

ENGINEERING TECHNOLOGY

DEPARTMENT OFFICE

School of Technology and Applied Sciences

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Engineering Technology at NMU

Programs offered by the Engineering Technology Department prepare students for careers in fields such as electronics engineering technology, mechanical engineering technology, industrial technology, industrial technology education. These programs have a foundation in mathematics, physical science, computer science, along with an in-depth technical focus.

The department also offers associate degrees in architectural technology, computer-aided design, electromechanical technology, electronics and manufacturing as well as a one-year certificate program in computer numerical control. These programs are designed for students who are seeking quick entry into the workforce. In most instances, courses completed toward an associate degree are applicable to a baccalaureate degree.

Student Organizations

- Society of Automotive Engineers
- Student Michigan Education Association

Department Facilities

- Automation Lab
- CAD Lab
- Data Acquisition Lab
- Electronics Lab
- Hydraulics Lab
- Machine Tool Lab
- Materials Testing Lab
- Process Control/PLC Lab

Department/Program Policies

Students must have a minimum grade of "C" and a grade point average of 2.25 for all major courses and minor programs. Students majoring in industrial technology education must maintain a grade point average of 2.70 or greater with no grade below a "C" in the professional education sequence, the major and/or minor(s) and required cognates combined.

BACHELOR DEGREE PROGRAMS

Liberal Studies: Complete information on the liberal studies requirements and additional graduation requirements, including the health promotion requirement, is in the "Liberal Studies Program and Graduation Requirements" section of this bulletin (38-44).

Courses within each major that can be used to satisfy liberal studies requirements are listed with the roman numeral (in brackets) that coincides with the liberal studies division the course falls under.

Electronics Engineering Technology Major

This major provides students with the necessary preparation for positions in industry as engineering technologists. Students choose a concentration in either digital systems or electromechanical technology. Graduates of the program are employed as field service engineers, application engineers, software engineers and technicians.

| | |
|---|--------------|
| Total Credits Required for Degree | 128 |
| Liberal Studies | 30-40 |
| Health Promotion | 2 |
| Major Courses | 28 |
| ET 112 DC Circuit Analysis | 4 |
| ET 113 AC Circuit Analysis | 4 |
| ET 201 Visual Programming | 4 |
| ET 210 Discrete Semiconductors | 4 |
| ET 211 Digital Electronics | 4 |
| ET 212 Advanced Linear Circuits | 3 |
| ET 410 Interfacing and Data Acquisition | 3 |
| ET 430 Electronics Senior Project | 2 |
| Major Concentration | 20-21 |
| <i>Choose one concentration from the following:</i> | |
| Electromechanical Systems Concentration | 20 |
| ET 250 Industrial Electrical Machinery | 4 |
| ET 252 Industrial Motor Controls | 4 |
| ET 311 Applied Programmable Controllers | 2 |
| ET 360 Process Controls Systems | 3 |
| IT 180 Introduction to Fluid Power | 3 |
| IT 265 Total Productive Maintenance | 1 |
| IT 214 Industrial Observation | 1 |
| IT 215 General Industrial Safety | 2 |
| Digital Systems Concentration | 21 |
| ET 320 Advanced Digital Systems | 3 |
| ET 420 Microcontroller Applications | 3 |
| CIS 430 Data Communications | 3 |

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|---|-----------|
| Electives | 12 |
| <i>Choose from the following:</i> | |
| ET 281 Computer Systems Servicing (3 cr.) | |
| ET 282 Software Systems (3 cr.) | |
| CIS 220 Network Concepts (2 cr.) | |
| CIS 230 Novell Operating Systems (2 cr.) | |
| CIS 234 Microsoft Network Operating Systems (2 cr.) | |
| CS 120 Computer Science I (4 cr.) [V] | |
| CS 122 Computer Science II (4 cr.) | |
| CS 222 Data Structures (4 cr.) <i>or</i> | |
| CS 228 Network Programming (3 cr.) | |

