LANCASTER COUNTY
CAREER & TECHNOLOGY CENTER

Our Mission: Preparing people for skilled, innovative, and productive careers.
2025/2026 Syllabus - Introduction to Manufacturing

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Welcome and Course Overview

Welcome to the 2025-2026 school year at the Lancaster County Career & Technology Center's Brownstown Campus. You will be embarking on an enjoyable yet rigorous journey. This course will test you in many ways. You will be learning about welding, metal fabrication, precision machining and electromechanical engineering.

Course Format

At LCCTC the format of our courses is split into three tiers. Knowledge, Skills, and Daily Expectation/Work Ethic. You will be graded on all three areas while you work in both the theory or classroom portion of class and the skill or lab portion of class.

The Knowledge/Theory portion of this course includes lectures, demonstrations and online learning tools that will be graded online and in person tests and quizzes for assessment.

The topics covered are welding, metal fabrication, precision machining and electromechanical engineering.

The projects include but not limited to weldments using shielded metal arc welding (SMAW), flux core arc welding (FCAW), gas tungsten arc welding (GTAW), oxyfuel cutting (OFC) and PLASMA cutting processes, metal fabrication projects like a box pan and toolbox, wiring parallel and series circuits using different AC/DC components, using a multimeter and precision machining projects like keychain, dice and cylindrical parts using both CNC and manual equipment.

The lab portion of the course is in an industrial setting which at times is very loud, hot and small working areas with flashing lights that require students to be able to follow all shop safety rules including being able to work individually and in a group setting.

Homework will only need to be done if the student is absent, unable to finish an assignment during classroom time or if a virtual learning day is declared.

Course Objectives

To explore the careers and skillsets required in welding, metal fabrication, precision machining and electromechanical engineering. These experiences will assist a student in the decision-making process for the following academic year.

Course Expectations

To maintain order and allow us to safely maximize class time, the following rules and requirements are to be always followed. Any infractions of these rules and regulations will result in discipline in accordance with the 2024-2025 LCCTC Handbook which can be found on our website and on our learning management system, Canvas.

Classroom Rules

•Be on time for class
•No cell phones, tablets, ear buds or any other unapproved electronic devices
•No horseplay
•No hats are allowed except for in the welding lab
•Be prepared with all materials, including uniform, safety glasses/PPE, "CHARGED" District supplied Chromebook/Laptop, 3-ring notebook/binder, pen or pencil, and project assignments
•Always use appropriate behavior and language in the shop and classroom
•Always stay on task
•Students may not share lockers or access another student's locker
•When absent, it is the student's responsibility to find out what was missed and obtain missed information and work
•A "CLEAN" uniform is expected to be worn every day.

Safety Requirements for Students

•Always follow safety guidelines
•Clean and return all tools and equipment to the proper place
•Report damaged or broken tools and equipment immediately
•Use only tools and equipment that you have permission and training to use
•When in doubt about procedure or operations ask first
•Uniforms and PPE are always required to perform shop work
•No loose jewelry
•Long hair must be pulled back and/or tucked in your shirt
•Shop area must be always kept clean
•Leather steel toe work boots, no sneakers or canvas shoes.

Course Resources

Lancaster County Career & Technology Center's Learning Management System, Canvas
www.lancasterctc.edu

Introduction to Manufacturing's Learning Management System, ToolingU/SME
www.toolingu.com

Course Outline

Theory Assessments

First Marking Period Weekly Assessment:
Week #1. Tooling U-Welding Safety 101& PPE for Welding 111
Week #2. Tooling U-What is Oxy Fuel Welding? 100 & Oxy Fuel Welding Safety 105
Week #3. Tooling U-Introduction to Welding 141 & Math Fundamentals 101
Week #4. Tooling U-Basic Measurement 101 & Introduction to OSHA 101
Week #5. Tooling U-Introduction to SMAW 252 & Units of Measurement 112
Week #6. Tooling U- Welding Fumes and Gases Safety 121 & Electrical Safety for Welding 131
Week #7. Tooling U-Electrode Selection 270 & GMAW Applications 311
Week #8. Tooling U-Introduction for Welding 141 & Fractions and Decimals 111
Week #9. Tooling U- Introduction to Welding Processes 151 & Hand and Power Tool Safety 201

Second Marking Period Weekly Assessment:
Week #1. Tooling U-Safety for Metal Cutting 101 & Introduction to Elding Processes 151
Week #2. Tooling U- Introduction to CNC Machines 201 & History and Definitions of CNC 202
Week #3. Tooling U-Coordinates for the CNC Mill 222 & Basics of G-Code Programming 231
Week #4. Tooling U- Introduction to GMAW 251 & Welding Symbols and Codes 231
Week #5. Tooling U-Electrical Units 101 & Safety for Electrical Work 111
Week #6. Tooling U-Press Brake Safety 100 & Press Brake Components 110
Week #7. Tooling U-Electrical Print Reading 261 & Introduction to Circuits 201
Week #8. Tooling U-DC Circuit Components 221 & AC Fundamentals 241
Week #9. Tooling U-Algebra Fundamentals 141 & Introduction to Robotics 201

Third Marking Period Weekly Assessment:
Week #1. Tooling U-Robot Components 221 & Geometry Lines and Angles 151
Week #2. Tooling U-Geometry Triangles 161 & Introduction to FCAW 261
Week #3. Tooling U-Benchwork and Layout Operations 241 & Shop Geometry 170
Week #4. Tooling U-Manual Mill Basics 201 & Manual Mill Setup 221
Week #5. Tooling U-Geometry Circles and Polygons 171 & Manual Mill Operations 251
Week #6. Tooling U-Hole Making on a Manual Mill 271 & Blueprint Reading 131
Week #7. Tooling U-Geometry Fundamentals for Welding 171 & Interpreting Blueprints 230
Week #8. Tooling U-Basic Measurement 101 & Calibration Fundamentals 111
Week #9. Tooling U-Basics of Tolerance 121 & Trig: Pythagorean Theorem 201

Fourth Marking Period Weekly Assessment:

Week #1. Tooling U-Engine Lathe Basics 211 & Shop Trig Overview 210
Week #2. Tooling U-Engine Lathe Setup221 & Trig: Sin, Cos, Tan 211
Week #3. Tooling U-Trig: Sin Bar Applications 221& What is Soldering 110
Week #4. Tooling U-Engine Lathe Operations 261 & Introduction to GTAW 262
Week #5. Tooling U- NIMS Core Machining Skills 121 & NIMS Core Skills 111
Week #6. Tooling U- Lockout/Tagout Procedures 141 & SDS Hazard Communication 151
Week #7. Tooling U- Plasma Cutting 283 & GTAW Applications 331
Week #8. Tooling U-Manufacturing Applications Part 1 124 & Fire Safety and Prevention 181
Week #9. Tooling U- Manufacturing Applications Part 1 124 & 5S Overview 151

Skills

First Marking Period Assessment

VA101 Identify school rules and lab policies.
VA102 Identify safe work habits.
VA201 Use and identify common hand tools
VA301 Operate handheld power tools.
VA302 Operate electric drill.
VA303 Demonstrate safe operation of hand-held grinder
VA701 Demonstrate safe operation of a pedestal grinder
VA702 Dress & true grinding wheel
VA609 Apply CNC safety procedures
VA610 Use G and M codes.
VA611 Use of Cartesian coordinate systems
VA1100 SHIELDED METAL ARC WELDING (SMAW)
VA1101 Start and restart an arc, flat position on a mild steel plate.
VA1102 Produce a pad weld, flat, with E6011 electrode.
VA1103 Produce a pad weld, flat, with E7018 electrode.
VA1104 Produce a multi pass fillet weld T-joint, horizontal position with E6011 electrodes.
VA1105 Produce a multi pass fillet weld T-joint, horizontal position with E7018 electrodes.
VA1106Produce a multi pass V-groove weld butt joint, flat position with E6011 electrodes.
VA1107 Weld a multi pass V-groove weld butt joint, flat position with E7018 electrodes.
VA801 Identify basic electrical theory.
VA802 Demonstrate electrical safety.
VA803 Identify symbols and circuits.
VA901 Operate bar folder
VA902 Operate cornice brake
VA903 Operate box and pan brake
VA1001 Basic welding print reading
VA1003 Basic metal fabrication print reading
VA1501 Assemble an OFC outfit, light and adjust the flame, and shut down the outfit.
VA1502 Produce a 90 degree straight cut on mild steel plate.

Second Marking Period Assessment

VA401 Operation identification and safety of the Bandsaw.
VA501 Calculate & set drill speed using reference charts.
VA502 Drill holes to blueprint specifications.
VA612 Prove a CNC program
VA613 Set part zero and tool offsets
VA614 Transfer data files to and from a CNC machine
VA615 Use CNC control functions
VA1201 Assemble all equipment accessories for a GMAW station.
VA1202 Build a pad weld, flat position, using stringer beads.
VA1203 Produce a multi pass fillet weld T-joint, horizontal position.
VA1204 Produce a multi pass fillet weld T-joint, vertical position.
VA1205 Produce a multi pass filled weld T-joint, overhead position.
VA1206 Produce a single pass lap joint, flat position.
VA1207 Produce a single pass lap joint, vertical position.
VA1208 Produce a single pass lap joint, overhead position.
VA1209 Produce a single pass square groove butt joint, flat position.
VA1210 Produce a single pass square groove butt joint, vertical position.
VA1211 Produce a single pass square groove butt joint, horizontal position.
VA908 Operate Pittsburgh Lock Machine
VA909 Operate power squaring shear
VA1002 Basic electrical print reading
VA1503 Produce a bevel cut, 30 degrees, on mild steel plate.
VA1504 Produce a circular hole cut on a mild steel plate.

Third Marking Period Assessment

VA601 Demonstrate proper use of a micrometer
VA602 Demonstrate proper use of a caliper
VA603 Demonstrate proper use of an indicator
VA606 Identify safe operations and parts of a milling machine
VA607 Drill holes to X-Y coordinates on a milling machine
VA1601 Assemble all equipment to set up an FCAW station.
VA1602 Produce a CS T-joint F1 position.
VA1603 Produce a CS T-joint F2 position.
VA1604 Produce a CS T-joint F3 position.
VA1605 Produce a CS Butt-joint G1 position.
VA1606 Produce a CS Butt-joint G3 position.
VA1505 Layout a pattern on mild steel and cut to specifications.
VA804 Identify meter symbols and terminology.
VA805 Measure voltage with multimeter.
VA806 Measure continuity with multimeter.
VA807 Measure resistance with multimeter.
VA808 Measure amperage with multimeter.
VA910 Operate soldering tools

VA1004 Basic machining print reading

Fourth Marking Period Assessment

VA604 Identify safe operation and parts of a lathe
VA605 Face and turn a shoulder on a lathe
VA608 Mill a slot or keyway
VA1301 Assemble all equipment accessories for a GTAW station for mild steel welding.
VA1302 Strike and maintain an arc to produce a stringer bead, flat position on mild steel.
VA1303 Produce an outside corner joint fillet weld, flat position, on mild steel.
VA1304 Produce a lap joint fillet weld, horizontal position, on mild steel.
VA1305 Produce a single pass square groove butt joint, flat position, on mild steel.
VA1306 Assemble all equipment accessories for a GTAW station for aluminum welding.
VA1307 Strike and maintain an arc to produce a stringer bead flat position on aluminum
VA1308 Produce a lap joint fillet weld, horizontal position, on aluminum.
VA1309 Produce a single pass square grove fillet weld, flat position, on aluminum.
VA1401 Identify parts of plasma arc cutting machine
VA1402 Demonstrate safe operation of plasma arc cutting machine
VA904 Operate slip forming rolls

Projects

First Marking Period

-SMAW

- Pad-Weld F1 6011 & 7018
- T-Joint F2 6011 & 7018
- V-Groove G1 6011 & 7018

-Box Pan

Second Marking Period

-GMAW

- T-Joint F2, F3 & F4
- Lap-Joint F1, F3 & F4
- Butt-Joint G1, G2 & G3

-OFC-Task Plate
-AC/DC Parrell and Series Circuit

Third Marking Period

-FCAW

- T-Joint F1, F2 & F3
- Butt-Joint G1 & G3

-Dice

-Multimeter Testing

- Ohms
- Volts
- Amps
- Continuity

Fourth Marking Period

-GTAW

- Corner-Joint F1 Steel
- Lap-Joint F2 Steel & Alum
- Butt-Joint G1 Steel & Alum

-OFC Layout Plate

-Plasma Layout Plate

Other Assignments

First Marking Period

-SMAW Blueprints

- Pad-Weld
- T-Joint
- V-Groove

-Box Pan Layout Print

-Career Safe Certification

Second Marking Period

-GMAW Blueprints

- T-Joint
- Lap-Joint
- Butt-Joint

-OFC-Task Plate Blueprint

-CNC G-Code Program

Third Marking Period
-FCAW Blueprints
- T-Joint
- Butt-Joint

-OFC Layout Plate Print

Fourth Marking Period
-GTAW Blueprints
- Corner-Joint
- Lap-Joint
- Butt-Joint

-Assembly Blueprint
-Plasma Layout Plate Print
-Steel Multi Joint Print
-Aluminum Tri Joint Print
-Resume

Grading Policy

The complete LCCTC policy is located on pages 24-26 of the student handbook, it is the student's responsibility to clarify with their instructor or administrator prior to signing the syllabus.
Overall grades for the technical programs will be Knowledge grades, Skills grades, and Daily Score/Work Ethic grades combined. The LCCTC grading system has been developed in concert with local employers and is established for ALL students.

