Department of Industrial and Management Systems Engineering

Degrees Offered

- Master of science in industrial engineering
- Master of science in engineering with a major in industrial engineering
- Master of science in industrial hygiene
- Master of science in safety management
- Doctor of philosophy with a major in industrial engineering
- Doctor of philosophy with a major in occupational safety and health

One of the defining attributes in the success of the department is the dedication and talent of its sixteen faculty and three staff members. The aggregate careers of our faculty and staff represent nearly 300 years of service to students at WVU. In these 300 years of service is embodied the wisdom and experience to successfully prepare industrial engineers and occupational health and safety professionals for the 21st-century. The faculty and staff typically educate 260 to 300 undergraduate, 100 to 120 M.S., and fifteen to twenty-five Ph.D. students. The department is in the unique position in the United States of having two complimentary graduate programs in industrial hygiene and safety accredited by the Applied Science Accreditation Commission (ASAC) of the Accreditation Board for Engineering and Technology (ABET). The combined resources and faculty talents of these two programs create synergies that provide our students with outstanding academic and research experiences in the field of occupational safety and health. Excellent academic and research opportunities are also available for students in the areas of operations research, decision sciences, manufacturing, and ergonomics.

Degree Programs

Masters of Science in Industrial Engineering and Masters of Science in Engineering with a Major in Industrial Engineering

A graduate of these master’s programs will be prepared to accomplish the following:

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

In order to meet the educational objectives, students of these master’s programs must be able to meet the following educational outcomes at the time of their graduation. Students will have acquired:

1. The ability to use and master modern and classical industrial engineering methodologies in their area of concentration
2. The ability to apply knowledge of math, science, and engineering
3. The ability to do research, and 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
4. The ability to work individually, on teams, and/or on multi-disciplinary teams to identify, formulate, and solve problems using industrial engineering knowledge, skills, and tools
5. The ability to design and implement or improve integrated systems that include people, materials, information, equipment, and energy using appropriate analytical, computational, and experimental practices
6. An understanding of professional and ethical responsibility and the broad education and knowledge of contemporary issues necessary to understand the impact of solutions in a global and societal context
7. A recognition of the need for and an ability to engage in life-long learning
8. The professional characteristics expected of a successful industrial engineer

Masters of Science in Industrial Hygiene

A graduate of the Industrial Hygiene Masters program will be prepared to:

1. Practice Industrial Hygiene and to initiate and develop leadership roles in business, industry, and/or government.
2. Continue professional development and life-long learning.
3. Interact in society and business in a professional, ethical manner to promote occupational and environmental health.
4. Be proficient in written and oral communication and to utilize people-oriented skills in individual and team environments.
5. Apply the skills from Industrial Hygiene to be proficient in his or her chosen field or doctoral studies.

In order to meet the educational objectives of the Industrial Hygiene program, students must be able to meet the following educational outcomes at the time of their graduation:

1. An ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice such as:
   • Principles and methods of industrial hygiene
   • Principles and methods of ergonomics
   • Principles and methods of safety
   • Principles of environmental sciences (Environmental elective)
   • Principles of epidemiology and biostatistics
   • Principles and methods of control of physical and chemical hazards
2. The ability to apply knowledge of math, science, and Industrial Hygiene;
3. The 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;
4. The ability to work individually, in teams, and/or in multi-disciplinary teams to identify, formulate, and solve problems using Industrial Hygiene, safety, and ergonomics knowledge, skills, and tools;
5. An ability to formulate or design a system, process, or program to meet desired needs;
6. An understanding of professional and ethical responsibility and the broad education and a knowledge of contemporary issues necessary to understand the impact of solutions in a global and societal context;
7. A recognition of the need for and an ability to engage in life-long learning; and
8. The professional characteristics expected of a successful Industrial Hygienist.

Masters of Science in Safety Management

A graduate of the Safety Management Masters program will be able to:

1. Communicate effectively, orally and in writing, including the transmission of safety data to management and employees.
2. Demonstrate knowledge and skills in the area of safety management.
3. Demonstrate knowledge of ethical and professional responsibilities and knowledge of applicable legislation and regulations.
4. Demonstrate the ability to apply various research activities through the decision-making process used in safety management.

