Manufacturing Engineering Major

Manufacturing Engineering is a good choice for people who have both aptitude and interest in production of goods for improved living standard for the general populace. This career field is all about the production of goods—from automobiles and tractors and airplanes…to electronic products, recreational products, sports equipment, books and toys…to foodstuffs. Manufacturing engineers are employed in every industry that produces goods of some kind.

Manufacturing engineers may focus on the interaction between work piece and tool as process scientists or process engineers. They may concentrate on integrating the many different processes and parts necessary to make up finished products—as production engineers. Or, as manufacturing systems engineers, they may take a very wide view of the manufacturing enterprise, including its supply chain, distribution channels, financial structure and resource management. In every particular focus, manufacturing engineers are the people who design the processes through which products are made with the required functionality, to high quality standards, in the quantities needed, available when and where customers prefer, and at the best possible price.

Every day, manufacturing engineers make decisions about technology, machinery, people, and money. The preparation for the excitement and challenge of modern manufacturing requires students to master the mathematics and applied science common to all engineering disciplines. They then will master the fundamentals of process engineering and production engineering so that they may apply these principles to production of any type of goods.

The Manufacturing Engineering 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 Manufacturing Engineering program will be able to:

1. Solve problems relevant to modern manufacturing industries, with principal emphasis on process engineering and production engineering, as well as selected aspects of process science and the manufacturing enterprise.
2. Design competitive manufacturing processes and production systems, integrating machinery, technology, people and money, with appropriate consideration for environmental factors, health and safety, sustainability 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 multi-disciplinary teams in both leadership and followership roles.
5. Effectively communicate complex technological concepts, issues and professional details to a variety of audiences.

Manufacturing Engineering graduates are well positioned to select career employment in any manufacturing industry. Graduates are actively recruited by companies that produce agricultural and construction machinery and vehicles, complex industrial apparatus, recreational vehicles, airplanes, household goods, building products, and both industrial and consumer electronics. Manufacturing Engineering graduates generally begin their careers designing processes and production systems or directly managing some phase of manufacturing. Frequently, they progress to increased responsibilities, with broader scope and yet more opportunity.

Manufacturing Engineering Areas of Emphasis

Students majoring in Manufacturing Engineering may prepare for specific career choices by careful use of the technical electives and the Engineering Science electives included in the Manufacturing Engineering major. It is suggested that students confer with their academic adviser for assistance in choosing the most appropriate optional courses. These topical areas also are available for post-graduate study, leading to Master of Science in Manufacturing Engineering, Master of Science in Industrial Engineering, and Doctor of Philosophy in Industrial and Manufacturing Engineering degrees. For more complete details, see the Graduate Bulletin (http://bulletin.ndsu.edu/graduate) online.

Selective Admission

The Department of Industrial and Manufacturing Engineering has a selective admission policy. To be admitted to the Manufacturing Engineering 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.

Manufacturing Sequences for Non-Majors

Most industrial enterprises engage in the production of some sort of goods in some way and to some degree. Students majoring in other disciplines can enhance their career value by expanding their knowledge of process engineering and production engineering. For students majoring in other engineering disciplines or in the agricultural or physical sciences, the technological foundations of manufacturing can be acquired through IME 330 Manufacturing Processes, IME 380 CAD/CAM for Manufacturing, IME 430 Process Engineering and IME 431 Production Engineering. Also, engineering majors from other disciplines may elect to acquire more depth through advanced manufacturing courses (IME 427 Packaging for Electronics, IME 432 Composite Materials Manufacturing, IME 433 Additive Manufacturing, IME 435 Plastics and Injection Molding Manufacturing, and IME 437 Methods for Precision Manufacturing).
Manufacturing Engineering Minor

Most industrial enterprises engage in the production of some sort of goods in some way and to some degree. Students majoring in other disciplines can enhance their career value by expanding their knowledge of the technologies, processes and systems of manufacturing. A minor in Manufacturing Engineering may be earned by any student in good standing and majoring in any engineering discipline or applicable agricultural or physical sciences. Students electing to pursue this minor will be expected to have achieved the necessary pre-requisite knowledge, consisting of basic calculus, statistics and physical sciences. Students completing a minor in Manufacturing Engineering will gain highly relevant understanding of the technologies, machine tools, fixturing and tooling, and production systems employed in the manufacture of a wide variety of goods used in modern society.

