Manufacturing Foundations Certificate

YOUR COLLEGE

Endorsed by the Ohio Engineering Technology Educators Association

A Career that Works for You

and Ohio

Revised: DATE

**Program Description:** The YOUR COLLEGE Manufacturing Foundation Certificate is a state-wide program that prepares students for entry-level positions in the high demand field of Manufacturing. The Manufacturing Foundation Certificate is supported by the Ohio Engineering Technology Educators Association.

**Prerequisite:** College ready in English, Reading, and Math.

**Program Goals/Outcomes:** This curriculum prepares students for entry level positions in industry and it is also effective preparation for additional education and training. Upon completion of the program, students will be able to:

1. Use a commercially available CAD system to create meaningful engineering drawings including: dimensions and tolerances; multiple views and projections; assemblies and bill of materials; and 3D models.
2. Apply their knowledge of materials to manufacturing processes and demonstrate an understanding of processes such as material removal, forging, casting, forming, finishing; fabrication processes such as welding, adhesives, and fasteners; production efficiencies (e.g., speed and feeds); and safety procedures and methods.
3. Apply knowledge related to industry led technical electives in subjects such as Engineering Materials, Quality Control, Internet of Things, Industry 4.0, and Safety.
4. Work as a member of a team to communicate effectively, solve problems, and improve productivity.
5. Continue their education seamlessly toward an associate degree, BS degree, and beyond.

**Implementation at** YOUR COLLEGE **—the Proposed Curriculum**

This proposed Manufacturing Foundation Certificate program meets the requirements of the state-wide model.

The proposed curriculum is:

Replace these OTM and TAG approved course names and numbers with your college’s information. Note that Pre-Calculus might be replaced with Intermediate Algebra and Co-Op may be replaced with a technical elective.

OTM Writing 3

OTM Math 3

OET012 Computer Aided Drafting 3

OET010 Manufacturing Processes 3

Industry Led Technical Electives\* 4-6

Total Credit Hours 16-18

* Replace Industry Led Technical Electives with courses such as: Engineering Materials, Quality Control, Internet of Things, CO-OP, Intro. To Engineering Technology, or Safety. Most or all credits earned in this certificate apply seamlessly toward the Mechanical Engineering Technology associate degree.

**Here is a sample curriculum from Miami University:**

EGS 215 Workplace Writing 3

MTH 125 Pre-Calculus 5

ENT 135 Computer Aided Drafting 3

Replace the Miami courses with your courses.

ENT 151 Engineering Materials 3

ENT 152 Manufacturing I (CAM I) 3

ENT 220 Co-Op 1-2

Total Credit Hours 18-19

**Beyond this Program:** This Manufacturing Foundation Certificate gives students the ability to enter the workforce and continue seamlessly toward an associate and bachelor’s degree program in Mechanical Engineering Technology at Miami. In addition, since the program is recognized state-wide, students may pursue additional certificates that can be “stacked” toward earning an associate and bachelor’s degree. Some certificate programs available at college partners near Miami (i.e., Cincinnati State and Sinclair) include CNC Operation and Programming, Quality Control, CAD Design, Welding, and more. These programs generally require 15 to 30 credits hours in addition to the Manufacturing Foundations courses.

**Projected enrollment:** There is considerable emphasis being placed on recruiting more young people into the manufacturing field. Recently, the Department of Labor (DOL) announced renewed emphasis on industry supported apprenticeship programs. The Ohio Manufacturers’ Association (OMA) is applying for DOL funding to support Manufacturing Pathways Apprenticeship programs. As such, other colleges across Ohio are currently requesting approval for the Manufacturing Foundations Certificate.

Conservatively, with promotion of the pathways and partnering with local industry, we can attract an additional 8-10 students per year into this pathway. We expect these students to also continue toward the associate degree in Mechanical Engineering Technology. In addition, some of these students will continue toward a BS degree in Mechanical Engineering Technology.

**Staffing:** There is currently room in our courses to support the additional students. Worst case, we may need additional sections of technical courses which could be staffed with adjunct faculty.

**Program Implementation:** It is proposed that YOUR COLLEGE ENT faculty partner with local industries to recruit and identify a cohort of students. Students will be identified early in the process to work at an industry partner. While taking classes, students will experience one or two day-long activities per semester at the company. This will include exposure to various manufacturing processes, learning more about company policies and procedures, and preparing the student for full-time work once they complete their academic course work. Some students will complete the academic courses in one semester while some will require two semesters to complete the course work. Upon completion of the academic courses, students will have one full-time work term under YOUR COLLEGE WORK EXPERIENCE COURSE. Upon successfully completing the academic courses and one work term, the student is eligible to receive the Manufacturing Foundations Certificate. It is expected that Career Planning and Placement will assist and support this program.

