Department of Industrial & Management Systems Engineering

E-mail: Statler-IMSE@mail.wvu.edu (/wafik.iskander@mail.wvu.edu)

Degree Offered

- Bachelor of Science in Industrial Engineering (B.S.I.E.)

Nature of Program

Industrial engineering is the discipline of engineering concerned with the design, improvement, and installation of integrated systems of people, material, information, equipment, and energy to assure performance, reliability, maintainability, schedule adherence, and cost control. Industrial engineers look at the “big picture” of an operation or system and bridge the gap between management and operations. They deal with and motivate people as well as determine what tools should be used and how they should be used. Industrial engineers use computers and sophisticated software as tools to solve complicated problems to design, quantify, predict, and evaluate the performance of all types of complex technologies and systems.

The mission of the B.S.I.E. program at WVU is to advance the industrial engineering profession through innovative and high-quality academic programs, relevant research, and professional services that address the needs of West Virginia, the nation, and the world. The industrial engineering students at WVU are taught to draw upon specialized knowledge and skills in the mathematical, physical, and social sciences, together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems. They are introduced to state-of-the-art software in their coursework for data analysis, information management, scheduling, quality control, optimization, and other practices and procedures used by the industrial engineering profession in highly evolving industries of the 21st century.

The discipline of industrial engineering has a rich, ever-increasing diversity of applications. Traditionally, industrial engineers have been employed by manufacturing companies to do facilities and plant design, plant management, quality control, ergonomics, and production engineering. Today, however, industrial engineers are employed in almost any type of industry, business, or institution. Because of their skills, industrial engineers are more widely distributed and in greater demand among more industries than any other engineering discipline.

As an industrial engineer educated at WVU, you can expect to have employment opportunities in manufacturing companies, insurance companies, banks, hospitals, technical sales, pharmaceutical companies, retail organizations including e-business, airlines, government agencies, consulting firms, construction, transportation, public utilities, social service, electronics, digital and wireless communications, etc. The diverse orientation of industrial engineering, coupled with the skills and training you receive at WVU, make you a prime source of management talent that offers unique professional advancement opportunities.

The B.S.I.E. program at WVU devotes considerable attention to the individual needs of the student. It is committed to develop student strengths in technical abilities, personal development, problem solving, and practical experience, preparing them for careers in industry, business, government, or advanced professional degrees. One of the defining attributes in the success of the department is the dedication and talent of its faculty and staff. The aggregate careers of our faculty and staff represent over 300 years of service to students at WVU. In these 300 years of service are embodied the wisdom and experience to successfully prepare industrial engineers for the 21st century.

The faculty works extensively with nearly 300 sophomore, junior, and senior students in such areas as communication skills, personal growth and development, creation of summer internship opportunities, senior capstone project experience, and permanent job opportunities. As faculty and staff, we are committed to provide for our students:

- A friendly, open-door, collegial environment
- Personable faculty mentoring students
- Teaching concepts and techniques for today’s demands
- Quality courses that are innovative and challenging
- Placement in the jobs they want
- Notable life-long successes

The industrial engineering program is accredited by the Engineering Accreditation Commission (EAC) of ABET.

Program Educational Objectives

Drawing from the University’s mission, the departmental mission, the needs of our constituents, and ABET Engineering Criteria, the following educational objectives were developed. A graduate of the industrial engineering baccalaureate program will be prepared to:

- Practice industrial engineering and initiate and develop leadership roles in business, industry, and/or government.
- Continue professional development and life-long learning.
- Interact in society and business in a professional, ethical manner.
- Be proficient in written and oral communication and utilize people-oriented skills in individual and team environments.
- Apply the skills from industrial engineering to be proficient in his/her chosen field or graduate studies.

**Student Outcomes**

Upon graduation, all Bachelor of Science students in Industrial Engineering will have acquired the:

- Ability to use modern and classical industrial engineering methodologies such as operations research, manufacturing systems, computer programming and simulation, production systems, human factors and ergonomics, engineering statistics and quality control, and engineering economics
- Ability to apply knowledge of math, science, and general engineering
- Ability to design and conduct experiments, analyze and interpret data, develop implementation strategies, and shape recommendations so that results will be achieved and findings will be communicated effectively
- Ability to work individually, on teams, and on multi-disciplinary teams to identify, formulate, and solve problems using industrial engineering knowledge, skills, and tools
- Ability to design and implement or improve integrated systems that include people, materials, information, equipment, and energy using appropriate analytical, computational, and experimental practices
- Broad education necessary to develop and maintain professional ethics and understand the comprehensive impact of their solutions on individuals and the society
- Recognition of the need for and an ability to engage in life-long learning
- Professional characteristics expected of a successful industrial engineer