Interested students are encouraged to visit with relevant faculty in the IME Department for advice on course selection to best suit their career interests.

Major Requirements

Major: Manufacturing Engineering

Degree Type: B.S.Mfg.E.
Required Degree Credits to Graduate: 131

General Education Requirements

First Year Experience (F):
UNIV 189 Skills For Academic Success (Students transferring in 24 or more credits do not need to take UNIV 189.)

Communication (C):
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):
MATH 165 Calculus I 4

Science & Technology (S):
CHEM 121 General Chemistry I
& 121L 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

IME Courses Required:
IME 111 Introduction to Industrial and Manufacturing Engineering 3
IME 311 Work/Station Design and Measurement 3
IME 330 Manufacturing Processes 3
IME 380 CAD/CAM for Manufacturing 3
IME 430 Process Engineering 3
IME 431 Production Engineering 3
IME 440 Engineering Economy 3
IME 456 Program and Project Management 3
IME 460 Evaluation of Engineering Data 3
IME 461 Quality Assurance and Control 3
IME 480 Production and Inventory Control 3
IME 482 Automated Manufacturing Systems 3
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<tr>
<th>Course Code</th>
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<tr>
<td>MATH 128</td>
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<td>Calculus II</td>
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<td>MATH 259</td>
<td>Multivariate Calculus</td>
<td>3</td>
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<td>MATH 266</td>
<td>Introduction to Differential Equations</td>
<td>3</td>
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<td>ME 212</td>
<td>Fundamentals of Visual Communication for Engineers</td>
<td>3</td>
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<tr>
<td>ME 221</td>
<td>Engineering Mechanics I</td>
<td>3</td>
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<tr>
<td>ME 222</td>
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<td>ME 223</td>
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<td>Materials Science and Engineering</td>
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<td>ENGR 402</td>
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<tr>
<td>PHYS 252L</td>
<td>University Physics II Laboratory</td>
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**Manufacturing Electives**

- **Computer Science Electives**: Select 3 credits from the following:
  - CSCI 122 Visual BASIC
  - CSCI 126 Beginning FORTRAN
  - CSCI 160 Computer Science I
  - ECE 173 Introduction to Computing

- **Engineering and Science Electives**: Select 9 credits from the following:
  - CE 309 Fluid Mechanics
  - ME 350 Thermodynamics and Heat Transfer

Select one of the following:
- EE 206 Circuit Analysis I
- ECE 275 Digital Design
- ECE 301 Electrical Engineering I

**Technical Electives**: Select 9 credits from the following:

- IME 335 Welding Technology
- IME 411 Human Factors Engineering
- IME 427 Packaging for Electronics
- IME 432 Composite Materials Manufacturing
- IME 433 Additive Manufacturing
- IME 435 Plastics and Injection Molding Manufacturing
- IME 437 Methods for Precision Manufacturing
- IME 450 Systems Engineering and Management
- IME 451 Logistics Engineering and Management
- IME 452 Integrated Industrial Information Systems
- IME 455 Management of People Systems
- IME 462 Total Quality In Industrial Management
- IME 463 Reliability Engineering
- IME 470 Operations Research I
- IME 472 Simulation of Business and Industrial Systems
- IME 485 Industrial and Manufacturing Facility Design

Only one of the following five courses may be counted as technical electives:
- 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
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
Manufacturing Engineering Minor
Minor Requirements
Required Credits: 18

Required Courses
IME 330 Manufacturing Processes 3
IME 380 CAD/CAM for Manufacturing 3
IME 430 Process Engineering 3
IME 431 Production Engineering 3

Electives: Select 6 credits from the following: 6
IME 335 Welding Technology
IME 427 Packaging for Electronics
IME 432 Composite Materials Manufacturing
IME 433 Additive Manufacturing
IME 435 Plastics and Injection Molding Manufacturing
IME 437 Methods for Precision Manufacturing
IME 461 Quality Assurance and Control
IME 482 Automated Manufacturing Systems

Total Credits 18

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 Manufacturing Engineering.