Laboratory (2.0 cr)
IE 3125 - Engineering Economic Analysis [SOC SCI] (3.0 cr)
IE 3130 - Materials Processing Engineering (3.0 cr)
IE 3140 - Human Factors and Ergonomic Design (3.0 cr)
IE 3222 - Occupational Systems Laboratory (2.0 cr)
IE 4010 - Six Sigma Quality Control (3.0 cr)
IE 4020 - Lean Production Management (3.0 cr)
ME 2105 - Introduction to Material Science for Engineers (3.0 cr)
ME 2226 - Dynamics (3.0 cr)

Industrial Engineering Elective (3 cr)

Take 1 or more course(s) totaling 3 or more credit(s) from the following:
- CHE 2111 - Material and Energy Balances (3.0 cr)
- CS 1521 - Computer Science II (5.0 cr)
- EE 1315 - Digital Logic (4.0 cr)
- EE 2111 - Linear Systems and Signal Analysis (4.0 cr)
- EE 2212 - Electronics I (4.0 cr)
- EE 2325 - Microprocessor Systems (4.0 cr)
- EE 3151 - Control Systems (4.0 cr)

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•EE 5995 - Special Topics: (Various Titles to be Assigned) (1.0 - 3.0 cr)
•IE 4196 - Cooperative Education I (1.0 cr)
•IE 4296 - Cooperative Education II (2.0 cr)
•IE 4491 - Independent Study (1.0 - 4.0 cr)
•IE 4495 - Special Topics: (Various Titles to be Assigned) (1.0 - 4.0 cr)
•IE 4993 - Industrial Engineering Seminar (1.0 cr)
•IE 5305 - Supply Chain Management (3.0 cr)
•IE 5315 *{Inactive}*(3.0 cr)
•IE 5325 - Advanced Engineering Economics (3.0 cr)
•IE 5335 *{Inactive}*(3.0 cr)
•IE 5991 - Independent Study in Industrial Engineering (1.0 - 4.0 cr)
•MATH 3298 - Calculus III (4.0 cr)
•MATH 3355 - Discrete Mathematics (4.0 cr)
•ME 2211 - Thermodynamics [SUSTAIN] (3.0 cr)
•ME 3010 - Fundamentals of Machining and Manufacturing (3.0 cr)
•ME 3140 - System Dynamics and Control (3.0 cr)
•ME 4135 - Robotics and Controls (3.0 cr)
•ME 4145 - CAD/CAM (4.0 cr)
•ME 4175 - Machine Design (3.0 cr)
•ME 4365 - Global Sustainability Experience in Design/Manufacturing in Africa (3.0 cr)
•ME 4495 - Special Topics: (Various Titles to be Assigned) (1.0 - 4.0 cr)
•ME 5315 - Nondestructive Evaluation of Engineering Materials (3.0 cr)
•ME 5325 - Sustainable Energy System (3.0 cr)
•MGTS 4472 - Entrepreneurship (3.0 cr)
•STAT 5411 - Analysis of Variance (3.0 cr)
•STAT 5511 - Regression Analysis (3.0 cr)
•ME 3111 - Fluid Mechanics (3.0 cr)
or CHE 3111 - Fluid Mechanics (3.0 cr)

Computer Science Electives (3 cr)

Take 1 or more course(s) from the following:
•CS 1121 - Introduction to Programming in Visual BASIC.NET [LE CAT, LOGIC & QR] (3.0 cr)
•CS 1411 - Introduction to Programming in Matlab (4.0 cr)
•CS 1511 - Computer Science I [LE CAT] (5.0 cr)
•CS 1581 - Honors: Computer Science I [LE CAT] (5.0 cr)
•CS 2121 *{Inactive}*[LE CAT, LOGIC & QR] (3.0 cr)

Courses From Other Programs (50 cr)

These courses help engineers develop a foundation of mathematics, sciences, economics, statistics, and communication skills. International engineering emphasizes the culture, historical perspective, and current events and issues in a foreign setting.

Business

BLAW 2001 - The Legal Environment [LE CAT8, HUMANITIES] (3.0 cr)

Chemistry

CHEM 1153 - General Chemistry I [LE CAT, NAT SCI] (4.0 cr)
CHEM 1154 - General Chemistry Lab I [LE CAT, NAT SCI] (1.0 cr)

Economics

ECON 1022 - Principles of Economics: Macro [LE CAT, SOC SCI] (3.0 cr)
or ECON 1023 - Principles of Economics: Micro [LE CAT, SOC SCI] (3.0 cr)

Engineering

CE 2017 - Engineering Mechanics: Statics and Mechanics of Materials (5.0 cr)
EE 2006 - Electrical Circuit Analysis (4.0 cr)

Mathematics

MATH 1296 - Calculus I [LE CAT, LOGIC & QR] (5.0 cr)
or MATH 1596 *{Inactive}*[LE CAT2, LOGIC & QR] (5.0 cr)
MATH 1297 - Calculus II [LOGIC & QR] (5.0 cr)
or MATH 1597 *{Inactive}*[LOGIC & QR] (5.0 cr)
MATH 3280 - Differential Equations with Linear Algebra (4.0 cr)
STAT 3411 - Engineering Statistics (3.0 cr)

Physics I

PHYS 2013 - General Physics I [LE CAT, NAT SCI] (4.0 cr)
or PHYS 2017 - Honors: General Physics I [NAT SCI] (4.0 cr)
PHYS 2014 - General Physics Lab I [NAT SCI] (1.0 cr)

Physics II

PHYS 2015 - General Physics II (4.0 cr)
PHYS 2016 - General Physics Lab II (1.0 cr)

Writing

WRIT 3130 is preferred.
Take 1 or more course(s) from the following:

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- WRIT 3130 - Advanced Writing: Engineering (3.0 cr)
- WRIT 3150 - Advanced Writing: Science (3.0 cr)
- WRIT 3180 - Honors: Advanced Writing (3.0 cr)

Courses Taken in Lulea Sweden (31 cr)

SX001S - Swedish for Beginners (3 cr) transfers as LANG 1101 which fulfills Oral Communication & Languages
Simulation of production systems (4 cr)
Automation (4 cr)
CAD (4 cr)
Intergrated manufacturing systems (8 cr)
Approved technical, manufacturing, or business electives (8 cr)

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