**FACULTY**

**CHAIR**
- Kenneth R Currie - Ph.D., P.E., (West Virginia University)
  Manufacturing systems design, Optimization, Automation & Controls, Healthcare Systems Engineering

**PROFESSORS**
- Rashpal S. Ahluwalia - Ph.D., P.E. (Western Ontario University)
  Manufacturing systems, Quality and reliability engineering, Robotics and automation
- Jack Byrd Jr. - Ph.D., P.E. (West Virginia University)
  Operations research, Workforce development, Work design, Integrated product development
- B. Gopalakrishnan - Ph.D., P.E., CEM (Virginia Polytechnic Institute and State University)
  Manufacturing processes and systems engineering, Information systems, Artificial intelligence applications, Expert systems development, Mechatronics, Facilities planning and materials handling, Databases, Industrial energy/waste productivity management
- Steven Guffey - Ph.D., C.I.H. (North Carolina State University)
  Ventilation systems theory and design, Noise measurement and control, Exposure assessment
- Wafik H. Iskander - Ph.D., P.E. (Texas Tech University)
  Operations research and optimization, Simulation modeling and analysis, Production planning and control, Applied statistics, Energy efficiency, Transportation planning
- Majid Jaridi - Ph.D. (University of Michigan)
  Statistics, Quality control, Forecasting and transportation research
- Warren R. Myers - Ph.D., C.I.H. (West Virginia University)
  Associate Dean for Academic Affairs. Industrial hygiene and safety, Worker exposure assessment and modeling, Aerosol filtration, Occupational respiratory protection design and testing
- Gary Winn - Ph.D. (Ohio State University)
  Construction safety, Transportation safety and program evaluation, Total quality management, Theory of paradigm shifts

**ASSOCIATE PROFESSORS**
- Alan McKendall Jr. - Ph.D. (University of Missouri - Columbia)
  Operations research, Meta-heuristics, Facilities layout and materials handling, Project scheduling, Integrated production systems
- Feng Yang - Ph.D. (Northwestern University)
  Simulation, Applied statistics, Stochastic Processes

**ASSISTANT PROFESSORS**
- Michael J. Klishis - Ph.D. (West Virginia University)
  Safe behaviors, Training and loss control, Instructional development, Mine safety and health
• Ashish Nimbarte - Ph.D. (Louisiana State University)
  Occupational biomechanics, Human factors engineering, Industrial ergonomics, Industrial hygiene, Occupational safety and health
• Xiaopeng Ning - Ph.D. (Iowa State University)
  Occupational safety and health, Occupational biomechanics, Human factors engineering, Industrial ergonomics

ADJUNCT AND VISITING PROFESSORS

• Lorenzo G. Cena - Ph.D. (University of Iowa)
  Occupational health and safety, Aerosol generation and characterization, Exposure assessment
• Christopher Coffey - Ph.D. (West Virginia University)
  Occupational Safety and Health, Assessment, Evaluation of Respiratory protective equipment
• Ren Dong - Ph.D. (Concordia University)
  Human Factors Engineering, Ergonomics, Safety engineering
• John R. Etherton - Ph.D. (West Virginia University)
  Safety engineering
• Martin Harper - Ph.D. (London School of Hygiene and Tropical Medicine)
  Industrial hygiene, Exposure assessment
• James Harris - Ph.D., P.E. (West Virginia University)
  Safety, Human factors
• Hongwei Hsiao - Ph.D. (University of Michigan)
  Safety, Human factors
• Kevin Michael - Ph.D. (The Pennsylvania State University)
  Acoustics, Hearing protection, Industrial hygiene
• Christopher Pan - Ph.D. (University of Cincinnati)
  Human factors engineering, Safety engineering, Ergonomics
  Industrial hygiene, Exposure assessment
• M. Abbas Virgi - Sc.D., C.I.H. (University of Massachusetts)
  Exposure assessment, Epidemiology, Biostatistics
• Ziqing Zhuang - Ph.D. (West Virginia University)
  Exposure assessment, Assessment and evaluation of respiratory protective equipment

LECTURERS

• Michael Carr - MSIE (West Virginia University)
  Decision support systems, Computer applications
• Kenton Colvin - MSIE (West Virginia University)
  Production planning and control, Manufacturing processes
• Daniel Kniska - MSIE (West Virginia University)
  Engineering economy, Statistics, Production planning and control