In order to meet the educational objectives of the Safety Management program, students must be able to meet the following educational outcomes at the time of their graduation:

1. Demonstrate knowledge and skills to build a comprehensive Safety and Health Program based on loss control and regulations.
2. Demonstrate knowledge and skills to use analytical techniques in the Safety and Health function.
3. Demonstrate knowledge and skills with federal, state, and non-governmental Safety and Health Program standards and best practices.
4. Demonstrate skills in communications, written and oral, at the level of professionals in safety and health positions.
5. Demonstrate knowledge and skills in writing and evaluating safety and health research proposals.
6. Demonstrate knowledge and skills in using management tools to implement and evaluate safety, hygiene, and environmental programs.

Doctor of Philosophy with a Major in Industrial Engineering

A graduate of the Industrial Engineering doctoral program will be prepared to:

1. Practice/teach Industrial Engineering and to initiate and develop leadership roles in education, business, industry and/or government.
2. Continue professional development and life-long learning.
3. Interact in society and business in a professional and ethical manner.
4. Be proficient in written and oral communication and to utilize people-oriented skills in individual and team environments.
5. Apply the skills from Industrial Engineering to be proficient in his/her chosen field.

In order to meet the educational objectives, students of the Industrial Engineering Doctoral program must be able to meet the following educational outcomes at the time of their graduation. Students will have acquired:

1. The ability to use, master, and teach modern and classical Industrial Engineering methodologies in their area of concentration.
2. The ability to apply knowledge of math, science, and engineering.
3. The ability to do research, and 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.
4. The ability to work individually, on teams, and/or on multi-disciplinary teams to identify, formulate, and solve problems using industrial engineering knowledge, skills, and tools.
5. The ability to design and implement or improve integrated systems that include people, materials, information, equipment, and energy using appropriate analytical, computational, and experimental practices.
6. A thorough understanding of professional and ethical responsibility and the broad education and knowledge of contemporary issues necessary to fully evaluate the impact of solutions in a global and societal context.
7. A recognition of the need for and an ability to engage in life-long learning.
8. The professional characteristics expected of a successful Industrial Engineer.

Doctor of Philosophy with a Major in Occupational Safety and Health

A graduate of the Occupational Safety and Health doctoral program will be prepared to:

1. Anticipate and recognize hazards and environmental cases requiring the application of safety and health methods in occupational settings.
2. Identify social and epidemiological trends in occupational safety and health issues at the national and international levels.
3. Identify methods of management in application of effective control techniques.
4. To demonstrate understanding of federal, state, and local regulatory agencies as they impact the practice of occupational safety and health.
5. Conduct, disseminate, and publish original research in occupational safety and health.
6. Be qualified to enter the profession as a professor, practitioner, or researcher in occupational safety and health.

In order to meet the educational objectives, students of the Occupational Safety and Health Doctoral program must be able to meet the following educational outcomes at the time of their graduation. Students will have acquired the ability:

1. To construct, manage, and evaluate a comprehensive safety and health program for large industry or government agencies.
2. To participate in the safety and health regulatory process as an individual or part of a corporation or university.
3. To critically evaluate research conducted by other individuals or corporations in occupational safety and health.
4. To provide excellent teaching at the University or corporate levels.
5. To participate in activities such as conferences or seminars for continued professional improvement.
6. To actively participate as a leader in the professional organizations that serve the occupational safety and health fields.
7. To demonstrate the highest possible ethical standards in the field of occupational safety and health.

Faculty Research

The department has quality research laboratories in manufacturing, robotics and vision systems, CAD/CAM, operations research, production planning and control, decision sciences, ergonomics, industrial hygiene, and safety. Graduate students are encouraged to utilize these resources to explore and develop their capabilities. Research initiatives and on-going funding opportunities are available to students in the areas of: ergonomics, operations research, manufacturing, occupational safety and health, artificial intelligence, and respirator research.

Required Courses

Required courses are determined by the student’s degree program and area of emphasis. Specific course information by program area is available at the following website: http://www.imse.cemr.wvu.edu/courses/.