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|---|-----------|
| Other Required Courses | 30 |
| CH 105 Chemical Principles [III] | 4 |
| DD 105 Schematic/Diagram Drafting | 2 |
| EN 211D Technical and Report Writing [I] | 4 |
| MA 104 College Algebra with Applications in the Sciences and Technology [III] | 4 |
| MA 106 Trigonometry [III] | 3 |
| MA 171 Introduction to Probability and Statistics [V] | 4 |
| MA 271 Calculus with Applications | 4 |
| PH 201 College Physics I [III] | 5 |

Industrial Technology Major

The program provides students with the skills to hold supervisory and technical positions in industry. Graduates of the program are hired as quality control technicians, production supervisors and managers. Students are strongly urged to meet with their adviser to select a minor that will support their career goals.

| | |
|---|--------------|
| Minimum Credits Required for Degree | 124 |
| Liberal Studies | 30-40 |
| Health Promotion | 2 |
| Major Courses | 32 |
| IT 180 Introduction to Fluid Power | 3 |
| MET 211 Mechanics-Statics | 4 |
| MET 213 Materials Science I | 3 |
| IT 214 Industrial Observation | 1 |
| IT 261 Robotics and Automation Systems | 4 |
| IT 265 Total Productive Maintenance | 1 |
| IT 300 Industrial Supervision | 3 |
| IT 340 Enterprise Resource Planning | 3 |
| IT 380 Facility Planning | 3 |
| IT 400 Industrial Safety and Ergonomics | 2 |
| IT 420 Quality Control | 3 |
| MET 430 Senior Project | 2 |
| Other Required Courses | 47 |
| ACT 202 Accounting Concepts for Management | 4 |
| CH 105 Chemical Principles [III] | 4 |
| DD 100 Technical Drafting/Introduction to CAD | 4 |
| ET 110 Introduction to Electricity | 4 |
| IS 100 Introduction to Windows, E-mail and the Internet [V] | 1 |
| IS 101 Beginning Word Processing [V] | 1 |
| IS 102 Beginning Spreadsheets [V] | 1 |
| IS 104 Beginning Database [V] | 1 |
| MA 104 College Algebra with Applications in the Sciences and Technologies [III] | 4 |
| MA 171 Probability and Statistics [V] | 4 |

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|-----------------------------------|---|
| MF 134 Manufacturing Processes | 4 |
| MGT 221 Business Law | 3 |
| MKT 230 Introduction to Marketing | 3 |
| PH 201 College Physics I [III] | 5 |
| SP 100 Public Address | 4 |

Minor, Contracted Minor or General Electives 20

Mechanical Engineering Technology Major

This major provides students with a solid foundation in science, mathematics, and engineering principles. Graduates are employed as designers, manufacturing engineers and in related positions.

| | |
|---|--------------|
| Total Credits Required for Degree | 128 |
| Liberal Studies | 30-40 |
| Health Promotion | 2 |
| Technology Core | 57 |
| DD 100 Technical Drawing/Introduction to CAD | 4 |
| DD 102 Engineering Graphics | 3 |
| DD 202 Product Design and Development | 4 |
| ET 112 DC Circuit Analysis | 4 |
| ET 201 Visual Programming | 4 |
| ET 410 Interfacing and Data Acquisition <i>or</i> | 3 |
| ET 420 Microcontroller Applications | |
| IT 180 Introduction to Fluid Power | 3 |
| IT 214 Industrial Observation | 1 |
| MET 211 Mechanics Statics | 4 |
| MET 213 Materials Science I | 3 |
| MET 216 Materials Science II | 3 |
| MET 310 Mechanics-Dynamics | 3 |
| MET 311 Strength of Materials | 4 |
| MET 320 Mechanical Design | 4 |
| MET 410 Thermodynamics | 4 |
| MET 430 Senior Project | 2 |
| MF 134 Manufacturing Processes | 4 |

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|---|-----------|
| Other Required Courses | 34 |
| CH 105 Chemical Principles [III] | 4 |
| EN 211D Technical and Report Writing [I] | 4 |
| IS 100 Introduction to Windows, E-Mail and the Internet [V] | 1 |
| IS Electives [V] | 3 |
| MA 104 College Algebra with Applications in the Sciences and Technologies [III] | 4 |
| MA 171 Introduction to Probability and Statistics [V] | 4 |
| MA 271 Calculus with Applications | 4 |
| PH 201 College Physics I [III] | 5 |
| PH 202 College Physics II [III] | 5 |