PROFESSOR EMERITUS

• Robert C. Creese - Ph.D., P.E. (Pennsylvania State University)
  Manufacturing processes/systems, foundry engineering, Cost engineering, Engineering economics
• Daniel E. Della-Giustina - Ph.D. (Michigan State University)
  Playground and recreation safety, Sport safety, Highway and traffic management, Safety, fire, and emergency response
• Ralph W. Plummer - Ph.D. (West Virginia University)
  Systems safety engineering, Energy conservation, Human factors, Ergonomics

ASSOCIATE PROFESSOR EMERITUS

• Andrew Sorine - Ph.D. (West Virginia University)
  Benchmarking, Safety and health programs, Safety management information systems

Curriculum in Industrial Engineering

GENERAL EDUCATION CURRICULUM

Please use this link to view a list of courses that meet each GEC requirement. (http://registrar.wvu.edu/current_students/general_education_curriculum)
NOTE: Some major requirements will fulfill specific GEC requirements. Please see the curriculum requirements listed below for details on which GECs you will need to select.

**General Education Curriculum**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101 &amp; ENGL 102</td>
<td>Composition and Rhetoric and Composition and Rhetoric</td>
<td>3-6</td>
</tr>
<tr>
<td>or ENGL 103</td>
<td>Accelerated Academic Writing</td>
<td></td>
</tr>
<tr>
<td>GEC 2A - Mathematics</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>GEC 2B - Natural and Physical Science</td>
<td></td>
<td>7-8</td>
</tr>
<tr>
<td>GEC 2C - Additional GEC 2A, B or C</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEC 3 - The Past and Its Traditions</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEC 4 - Issues of Contemporary Society</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEC 5 - Artistic Expression</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEC 6 - The Individual in Society</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEC 6F - First Year Seminar</td>
<td></td>
<td>1-3</td>
</tr>
<tr>
<td>GEC 7 - American Culture</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEC 8 - Western Culture</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEC 9 - Non-Western Culture</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td><strong>38-45</strong></td>
</tr>
</tbody>
</table>

**Curriculum Requirements**

To be eligible for graduation with a bachelor of science in industrial engineering, a student must meet the University’s undergraduate degree requirements, take all the courses indicated below, and attain a grade point average of 2.0 or better in all industrial engineering courses. If an industrial engineering is repeated, only the last grade received is used to compute the major grade point average, and the course credit hours are counted only once. This requirement assures that the student has demonstrated overall competence in the major.

**Non-Industrial Engineering Core**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ECON 201</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 202</td>
<td>Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 101</td>
<td>Engineering Problem Solving 1</td>
<td>2</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENGR 102</td>
<td>Engineering Problem-Solving 2</td>
<td></td>
</tr>
<tr>
<td>MAE 102</td>
<td>Introduction to Mechanical and Aerospace Engineering Design</td>
<td></td>
</tr>
<tr>
<td>CHE 102</td>
<td>Introduction to Chemical Engineering</td>
<td></td>
</tr>
<tr>
<td>ENGR 103</td>
<td>Introduction to Nanotechnology Design</td>
<td></td>
</tr>
<tr>
<td>ENGR 199</td>
<td>Orientation to Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>MATH 155</td>
<td>Calculus 1</td>
<td></td>
</tr>
<tr>
<td>or MATH 153 &amp; MATH 154</td>
<td>Calculus 1a with Precalculus and Calculus 1b with Precalculus</td>
<td></td>
</tr>
<tr>
<td>MATH 156</td>
<td>Calculus 2</td>
<td>4</td>
</tr>
<tr>
<td>MATH 251</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 261</td>
<td>Elementary Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 111</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>PHYS 112</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>CHEM 116</td>
<td>Fundamentals of Chemistry</td>
<td></td>
</tr>
</tbody>
</table>

