BACHELOR OF ENGINEERING IN INDUSTRIAL AND SYSTEMS ENGINEERING

Welcome to the Youngstown State University (YSU) Industrial & Systems Engineering program webpage. We offer a Bachelor of Engineering (BE) degree in Industrial & Systems Engineering. This program offers a strong background in mathematics, the sciences, management principles, and principles of engineering analysis and design. Also, in addition to receiving a quality education in this program, many students participate in co-op or internship job assignments during their time with us, making them highly marketable upon completion of their degrees. Graduates of the program enjoy placement in many areas of the diverse industrial engineering job market.

I hope that you find this webpage informative. If you have any additional questions, please contact me.

Martin Cala, Ph.D., P.E.
Professor and Program Coordinator
Department of Mechanical, Industrial and Manufacturing Engineering
Phone: (330) 941-1746
E-mail: mcala@ysu.edu
(330) 941-3016

The industrial and systems engineer functions as a problem-solver, innovator, coordinator, and agent of change in a wide variety of positions in manufacturing industries, service industries, and government. The industrial and systems engineer’s unique background combines a study of science, mathematics, and management principles with the principles of engineering analysis and design to provide access to a wide variety of flexible technical and managerial careers.

The aim of the industrial and systems engineering program is to produce graduates who secure professional engineering positions, practice the profession ethically and effectively, maintain their professional competency through lifelong learning, and advance in one of the many technical and managerial career paths available to industrial and systems engineers.

The program prepares its students for these accomplishments by providing them with a broad scientific and engineering base via courses in mathematics, physics, chemistry, and the engineering sciences. In addition, courses in the social sciences and the humanities develop sensitivity to the social context within which the profession must be ethically practiced. Finally, industrial and systems engineering courses in the areas of manufacturing systems, human machine systems, management systems, and management science develop the technical expertise required by professional practice.

Program Educational Objectives

The industrial and systems engineering program at Youngstown State University is committed to offering its students a high standard of educational training. In fulfillment of its mission, as well as the missions of the College of STEM and the University, the program has established educational objectives that ensure graduating engineers have the educational knowledge and skills to practice industrial engineering effectively. The objectives of the Industrial and Systems Engineering Program are for our graduates to be:

- Professionals who are technically competent in modern industrial engineering based careers, as well as other emerging disciplines.
- World citizens who exhibit leadership qualities in their chosen disciplines, and who pursue continuing education through advanced degrees, certifications, licensure, etc.
- Active contributors to their professions, industries and/or communities.

Program Student Outcomes

To achieve the program educational objectives, our students are expected to have attained the required professional, technical, and social experience in the program with the ability to:

1-1. Apply knowledge of mathematics, science, and engineering science to solve engineering problems.
1-2. Utilize their design knowledge, skills, and technical experience to practice engineering.
1-3. Incorporate design of experiments with engineering analysis and design.
1-4. Use design techniques to design systems, components, and processes that satisfy predetermined economic, environmental, manufacturability, ethical, social, health, and safety constraints.
1-5. Recognize technical problems, develop ideas and formulate methods to determine acceptable solutions.
2-1. Work as a member of an engineering team in industrial engineering practice.
2-2. Accept project responsibilities and use problem solving skills.
2-3. Understand their professional roles and ethical responsibilities in the engineering profession and society.
3-1. Communicate their ideas and the application of engineering skills orally and/or in writing.
3-2. Understand the global impact of engineering solutions on societal needs.
3-3. Understand that the technology is constantly changing and industrial engineers must upgrade their knowledge in conjunction with the technological changes.
4-1. Recognize the importance of professional development through involvement and leadership in technical societies such as the IIE.
4-2. Have the broad knowledge to understand contemporary issues pertaining to the interaction between technology and society.

Industrial and Systems Engineering Annual Enrollment and Graduation Data

The Industrial and Systems Engineering BE Program has been accredited by the engineering accreditation commission of ABET, http://www.abet.org

- The last campus visit by ABET was on October 27-29, 2013.
- The next campus visit by ABET will be in the 2019-2020 academic year.

<table>
<thead>
<tr>
<th>Term</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2012</td>
<td>35</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>40</td>
</tr>
<tr>
<td>Fall 2014</td>
<td>38</td>
</tr>
<tr>
<td>Fall 2015</td>
<td>46</td>
</tr>
<tr>
<td>Fall 2016</td>
<td>54</td>
</tr>
</tbody>
</table>
Industrial and Systems Engineering Laboratories

The industrial and systems engineering laboratory spaces are located in Moser Hall and are equipped with hardware, software and networks to serve experiences within the curriculum that are hands on, team based, and communications or computational intensive. Laboratory experiences develop capabilities to design detailed components and to integrate solutions into large scale systems. Successively more challenging assignments are taken on throughout the curriculum and culminate in comprehensive experiences in the capstone facilities design sequence.

The industrial and systems engineering program makes optimum use of the Engineering Computing Complex, which is equipped with state-of-the-art computation, design, and communication hardware and software of a multi-disciplinary nature.

The ISE Project Laboratory is focused on team-based activities throughout the curriculum and particularly serves the methods engineering, human factors engineering and facilities design areas. At its core is a network of computing stations equipped with modern industrial and systems engineering software. Data collection and processing software supports video analysis of human performance, workspace and manufacturing cell design, facility layout, flow analysis and line balancing. The goal of this laboratory is to be able to cover any topic from the planning of initial resources for a start-up enterprise to the distribution of goods and services in global networks.