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| Technical Electives | 12 |
| <i>Choose from the following:</i> | |
| DD 103 Geometric Dimensioning and Tolerancing (2 cr.) | |
| DD 105 Schematic/Diagram Drafting (2 cr.) | |
| DD 203 Industrial Drawing and Design (4 cr.) | |
| ET 113 AC Circuit Analysis (4 cr.) | |
| ET 250 Industrial Electrical Machinery (4 cr.) | |
| ET 252 Industrial Motor Controls (4 cr.) | |
| ET 311 Applied Programmable Controllers (2 cr.) | |
| ET 360 Process Control (3 cr.) | |
| IT 265 Total Productive Maintenance (1 cr.) | |

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| IT 300 Industrial Supervision (3 cr.) |
| IT 340 Enterprise Resource Planning (3 cr.) |
| IT 380 Facility Planning (3 cr.) |
| IT 400 Industrial Safety and Ergonomics (2 cr.) |
| IT 420 Quality Control (3 cr.) |
| MF 233 Numerical Control (4 cr.) |
| MF 383 Computer Aided Manufacturing (4 cr.) |
| MGT 210 Time Management (1 cr.) |
| BI 104 Human Anatomy and Physiology (4 cr.) [III] <i>or</i> |
| B1 201 Human Anatomy (3 cr.) |
| PE 317 Anatomical Kinesiology (2 cr.) |
| PE 417 Biomechanics (2 cr.) |
| DD 295, ET 295, IT 295 or MF 295 Special Topics (1-4 cr.) |
| DD 298, ET 298, IT 298 or MF 298 Directed Study and Research (1-4 cr.) |

Secondary Education Industrial Technology Major

Completion of the technical courses, a teaching minor and the professional education sequence lead to certification as a secondary teacher of industrial technology.

| | |
|---|--------------|
| Total Credits Required for Degree | 135 |
| Liberal Studies | 30-40 |
| Health Promotion | 2 |
| Major Courses | 37 |
| DD 100 Technical Drafting with Intro to CAD | 4 |
| ET 110 Introduction to Electricity | 4 |
| MF 134 Manufacturing Processes | 4 |
| WD 140 Introduction to Welding | 4 |
| WT 161 Wood Processes I | 2 |
| IT 180 Introduction to Fluid Power | 3 |
| DD 202 Product Development and Design | 4 |
| MET 213 Materials Science I | 3 |
| IT 214 Industrial Observation | 1 |
| CN 156 Construction Systems and Methods | 3 |
| TE 100 Graphic Arts Printing | 2 |
| Technical Elective | 3 |
| Teaching Minor, minimum | 24 |
| Professional Education | 32 |
| ED 201 Introduction to Education | 2 |
| ED 231 Teaching and Learning in the Secondary Classroom | 4 |
| ED 301 Dimensions of American Education | 2 |
| ED 319 Teaching of Reading-Secondary Teacher | 3 |
| ED 349 Teaching for Diversity, Equity and Social Justice in the Secondary School Community | 2 |
| ED 361 Special Education & the General Classroom Teacher | 2 |
| ED 483 Educational Media and Technology | 2 |
| TE 350 Methods and Materials/Industrial Technology | 3 |
| ED 430 Teaching in the Secondary School | 11 |
| ED 450 Seminar in Teaching | 1 |
| Other Required Courses | 12 |
| EN 211D Technical and Report Writing [I] | 4 |
| MA 104 College Algebra with Applications in the Sciences and Technology [III] | 4 |
| TE 351 Humanity and Technology [II] | 4 |

Technology and Applied Sciences Major

This major provides students a bachelor's degree with a foundation in the physical sciences and mathematics while retaining a flexible technical focus.

