

Industrial Engineering and Management

Industrial Engineering & Management Major

Industrial Engineering and Management (IE&M) is a good choice for people with the aptitude and interest for careers that blend technology and people. First, this is an engineering program, with the traditional content of mathematics, sciences, engineering analysis and design. Beyond the basics, this program also challenges students to integrate resources with technology. In addition to scientific principles and technological systems, IE&M students study people systems, cost analysis, facilities and other elements of the business enterprise. The "engineering" and "management" pieces are blended and integrated.

IE&M graduates are in high demand across a wide spectrum of industries. In recent years, the most active employers have represented manufacturing, healthcare, transportation, warehousing and distribution, information systems, software, facilities development and consulting industries, as well as many of the production sectors that have been the traditional concentration for industrial engineers. IE&M graduates are sought after for positions in design of products, processes, procedures, facilities, and systems; material handling, distribution, warehousing, and logistics; project and organizational management; financial modeling; and technological training.

Just as the profession requires a blend of scientific, technological and humanistic skills, student learning in IE&M is an integrated process. The discipline-specific courses place the student in position to experience many elements of real situations in industry and commerce. Moreover, the program has been nationally cited for integrating design across all levels, with freshmen and juniors or sophomores and seniors often working together.

The Industrial Engineering and Management program at NDSU is accredited by the Engineering Accreditation Commission of ABET (www.abet.org). The curriculum is designed to produce baccalaureate-level graduates who are well prepared to accept engineering positions in industry and government or to pursue advanced degree studies. Graduates of the IE&M program will be able to:

1. Apply statistical, operations research and simulation tools to solve problems relevant to modern manufacturing, healthcare, production, commercial, social and/or governmental organizations, with principal emphasis on quality, productivity, continuous improvement, and enterprise integration.
2. Design processes and systems to effectively and economically employ and integrate technology and people in organizational environments in industrial, healthcare, logistics, service and/or governmental settings, with appropriate consideration for environmental factors, health and safety, manufacturability and ethical, economic, social and political issues.
3. Engage in effective learning in topics and areas relevant to professional advancement and to enhancing the quality of personal life.
4. Participate effectively in multidisciplinary teams in both leadership and followership roles.
5. Effectively communicate complex technological concepts, issues and professional details to a variety of audiences.

Industrial Engineering & Management Areas of Emphasis

Students majoring in Industrial Engineering and Management may prepare for specific career choices by careful use of the technical electives included in the IE&M major. All Industrial Engineering and Management majors choose a minimum of three technical elective courses. It is suggested that students confer with their academic adviser for assistance in choosing the most appropriate technical elective courses. Particular areas of emphasis may be selected in the following special interests: Management of people systems; Advanced manufacturing engineering; Healthcare management engineering; Production operations & management; Quality engineering & management; Reliability engineering; and Lean manufacturing.

These topical areas are also available for post-graduate study, leading to the Master of Science in Industrial Engineering and Management, Master of Science in Manufacturing Engineering, and the Doctor of Philosophy in Industrial and Manufacturing Engineering degrees. For complete details, see the Graduate Bulletin (<http://bulletin.ndsu.edu/past-bulletin-archive/2015-16/graduate>) online.

Selective Admission

The Department of Industrial and Manufacturing Engineering has a selective admission policy. To be admitted to the program, freshman applicants must have a minimum high school GPA of 2.5 and a composite ACT score of 21 or higher. Transfer students, whether from another university or from another department at NDSU, must have an institutional grade point average of at least 2.30.

Industrial Engineering and Management Minor

Students majoring in any engineering discipline may elect a minor in Industrial Engineering and Management. These optional studies offer engineering students the opportunity to add important career-enhancing skills to their technological competencies. The elected courses in an IE&M minor add skills for integrating technology and resources within the complex of people, technology, machinery and information that make up the successful modern business enterprise. Students completing this minor will achieve better understanding of organizational and management processes and will be better prepared to work in the multifunctional teams crucial to success in industry.

Minor in IE&M require a minimum of 18 credits. The foundation requirements for the IE&M minor are:

- IME 111 Introduction to Industrial and Manufacturing Engineering

- IME 311 Work/Station Design and Measurement

The remaining 12 credits must be selected from a list of approved IME 300- and 400-level courses for which prerequisites are in place.

