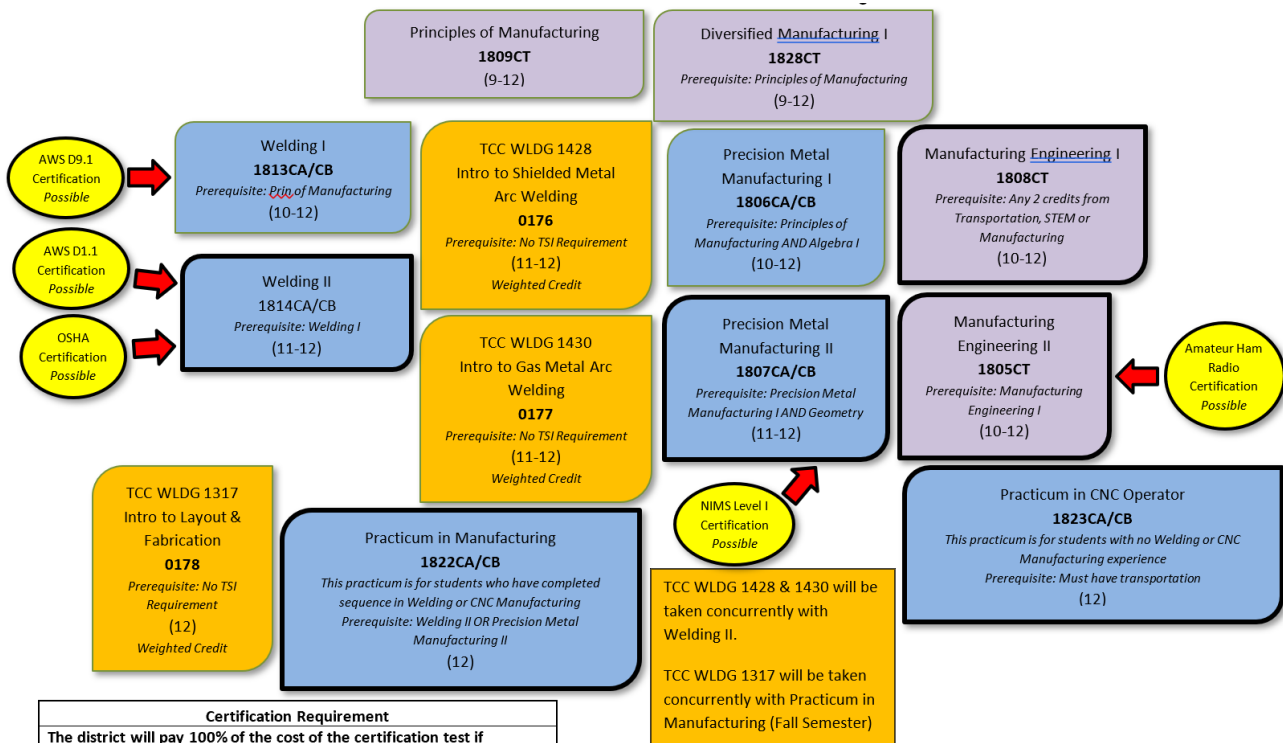


# Manufacturing Program of Study



# MANUFACTURING

## Endorsement: Business & Industry

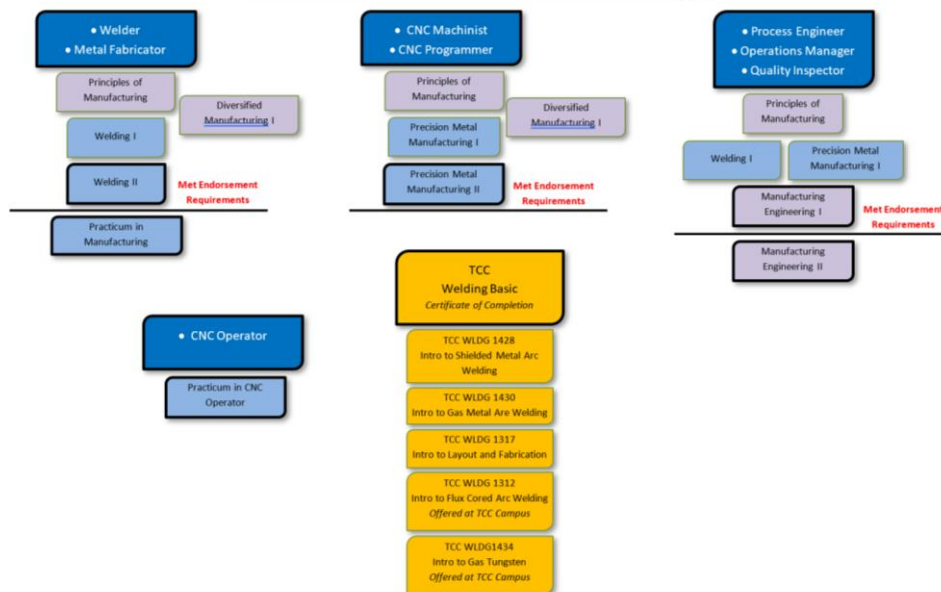


Certification Requirement	
The district will pay 100% of the cost of the certification test if students can show mastery by:	
Passing a certification practice test	
Maintaining an 80+ overall course average at the time of the certification test	
If students don't meet the requirements above, they must pay 100% of the cost of the certification test	

LEGEND					
Fill Color	Length	Credit	Fill Color	Length	Credit
	18 weeks	1		HC - 18 weeks	0.5
	36 weeks	2-3		HC - 36 weeks	1
	College Course			Advanced Course	

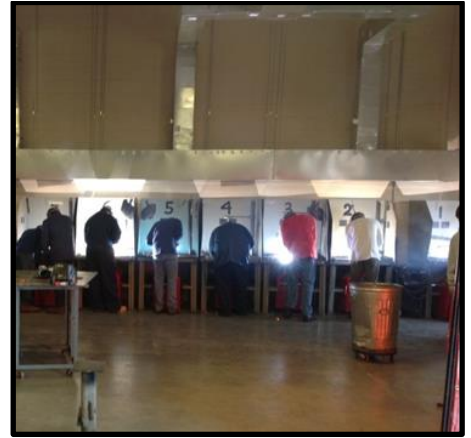
To earn an endorsement, an MISD student must complete a coherent sequence for 4 or more credits that consist of 2 courses in the same program of study including at least 1 advanced CTE course

## Manufacturing Recommended Career Pathways



To earn an endorsement, an MISD student must complete a coherent sequence for 4 or more credits that consist of 2 courses in the same program of study including at least 1 advanced CTE course

# Principles of Manufacturing



**Prerequisite:** None

**Course:** 1809CT

**Credits:** 1

**Length:** 18 weeks

**Placement:** 9-12

## Course Description

In Principles of Manufacturing, students gain knowledge and skills in the application, design, production, and assessment of products, services, and systems. Knowledge and skills in the proper application of principles of manufacturing, the design of technology, the efficient