

Department of Industrial & Management Systems Engineering

Degree Offered

- Bachelor of Science in Industrial Engineering (B.S.I.E.)
- Accelerated Bachelor's/Master's Program in Industrial Engineering

Nature of the 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 Bachelor of Science degree in Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, under the General Criteria and the Program Criteria for Industrial Engineering

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. Within a few years of graduation, an IE graduate...

- Creates value by applying the appropriate industrial engineering methods and tools to organizations through critical and creative thinking, structured problem solving, analysis, evaluation, and improvement of systems and processes.

- Communicates effectively across disciplines and cultures to influence decisions and lead activities in support of organizational goals and objectives.
- On a continual basis, pursues professional development and inquiry via graduate study, continuing education and/or training and development through employer-based or industry/sector groups.
- Works collaboratively as both a member and leader of cross-functional teams comprised of members with varying experience levels, organizational backgrounds, positions, and geographic locations.
- Demonstrates ethical standards in designing and implementing innovative systems or processes taking into account social responsibility, global responsibility, and overall benefit to organizational constituents.

FACULTY

CHAIR

- Ashish Nimbarte - Ph.D., P.E., C.P.E., C.E.M., C.ErgHF (Louisiana State University)
Occupational biomechanics, Human factors engineering, Industrial ergonomics, Industrial hygiene, Occupational safety and health, Energy efficiency and sustainability

PROFESSORS

- 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
- Ashish Nimbarte - Ph.D., P.E., C.P.E., C.E.M., C.ErgHF (Louisiana State University)
Occupational biomechanics, Human factors engineering, Industrial ergonomics, Industrial hygiene, Occupational safety and health, Energy efficiency and sustainability
- David Wyrick - Ph.D., P.E., C.P.E.M. (University of Missouri-Rolla)
Associate Dean for Academic Affairs, Engineering management, Engineering education, Effective management of technology in SMEs

ASSOCIATE PROFESSOR

- Alan McKendall Jr. - Ph.D. (University of Missouri - Columbia)
Operations research, Meta-heuristics, Facilities layout and materials handling, Project scheduling, Integrated production systems

ASSISTANT PROFESSORS

- JuHyeong Ruy - Ph.D. (University of Waterloo, Canada)
Occupational Safety & Health, Immersive safety training, AI-driven wearable risk assessment, Industrial ergonomics
- Avishek Choudhury - Ph.D. (Stevens Institute of Technology)
Human Factors, Artificial Intelligence, Occupational Safety & Health, Medical Informatics, Digital Health, Patient Safety
- Imtiaz Ahmed - Ph.D. (Texas A&M University)
Data science, Machine learning, Quality control and inventory management
- Zhichao Liu - Ph.D. (Texas Tech University)
Manufacturing processes, Metal additive manufacturing, Sustainable manufacturing
- Zeyu Liu - Ph.D. (The University of Tennessee, Knoxville)
Optimization, Markov models learning, and agent-based simulation

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
- Ju-Hyeong Park - Sc.D., M.P.H., C.I.H. (Harvard)
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

- Alvin Guthrie - B.S.I.E. (West Virginia University)
Operations management, Manufacturing systems, Production planning and control
- Daniel Kniska - M.S.I.E. (West Virginia University)
Engineering economy, Statistics, Production planning and control
- Ozan Ozbeker - B.S.I.E. (West Virginia University)
Data science and analytics, Data engineering

TEACHING ASSISTANT PROFESSOR

- Makenzie Keepers - Ph.D. (West Virginia University)
Capstone project design, Engineering education, Statistical analysis
- Omar Al-Shebeeb - Ph.D. (West Virginia University)
Manufacturing processes, Project management, Quality control, Facility layout
- Jeremy Gouzd - Ph.D., (West Virginia University)
Occupational safety and health, Risk assessment, Engineering safety

ADJUNCT INSTRUCTOR

- Jannette Perez Barbosa - M.S.I.E., P.E. (University of Puerto Rico-Mayaguez)
Project management, Lean six sigma
- Ronald Edward Giachetti - Ph.D. (North Carolina State University)
Engineering management, Systems engineering, Digital engineering
- Nelson F. Rekos - B.S.M.E. (University of Maryland), MBA (West Virginia University)
Project management, Materials science, Advanced energy systems, Government Contracting

