

# Manufacturing Engineering

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## Manufacturing Engineering Major

Manufacturing Engineering is a good choice for people who have both aptitude and interest in working in manufacturing environment and produce physical products for improved living standard for the general populace. This career field is focused on design and production of any type 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 designs and produces goods/services.

These days manufacturing engineers focus on designing seamless integration of different elements of manufacturing processes. 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](http://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/past-bulletin-archive/2017-18/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 for Baccalaureate Degree

- A list of approved general education courses is available here (<http://bulletin.ndsu.edu/past-bulletin-archive/2017-18/academic-policies/undergraduate-policies/general-education/#genedcoursestext>).
- General education courses may be used to satisfy requirements for both general education and the major, minor, and program emphases, where applicable. Students should carefully review the major, minor, and program emphases requirements for minimum grade restrictions, should they apply.

Code	Title	Credits
<b>Communication (C)</b>		12
ENGL 110	College Composition I	
ENGL 120	College Composition II	
COMM 110	Fundamentals of Public Speaking	
Upper Division Writing <sup>†</sup>		
<b>Quantitative Reasoning (R) <sup>†</sup></b>		3
<b>Science and Technology (S) <sup>†</sup></b>		10
<b>Humanities and Fine Arts (A) <sup>†</sup></b>		6
<b>Social and Behavioral Sciences (B) <sup>†</sup></b>		6
<b>Wellness (W) <sup>†</sup></b>		2
<b>Cultural Diversity (D) <sup>*†</sup></b>		
<b>Global Perspectives (G) <sup>*†</sup></b>		
Total Credits		39

\* May be satisfied by completing courses in another General Education category.

† May be satisfied with courses required in the major. Review major requirements to determine if a specific upper division writing course is required.

## Major Requirements

Code	Title	Credits
<b>Manufacturing Engineering Core Requirements</b>		
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
IME 489	Industrial and Manufacturing Engineering Capstone	3
MATH 128	Introduction to Linear Algebra	1
MATH 165	Calculus I (May satisfy general education category R)	4
MATH 166	Calculus II	4
MATH 259	Multivariate Calculus	3
MATH 266	Introduction to Differential Equations	3
ME 212	Fundamentals of Visual Communication for Engineers	3
ME 221	Engineering Mechanics I	3
ME 222	Engineering Mechanics II	3
ME 223	Mechanics of Materials	3
ME 331	Materials Science and Engineering	4
CHEM 121 & 121L	General Chemistry I and General Chemistry I Laboratory (May satisfy general education category S)	4
CHEM 122	General Chemistry II (May satisfy general education category S)	3
ENGL 321	Writing in the Technical Professions (May satisfy general education category C)	3
ENGR 402	Engineering Ethics and Social Responsibility	1
PHYS 252 & 252L	University Physics II and University Physics II Laboratory (May satisfy general education category S)	5

**Manufacturing Electives**

Computer Science Electives: Select 3 credits from the following: 3

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	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

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

Total Credits

107-108

### 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

Code	Title	Credits
<b>Required Courses</b>		
IME 330	Manufacturing Processes	3
IME 380	CAD/CAM for Manufacturing	3
IME 430	Process Engineering	3
IME 431	Production Engineering	3
<b>Electives: Select 6 credits from the following:</b>		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.