production of technology, and the assessment of the effects of manufacturing production technology prepare students for success in the modern world. Students gain an understanding of career opportunities available in manufacturing and what employers require to gain and maintain employment in these careers.

## Student Activities

Students will be instructed in the following areas:

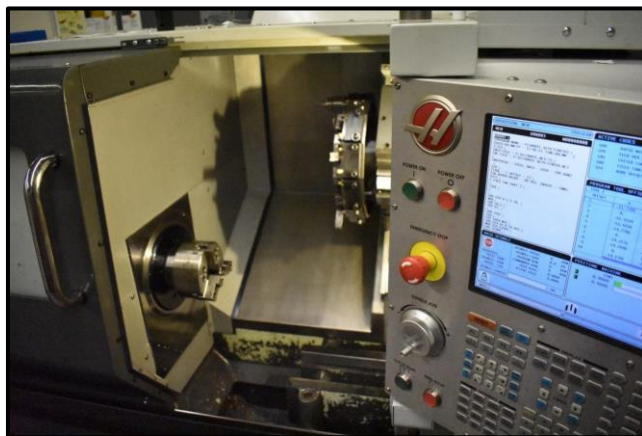
- Shop safety
- Measurement
- Reading and interpreting working drawings
- Hand Tools – names and use
- Shielded Metal Arc Welding
- Cutting with an Oxy-Acetylene torch
- Working individually and in groups
- Power tools – names and use

## Organizations/After School/Competition



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# Diversified Manufacturing I



**Prerequisite:** Principles of Manufacturing

**Course:** 1828CT

**Credits:** 1

**Length:** 18 weeks

**Placement:** 9-12

## Course Description

In Diversified Manufacturing I, students gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. The study of manufacturing systems allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings in a manufacturing setting. Diversified Manufacturing I allows students the opportunity to understand the process of mass production by using a wide variety of materials and manufacturing techniques. Knowledge about career opportunities, requirements, and expectations and the development of skills prepare students for workplace success. Students will be expected to design a project, develop a process plan, develop a budget, and ultimately build their projects.