Faculty

Chair

• Wafik Iskander - Ph.D., P.E. (Texas Tech University)

Professors

• Rashpal 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)
• Robert Creese - Ph.D., P.E. (Pennsylvania State University)
  Manufacturing Processes/Systems, Foundry Engineering, Cost Engineering
• Daniel Della-Giustina - Ph.D. (Michigan State University)
  Playground and Recreation Safety, Sport Safety, Highway and Traffic Management; Safety, Fire, and Emergency Response
• Bhaskaran Gopalakrishnan - Ph.D., P.E., CEM. (Virginia Polytechnic Institute and State University)
  Building’s Energy Efficiency, Industrial Energy and Waste Minimization, Productivity Improvement
• Steven Guffey - Ph.D., C.I.H. (North Carolina State University)
  Ventilation Systems Theory and Design, Noise Measurement and Control, Exposure Assessment
• Majid Jaridi - Ph.D. (University of Michigan)
  Statistics, Quality Control, Forecasting and Transportation Research
• Warren 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 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

• Michael Klishis - Ph.D. (West Virginia University)
  Safe Behaviors and Loss Control, Training, Instructional Development, Mine Safety and Health
• Ashish Nimbarte - Ph.D. (Louisiana State University)
  Work Related Musculoskeletal Disorders, Occupational Biomechanics and Biomechanical Modeling
• Xiaopeng Ning - Ph.D. (Iowa State University)
  Safety Engineering, Biomechanics, Ergonomics, Human Factors Engineering
• Feng Yang - Ph.D. (Northwestern University)
  Simulation, Applied Statistics, Stochastic Processes
• Qipeng Zheng - Ph.D. (University of Florida)
  Operations Research, Optimization, Energy Systems

Professor Emeritus

• Ralph Plummer - Ph.D., P.E. (West Virginia University)
  Systems Safety Engineering, Energy Conservation, Human Factors, Ergonomics

Associate Professor Emeritus

• Andrew J. Sorine - Ed.D. (West Virginia University)
  Benchmarking, Safety and Health Programs, Safety Management Information Systems

Visiting and Adjunct Professors

• Lorenzo G. Cena - Ph.D. (University of Iowa)
  Occupational and Environmental Health, 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, Human Factors
• Martin Harper - Ph.D. (London School of Hygiene and Tropical Medicine)
  Industrial Hygiene, Exposure Assessment
• James R. Harris - Ph.D., P.E. (West Virginia University)
  Safety Research, Human Factors
• Hongwei Hsiao - Ph.D. (University of Michigan)
  Safety Engineering, Human Factors
• Kevin Michael - Ph.D. (Pennsylvania State University)
  Acoustics, Hearing Protection, Industrial Hygiene
• Christopher Pan - Ph.D. (University of Cincinnati)
  Industrial Hygiene, Exposure Assessment
• Ju-Hyeong Park - Sc.D. M.P.H., C.I.H. (Harvard University)
  Industrial Hygiene, Exposure Assessment
Admission

To qualify as a regular graduate student, applicants must have as a minimum the equivalent of a 3.0 GPA. Applicants with a minimum 2.75 GPA (or the equivalent) may be admitted on a provisional basis. Applicants with GPA below 2.75 would need approval of the dean or his designee. International students must demonstrate proficiency in communicating in English (a minimum TOFEL Score of 550, or IBT Score of 79, or IELTS Score of 6.5). Students must comply with the rules and regulations as outlined in this catalog for graduate work in the College of Engineering and Mineral Resources.

• For admission into the M.S.I.E. and M.S.E. programs, applicants must have a bachelor of science degree from an engineering department, or from physics, chemistry, computer sciences, mathematics, or a similar technical or science program. In general, a degree in one of the “hard” science programs is required with at least two years of calculus or equivalent mathematics.

• For admission into the M.S. Industrial Hygiene Program, applicants must meet ABET/ASAC prerequisite course requirements which are currently a minimum of sixty-three credit hours of approved science, mathematics, and other technical courses. Of these, at least fifteen credit hours must be junior or senior level. Specific pre/corequisite course requirements include two semesters of general/inorganic chemistry and two semesters of physics. On an individual basis, the faculty may identify additional pre/corequisite coursework, often including organic chemistry and biology. Applicants will be advised about their specific requirements at the time of admission. Applicants not meeting all of the listed requirements may be considered for admission as provisional students.