PROFESSORS EMERITI

- Jack Byrd Jr. - Ph.D., P.E. (West Virginia University)
Operations research, Workforce development, Work design, Integrated product development
- Rashpal S. Ahluwalia - Ph.D., P.E. (Western Ontario University)
Manufacturing systems, Quality and reliability engineering, Robotics and automation
- 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
- Steven Guffey - Ph.D., C.I.H. (North Carolina State University)
Ventilation systems theory and design, Noise measurement and control, Exposure assessment
- Wafik 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 Myers - Ph.D., C.I.H. (West Virginia University)
Industrial hygiene and safety, Worker exposure assessment and modeling, Aerosol filtration, Occupational respiratory protection design and testing
- 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

CAREER & PROFESSIONAL MENTOR

- Philomena Krosmico - M.S.I.E. (West Virginia University)

RESEARCH ASSOCIATE

- Christopher Moore - Ph.D. (West Virginia University)
Energy efficiency and sustainability, Occupational safety and health

Degree Requirements

Students must meet the following criteria to qualify for a Bachelor of Science in Industrial Engineering degree:

- Complete a minimum of 129 credit hours
- Satisfy WVU's undergraduate degree requirements
- Satisfy Statler College's undergraduate degree requirements (<http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/#policies>)
- Complete all courses listed in the curriculum requirements with the required minimum grades
- Attain an overall grade point average of 2.00 or better
- Attain a WVU grade point average of 2.00 or better
- Attain a Statler grade point average of 2.00 or better
- A maximum of one math or science courses with a grade of D+, D, or D- may apply towards a Statler College degree
- Complete a survey regarding their academic and professional experiences at WVU, as well as post-graduation job placement or continuing education plans.

The Statler GPA is computed based on all work taken at WVU with a subject code within Statler College (BIOM, BMEG, CE, CHE, CPE, CS, CSEE, CYBE, EE, ENGR, ENVE, ETEC, IENG, IH&S, MAE, MINE, PDA, PNGE, SAFM, SENG) excluding ENGR 140, ENGR 150, and CS 101. The WVU GPA is computed based on all work taken at WVU. The Overall GPA is computed based on all work taken at WVU and transfer work.

Curriculum Requirements

Code	Title	Hours
University Requirements		16
Fundamentals of Engineering Requirements		5
Math and Science Requirements		28
Industrial Engineering Program Requirements		80
Total Hours		129

University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 5, 6, and 7		15
ENGR 191	First-Year Seminar	1
Total Hours		16

Fundamentals of Engineering Requirements

Code	Title	Hours
A minimum grade of C- is required in all Fundamentals of Engineering courses.		
ENGR 101	Engineering Problem Solving 1	2
Engineering Problem Solving (Select one of the following):		3
CHE 102	Introduction to Chemical Engineering	
ENGR 102	Engineering Problem Solving 2	
ENGR 103	Introduction to Nanotechnology Design	

MAE 102	Introduction to Mechanical and Aerospace Engineering Design	
Total Hours		5

Math and Science Requirements

Code	Title	Hours
A minimum grade of C- is required in all Math and Science courses.		
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 2B)	4
Calculus I (GEF 3):		4
MATH 155	Calculus 1	
MATH 156	Calculus 2 (GEF 8)	4
MATH 251	Multivariable Calculus	4
MATH 261	Elementary Differential Equations	4
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (GEF 8)	4
Required Science Elective (Select one of the following) (GEF 8):		4
BIOL 115 & 115L	Principles of Biology and Principles of Biology Laboratory	
CHEM 116 & 116L	Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory	
Total Hours		28

Industrial Engineering Program Requirements

Code	Title	Hours
ECON 201	Principles of Microeconomics (GEF 4)	3
ECON 202	Principles of Macroeconomics	3
EE 221	Introduction to Electrical Engineering	3
EE 221L	Introduction to Electrical Engineering Laboratory	1
MAE 241	Statics	3
MAE Elective (Select one of the following):		3
MAE 242	Dynamics	
MAE 243	Mechanics of Materials	
MAE 320	Thermodynamics	
MAE 331	Fluid Mechanics	
IENG 200	Fundamentals of Industrial Engineering	1
IENG 213	Engineering Statistics	3
IENG 220 & 220L	Re-Engineering Management Systems and Re-Engineering Management Systems Laboratory	3
IENG 301	Materials and Costing	3
IENG 302	Manufacturing Processes	2
IENG 302L	Manufacturing Processes Laboratory	1
IENG 305	Introduction to Systems Engineering	3
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 445	Project Management for Engineers	3