Interested students are encouraged to visit the IME Department for advice on course selection to best suit their career interests. Students must complete the graduation requirements for another engineering major before the designation of the IE&M minor will be placed on their transcripts.

Industrial Engineering & Management Sequence for Non-Majors

The practices and procedures learned in the Industrial Engineering & Management major are universally applied in public and private organizations of all kinds. IE&M courses are available as electives for students majoring in other programs including engineering, computer science, mathematics, sciences, business administration, cereal science, and agricultural economics. Courses recommended for non-majors are:

| | | |
|---------|--|-----|
| IME 311 | Work/Station Design and Measurement | 3 |
| IME 440 | Engineering Economy | 2-3 |
| IME 450 | Systems Engineering and Management | 3 |
| IME 451 | Logistics Engineering and Management | 3 |
| IME 452 | Integrated Industrial Information Systems | 3 |
| IME 453 | Hospital Management Engineering | 3 |
| IME 455 | Management of People Systems | 2 |
| IME 456 | Program and Project Management | 3 |
| IME 460 | Evaluation of Engineering Data | 3 |
| IME 461 | Quality Assurance and Control | 3 |
| IME 462 | Total Quality In Industrial Management | 3 |
| IME 463 | Reliability Engineering | 3 |
| IME 470 | Operations Research I | 3 |
| IME 480 | Production and Inventory Control | 3 |
| IME 482 | Automated Manufacturing Systems | 3 |
| IME 485 | Industrial and Manufacturing Facility Design | 3 |

Major Requirements

Major: Industrial Engineering & Management

Degree Type: B.S.I.E.Mgt.

Required Degree Credits to Graduate: 131

General Education Requirements

First Year Experience (F):

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| UNIV 189 | Skills For Academic Success (Students transferring in 24 or more credits do not need to take UNIV 189.) | 1 |
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Communication (C):

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|----------|--------------------------------------|---|
| ENGL 110 | College Composition I | 3 |
| ENGL 120 | College Composition II | 3 |
| ENGL 321 | Writing in the Technical Professions | 3 |
| COMM 110 | Fundamentals of Public Speaking | 3 |

Quantitative Reasoning (R):

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|----------|------------|---|
| MATH 165 | Calculus I | 4 |
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Science & Technology (S):

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| CHEM 121 & 121L | General Chemistry I and General Chemistry I Laboratory | 4 |
| CHEM 122 | General Chemistry II | 3 |
| PHYS 252 | University Physics II | 4 |

Humanities & Fine Arts (A): Select from current general education list 6

Social & Behavioral Sciences (B): Select from current general education list 6

Wellness (W): Select from current general education list 2

Cultural Diversity (D): Select from current general education list

Global Perspectives (G): Select from current general education list**Total Credits** 42**Major Requirements****General Education Requirements** 40**Industrial Engineering & Management Core Requirements**

| | | |
|---------|--|---|
| IME 111 | Introduction to Industrial and Manufacturing Engineering | 3 |
| IME 311 | Work/Station Design and Measurement | 3 |
| IME 330 | Manufacturing Processes | 3 |
| IME 440 | Engineering Economy | 3 |
| IME 450 | Systems Engineering and Management | 3 |
| IME 456 | Program and Project Management | 3 |
| IME 460 | Evaluation of Engineering Data | 3 |
| IME 461 | Quality Assurance and Control | 3 |
| IME 470 | Operations Research I | 3 |
| IME 472 | Simulation of Business and Industrial Systems | 3 |
| IME 480 | Production and Inventory Control | 3 |
| IME 482 | Automated Manufacturing Systems | 3 |
| IME 485 | Industrial and Manufacturing Facility Design | 3 |
| IME 489 | Industrial and Manufacturing Engineering Capstone | 3 |

MATH Courses Required:

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|----------|--|---|
| MATH 129 | Basic Linear Algebra | 2 |
| MATH 166 | Calculus II | 4 |
| MATH 259 | Multivariate Calculus | 3 |
| MATH 266 | Introduction to Differential Equations | 3 |

ME Courses Required:

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|--------|--|---|
| ME 212 | Fundamentals of Visual Communication for Engineers | 3 |
| ME 221 | Engineering Mechanics I | 3 |
| ME 222 | Engineering Mechanics II | 3 |

Other Required Courses:

| | | |
|-----------|--|---|
| ENGR 402 | Engineering Ethics and Social Responsibility | 1 |
| PHYS 252L | University Physics II Laboratory | 1 |

Industrial Engineering and Management Electives

Computer Science Electives: Select one of the following: 3

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|----------|---------------------------|--|
| CSCI 122 | Visual BASIC | |
| CSCI 126 | Beginning FORTRAN | |
| CSCI 160 | Computer Science I | |
| ECE 173 | Introduction to Computing | |

Programming Language: Any programming language course must be approved by your adviser.