**Major in Industrial Engineering Requirements**

A minimum GPA of 2.0 is required in all IENG courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 221</td>
<td>Introduction to Electrical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EE 222</td>
<td>Introduction to Electrical Engineering Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>IENG 200</td>
<td>Fundamentals of Industrial Engineering</td>
<td>1</td>
</tr>
<tr>
<td>IENG 213</td>
<td>Engineering Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>
IENG 220  Re-Engineering Management Systems  3
IENG 301  Materials and Costing  1
IENG 302  Manufacturing Processes  2
IENG 303  Manufacturing Processes Laboratory  1
IENG 305  Introduction to Systems Engineering  2
IENG 314  Advanced Analysis of Engineering Data  3
IENG 316  Industrial Quality Control  3
IENG 331  Computer Applications in Industrial Engineering  3
IENG 343  Production Planning and Control  3
IENG 350  Introduction to Operations Research  3
IENG 360  Human Factors Engineering  3
IENG 377  Engineering Economy  3
IENG 446  Plant Layout/Material Handling  3
IENG 455  Simulation by Digital Methods  3
IENG 471  Design of Productive Systems 1  3
IENG 472  Design of Productive Systems 2  3
MAE 241  Statics  3
MAE 243  Mechanics of Materials  3
IENG Technical Electives (Any 400 and 500 level IENG courses)  6
MAE Elective - Choose one of the following:  3
  MAE 242  Dynamics
  MAE 320  Thermodynamics
  MAE 331  Fluid Mechanics
Additional Technical Elective - Choose one of the following:  3
  CE 347  Introduction to Environmental Engineering
  CE 414  Construction Engineering
  CS 430  Advanced Software Engineering
  CS 440  Database Design and Theory
  EE 425  Bioengineering
  EE 426  Biometric Systems
  GEOG 350  Geographic Information Systems and Science
IENG 400 level courses
IENG 500 level courses
IH&S 500 level courses
  MAE 242  Dynamics
  MAE 320  Thermodynamics
  MAE 331  Fluid Mechanics
  MAE 427  Heating, Ventilating, and Air Conditioning
  MATH 343  Introduction to Linear Algebra
  MATH 420  Numerical Analysis 1
  MATH 441  Applied Linear Algebra
  SAFM 470  Managing Construction Safety
  STAT 421  Statistical Analysis System (SAS)
  STAT 541  Applied Multivariate Analysis
GEC Electives 1, 3, 5, 6, 7, 9 (Students who take ENGL 103 must take another Technical Elective course or department approved course)  21

Total Hours  129

**Suggested Plan of Study**

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical B.S.I.E. degree program that completes degree requirements in four years is as follows.
### First Year

<table>
<thead>
<tr>
<th>Fall Hours</th>
<th>Spring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 155 (GEC 2A)</td>
<td>4 MATH 156 (GEC 2C)</td>
</tr>
<tr>
<td>ENGR 101</td>
<td>2 ENGR 102</td>
</tr>
<tr>
<td>ENGR 199 (GEC 6F)</td>
<td>1 PHYS 111 (GEC 2B)</td>
</tr>
<tr>
<td>CHEM 115 (GEC 2B)</td>
<td>4 GEC Elective 5</td>
</tr>
<tr>
<td>ENGL 101 (GEC 1)</td>
<td>3 GEC Elective 6</td>
</tr>
<tr>
<td>GEC Elective 3</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total hours:**

- **Fall:** 17
- **Spring:** 17

### Second Year

<table>
<thead>
<tr>
<th>Fall Hours</th>
<th>Spring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 251</td>
<td>4 MATH 261</td>
</tr>
<tr>
<td>CHEM 116 or PHYS 112</td>
<td>4 MAE 243</td>
</tr>
<tr>
<td>MAE 241</td>
<td>3 IENG 213</td>
</tr>
<tr>
<td>ENGL 102 (GEC 1)</td>
<td>3 IENG 377</td>
</tr>
<tr>
<td>IENG 200</td>
<td>1 GEC Elective 7</td>
</tr>
<tr>
<td>IENG 220</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total hours:**

- **Fall:** 18
- **Spring:** 16

### Third Year

<table>
<thead>
<tr>
<th>Fall Hours</th>
<th>Spring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 201 (GEC 4)</td>
<td>3 ECON 202 (GEC 8)</td>
</tr>
<tr>
<td>IENG 301</td>
<td>1 IENG 302</td>
</tr>
<tr>
<td>IENG 314</td>
<td>3 IENG 303</td>
</tr>
<tr>
<td>IENG 305</td>
<td>2 IENG 316</td>
</tr>
<tr>
<td>IENG 350</td>
<td>3 IENG 331</td>
</tr>
<tr>
<td>IENG 360</td>
<td>3 IENG 343</td>
</tr>
</tbody>
</table>

**Total hours:**

- **Fall:** 15
- **Spring:** 15

### Fourth Year

<table>
<thead>
<tr>
<th>Fall Hours</th>
<th>Spring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 221</td>
<td>3 IENG 472</td>
</tr>
<tr>
<td>EE 222</td>
<td>1 IENG Technical Elective</td>
</tr>
<tr>
<td>IENG Technical Elective</td>
<td>3 IENG 446</td>
</tr>
<tr>
<td>IENG 455</td>
<td>3 MAE Elective</td>
</tr>
<tr>
<td>IENG 471</td>
<td>3 Technical Elective</td>
</tr>
<tr>
<td>GEC Elective 9</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total hours:**

- **Fall:** 16
- **Spring:** 15

**Total credit hours:** 129