

# Mechanical Engineering Technology - Manufacturing Management Option & CNC Certificate (METM, METMC)

## Mechanical Engineering Technology —Manufacturing Management Option (METM)

In the Mechanical Engineering Technology - Manufacturing Management Option, students gain proficiency using the technologies and skills needed to manage a high-tech production facility.

The curriculum includes hands-on manufacturing processes, state-of-the-art computer-aided drafting and computer-aided machining (CAD/CAM), computer numerical control (CNC), and materials and quality control analysis using statistical process control (SPC).

Graduates earn an Associate of Applied Science degree and are prepared for immediate employment in a production facility, or for transition into to related bachelor's degree studies.

For more information, please contact the Engineering and Information Technologies Division at (513) 569-1743.

To apply for this program at Cincinnati State, visit the Admissions (<http://www.cincinnati.edu/academics/admission/>) section of the College website.

## Mechanical Engineering Technology - Manufacturing CNC Certificate (METMC)

The Mechanical Engineering Technology - Manufacturing CNC Certificate is designed for individuals currently employed in a manufacturing field who desire additional knowledge of computer numerical control (CNC) programming and computer-aided manufacturing processes.

Most students can complete the certificate requirements in a year or less. All courses completed while earning this certificate may be applied to the associate's degree program Mechanical Engineering Technology - Manufacturing Management Option.

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## Mechanical Engineering Technology — Manufacturing Management Option (METM)

Semester 1		Lec	Lab	Credits
MET 100	Introduction to Mechanical Engineering Technology ( <b>B</b> )	1	2	2
MET 111	Manufacturing Processes 1 ( <b>B</b> )	2	3	3
MET 131	MET Computer Aided Drafting 1 ( <b>B</b> )	2	3	3
ENG 101	English Composition 1 ( <b>G</b> )	3	0	3
FYE 1XX	First Year Experience Elective ( <b>B</b> )	1	0	1
MAT XXX	Mathematics Elective 1 ( <b>G</b> )	3	2	4
Semester 2				
MET 112	Manufacturing Processes 2 ( <b>T</b> )	2	3	3
MET 132	MET Computer Aided Drafting 2 ( <b>T</b> )	2	3	3
MET 140	Engineering Materials ( <b>T</b> )	2	2	3
MET 150	Statics and Strength of Materials for MET ( <b>T</b> )	2	3	3
MAT XXX	Mathematics Elective 2 ( <b>B</b> )	3	2	4
Semester 3				
MET 291	Full-Time Cooperative Education 1: Mechanical Engineering Technology ( <b>T</b> )	1	40	2
Semester 4				
MET 113	Manufacturing Processes 3 ( <b>T</b> )	2	3	3
MET 240	Hydraulics and Pneumatics ( <b>T</b> )	2	3	3
MET 285	Mechanical Engineering Technology Capstone Project 1 ( <b>T</b> )	2	3	3
EET 101	Electronic Fundamentals 1 ( <b>T</b> )	2	3	3
ENG 10X	English Composition Elective ( <b>G</b> )	3	0	3
Semester 5				
MET 290	Mechanical Engineering Technology Capstone Project 2 ( <b>T</b> )	2	3	3
PHY 151	Physics 1: Algebra and Trigonometry-Based ( <b>G</b> )	3	3	4

XXX XXX		3	0	3
Arts/ Humanities or Social/ Behavioral Science Elective (G)				
MET 215	Advanced and Additive Manufacturing ( T)	2	3	3
<b>Semester 6</b>				
MET 292	Full-Time Cooperative Education 2: Mechanical Engineering Technology ( T)	1	40	2
<b>Total</b>		<b>46</b>	<b>124</b>	<b>64</b>
<b>Credits:</b>				

## Electives

### First Year Experience Elective

FYE 100	College Success Strategies: Overview	1
FYE 105	College Success Strategies: Overview and Application	2
FYE 110	College Success Strategies: Practice and Application	3

### Mathematics Electives 8

Take one of the following series:

MAT 125 Algebra and Trigonometry  
& MAT 126 and Functions and Calculus

Or

MAT 251 Calculus 1  
& MAT 252 and Calculus 2

### English Composition Elective

ENG 102	English Composition 2: Contemporary Issues	3
ENG 104	English Composition 2: Technical Communication	3
ENG 105	English Composition 2: Business Communication	3

### Arts/Humanities or Social/Behavioral Science Elective

Any course from CULT, ECO, GEO, HST, LBR, PHI, POL, PSY, SOC

Some courses are offered in alternative versions identified with a letter after the course number-- for example, ENG 101 and ENG 101A.