## Student Activities

Students will develop the processes needed to complete a project such as initiate, plan, execute, monitor and control, and close. Students will learn and develop these skills using different types of materials such as wood, plastic, and metal. The tools that they will be using will include welders, milling machines, turning machines, 3D printer, and more. Some of the projects students will put into mass production may include fire pits, dice theme rings, puzzles and projects for actual customers like building parts for NASA HUNCH. All of these skills are meant to further the knowledge and skills and prepare them for real world practices seen in industry.

## Additional Considerations

Students need fine motor skills and mobility. Students handle sharp objects and use dangerous equipment. If seeking certification, curriculum cannot be modified.

## Organizations/After School/Competition

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# Welding I



**Prerequisite:** Principles of Manufacturing

**Course:** 1813CA/CB

**Credits:** 2

**Length:** 36 weeks

**Placement:** 10-12

## Course Description

Welding provides the knowledge, skills, and technologies required for employment in metal technology systems. Students develop knowledge and skills related to this system and apply them to personal career development. This course supports integration of academic and technical knowledge and skills. Students will reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for future success.

## Student Activities

Students will be instructed in advanced skills in the following areas:

- Shielded Metal Arc Welding (SMAW)
- Gas Metal Arc Welding (GMAW)
- Flux Cored Arc welding (FCAW)
- Gas Tungsten Arc Welding (GTAW)
- Oxy-Acetylene cutting and welding
- Plasma cutting
- Project design and fabrication
- Working individually and in groups
- Employability and careers in Manufacturing
- Academic skills used in Welding

## Certifications

AWS D9.1 Certification Possible

Student Cost: \$84

Certification paid for by CTE if student has an 80+ GPA in course and passes a practice test

## Additional Considerations

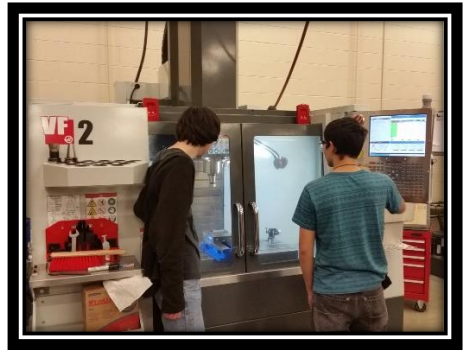
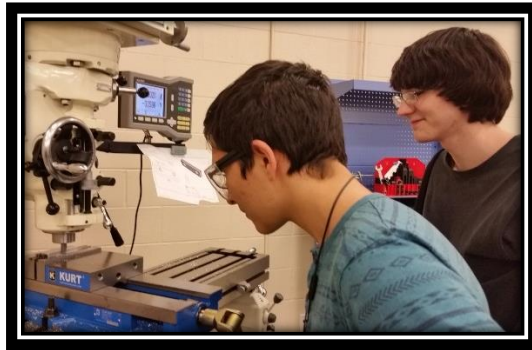
Students need fine motor skills and mobility. Students handle sharp objects and use dangerous equipment. If seeking certification, curriculum cannot be modified.

## Organizations/After School/Competition



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# Precision Metal Manufacturing I



**Prerequisite:** Principles of Manufacturing AND Algebra 1

**Course:** 1806CA/CB

**Credits:** 2

**Length:** 36 weeks

**Placement:** 10-12

## Course Description

Precision Metal Manufacturing provides the knowledge, skills, and technologies required for employment in metal technology systems. This course may also address a variety of materials in addition to metal such as plastics, ceramics, and wood. Students develop knowledge of the concepts and skills related to these systems to apply them to personal and career development. This course supports integration of academic and technical knowledge and skills. Students will learn to use equipment such as manual lathes and milling machines as well as larger CNC machines to create parts and objects.

## Student Activities

Students will be instructed in the following areas:

- Machine Safety
- Precision Measurement
- Machine Tools
- Milling Operations
- Lathe Operations
- Use of materials from steel to aluminum to plastics.

## Organizations/After School/Competition



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# Manufacturing Engineering I



**Prerequisite:** Any 2 credits from Manufacturing, Transportation OR STEM

**Course:** 1808CT

**Credits:** 1

**Length:** 18 weeks

**Placement:** 10-12

## Course Description

In Manufacturing Engineering, students gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. Knowledge and skills in the proper application of Manufacturing Engineering, the design of technology, efficient manufacturing technology, and the assessment of the effects of production technology prepare students for success in the global economy. The main project for this class will be to manufacture a solar car for the Solar Challenge.

## Student Activities

Students will be instructed in advanced skills in the following areas:

- Shielded Metal Arc Welding (SMAW)
- Gas Metal Arc Welding (GMAW)
- Flux Cored Arc welding (FCAW)
- Gas Tungsten Arc Welding (GTAW)
- Oxy-Acetylene Cutting and Welding
- Plasma Cutting
- Project Design and Fabrication
- Working individually and in groups
- Employability and Careers in Manufacturing

## Organizations/After School/Competition

## Additional Considerations

Students need fine motor skills and mobility. Students handle sharp objects and use dangerous equipment. If seeking certification, curriculum cannot be modified.



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# Welding II



**Prerequisite:** Welding I

**Course:** 1814CA/1814CB    **Credits:** 2    **Length:** 36 weeks    **Placement:** 11-12

## Course Description

Advanced Welding builds on knowledge and skills developed in Welding. Students will develop advanced welding concepts and skills as they relate to personal and career development. This course integrates academic and technical knowledge and skills. Students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems.

## Student Activities

Students will be instructed in advanced skills in the following areas:

- Shielded Metal Arc Welding (SMAW)
- Gas Metal Arc Welding (GMAW)
- Flux Cored Arc welding (FCAW)
- Gas Tungsten Arc Welding (GTAW)
- Oxy-Acetylene cutting and welding
- Plasma cutting
- Project design and fabrication
- Working individually and in groups
- Employability and careers in Manufacturing
- Academic skills used in Welding

## Certifications

AWS D1.1 Certification Possible

Student Cost: \$84

OSHA Certification Possible

Student Cost: \$24

Certification paid for by CTE if student has an 80+ GPA in course and passes a practice test

## Additional Considerations

Students need fine motor skills and mobility. Students handle sharp objects and use dangerous equipment. If seeking certification, curriculum cannot be modified.

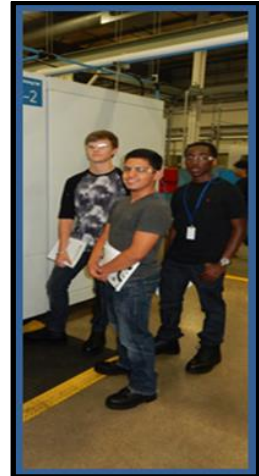
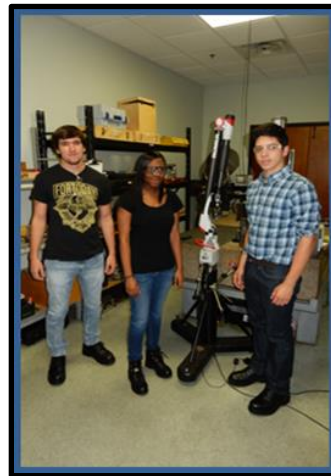
## TCC Dual Credit Opportunity



TCC WLDG 1428 Introduction to Shielded Metal Arc Welding AND TCC 1430 Introduction to Gas Metal Arc Welding can be taken concurrently with this class. There is no TSI requirement, but students must register and pay tuition by TCC deadline.



# Precision Metal Manufacturing II



**Prerequisite:** Precision Metal Manufacturing I AND Geometry

**Course:** 1807CA/1807CB    **Credits:** 2    **Length:** 36 weeks    **Placement:** 11-12

## Course Description

Precision Metal Manufacturing II will provide students the knowledge, skills, and technologies required for employment in precision machining. This course is designed to provide necessary skills for machining in a real-world setting. This course will address a variety of materials through project based learning, manufactured with materials such as plastics, ceramics, wood, and metals. Students will develop knowledge of the concepts and skills related to these systems to apply them to personal and career development. This course is designed to provide entry-level employment for the student or articulated credit integration into a community college and dual credit with a community college with completion of the advanced course. Students will have the opportunity to advance their skills on equipment such as manual lathes and milling machines. They will also work more in depth with CNC machines to create parts and projects. Students will develop skills in areas such as fixture building, computer aided manufacturing software, design, blueprint reading, and G and M code identification and programming.

## Student Activities

- **Advanced Precision measurement processes**
- **Milling projects** such as Jenga sets, tic tac toe boards, Sign plates, 1-2-3 blocks, 3-D milling operations, and personal projects.
- **Lathe projects** such as Brass hammers, nut crackers, and chess sets
- **CAM- Computer Aided Manufacturing** – Personal designed and manufactured projects

## Certifications

NIMS Level I Certification Possible  
Student Cost: \$75

Certification paid for by CTE if student has an 80+ GPA  
in course and passes a practice test

Organizations/After  
School/Competition



# Manufacturing Engineering II



**Prerequisite:** Manufacturing Engineering I

**Course:** 1805CT

**Credits:** 1

**Length:** 18 weeks

**Placement:** 10-12

## Course Description

In Manufacturing Engineering Technology II, students will gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. The study of Manufacturing Engineering Technology II will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The main project for this class will be designing and building a new solar car chassis.