| | |
|--|--------------|
| Total Credits Required for Degree | 126 |
| Liberal Studies | 30-40 |
| Health Promotion | 2 |
| Major Courses | 38-39 |
| ET 110 Introduction to Electricity <i>or</i> | 4 |
| ET 100 Fundamentals of Electricity (2 cr.) <i>and</i> | |
| ET 101 Principles of Electrical Wiring (2 cr.) | |
| ET 252 Industrial Motor Controls | 4 |
| ET 311 Applied Program Control | 2 |
| IT 180 Introduction to Fluid Power | 3 |
| MET 211 Mechanics-Statics | 4 |
| MET 213 Materials Science I | 3 |
| IT 214 Industrial Observation | 1 |
| MET 311 Strength of Materials | 4 |
| MA 271 Calculus with Applications | 4 |
| PH 201 College Physics I [III] | 5 |
| PH 202 College Physics II (5 cr.) [III] <i>or</i> | 4-5 |
| ENV 101 Environmental Science (4 cr.) [III] | |
| Other Required Courses | 16 |
| EN 211D Technical and Report Writing [I] | 4 |
| MA 104 College Algebra with Applications in the Sciences and Technology [III] | 4 |
| TE 351 Humanity and Technology [II] | 4 |
| CH 105 Chemical Principles [III] | 4 |
| Technical Minor | 20 |

ASSOCIATE DEGREE PROGRAMS

Architectural Technology

Associate of Applied Science

This degree prepares students for career positions in architecture, facilities management, construction and related fields. Students use computer software to design residential and commercial buildings and gain detailing and preparation skills.

| | |
|---|--------------|
| Total Credits Required for Degree | 62 |
| Liberal Studies | 16 |
| EN 111 College Composition I | 4 |
| EN 211D Technical and Report Writing | 4 |
| MA 104 College Algebra with Applications in the Sciences and Technology | 4 |
| AD 260 Why America Looks This Way <i>or</i> Any other liberal studies elective | 4 |
| Health Promotion | 1 |
| HP 200 Physical Well Being | 1 |
| Major Courses | 20 |
| DD 205 Architectural Presentation Techniques | 2 |
| DD 206 Architectural and Industrial Prototypes | 2 |
| DD 207 Architectural Design | 4 |
| DD 208 Architectural Detailing | 4 |
| DD 302 Architectural Drawing-Residential | 4 |
| DD 303 Architectural Drawing-Commercial | 4 |
| Other Required Courses | 20-21 |
| DD 100 Technical Drafting with Intro to CAD | 4 |
| DD 102 Engineering Graphics | 3 |
| IT 380 Facility Planning | 3 |
| CN 252 Codes and Inspections | 3 |
| MET 211 Mechanics-Statics | 4 |
| ET 282 Software Systems (3 cr.) <i>or</i> CIS 110 Principles of Computer Information Systems (4 cr.) | 3-4 |
| General Electives | 4-5 |

Computer Aided Design Mechanical

Associate of Applied Science

This major gives students a background in the use of computer-aided design software for the design of mechanical parts devices. Students learn to use AutoCAD and Solid Works design software to qualify for positions as CAD designers and mechanical engineering aids.

| | |
|---|--------------|
| Total Credits Required for Degree | 64 |
| Liberal Studies | 15-17 |
| EN 111 College Composition I | 4 |
| EN 211D Technical and Report Writing | 4 |
| MA 104 College Algebra with Applications in the Sciences and Technology | 4 |
| PH 201 College Physics I (5 cr.) <i>or</i> MA 106 Trigonometry (3 cr.) | 3-5 |
| Health Promotion | 1 |
| HP 200 Physical Well Being | 1 |
| Major Courses | 19 |
| DD 100 Technical Drafting with Introduction to CAD | 4 |
| DD 102 Engineering Graphics | 3 |
| DD 103 Geometric Dimensioning and Tolerancing | 2 |
| DD 105 Schematic/Diagram Drafting | 2 |
| DD 202 Product Design and Development | 4 |
| DD 203 Industrial Drawing and Design | 4 |
| Other Required Courses | 23-26 |
| MF 134 Manufacturing Processes | 4 |
| MF 233 Computer Numerical Control (4 cr.) <i>or</i> IT 180 Introduction to Fluid Power (3 cr.) <i>or</i> IT 380 Facility Planning (3 cr.) | 3-4 |
| MET 211 Mechanics-Statics | 4 |
| MET 213 Materials Science I | 3 |
| IT 214 Industrial Observation | 1 |
| IS 100 Introduction to Windows, E-mail and the Internet <i>and</i> Three IS Electives <i>or</i> ET 282 Software Systems (3 cr.) | 3-4 |
| DD 207 Architectural Design <i>or</i> DD 208 Architectural Detailing <i>or</i> DD 302 Architectural Drawing-Residential | 4 |
| ET 100 Fundamentals of Electricity | 2 |
| General Electives | 1-6 |

