

# MANUFACTURING TECH TC1 (340MFGT)

## Manufacturing Tech TC1 (340MFGT) 104

### Statistical Process Control

This course introduces the use of statistical process control (SPC) which ensures that production systems maintain quality through predictive control of variations. Various distribution curves and statistical control charts are introduced through specific production problems. The interpretation and use of process and product control data is presented through simulations of real scenarios. The course will also prepare students for the Manufacturing Skill Standards Council's Quality Practices and Measurement exam. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 139, and Grade of C or better or concurrent enrollment in MATH 125; or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA

## Manufacturing Tech TC1 (340MFGT) 105

### Introduction to Advanced Manufacturing I

This course presents the fundamentals of print reading, measuring skills needed to verify if produced parts meet print requirements and provide a general understanding of the materials and processes used in manufacturing. Visualization of 3D objects from orthographic views. The use of micrometers and dial calipers are stressed. The concepts of (GD&T) Geometric Dimensioning and Tolerancing, and quality tools are introduced. Computer-aided Design (CAD) will be introduced. The course also provides a general understanding of the behavior of the materials commonly used in manufacturing, the basic techniques used in processing them into useful products, the scientific theory underlying those processes, and the criteria for selecting particular tools, machines, and processes. Shop safety is discussed in detail. The course can lead to industry recognized certifications such as, Starrett PMI metrology, Lincoln Electric print reading, 3MSafety certificates, all NC3. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

## Manufacturing Tech TC1 (340MFGT) 106

### Introduction to Advanced Manufacturing II

This course is an introduction to the fields of Advanced Manufacturing. Topics covered are the use of Computer Numerical Control in 3D printing, machining and robotics. Introductions to virtual welding and electricity will be covered. In the fluid power sections of the course topics included will be fluid power schematics, compressors, pumps, valves, and actuators. Students will design and build fluid power circuits using fluid power sources, valves, and actuators. In the industrial mechanisms section of the course, principals covered are drive trains, including gear, belt and chain drives, fastening devices. Torque and shaft speed measurements are covered. Students will also learn how to select the proper hand and power tools, including torque measuring tools. These studies can lead to industry-recognized certificates such as, Festo Industry 4.0 Fundamentals, Intro to Mechatronics, Snap-On meters, all NC3. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

## Manufacturing Tech TC1 (340MFGT) 107

### Introduction to Advanced Manufacturing III

This class utilizes Computer Aided Drafting software such as AutoCAD, prototyping equipment, and small machines such as those found in a maker space to develop product design and prototyping skills. CAD software is taught to enable students to design a product with group input, and a class project will involve creating products with each of the available prototyping technologies. The class will conclude with a written and oral presentation of the products designed and issues taken into consideration while creating the designs, and discussing the next steps in the product design process. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

## Manufacturing Tech TC1 (340MFGT) 108

### Robotics I

This course provides students with the basic operations of industrial robots, using the teach pendant. The course covers the tasks that the student needs to setup, record and/or troubleshoot programs. Students will be prepared to earn robotic operator certificates, such as Festo Robotics 1 NC3, Fanuc. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

## Manufacturing Tech TC1 (340MFGT) 109

### Introduction to Manual Machining

This course is an introduction to machine tools and metal-cutting processes used in manufacturing. Students complete projects that require precision layout, set-up, machining, and inspection. These projects require students to perform various operations using horizontal and vertical band saws, drill presses, mills, and lathes. Students are also prepared to take industry recognized certification tests, such as NIMS Level 1 Measurement, Materials and Safety, Starrett metrology, 3M Safety NC3. Writing and math assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

## Manufacturing Tech TC1 (340MFGT) 110

### CNC I Operations

The course introduces students to the CNC process, the operation of the CNC lathe and mill, and to their basic set-up, tooling, operation, and trouble-shooting of CNC machines. Topics include math for CNC, control functions, and the identification and use of various cutting tools. Students have the opportunity to obtain nationally recognized certifications, such as Hass, NIMS, Starrett metrology NC3. Writing and math assignments, as appropriate, are a part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 111**

**Machining Processes I**

This course is an introduction to machine tools and metal-cutting processes used in manufacturing. Students complete projects that require precision layout, set-up, machining, and inspection. These projects require students to perform various operations on engine lathes, drill presses and power saws. Students are also prepared to take the NIMS Level 1 Measurement, Materials and Safety test, and the MSSC Safety test. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for READING 99 by COMPASS Reading (50-64), or Consent of Department Chairperson.*