Engineering Science Electives: Select 12 credits from the following:

| | | |
|--------|----------------------------------|---|
| CE 309 | Fluid Mechanics | 3 |
| ME 223 | Mechanics of Materials | 3 |
| ME 350 | Thermodynamics and Heat Transfer | 3 |

Select one of the following: 3-4

| | | |
|---------|--------------------------|--|
| EE 206 | Circuit Analysis I | |
| ECE 275 | Digital Design | |
| ECE 301 | Electrical Engineering I | |

Technical Electives: Select 9 credits from the following: 9

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|---------|---------------------------|--|
| IME 335 | Welding Technology | |
| IME 380 | CAD/CAM for Manufacturing | |
| IME 411 | Human Factors Engineering | |
| IME 427 | Packaging for Electronics | |

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| IME 430 | Process Engineering |
| IME 431 | Production Engineering |
| IME 432 | Composite Materials Manufacturing |
| IME 437 | Methods for Precision Manufacturing |
| IME 433 | Additive Manufacturing |
| IME 451 | Logistics Engineering and Management |
| IME 452 | Integrated Industrial Information Systems |
| IME 453 | Hospital Management Engineering |
| IME 455 | Management of People Systems |
| IME 463 | Reliability Engineering |
| Only one of the following 5 courses may be counted as a technical elective. | |
| BUSN 340 | International Business |
| BUSN 431 | Business Law I-Contracts, Property and Torts |
| MGMT 320 | Foundations of Management |
| MRKT 320 | Foundations of Marketing |
| MIS 320 | Management Information Systems |

Total Credits**131-132**

Degree Requirements and Notes

- A student must complete at least 60 semester credits of professional level course work in his/her program while in residence and enrolled in the college. Students transferring into the college from programs with professional accreditation are exempt from this residency requirement but are subject to the residency requirement of NDSU.
- Grades less than 'C' will not be accepted for required courses in CHEM, MATH, and PHYS.
- Students may request approval for other 300-400 level engineering or related courses to be approved as technical electives. To request approval, a student should submit a memo to the IME Department indicating the course of interest and why the course should be approved as a technical elective. This memo will be reviewed by the IME Department Chair for approval.
- 300-400 level BUSN courses require at least junior standing and a minimum 2.50 cumulative GPA.

Minor Requirements

Industrial Engineering & Management Minor

Minor Requirements

Required Credits: 18**Required Courses**

| | | |
|---|--|-----------|
| IME 111 | Introduction to Industrial and Manufacturing Engineering | 3 |
| IME 311 | Work/Station Design and Measurement | 3 |
| Electives: Select 12 credits from the following: | | 12 |
| IME 450 | Systems Engineering and Management | 3 |
| IME 451 | Logistics Engineering and Management | 3 |
| IME 452 | Integrated Industrial Information Systems | 3 |
| IME 453 | Hospital Management Engineering | 3 |
| IME 455 | Management of People Systems | 2 |
| IME 456 | Program and Project Management | 3 |
| IME 461 | Quality Assurance and Control | 3 |
| IME 462 | Total Quality In Industrial Management | 3 |
| IME 463 | Reliability Engineering | 3 |
| IME 470 | Operations Research I | 3 |
| IME 472 | Simulation of Business and Industrial Systems | 3 |
| IME 480 | Production and Inventory Control | 3 |
| IME 482 | Automated Manufacturing Systems | 3 |
| IME 485 | Industrial and Manufacturing Facility Design | 3 |

Minor Requirements and Notes

- A minimum of 8 credits must be taken at NDSU.
- Only students majoring in an engineering discipline or with department permission agricultural or physical science majors may elect a minor in Industrial Engineering & Management.