# Manufacturing Foundations Curriculum (16-18 semester credit hours)

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| Transfer Assurance Guide/Transfer Module Course | Course Description |
| A course in Technical Writing  -OR-  English/Writing  TME001  (3 semester credit hours) | Written communication is important to success in business and industry. Students are encouraged to develop effective writing skills.  Technical Writing (Resume’, proposal letters, instructions, explanation of a process or idea, preparing analytical reports). Note that some colleges may have a pre-requisite for Technical Writing. Topics of technical writing should also be embedded in technical courses.  -OR-  TME001 English Composition First Writing Course 3 semester credit hours. Technical courses should require writing reports, etc.  <http://regents.ohio.gov/transfer/otm/english-comp/TME001-First-Writing-Course.pdf> |
| Technical Math  -OR-  TMM 011 - Quantitative Reasoning  -OR-  College Algebra  TMM001  (3 semester credit hours)\* | Basic math skills are crucial in manufacturing. Math will also be used in technical courses. Students are encouraged to develop their math skills. The following levels of math are basic minimums. Students who want to continue in technical education are strongly encouraged to pursue Algebra and beyond.    TMM 011 - Quantitative Reasoning 3-4 semester credit hours  <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/transfer/documents/OTM/TMM011%20Quantitative%20Reasoning%20FINALIZED%20v2-%2012-21-2015.pdf>  -OR-  TMM001: College Algebra 3 semester credit hours  <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/transfer/documents/OTM/TMM001%20College%20Algebra%20Revision%20Rationale%2012-8-2015.pdf> . |
| Computer Aided Drafting/Design  OET012  3 semester credit hours | OET 012– Computer Aided Drafting/Design (CAD). Also approved as a CTAG CTMET005. This course introduces the student to the fundamental concepts used in creating computer-generated drawings using a commercial CAD software. Topics include coordinate systems, construction, text insertion, editing techniques, views, projections, display control, inquiry techniques, dimensioning and use of part libraries in the creation of drawings and assemblies. Bill of materials will be generated from multi-sheet assemblies. Students will develop 3D objects using primitive solids and Boolean operations. Learning outcomes are achieved through various in class and laboratory experiences. <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/transfer/documents/TAG/FINAL%20Learning%20Outcomes%20for%20CAD%20TAG%20Course%209-30-16.pdf>  Rubric: <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/transfer/CT2/Rubric_CAD.pdf> |
| Engineering Materials  OET013  3 semester credit hours  (May be replaced with a course in Quality) | OET 013– Engineering Materials. This course covers the basic physical and chemical properties of materials, structures, and technical information required to select appropriate materials and treatment processes that could be used in engineering applications. Also covered are the limitations and production processes of material such as plastics, metals, ceramics, composites, cemented carbides, and other materials and variety of testing methods used for selection and design specifications. Learning outcomes are achieved through various in class and laboratory experiences. <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/transfer/documents/TAG/FINAL%20Learning%20Outcomes%20for%20Engineering%20Materials%20TAG%20Course%209-30-16.pdf>  Some colleges may require Algebra as a prerequisite. |
| Manufacturing Processes  OET010  3 semester credit hours | OET 010– Manufacturing Processes Also approved as a CTAG CTMET004. The focus of this course is to provide the student with an introduction to common major manufacturing processes. Students will study and gain practical experience in various manufacturing processes such as metrology, materials, heat-treating, machine operations, metal forming, extrusions, castings, welding, finishing, adhesion, fasteners, assembly, and applications of empirical data to determine speeds and feeds to optimize production efficiencies. Learning outcomes are achieved through various in class and laboratory experiences. <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/transfer/documents/TAG/FINAL%20Learning%20Outcomes%20for%20Manufacturing%20Processes%20TAG%20Course%209-30-16.pdf>  Rubric: <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/transfer/CT2/Rubric_ManufacturingProcesses.pdf>  Some Algebra concepts may be required. |
| Workplace learning 1-3 semester credit hours | Students need a co-op or similar work-based learning experience. |
| 16-18 credit hours total | See Rubrics for technical courses |

\* Students who expect to continue toward an associate degree should take Algebra or a higher-level math.