1 Lecture Hours. 4 Laboratory Hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 112**

**Machining Processes II**

This course is an introduction to machine tools and metal-cutting processes used in manufacturing. Students complete projects that require precision layout, set up, machining, and inspection. These projects require students to perform various operations on vertical milling machines, power saws and surface grinders. Students also have the opportunity to earn one or more NIMS Level 1 machining credentials including "Measurement, Materials and Safety," or "Job Planning, Benchwork, and Layout." Students with machine shop experience may attempt to earn NIMS Machining Level 1 in "Milling," or "Drill Press," or "Surface Grinding." Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for READING 99 by COMPASS Reading (50-64), or Consent of Department Chairperson.*

1 Lecture Hours. 4 Laboratory Hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 113**

**Multiple Spindle III**

A study of theories and principles of multiple spindle practitioners utilizing practical lab applications. Study will include equipment operations such as tool grinding, electrical operations, tooling, and various service setting techniques. Writing assignments, as appropriate to the discipline, are part of the course.

4 Laboratory hours. 4 Lecture hours. 6 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 123**

**CNC Milling Operations & Programming**

This course introduces the programming setup and operation of CNC machining center. Topics include programming formats, control functions, program editing, part production, and inspection. Various projects will strengthen the students' skills in the proper use, programming, troubleshooting of this equipment. Students will also earn the NIMS level 1 CNC Milling Program, Setup, and Operate credentials. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 140 and 340MFGT 112-1 or Consent of Department Chairperson.*

4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 137**

**CNC Turning Operations & Programming**

This course introduces the programming, setup, and operation of Computer Numerical Control (CNC) turning centers. Topics include: programming formats, control functions, program editing, part production and inspection. Various projects will strengthen the students' skills in the proper use, programming and troubleshooting of this equipment. Students will also have the chance to earn the NIMS Level 1 CNC Turning Program, Setup, and Operate Credential. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 140 and 340MFGT 111-1 or Consent of Department Chairperson.*

4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 138**

**Intro to Solidworks**

This course covers part modeling, detailing and assembly design using SolidWorks software. SolidWorks is a feature-based parametric solid modeler used for mechanical design and manufacturing. The topics include the basic functions needed to use SolidWorks to create parts, assemblies and production drawings. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 99 and Grade of C or better in 340MFGT 139 or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 139**

**Print Requirements-Quality Assurance**

This course focuses on the fundamentals of print reading and the measuring skills needed to verify print requirements. Visualization of 3D objects from orthographic views and the use of micrometers and dial calipers are stressed. The concepts of Geometric Dimensioning and Tolerancing, and quality tools (such as Pareto diagrams and fishbone charts) are introduced. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96 or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 140**

**CNC Fundamentals**

This course introduces students to the CNC process, the operation of the CNC lathe and mill, and to the basic set up, tooling, operation, and troubleshooting of CNC Machining. Students will earn at least one NIMS Level 1 CNC Operator credential. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 99 and Grade of C or better in 340MFGT 111-1 or 340MFGT 112-1 or Consent of Department Chairperson.*

4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 141**

**Manufacturing Materials & Processes**

The course will provides a general understanding of the behavior of the materials commonly used in manufacturing; the basic techniques used in processing them into useful products, the scientific theory underlying those processes, and the criteria for selecting particular tools, machines, and processes. Students will have the opportunity to earn the MSSC Manufacturing Processes and Production credential. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for ENGLISH 96 or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 142**

**Geometric Dimensioning and Tolerancing**

This course expands upon the student's basic knowledge of mechanical drawings by adding form and feature controls in order to meet assembly requirements at the lowest cost. The differences between traditional dimensioning and geometric dimensioning will be stressed. This course prepares students for an ASME certification in GDT. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 139 or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 143**

**Advanced Metrology**

The course focuses on the use of the Coordinate Measuring Machine (CMM) and the optical comparator to inspect machine parts to the current ASME Y 14.5 Geometric Dimensioning and Tolerancing (GD&T) standards. Lab exercises will focus on the set up and operation of precision measuring tools, including the CMM and the optical comparator, to inspect complex parts. Bore gages, attribute gages, gage blocks and pins and their use in calibration will also be covered. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better or Concurrent enrollment in 340MFGT 142 or Consent of Department Chairperson.*