• For admission into the M.S. Safety Management Program, applicants must meet ABET/ASAC prerequisite course requirements, which are currently a minimum of sixty-three credit hours of approved science, mathematics, and other technical courses. Of these, at least fifteen credit hours must be junior or senior level. In addition, students must have a minimum of twenty-one hours of social sciences, humanities, and/or communications. On an individual basis, the faculty may identify additional prerequisite coursework. Applicants will be advised about their specific requirements at the time of admission. Applicants not meeting all of the listed requirements may be considered for admission as provisional students.

Masters Degree Programs

Graduate programs in industrial and management systems engineering are designed to give students experience in developing innovative solutions to real problems by implementing creative ideas. Students can expect to develop their creative abilities in order to be effective in innovative environments while improving their abilities to communicate and implement new ideas.

Four degrees are offered at the master’s level: M.S.I.E., M.S.E., M.S. in industrial hygiene, and M.S. in safety management. See our graduate webpage at http://www.imse.cemr.wvu.edu/grad/degrees.php.

• The M.S. industrial engineering degree program is appropriate for students with a B.S. in industrial engineering or other engineering disciplines.
• The M.S. engineering degree program is designed for students having a baccalaureate degree in a technical field other than industrial engineering who wish to pursue a broader, more interdisciplinary program of graduate studies. An undergraduate degree in either another engineering field or the basic sciences is required for admission to the M.S.E.
• The M.S. in industrial hygiene is accredited by the Applied Science Accreditation Committee (ASAC) of the Accreditation Board of Engineering and Technology (ABET). Suitable undergraduate degrees include engineering, chemistry, biology, medical sciences, animal sciences, and the physical sciences. The three disciplines that form the basis of hygiene are industrial hygiene, industrial safety, and ergonomics.
• The M.S. in safety management degree program is accredited by the Applied Science Accreditation Committee (ASAC) of the Accreditation Board of Engineering and Technology (ABET). It is designed for students trained in the areas of business and economic sciences, animal sciences, chemical and biological sciences, engineering and technology sciences, medical sciences, and the physical sciences who have an interest in safety management.

Thesis

When a student elects the thesis or problem report option, the thesis or problem must conform to the general requirements of the university and to the written requirements of the Department of Industrial and Management Systems Engineering.

Graduation Requirements

The M.S.I.E. or M.S.E. degree requirements for the thesis option include completion of a minimum of twenty-four credit hours, plus a six-hour thesis; or candidates may take thirty-three credit hours and complete a three-hour problem report. The M.S.I.H. degree requires a total of a minimum thirty-six hours, including credits for a thesis or a problem report. A candidate for the M.S.I.E., M.S.E., or M.S.I.H. degrees must pass an oral examination on coursework and the thesis or problem report. M.S. in safety management degree candidates may opt to complete a minimum of thirty-one credit hours, plus a six-hour thesis, or they may opt to complete a minimum of thirty-four credit hours and a problem report, or a thirty-seven-credit-hour
all coursework program. Candidates who take the thirty-four or thirty-seven-hour options are also required to pass a final comprehensive written examination. All graduate students must have a final grade point average of at least 3.0.

**Doctor of Philosophy**

The Doctor of Philosophy degree is administered through the college’s interdisciplinary program; industrial engineering or occupational safety and health may be the major. A candidate for the degree of doctor of philosophy must comply with the rules and regulations outlined in the general requirements of the Statler College of Engineering and Mineral Resources. The research work for the doctoral dissertation must show a high degree of originality on the part of the student and must constitute an original contribution to the art and science of industrial engineering or occupational safety and health.

To be accepted in the Ph.D. program, applicants should have, at a minimum (or equivalent), a 3.4 GPA in their graduate work. They must also meet all the entrance requirements stated earlier for the master’s programs. Each student will develop a program with a major in industrial engineering or occupational safety and health designed to meet his/her needs and objectives in consultation with an advisor and the advisory and examining committee (AEC).

Required core courses for the Ph.D. program are determined by the student’s area of emphasis. In general, Ph.D. students take approximately fifty-four hours of coursework beyond their baccalaureate degree, with a minimum of thirty hours in industrial engineering or occupational safety and health. The research work for the doctoral dissertation may entail a fundamental investigation or a broad and comprehensive investigation into an area of specialization.

Early in the doctoral program, the student must pass an examination to demonstrate master’s-level proficiency in industrial engineering or occupational safety and health subject matter. Upon completion of the coursework, the student must pass a written examination in order to be admitted to candidacy. An acceptable dissertation must be written and defended.