Industrial Engineering

Degrees Offered:

- Masters of Science, Industrial Engineering (M.S.I.E.)
- Doctor of Philosophy, Industrial Engineering (Ph.D.)

MASTERS OF SCIENCE IN INDUSTRIAL ENGINEERING

A graduate of this master’s program 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 this master’s 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 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

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.
For admission into the M.S. Industrial Engineering programs, applicants must meet department admission standards and 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 Ph.D. program, typically, a Masters degree is required. However, applicants with B.S. degree with exceptional academic record can also be considered for direct admission into the Ph.D. program. Applicants with a M.S. degree should have, at a minimum, a 3.4 GPA (or equivalent) in their graduate coursework. Applicants with a B.S. degree should have, at a minimum, a 3.5 GPA (or equivalent) in their undergraduate coursework. Ph.D. applicants with a M.S. degree, must also meet all the entrance requirements stated above for the Master's program.

Curriculum in Masters of Science in Industrial Engineering

A candidate for the M.S. degree in industrial engineering must comply with the rules and regulations as outlined in the WVU Graduate Catalog and the specific requirements of the Statler College and the Industrial and Management Systems Engineering Department.

Program Requirements

All M.S. degree candidates are required to perform research and follow a planned program of study. The student’s research advisor, in conjunction with the student’s Advising and Examining Committee (AEC) will be responsible for determining the plan of study appropriate to the student’s needs. The underlying principle of the planned program is to provide the students with the necessary support to complete their degree and prepare them for their career.

Curriculum Requirements

A minimum cumulative GPA of 3.0 is required in all courses

Course Requirements

A minimum of 60% of courses must be from 500 level or above

Complete one of the following options:

**Thesis Option - 31 total credit hours**
- Complete one core course from each Area of Concentration (9 credit hours)
- Complete one Area of Concentration (15 credit hours) includes: (Core Courses - 9 credit hours and Elective Courses - 6 credit hours)
  - IENG 697 Research (6 hours)
  - IENG 796 Graduate Seminar (1 credit hour)
- Written Proposal
- Thesis
- Final Oral or Written Examination

**Problem Report Option - 34 total credit hours**
- Complete one core course from each Area of Concentration (9 credit hours)
- Complete one Area of Concentration (15 credit hours) includes: (Core Courses - 9 credit hours and Elective Courses - 6 credit hours)
  - Any BIOM, CE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, or STAT courses 400-799 as approved by the student’s AEC (6 credit hours)
  - IENG 697 Research (3 hours)
  - IENG 796 Graduate Seminar (1 credit hour)
- Written Proposal
- Formal written report or professional report/paper
- Final Oral or Written Examination

**Coursework Option - 34 total credit hours**
- Complete one core course from each Area of Concentration (9 credit hours)
- Complete one Area of Concentration (15 credit hours) includes: (Core Courses - 9 credit hours and Elective Courses - 6 credit hours)
  - Any BIOM, CE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, or STAT courses 400-799 as approved by the student’s AEC (9 credit hours)
  - IENG 796 Graduate Seminar (1 credit hour)
- Final Oral or Written Examination

Areas of Concentration

**MANUFACTURING SYSTEM**

**Core Courses**

| IENG 514 | Design of Industrial Experiments |
### Industrial Engineering

#### Core Courses
- IENG 542: Advanced Production Control
- IENG 551: Quality and Reliability Engineering
- IENG 577: Advanced Engineering Economy

#### Elective Courses
- IENG 505: Computer Integrated Manufacturing
- IENG 506: Computer Aided Process Planning
- IENG 507: Robotics and Flexible Automation
- IENG 518: Technology Forecasting
- IENG 554: Applied Integer/Heuristic Programs
- IENG 556: Supply Chain Management

#### ERGONOMICS

**Core Courses**
- IENG 514: Design of Industrial Experiments
- IENG 564: Industrial Ergonomics
- IENG 577: Advanced Engineering Economy
- IENG 660: Human Factors System Design

**Elective Courses**
- IENG 461: System Safety Engineering
- IENG 518: Technology Forecasting
- IENG 561: Industrial Hygiene Engineering
- IENG 662: Systems Safety Engineering

#### DECISION SCIENCES & PRODUCTION SYSTEMS

**Core Courses**
- IENG 455: Simulation by Digital Methods
- IENG 514: Design of Industrial Experiments
- IENG 553: Applied Linear Programming
- IENG 577: Advanced Engineering Economy

**Elective Courses**
- IENG 518: Technology Forecasting
- IENG 554: Applied Integer/Heuristic Programs
- IENG 556: Supply Chain Management
- IENG 754: Inventory Theory
- IENG 756: Applied Stochastic Processes

*Students who do not hold a baccalaureate degree in industrial engineering are required to take a set of undergraduate industrial engineering courses above and beyond the minimum coursework requirements.*

### Final Examination

M.S. students following the thesis or problem report option must prepare a written research proposal. The proposal must be approved by the student’s AEC at least one semester prior to the final oral examination.