The Automation Laboratory Suite is a collection of spaces where students at all levels can learn and achieve together with an opportunity to make sustainable contributions to an initial or on-going project experience. It encompasses programmable robots, programmable logic controllers, vibratory bowl feeders, reciprocating feeders, power conveyors and numerous actuator and sensing devices.

The Manufacturing Laboratory Suite consists of several spaces containing equipment for rapid prototyping, casting processes, plastic injection molding and blow molding processes, CNC machining processes, sheet metal processing and instrumentation for inspection, measurement, and testing.

For more information, visit Industrial And Systems Engineering (http://www.ysu.edu/academics/science-technology-engineering-mathematics/industrial-and-systems-engineering-major).

Cooperative Education

The industrial and systems engineering program strongly encourages its students to actively participate in the optional cooperative education program. The parallel co-op arrangement which combines work and study each semester is recommended. However, full-time employment in the summer can also be included. Students must register for a co-op course and submit documentation as specified by professional practice office. Currently a substitution of one elective course with three co-op experiences is allowed.
Bachelor of Engineering in Industrial and Systems Engineering

CEEN 2601 Statics 3
ECEN 2614 Basics of Electrical Engineering 3
MECH 2641 Dynamics 3

STEM Elective 4

STEM Recommended Electives:
MECH 1560 Engineering Communication with CAD 2
MECH 2606 Engineering Materials 3
CSIS 2610 Programming and Problem-Solving 4
ISEN 5811L Manufacturing Practices I Laboratory 1

Mathematics Courses
MATH 1571 Calculus 1 4
MATH 1572 Calculus 2 4
MATH 2673 Calculus 3 4
Math Elective 3
MATH 3705 Differential Equations 3 or MATH 3720 Linear Algebra and Matrix Theory 3

Science Courses
CHEM 1515 General Chemistry 1 4
PHYS 2610 General Physics 1 4
PHYS 2611 General Physics 2 4
Science Elective 3

Total Semester Hours Required 120

Recommended GER Electives
PHIL 1561 Technology and Human Values 3
PHIL 2626 Engineering Ethics 3
SOC 1500 Introduction to Sociology 3
PSYC 1560 General Psychology 3
FNUT 1551 Normal Nutrition 3
COUN 1587 Introduction to Health and Wellness in Contemporary Society 3

Year 1
Fall 3-4
ENGL 1550 or ENGL 1549 Writing 1 or Writing 1 with Support
or Writing 1 with Support
or Writing 1 with Support
MATH 1571 Calculus 1 4
CHEM 1515 General Chemistry 1 & 1515L and General Chemistry 1 Laboratory 4
ENGR 1500 Engineering Orientation 1
ENGR 1550 Engineering Concepts 2
Semester Hours 14-15

Spring
ENGL 1551 Writing 2 3
MATH 1572 Calculus 2 4
PHYS 2610 General Physics 1 4
ENGR 1560 Engineering Computing 2
Semester Hours 13

Year 2
Fall
ISEN 3710 Engineering Statistics 3
ISEN 3724 Engineering Economy 3
MATH 2673 Calculus 3 4
CSIS 2610 Programming and Problem-Solving (others with consent of Program Coordinator) 4
CMST 1545 Communication Foundations 3
Semester Hours 17

Spring
ISEN 3716 Systems Analysis and Design 3
ISEN 3736 Methods Engineering 3
& 3736L and Methods Engineering Laboratory 4
PHYS 2611 General Physics 2 4
CEEN 2601 Statics 3
GER Elective (SS) 3

Year 3
Fall
ISEN 3723 Manufacturing Processes 3
ISEN 3727 Simulation of Industrial Engineering Systems 3
ISEN 3745 Accounting for Engineers 3
ECEN 2614 Basics of Electrical Engineering (others with consent of Program Coordinator) 3
MECH 2641 Dynamics 3

Semester Hours 15

Spring
ISEN 3720 Statistical Quality Control 3
ISEN Elective 1 (Spring) 3
ISEN Elective 2 (Spring) 3
MATH Elective 3
GER Elective (SS) 3

Year 4
Fall
ISEN 4821 Capstone Design 1: Manufacturing and Service Systems 3
ISEN 5801 Operations Research 1 3
ISEN Elective 3 (Fall) 3
Science Elective 3
GER Elective (SPA) 3
Semester Hours 15

Spring
ISEN 4822 Capstone Design 2: Logistics Systems 3
ISEN Elective 4 (Spring) 3
GER Elective (SPA) 3
GER Elective (AH) 3
GER Elective (AH) 3

Semester Hours 15
Total Semester Hours 120-121

Required STEM and Electives

COURSE TITLE S.H.

Required Stem Hours
ENGR 1500 Engineering Orientation 1
ENGR 1550 Engineering Concepts 2
ENGR 1560 Engineering Computing 2
CSIS 2610 Programming and Problem-Solving 4
CEEN 2601 Statics 3
ECEN 2614 Basics of Electrical Engineering 3
MECH 2641 Dynamics 3
MECH 1560 Engineering Communication with CAD 2
MECH 2606 Engineering Materials 3

Recommended GER Electives
SOC 1500 Introduction to Sociology (SS) 3


**Student Outcomes**

The curriculum is structured to achieve the following outcomes as prescribed by ABET:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies