

Course Number and Title: MET 225 Adv. Manufacturing Techniques

Campus Location:

Georgetown, Stanton

Effective Date:

2021-51

Prerequisite:

MET 123, EDD 131 or EDD 141

Co-Requisites:

None

Course Credits and Hours:

3.00 credits

2.00 lecture hours/week

4.00 lab hours/week

Course Description:

This course covers laboratory and lecture activities, including metal inert gas (MIG) welding, tungsten inert gas (TIG) welding, computer integrated manufacturing, abrasive machining, and other specialized machining processes. Topics include material on ferrous metals, non-ferrous metals, plastics, and heat treatment of steels. Students apply industry standard allowances and tolerances to manufacture assemblies.

Required Text(s):

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:

None

Schedule Type:

Classroom Course

Disclaimer:

None

Core Course Performance Objectives (CCPOs):

1. Identify metal finishing processes. (CCC 1, 2, 5; PGC MET 1, 8; PGC DEM 5)
2. Use typical machine shop equipment. (CCC 1, 2, 3, 4, 6; PGC MET 1, 5; PGC DEM 1, 2, 4, 5)
3. Perform selected welding and joining processes. (CCC 1, 2, 3, 4, 5; PGC MET 1, 5, 8; PGC DEM 1, 2, 4, 5)
4. Identify plastics and composites and their properties. (CCC 1, 2, 3, 4, 5; PGC MET 1, 5, 8; PGC DEM 1, 2, 4, 5)
5. Describe and use computer integrated manufacturing (CIM) and computer numerical control (CNC) processes. (CCC 1, 2, 5, 6; PGC MET 2, 3, 4; PGC DEM 1, 2, 4, 5)
6. Describe common heat treatment processes. (CCC 1, 2, 5; PGC MET 1, 8; PGC DEM 1, 2, 5)
7. Describe non-traditional machining. (CCC 1, 2, 5; PGC MET 1, 8; PGC DEM 1, 2, 5)
8. Explain types of competitive manufacturing such as lean, just-in-time (JIT), Six Sigma, Kanban, and Kaizen. (CCC 1, 2, 5; PGC MET 1, 5; PGC DEM 1, 2, 5)
9. Explain the applications of bulk deformation processes such as forming, rolling, drawing, and extrusion. (CCC 1, 2, 5; PGC MET 5; PGC DEM 1, 2, 5)
10. Determine the appropriate allowances and tolerances for fits using standard American National Standards Institute (ANSI) B4.1 (or B4.2 as applicable) for the assembly of mating parts. (CCC 1, 2, 5; PGC MET 1, 6, 10; PGC DEM 1, 2, 5)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Identify metal finishing processes.
 1. Explain the following types of metal finishing processes:
 1. Honing
 2. Lapping
 3. Superfinishing
 4. Grinding
 5. Polishing
 2. Identify natural abrasives and their applications.
 3. Describe the grinding wheel marking system.
 4. List synthetic abrasives and their uses.
2. Use typical machine shop equipment.
 1. Use a milling machine to accurately produce a part.

2. Use a lathe to turn a part.
3. Produce threaded parts.
4. Operate an outer diameter (OD) grinder.
5. Use a surface grinder.
3. Perform selected welding and joining processes.
 1. Identify soldering and brazing equipment.
 2. List common types of solders, brazing materials, and fluxes.
 3. Explain the different types of welding such as gas tungsten arc welding (GTAW), gas metal arc welding (GMAW), resistant spot welding (RSW), and shielded metal arc welding (SMAW).
 4. Identify typical welding equipment used in industry.
 5. List the safety precautions and personnel equipment needed for welding.
 6. Safely weld, solder, and braze sample materials together.
4. Identify plastics and composites and their properties.
 1. Identify thermosetting plastics.
 2. List typical thermoplastics.
 3. Describe composite materials.
 4. Explain how machining plastics/composites differ from traditional metals.
 5. Machine plastic material on a lathe.
 6. Machine plastic material on a milling machine.
5. Describe and use computer integrated manufacturing (CIM) and computer numerical control processes (CNC).
 1. Identify concepts of a CIM factory.
 2. List typical components of a flexible manufacturing system (FMS).
 3. Define advantages and disadvantages of CIM.
 4. Discuss common tooling and related equipment for CNC.
 5. Calculate speeds and feeds for CNC.
 6. Write part programs on CNC equipment and use Mastercam Software.
6. Describe common heat treatment processes.
 1. List the principles of heat treatment.
 2. Identify typical effects of heat treatment on selected materials.
 3. Explain terms associated with heat treatment methods such as hardening, tempering, annealing, and normalizing.
 4. Discuss surface hardening processes.
7. Describe non-traditional machining.
 1. Identify characteristics of the following advanced processes:
 1. Chemical machining
 2. Electrochemical machining
 3. Electrical discharge machining
 4. Laser beam machining
 5. Water jet machining
 6. Nanofabrication
8. Explain types of competitive manufacturing such as lean, just-in-time (JIT), Six Sigma, Kanban, and Kaizen.
 1. Identify current trends in manufacturing such as lean manufacturing, JIT, Kanban, the Toyota system, and 5S.
 2. Identify how product design influences materials, manufacturing processes, and costs.
 3. Discuss manufacturing costs.
9. Explain the applications of bulk deformation processes such as forming, rolling, drawing, and extrusion.
 1. Describe the forging process.
 2. Explain the drawing process.
 3. Identify the extrusion process.
 4. Describe the metal stamping process.
 5. Explain the metal shearing process.
 6. Describe the bending and spinning process.
 7. List the advantages and disadvantages of hot working metals.
 8. List the advantages and disadvantages of cold working metals.
10. Determine the appropriate allowances and tolerances for fits using standard American National Standards Institute (ANSI) B4.1 (or B4.2 as applicable) for the assembly of mating parts.
 1. Describe basic size, nominal size, and tolerance.
 2. Describe clearance fit, interference fit, and transition fit.
 3. Determine the specific fit from a description.
 4. Use standard fit tables to calculate nominal and tolerance dimensions for mating parts.

Evaluation Criteria/Policies:

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Tests 1-4 (equally weighted) (summative)	50%
Project 1 (formative)	7.5%
Project 2 (formative)	7.5%
Project 3 (formative)	30%
Project 4 – Welding (formative)	5%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems

Disabilities Support Statement:

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.