All students, regardless of option, are required to pass a final oral or written examination, administered by their AEC, covering the thesis or problem report and/or related course material.

### Suggested Plan of Study

The plan below illustrates the Thesis Option. 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 M.S.I.E degree program that completes degree requirements in two years is as follows.

#### First Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Area</th>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Core Course Area of Concentration 1</td>
<td>3 Core Course Area of Concentration 1</td>
<td>3</td>
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<td>Core Course Area of Concentration 1</td>
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<td>Elective Course Area of Concentration 1</td>
<td>3 Elective Course Area of Concentration 1</td>
<td>3</td>
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**Curriculum in Doctor of Philosophy – Industrial Engineering**

A candidate for the Ph.D. degree with a major in industrial engineering must comply with the rules and regulations as outlined in the WVU Graduate Catalog and the specific requirements of the Statler College and the Industrial and Management Systems Engineering Department.

**Program Requirements**

The doctor of philosophy degree with a major in industrial engineering is administered through the college’s interdisciplinary Ph.D. program. 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.

All Ph.D. degree candidates are required to perform research and follow a planned program of study. The student’s research advisor, in conjunction with the student’s Advising and Examining Committee (AEC) will be responsible for determining the plan of study appropriate to the student’s needs. The underlying principle of the planned program is to provide the students with the necessary support to complete their degree and prepare them for their career.

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.

**Curriculum Requirements**

A minimum cumulative GPA of 3.4 is required in all courses.

**Course Requirements**

<table>
<thead>
<tr>
<th>Research</th>
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<tbody>
<tr>
<td>IENG 797</td>
<td>Research</td>
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Select from the following based on degree path:

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<th>30</th>
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<tbody>
<tr>
<td>Any BIOM, CE, CHE, CHEM, CPE, CS, EE, IENG, IH&amp;S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, or STAT courses 500-799</td>
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**Examinations**

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<th>Qualifying Exam</th>
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<tr>
<td>Candidacy Exam</td>
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<tr>
<td>Final Exam</td>
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</tbody>
</table>

Total Hours: 54

* Students who do not hold a baccalaureate degree in industrial engineering are required to take a set of undergraduate industrial engineering courses above and beyond the minimum coursework requirements.

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.

**Examinations**

**QUALIFYING EXAM**

All students must take and pass a written qualifying examination. Normally, the qualifying examination is given no later than one semester after completion of eighteen credit hours toward the doctoral degree. This examination is designed to assess the basic competency of students in the industrial engineering field to determine whether or not they have sufficient knowledge to undertake independent research.

**CANDIDACY EXAMINATION**

In order to be admitted to candidacy, the student must pass a candidacy exam, which is designed to evaluate the student’s overall ability to engage in high-level research.
A student who has successfully completed all coursework, passed the qualifying examination, and successfully defended the research proposal is defined as one who is a candidate for the Ph.D. degree.

**FINAL EXAMINATION**

At the completion of the dissertation research, candidates must prepare a dissertation and pass the final oral examination (defense) administered by their AEC.

In order to complete the Ph.D. requirements, a student must pass a final oral examination on the results embodied in the dissertation. This examination is open to the public and, in order to evaluate critically the student's competency, may include testing on material in related fields, as deemed necessary by the AEC. In addition, since the Ph.D. degree is primarily a research degree that embodies the results of an original research proposal and represents a significant contribution to scientific literature, the student must submit a manuscript on this research to the AEC.

**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 doctoral degree program that completes degree requirements in three years is as follows

<table>
<thead>
<tr>
<th>First Year</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tbody>
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<tr>
<th>Second Year</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Fall</td>
<td>Course</td>
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<th>Third Year</th>
<th>Hours</th>
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<th>Hours</th>
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<tr>
<td>Fall</td>
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<td>Course</td>
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<td>IENG 797</td>
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<td>IENG 797</td>
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</table>

Total credit hours: 54

**Major Learning Goals**

**INDUSTRIAL ENGINEERING**

**MSIE**

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.

**PhD**

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.