# MANUFACTURING ANALYTICS ENGINEERING

The program may be completed entirely on campus, entirely online, or through a combination of on-campus and online courses.

## Admission

Admission to the program requires a Bachelor of Science degree in engineering or a physical science from an accredited program with an average of B or better (GPA of 3.0 on a 4-point scale).

Students who do not meet BS degree requirements of the program should speak to the program advisor regarding the additional requirements to be met.

**Course Prerequisites**

- Course in probability and statistics (IMSE 510, Probability and Statistical Models or equivalent). The IMSE 510 requirements can be completed after admission into the program and will count as an elective toward the 30-credit degree requirement.
- Course in engineering materials (ENGR 250 or equivalent). No credit will be given for the ENGR 250.

## Degree Requirements

The MSE in Manufacturing Analytics Engineering requires a minimum of 30 credit hours.

Minimum Grade Requirement in addition to maintaining a minimum cumulative GPA of 3.0 or higher every semester.

- Courses in which grades of C- or below are earned cannot be used to fulfill degree requirements.
- A minimum of a 3.0 cumulative GPA or higher is required at the time of graduation.

Please see Graduate Academic Policies (http://catalog.umd.umich.edu/academic-policies-graduate/) for additional information.

## Requirements

Students in the MSE-MAE program will have the option to declare one of 3 concentration areas, namely, Digital and Smart Manufacturing, Manufacturing and Quality Analytics, and Manufacturing Enterprise Management or to not declare a concentration. Each student is advised to declare a concentration according to their interest and take 4 courses in the selected concentration area. A student may also choose not to declare a concentration and take 4 courses from any concentration areas. A thesis may be submitted in lieu of six hours of concentration courses, on approval by the program director.

| Code | Title | Credit Hours |
|---|---|---|
| **Core Courses** | | |
| The core courses will introduce production and operations management, product and process design, and quality engineering. . The following courses are required: | | |
| IMSE 586 | Big Data Aanal & Visuliztn | 3 |
| IMSE 568 | AI for Smart Manufacturing | 3 |
| EMGT 580 | Mgt of Prod and Proc Design | 3 |
| **Concentration Options** | | |
| Students have the option to declare one of the following concentrations according to her/his interest and take 12 credits in the selected concentration: Digital and Smart Manufacturing, Manufacturing and Quality Analytics, or Manufacturing Enterprise Management. A student may also choose not to declare a concentration and take 4 courses from any concentration areas. A thesis may be submitted in lieu of six hours of concentration courses, on approval by the program director. See Concentration section for requirement details. | | 12 |
| **No Concentration Option** | | |
| Select 12 credits from the following: | | |
| ACC 505 | Devel & Interp Financial Info | |
| CIS 545 | Data Security and Privacy | |
| CIS 569 | Internet of Things and Smart Cities | |
| CIS 5570 | Introduction to Big Data | |
| ESE 510 | Sustainability Science and Engineering | |
| IMSE 502 | Computer-Integrated Mfg | |
| IMSE 507 | Industrial Robots | |
| IMSE 511 | Design and Analysis of Exp | |
| IMSE 514 | Multivariate Statistics | |
| IMSE 516 | Project Management and Control | |
| IMSE 517 | Managing Global Programs | |
| IMSE 519 | Quan Meth in Quality Engin | |
| IMSE 538 | Intelligent Manufacturing | |
| IMSE 561 | Tot Qual Mgmt and Six Sigma | |
| IMSE 564 | Applied Data Analytics and Modeling for Enterprise Systems (* see note) | |
| IMSE 567 | Reliability Analysis | |
| IMSE 570 | Enterprise Information Systems (*see note) | |
| IMSE 580 | Prod & Oper Engineering I | |
| IMSE 5205 | Eng Risk-Benefit Analysis | |
| IMSE 5215 | Program Budget, Cost Est & Con | |
| IMSE 5655 | Supply Chain Management | |
| IMSE 5755 | Bus Proc Int using Entrpr Tech (*See note) | |
| ME 559 | Battery Materials, Manufacturing and Recycling | |
| ME 595 | Digital Manufacturing | |
| OB 510 | Organization Behavior | |
| OM 664 | Strategic Sourcing (requires IMSE 580 as a prerequisite, which can be completed as an elective) | |
| * Note: Completion of IMSE 564, IMSE 570, and IMSE 5755 leads to an SAP certification diploma. | | |
| **Professional Electives** | | |
| 9 credits of any 500-level CECS graduate level courses will count toward satisfying the Professional Electives requirement, excluding ENGR 500 and ENGR 501. Note a student who lacks IMSE 510: Probability and Statistical Models or equivalent must choose IMSE 510 as a required elective course. | | 9 |
| **Total Credit Hours** | | **30** |