- This curriculum displays only course numbers without the added letter.
- The alternative version, when available, meets the requirements of the course version without the added letter.

The letters G, B, and T (displayed after course titles or elective descriptions) identify types of courses required by the Ohio Department of Higher Education as part of an associate's degree curriculum.

G = General Education course in this curriculum

B = Basic Skills course in this curriculum

T = Technical course in this curriculum

## Mechanical Engineering Technology - Manufacturing CNC Certificate (METMC)

### First Year

Semester 1		Lec	Lab	Credits
MET 111	Manufacturing Processes 1	2	3	3
MAT 12X	Mathematics Elective	3	2	4
MET 131	MET Computer Aided Drafting 1	2	3	3
Semester 2				
MET 112	Manufacturing Processes 2	2	3	3
MET 132	MET Computer Aided Drafting 2	2	3	3

### Semester 3

MET 113	Manufacturing Processes 3	2	3	3
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<b>Total</b>		<b>13</b>	<b>17</b>	<b>19</b>
<b>Credits:</b>				

## Electives

### Mathematics Elective

MAT 124	Applied Algebra and Geometry	4
MAT 125	Algebra and Trigonometry	4

Some courses are offered in alternative versions identified with a letter after the course number-- for example, ENG 101 and ENG 101A.

- This curriculum displays only course numbers without the added letter.
- The alternative version, when available, meets the requirements of the course version without the added letter.

## Mechanical Engineering Technology (METD, METM)

- Ability to conduct standard tests and measurements, and to conduct, analyze, and interpret experiments.
- Ability to function effectively as a member of a technical team.
- Ability to design systems, components, or processes to solve engineering technology problems.
- Ability to identify, analyze, and solve narrowly defined engineering technology problems.
- Ability to apply written, oral, and graphical communication in technical environments.
- Demonstrate commitment to quality, timeliness, and continuous improvement.

## Faculty

### Program Chair/Advisor

Michael DeVore, PhD, PE  
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### Co-op Coordinator

Brian Hooten, MAOL  
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## Advisors

Wendy Steinberg, MS  
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Carole Womeldorf, PhD  
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## Courses

### **MET 100 Introduction to Mechanical Engineering Technology** **2 Credits. 1 Lecture Hour. 2 Lab Hours.**

An orientation to the Mechanical Engineering Technology program and the profession. Topics include: computers and software used in the profession, career opportunities, professional skills, and preparation for cooperative education.

Prerequisites: ENG 085 and MAT 124, or appropriate placements

### **MET 111 Manufacturing Processes 1** **3 Credits. 2 Lecture Hours. 3 Lab Hours.**

An introduction to machining and fabrication. Topics include: measuring techniques, manual and computer numerical controlled metal removal processes, machine operations, and materials considerations.

Prerequisites: ENG 085 and MAT 124, or appropriate placements  
Ohio Transfer Assurance Guide Approved

### **MET 112 Manufacturing Processes 2** **3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A continuation of MET 111. Topics include: CNC programming of complex parts on two-axis mills and lathes, and CNC control.

Prerequisites: MET 111 (minimum grade C), and MET 131, and MAT 124 or MAT 125, or appropriate placement

### **MET 113 Manufacturing Processes 3** **3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A continuation of MET 112. Topics include: CAM simulation, machining processes, prototyping techniques, and using CAD/CAM software to create programs for producing components on CNC machines.

Prerequisites: MET 112 (minimum grade C)

### **MET 131 MET Computer Aided Drafting 1** **3 Credits. 2 Lecture Hours. 3 Lab Hours.**

An introduction to mechanical drafting and computer aided drafting. Topics include: geometric construction, orthographic projection, dimensioning, section views, and auxiliary views.

Prerequisites: ENG 085 and MAT 124, or appropriate placements  
Ohio Transfer Assurance Guide Approved

### **MET 132 MET Computer Aided Drafting 2** **3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A continuation of MET 131. Topics include: 3D modeling, geometric dimensioning and tolerancing, and creating assembly models.

Prerequisites: MET 131 (minimum grade C)  
Ohio Transfer Assurance Guide Approved

### **MET 140 Engineering Materials** **3 Credits. 2 Lecture Hours. 2 Lab Hours.**

A course on the materials used in designing and manufacturing machinery and products. Topics include: steel and non-ferrous metals, polymers, ceramics, and composites. Students use the materials testing laboratory to study physical and mechanical properties of materials.