## Student Activities

Students will be instructed in advanced skills in the following areas:

- Shielded Metal Arc Welding (SMAW)
- Gas Metal Arc Welding (GMAW)
- Flux Cored Arc welding (FCAW)
- Gas Tungsten Arc Welding (GTAW)
- Oxy-Acetylene Cutting and Welding
- Plasma Cutting
- Project Design and Fabrication
- Working individually and in groups
- Employability and Careers in Manufacturing

## Certifications

Amateur Ham Radio

Student Cost: \$15

## Additional Considerations

Students need fine motor skills and mobility. Students handle sharp objects and use dangerous equipment. If seeking certification, curriculum cannot be modified.

## Organizations/After School/Competition



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# Practicum in Manufacturing



**Prerequisite:** Welding II OR Precision Metal Manufacturing II

**Course:** 1822CA/1822CB    **Credits:** 2    **Length:** 36 weeks

**Placement:** 12

## Course Description

Practicum in Manufacturing is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the manufacturing cluster.

## Student Activities

Students will be instructed in advanced skills in the following areas:

- Shielded Metal Arc Welding (SMAW)
- Gas Metal Arc Welding (GMAW)
- Flux Cored Arc welding (FCAW)
- Gas Tungsten Arc Welding (GTAW)
- Plasma cutting
- Project design and fabrication
- Working individually and in groups
- Employability and careers in Manufacturing

## Additional Considerations

Students must provide their own transportation and complete independent internship. If seeking certification, curriculum cannot be modified.

## TCC Dual Credit Opportunity



TCC WLDG 1317 Introduction to Layout & Fabrication can be taken concurrently with this class. There is no TSI requirement, but students must register and pay tuition by TCC deadline.



# Practicum in CNC Operator



**Prerequisite:** Must be a senior with transportation

**Course:** 1823CA/1823CB    **Credits:** 2    **Length:** 36 weeks    **Placement:** 12

## Course Description

Students will learn about precision measurement, tooling, CNC operations, basic offset changes and basic programming with the focus on operating the mill and lathe machine. The purpose of this course is to prepare students to join the workforce as a CNC operator.

## Student Activities

The manufacturing industry is booming with a huge shortage of qualified CNC operators. Students in this course will work onsite with manufacturing community partners after the students learn basic skills in the machine shop at Ben Barber. Students will learn about each company and prospective employers will learn a student's abilities on the job.

## Additional Considerations

Students need fine motor skills and mobility. Students handle sharp objects and use dangerous equipment. If seeking certification, curriculum cannot be modified.

Students must have transportation to participate in this class

## Organizations/After School/Competition



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# Manufacturing Certifications

Name	Course	Provider	Cost
OSHA	Principles of Manufacturing	CareerSafe Online	Student Pays: \$ 25
The OSHA certification is an online 10 hour course. Students may access the course in class or at home with internet access. The course is broken up into modules with a test at the end of each module. Students must pass with a 70 or above in 3 attempts or less.			
NIMS Level I	Precision Metal Manufacturing II	NIMS	Student Pays: \$ 75
NIMS credentials are earned by students, trainees, apprentices, employees, and military personnel nationwide and around the world. By earning NIMS credentials, these individuals secure a competitive edge when applying for jobs because they have demonstrated that their skills meet the industry established standards. And NIMS credentials never expire. <a href="https://www.nims-skills.org/">https://www.nims-skills.org/</a>			
American Ham Radio	Manufacturing Engineering	ARRL Amateur Radio	Student Pays: \$ 15
This Technician class license is the entry-level license of choice for most new ham radio operators. Earning the Technician license requires passing one examination totaling 35 questions on radio theory, regulations and operating practices. The license gives access to all Amateur Radio frequencies above 30 megahertz, allowing these licensees the ability to communicate locally and most often within North America. This certification is required to participate in the Solar Car race each summer.			
AWS D9.1 AWSD1.1	Welding I Welding II	American Welding Society	Student Pays: \$ 84
One of the best ways to advance your welding career is by earning a specialized certification. This opens up opportunities for more money, leadership roles and higher-level career challenges. <a href="https://www.aws.org/certification/">https://www.aws.org/certification/</a>			