# Concentration Options

The student is required to take 4 courses (12 credits) to satisfy the concentration requirement. A thesis may be submitted in lieu of six hours of concentration courses, on approval by the program director.

| Code | Title | Credit Hours |
|---|---|---|
| **Digital and Smart Manufacturing Concentration** | | |
| Required Course: | | |
| ME 595 | Digital Manufacturing | 3 |
| Select three courses from the following: | | 9 |
| IMSE 502 | Computer-Integrated Mfg | |
| IMSE 507 | Industrial Robots | |
| IMSE 538 | Intelligent Manufacturing | |
| IMSE 580 | Prod & Oper Engineering I | |
| CIS 545 | Data Security and Privacy | |
| CIS 569 | Internet of Things and Smart Cities | |
| ME 559 | Battery Materials, Manufacturing and Recycling | |
| ESE 510 | Sustainability Science and Engineering | |
| **Total Credit Hours** | | **12** |

The student is required to take 4 courses (12 credits) to satisfy the concentration requirement. A thesis may be submitted in lieu of six hours of concentration courses, on approval by the program director.

| Code | Title | Credit Hours |
|---|---|---|
| **Manufacturing Enterprise Management Concentration** | | |
| Select one of the following: | | 3 |
| IMSE 5655 | Supply Chain Management | 3 |
| OM 664 | Strategic Sourcing (requires IMSE 580 as a prerequisite, which can be completed as an elective) | 3 |
| Select three courses from the following: | | 9 |
| IMSE 516 | Project Management and Control | 3 |
| IMSE 517 | Managing Global Programs | 3 |
| IMSE 5205 | Eng Risk-Benefit Analysis | 3 |
| IMSE 5215 | Program Budget, Cost Est & Con | 3 |
| IMSE 564 | Applied Data Analytics and Modeling for Enterprise Systems [1] | 3 |
| IMSE 570 | Enterprise Information Systems [1] | 3 |
| IMSE 5755 | Bus Proc Int using Entrpr Tech [1] | 3 |
| ACC 505 | Devel & Interp Financial Info | 3 |
| OB 510 | Organization Behavior | 3 |

[1] Completion of IMSE 564, IMSE 570, and IMSE 5755 leads to an SAP certification diploma.

The student is required to take 4 courses (12 credits) to satisfy the concentration requirement. A thesis may be submitted in lieu of six hours of concentration courses, on approval by the program director.

| Code | Title | Credit Hours |
|---|---|---|
| **Manufacturing and Quality Analytics Concentration** | | |
| Required Course: | | |
| IMSE 561 | Tot Qual Mgmt and Six Sigma | 3 |
| Select three courses from the following: | | 9 |
| IMSE 511 | Design and Analysis of Exp | |
| IMSE 514 | Multivariate Statistics | |
| IMSE 519 | Quan Meth in Quality Engin | |
| IMSE 567 | Reliability Analysis | |
| IMSE 580 | Prod & Oper Engineering I | |
| CIS 5570 | Introduction to Big Data | |
| **Total Credit Hours** | | **12** |