I. Knowledge
Tests, quizzes, homework and assignments are utilized each marking period to encourage the comprehension of technical and related information.
At the end of each marking period, the scores for students are averaged to calculate the Knowledge Grade.
II. Skills
A range of tasks to be completed in a marking period is determined for each program's content area. Skills are evaluated to encourage high standards of workmanship.
III. Daily Score / Work Ethic
Daily Score / Work Ethic reflects student behavior, employability and reliability. Instructors will evaluate each student's work ethic grade daily. This grade is based on work ethic competencies and performance (approved grading rubric) as approved by the LCCTC General Advisory Committee. Refer to page 30 for the approved Daily Score/Work Ethic grading rubric.
IV. Marking Period Grade
The final marking period grade is a combination of the student's knowledge, skills, and daily score work ethic grades.

33%-Knowledge "Test/Quiz"
33%-Skill "Projects"
34%-Daily Score/Work Ethic "Employability"

Rating Scale:

90-100% A
80-89% B
70-79% C
60-69% D
59% and below F

•Unexcused absences will be graded "0" for daily Work Ethic grade with no makeup privileges.
•Homework or other assignment grades will be reduced by 50% if they are turned in late.

Special Education

Lancaster County Career & Technology Center (LCCTC) in partnership with Lancaster-Lebanon Intermediate Unit 13 (IU13) offers a variety of special education supports. These supports known as Specially Designed Instruction (SDI) are designed to meet the unique needs of each student as outlined in their Individualized Education Plans (IEPs). These SDIs aim to help students access the curriculum, build skills, and succeed in a manufacturing environment while addressing their unique educational needs. These supports and strategies may include:

Instructional Support:

- Simplified step-by-step instructions for completing manufacturing tasks.
- Visual aids (e.g., diagrams, flowcharts) to enhance understanding of processes.
- Use of videos or demonstrations for hands-on tasks.

Accommodations:

- Extended time for assignments, projects, or skill demonstrations.
- Access to adaptive tools or technology, such as modified machinery controls or assistive software for design work.
- Preferential seating or strategic positioning for better access to instructions and materials.

Behavioral Supports:

- Frequent breaks to manage attention and focus during extended work periods.
- Positive reinforcement strategies to encourage task completion and participation.
- Organizational Aids.

Skill Development:

- Hands-on practice opportunities in small, structured group settings.
- Scaffolding strategies to build proficiency in using tools and equipment.

Progress Monitoring:

- Regular check-ins to assess progress and adjust instruction as needed.
- Use of rubrics to provide clear expectations and feedback.

Absence policy

The complete LCCTC policy is located on pages 19-23 of the student handbook, it is the student's responsibility to clarify with their instructor or administrator prior to signing the syllabus.
In the case of an **excused** absence, students are provided 3 school days to make up assignments and exams. It is the student's responsibility to conference with the instructor within those 3 days to potentially earn or within the established deadline defined by the instructor for full credit. Under exceptional circumstances, such as long-term illness or injury and/or full suspension, additional time may be granted for make-up of work missed through a mutual agreement among student, teacher, parents, counseling and administrative personnel at the LCCTC. Work not completed within the allotted school days will result in no points earned from the assignment. Arrangements for completing any missed work shall be the responsibility of the student. See Attendance Regulations for more information.
When an absence is unexcused**,** students' absences cannot receive credit for any amount unless the make-up work is completed properly as determined by their LCCTC instructor. Exceptions to this regulation shall be reviewed on a case-by-case basis. This regulation does not apply to cases of extenuating circumstances, but the decision of what constitutes a valid exception extenuating circumstances that rests with the LCCTC administration.

Plagiarism Policy

All students are expected to submit unique assignments. Copying from a classmate or using artificial intelligence will result in no credit awarded for the assignment. In addition, using any material from any source (internet, film, book, magazine, newspapers, television, songs, etc.) without properly documenting the use of such materials will result in no credit for the assignment.

Acceptable use of the Internet, Computer, or other Technology

The complete LCCTC policy is located on pages 15-19 of the student handbook, it is the student's responsibility to clarify with their instructor or administrator prior to signing the syllabus.
The Lancaster County Career & Technology Center provides most, if not all, students with electronic access, a network connection, and Internet/Intranet access. This policy governs all use of the school's network, network systems and storage, Internet/Intranet access, email system and equipment. This policy applies to all information technology resources, including but not limited to, electronic mail, chat rooms, the Internet, news groups, electronic bulletin boards, the school's Intranet and all other information electronic messaging systems.

Personal Responsibility

By accepting a user account, password, and accessing the school's network or internet a student agrees to adhere to the school's policies regarding their use. The student also agrees to report any misuse or policy violation (s) (including the reception of inappropriate materials) to your instructor or the School's Technology Director.

Lancaster County Career and Technology Center Student Contract

I have read the above document, discussed any misunderstandings with my instructor and have discussed the expectations for this class with my parents/guardians. I will abide by those policies outlined above and work to my fullest potential to be an independent student and meet set deadlines. If I need assistance with any assignment, I will seek help from my class instructor.

Student Signature _____ Date _____

Parent / Guardian Signature _____ Date_____