Electromechanical Technology

Associate of Applied Science

This program prepares students for the position as a technician in an environment where electrical machinery, electro-pneumatic systems, or motor control systems are prevalent, such as in industries, paper mills and other manufacturing or processing plants.

| | |
|--|-----------|
| Total Credits Required for Degree | 62 |
| Liberal Studies | 21 |
| EN 111 College Composition I | 4 |
| EN 211D Technical and Report Writing | 4 |
| MA 104 College Algebra with Applications in the Sciences and Technology | 4 |
| PH 201 College Physics I | 5 |
| IS 100 Introduction to Windows, E-mail and the Internet | 1 |
| IS Electives | 3 |
| Health Promotion | 1 |
| HP 200 Physical Well Being | 1 |
| Major Courses | 37 |
| ET 112 DC Circuit Analysis | 4 |
| ET 113 AC Circuit Analysis | 4 |
| ET 210 Discrete Semiconductors | 4 |
| ET 211 Digital Electronics | 4 |
| ET 212 Advanced Linear Circuits | 3 |
| ET 250 Industrial Electrical Machinery | 4 |
| ET 252 Industrial Motor Controls | 4 |
| ET 311 Applied Programmable Controllers | 2 |
| ET 360 Process Control Systems | 3 |
| IT 180 Introduction to Fluid Power | 3 |
| IT 215 General Industrial Safety | 2 |
| General Electives | 3 |

Electronics Technology

Associate of Applied Science

This major offers students a solid foundation in electronics with the opportunity to chose technical electives. Students may choose to concentrate in computer maintenance, application software, computer interfacing, or biomedical technology through an internship at Marquette General Hospital.

| | |
|--|-----------|
| Total Credits Required for Degree | 64 |
| Liberal Studies | 25 |
| EN 111 College Composition I | 4 |
| EN 211D Technical and Report Writing | 4 |
| MA 104 College Algebra with Applications in the Sciences and Technology | 4 |
| PH 201 College Physics I | 5 |
| IS 100 Introduction to Windows, E-mail and the Internet | 1 |
| Social Science elective | 4 |
| IS Electives | 3 |
| Health Promotion | 1 |
| HP 200 Physical Well Being | 1 |
| Major Courses | 23 |
| ET 112 DC Circuit Analysis | 4 |
| ET 113 AC Circuit Analysis | 4 |
| ET 201 Visual Programming for Technicians | 4 |
| ET 210 Discrete Semiconductors | 4 |
| ET 211 Digital Electronics | 4 |
| ET 212 Advanced Linear Circuits | 3 |
| General Electives | 15 |

Manufacturing Technology

Associate of Applied Science

This program prepares students for employment as manufacturing technicians, computer numerical control (CNC) programmers, and quality technicians.

| | |
|---|-----------|
| Total Credits Required for Degree | 64 |
| Liberal Studies | 16 |
| EN 111 College Composition I | 4 |
| EN 211D Technical and Report Writing | 4 |
| IS 100 Introduction to Windows, E-mail and the Internet | 1 |
| IS 101 Beginning Word Processing | 1 |
| IS 102 Beginning Spreadsheets | 1 |
| IS 104 Beginning Databases | 1 |
| CH 105 Chemical Principles | 4 |
| Health Promotion | 1 |
| HP 200 Physical Well Being | 1 |
| Technical Concentration | 19 |
| DD 100 Technical Drafting with Introduction to CAD | 4 |
| DD 103 Geometric Dimensioning and Tolerancing | 2 |
| MF 134 Manufacturing Processes | 4 |
| MF 133 Machinery Handbook | 2 |
| MF 233 Numerical Control | 4 |
| MET 213 Materials Science I | 3 |