Prerequisites: MET 111 and MAT 124, or appropriate placement  
Ohio Transfer Assurance Guide Approved

### **MET 150 Statics and Strength of Materials for MET** **3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A course on analyzing forces that occur within machine and structural elements subjected to various types of loads. Topics include: vector analysis, free body diagrams, individual stresses, and combined stresses.

Prerequisites: MAT 124 or MAT 125 or appropriate placement

### **MET 191 Part-Time Cooperative Education 1: Mechanical Engineering Technology**

#### **1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking an associate's degree participate in their first part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 100

### **MET 192 Part-Time Cooperative Education 2: Mechanical Engineering Technology**

#### **1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking an associate's degree participate in their second part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 191

### **MET 193 Part-Time Cooperative Education 3: Mechanical Engineering Technology**

#### **1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking an associate's degree participate in their third part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 192

### **MET 194 Part-Time Cooperative Education 4: Mechanical Engineering Technology**

#### **1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking an associate's degree participate in their fourth part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 193

### **MET 195 Part-Time Cooperative Education 5: Mechanical Engineering Technology**

#### **1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking an associate's degree participate in their fifth part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 194

**MET 196 Part-Time Cooperative Education 6: Mechanical Engineering Technology****1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking an associate's degree participate in their sixth part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 195

**MET 215 Advanced and Additive Manufacturing****3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A course on innovative manufacturing techniques and tools used in industry today. Topics include additive manufacturing, rapid prototyping, laser scanning, laser cutting, and reverse engineering.

Prerequisites: MET 112 and MET 132

**MET 230 Quality Control and Six Sigma****4 Credits. 3 Lecture Hours. 2 Lab Hours.**

A course on modern quality methods used in manufacturing. Topics include: data collection, statistical process control, continuous improvement, and the reduction of product defects through the six-sigma process.

Prerequisites: MET 150

**MET 240 Hydraulics and Pneumatics****3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A course on applied fluid power systems. Topics include: fluid transport, power systems components and circuits, relay logic, and ladder diagrams. Students design, build, and operate hydraulic and pneumatic circuits in the laboratory.

Prerequisites: MET 150

**MET 250 Machine Design****4 Credits. 3 Lecture Hours. 3 Lab Hours.**

A course on applying principles of engineering mechanics and strength of materials to the analysis and selection of mechanical components. Topics include: combined stresses, failure theories, shaft components, shaft design, and fasteners.

Prerequisites: MET 140 and MET 150 (minimum grade C for both)

**MET 260 Applied Thermodynamics****3 Credits. 2 Lecture Hours. 2 Lab Hours.**

A course in the engineering study of energy. Topics include: first and second laws of thermodynamics, general energy equation, Mollier diagrams, ideal cycles, steam generation and turbines, and refrigeration.

Prerequisites: MET 150 and MAT 124, or appropriate placement

**MET 270 Kinematics****3 Credits. 2 Lecture Hours. 2 Lab Hours.**

A course on analyzing mechanisms. Topics include: linear and angular displacement, velocity, acceleration, mass moment of inertia, and dynamic balance. Students use computer simulation software to analyze machine motions and forces.

Prerequisites: MET 150 and PHY 151

**MET 285 Mechanical Engineering Technology Capstone Project 1****3 Credits. 2 Lecture Hours. 3 Lab Hours.**

Students participate in a team design project. Topics include: feasibility study, design concepts, detail and assembly drawings, bill of materials, commercial and fabricated parts, vendors, costs, and manufacturing.

Prerequisites: MET 111 and MET 132 and MET 140 and MET 150 (minimum grade C for all)

**MET 290 Mechanical Engineering Technology Capstone Project 2****3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A continuation of MET 285. Students manufacture, assemble, and test the product designed in MET 285, and prepare a presentation on the complete design process.

Prerequisites: MET 285

**MET 291 Full-Time Cooperative Education 1: Mechanical Engineering Technology****2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking an associate's degree participate in their first full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 100

**MET 292 Full-Time Cooperative Education 2: Mechanical Engineering Technology****2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking an associate's degree participate in their second full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 291

**MET 293 Full-Time Cooperative Education 3: Mechanical Engineering Technology****2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking an associate's degree participate in their third full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 292

**MET 294 Internship 1: Mechanical Engineering Technology****2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking an associate's degree participate in their first unpaid field learning experience related to their degree. Students must follow applicable policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 100

**MET 295 Internship 2: Mechanical Engineering Technology****2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking an associate's degree participate in their second unpaid field learning experience related to their degree. Students must follow applicable policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: MET 294