IENG 446	Plant Layout/Material Handling	3
IENG 455	Simulation by Digital Methods	3
IENG 471	Design of Productive Systems 1 (Fulfills Writing and Communications Skills Requirement)	3
IENG 472	Design of Productive Systems 2	3
IENG Technical Electives (Any 400 and 500 level IENG courses)		6
Additional Technical Electives (Select two of the following):		6
CE 347 & 347L	Introduction to Environmental Engineering and Introduction to Environmental Engineering Laboratory	
CE 414	Construction Engineering	
CS 430	Advanced Software Engineering	
CS 440	Database Design and Theory	
BIOM 425	Bioengineering	
GEOG 350 & 350L	Geospatial Problem Solving and Geospatial Problem Solving Laboratory	
IENG 400 level courses		
IENG 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	
Total Hours		80

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

Fall	Hours	Spring	Hours
CHEM 115 & 115L (GEF 2B)		4 ENGR 102	3
ENGL 101 (GEF 1)		3 PHYS 111 & 111L (GEF 8)	4
ENGR 101		2 MATH 156 (GEF 8)	4
ENGR 191		1 GEF 6	3
MATH 155 (GEF 3)		4 GEF 7	3
GEF 5		3	
		17	17

Second Year

Fall	Hours	Spring	Hours
IENG 200		1 IENG 331	3
IENG 213		3 IENG 377	3
IENG 220 & 220L		3 MATH 261	4
ENGL 102 (GEF 1)		3 MAE Elective	3
MATH 251		4 Science Elective and Laboratory	4
MAE 241		3	
		17	17

Third Year

Fall	Hours	Spring	Hours
EE 221 & 221L		4 ECON 201	3
IENG 301		3 IENG 302 & 302L	3
IENG 305		3 IENG 314	3
IENG 343		3 IENG 316	3
IENG 360		3 IENG 350	3
		16	15

Fourth Year

Fall	Hours	Spring	Hours
IENG 445		3 ECON 202	3
IENG 455		3 IENG 446	3
IENG 471		3 IENG 472	3
IENG Technical Elective		3 IENG Technical Elective	3
Technical Elective		3 Technical Elective	3
		15	15

Total credit hours: 129

Accelerated Program

- B.S.I.E. Industrial Engineering and M.S.I.E. Industrial Engineering (p. 7)

Accelerated Bachelor's/Master's in Industrial Engineering

Students must fulfill all degree requirements for the B.S.I.E. in Industrial Engineering and all the requirements of the M.S.I.E. in Industrial Engineering. Students must also meet all the requirements of the ABM.

ABM REQUIREMENTS

Code	Title	Hours
Undergraduate Coursework		117
Shared Bachelor's/Master's Coursework		12
Graduate Coursework		19
Total Hours		148

SHARED COURSEWORK CURRICULUM REQUIREMENTS

Code	Title	Hours
Courses completed must be at the 400 or 500 level. At least one course must be at the 500 level.		
See BSIE and MSIE for list of elective course options		
Courses:		
IENG 455	Simulation by Digital Methods	3
Elective Course		3
Elective Course		3
Elective Course		3
Total Hours		12

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 ABM B.S.I.E. & M.S.I.E degree program that completes degree requirements in five years is as follows.

First Year

Fall	Hours	Spring	Hours
MATH 155 (GEF 3)		4 MATH 156	4
ENGR 101		2 ENGR 102	3
ENGR 191		1 PHYS 111 & 111L	4
CHEM 115 & 115L (GEF 2B)		4 GEF 6	3
ENGL 101 (GEF 1)		3 GEF 7	3
GEF 5		3	
		17	17

Second Year

Fall	Hours	Spring	Hours
MATH 251		4 MATH 261	4
MAE 241		3 IENG 213	3
ENGL 102 (GEF 1)		3 IENG 377	3
IENG 200		1 EE 221	3
IENG 220 & 220L		3 EE 221L	1
Required Science Elective		4 ECON 201	3
BIOL 115 & 115L			
CHEM 116 & 116L			
PHYS 112 & 112L			
		18	17

Third Year

Fall	Hours	Spring	Hours
IENG 301		3 ECON 202	3
IENG 305		3 IENG 302	2
IENG 314		3 IENG 302L	1
IENG 350		3 IENG 316	3
IENG 360		3 IENG 331	3
		IENG 343	3
		15	15

Fourth Year

Fall	Hours	Spring	Hours
IENG 445		3 IENG 446	3
IENG 455*		3 IENG 472	3
IENG 471		3 Elective Course*	3
Technical Elective		3 Elective Course*	3
Elective Course*		3 MAE Elective	3
		15	15

Fifth Year

Fall	Hours	Spring	Hours
Foundation Course		3 Foundation Course	3
Foundation Course		3 MS Elective Course	3
MS Elective Course		3 MS Elective Course	3
		IENG 796	1
		9	10

Total credit hours: 148

★

Indicates that this course will be shared with the MS requirements

Major Learning Outcomes

INDUSTRIAL ENGINEERING

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

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.