Other Required Courses

| | |
|--|----|
| ET 110 Introduction to Electricity | 20 |
| ET 100 Fundamentals of Electricity <i>or</i> | 4 |
| ET 101 Principles of Electrical Wiring | |
| MET 216 Materials Science II | 3 |
| IT 215 General Industrial Safety | 2 |
| IT 180 Introduction to Fluid Power | 3 |
| MA 100 Intermediate Algebra | 4 |
| SP 100 Public Address | 4 |

General Electives

8

MINOR PROGRAMS

Architectural Technology Minor

Total Credits Required for Minor

20

| | |
|--|---|
| DD 102 Engineering Graphics | 3 |
| DD 205 Architectural Presentation Techniques | 2 |
| DD 206 Architectural and Industrial Prototypes | 2 |
| DD 207 Architectural Design | 4 |
| DD 208 Architectural Detailing | 4 |
| DD 302 Architectural Drawing–Residential <i>or</i> | |
| DD 303 Architectural Drawing–Commercial | 4 |

Technical Elective

1

Computer Aided Design–Mechanical Minor

Total Credits Required for Minor

20

| | |
|---|---|
| DD 102 Engineering Graphics | 3 |
| DD 103 Geometric Dimensioning and Tolerancing | 2 |
| DD 105 Schematics/Diagram Drafting | 2 |
| DD 202 Product Design and Development | 4 |
| DD 203 Industrial Drawing and Design | 4 |

Drafting and Design Electives

5

Electronics Minor

Total Credits Required for Minor

20

| | |
|---|---|
| ET 110 Introduction to Electricity | 4 |
| ET 210 Discrete Semiconductors | 4 |
| ET 211 Digital Electronics | 4 |
| ET 212 Advanced Linear Circuits | 3 |
| ET 430 Senior Project | 2 |
| ET 410 Interfacing and Data Acquisition | 3 |

Electromechanical Technology Minor

Total Credits Required for Minor

20

| | |
|---|---|
| ET 210 Discrete Semiconductors | 4 |
| ET 211 Digital Electronics | 4 |
| ET 250 Industrial Electrical Machinery | 4 |
| ET 252 Industrial Motor Controls | 4 |
| IT 215 General Industrial Safety | 2 |
| ET 311 Applied Programmable Controllers | 2 |

Manufacturing Minor

Total Credits Required for Minor

23

| | |
|---|---|
| DD 103 Geometric Dimensioning and Tolerancing | 2 |
| DD 202 Product Development and Design | 4 |
| MF 133 Machinery Handbook | 2 |
| MF 233 Numerical Control | 4 |
| MET 216 Materials Science II | 3 |
| WD 140 Introduction to Welding | 4 |
| MF 383 Computer-Aided Manufacturing | 4 |

Contracted Minor

Total Credits Required for Minor

20

The contracted minor may consist of courses that emphasize a technical or industrial area of study. Courses comprising this minor must be submitted to the Degree Audits Office along with the department head and adviser's approval.

CERTIFICATE PROGRAM

Computer Numerical Control Technician Certificate

Graduates of this program are employed by manufacturers as CNC technicians.

Total Credits Required for Certificate

31

| | |
|--|----|
| Health Promotion | 1 |
| HP 200 Physical Well Being | 1 |
| Technical Concentration | 19 |
| DD 100 Technical Drafting with Introduction to CAD | 4 |
| DD 103 Geometric Dimensioning and Tolerancing | 2 |
| MF 133 Machinery Handbook | 2 |
| MF 134 Manufacturing Processes | 4 |
| MF 233 Numerical Control | 4 |
| MF 235 Computer Numerical Control | 3 |

Other Required Course

1

| | |
|---|---|
| IS 100 Introduction to Windows, E-mail and the Internet | 1 |
|---|---|

General Electives

10

Pioneer Surgical Internship Option*

**Students seeking participation in the Pioneer Surgical Internship program should take the following courses as electives: IT 150 Industrial Practices I (2 cr.), IT 151 Industrial Practices II (2 cr.), and DD 202 Product Development and Design (4 cr.).*