4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 144**

**Wire Electrical Discharge Machining**

The course covers operations and procedures for Wire Electrical Discharge Machining systems (Wire EDM). The course content includes an overview of the Wire EDM, EDM operating processes, EDM machine functions, EDM manual part programming, and EDM application in tool rooms and production. Students may also earn the NIMS Wire EDM credential. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 140 or Consent of Department Chairperson.*

4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 145**

**Computer Integrated Manufacturing (CIM)**

Students will study aspects of automated assembly and process control, including programmable controllers, computer assisted part programming, CAD/CAM systems computerized instrumentation and robotics. This course stresses a systems approach and how hydraulic, pneumatic and electromechanical components function together as a system. Troubleshooting automation is a major activity of this course. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 291 or Consent of Department Chairperson.*

4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 146**

**Team Dynamics in Manufacturing**

This course provides an exploration into how employees work in groups for the completion of organizational objectives. Emphasis is placed on the growing dependency on self-directed work teams in a manufacturing environment. This course equips students with the ability to manage work teams, work in teams successfully, and to obtain the results via team dynamics. In addition, impacts upon customer satisfaction are explored. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for ENGLISH 96 or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 147**

**Multi Axis Machining**

This course covers operations and procedures for Swiss multi axis machining. The course content is inclusive of an overview of multi axis machining. Course will cover: Safety Precautions, Specifications, Operational panel functions, Functions of multi axis Swiss lathe operations, Programming, Automatic operations, Setting and Adjustment, Troubleshooting, Inspection and Maintenance. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 140, or Consent of Department Chairperson.*

4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** WR

**Manufacturing Tech TC1 (340MFGT) 151**

**Introduction to Welding**

This is a beginning welding course that teaches basic welding skills that lead to an American Welding Society qualification Gas Metal Arc Welding (GMAW or MIG). Topics include metallurgy, welding processes, welding safety, and steel designations. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for English 096 or Consent of Department Chairperson.*

6 Laboratory hours. 3 Credit Hours.

**Offered At:** DA

#### **Manufacturing Tech TC1 (340MFGT) 152**

##### **Intermediate Welding**

This is a second welding course that teaches basic welding skills that lead to an American Welding Society (AWS) qualification in Gas Tungsten Arc Welding (BTAW or TIG) and/or Shielded Metal Arc Welding (SMAW or Stick). In addition to teaching the theory and practice of GTAW and SMAW welding processes, the course including training in welding with a FANUC robot, resistance welding and torch work. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 151, or consent of Department Chairperson.*

6 Laboratory hours. 3 Credit Hours.

**Offered At:** DA

#### **Manufacturing Tech TC1 (340MFGT) 153**

##### **Welding I GMAW**

This is a beginning welding course that teaches basic welding skills in Gas Metal Arc Welding (GMAW or MIG). Topics include metallurgy, welding processes, welding safety, and steel designations. Also discussed will be plasma cutting. Students will have the opportunity to train for and take nationally recognized certifications, such as Lincoln Electric NC3. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

#### **Manufacturing Tech TC1 (340MFGT) 154**

##### **Welding II GTAW**

This is a second welding course that teaches basic welding skills that can lead to an industry certification, such as Lincoln Electric, Intro to GTAW, SMAW, and FCAW NC3 in Gas Tungsten Arc Welding (GTAW or TIG). In addition to teaching the theory and practice of GTAW, other processes will be discussed, i.e., Shielded Metal Arc Welding (SMAW), oxy-fuel, and plasma cutting. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96 or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

#### **Manufacturing Tech TC1 (340MFGT) 160**

##### **CNC II Operations and Programming**

This course introduces programming, setup and 'hands-on' operations of Computer Numerical Control (CNC) machinery. Topics include programming formats, control functions, program editing, part production, inspection, and an intro to other CNC controlled machine tools. Various projects will strengthen the students' skills in the proper use, programming, and troubleshooting of CNC machinery. Students will have the opportunity to earn nationally recognized certifications, such as Starrett Metrology NC3, Hass, and NIMS. Writing and math assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 110 or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

#### **Manufacturing Tech TC1 (340MFGT) 162**

##### **Industrial 2D/3D CAD**

This course is designed for students who wish to be involved in the engineering design fields and for those interested in computer aided design. Students will be introduced to both traditional and computer aided drafting skills. The aim of CAD is to introduce students to basic information, skills, and concepts related to drafting and design. Special attention is given to: sketching, measurement, room planning, multi-view drawing, auxiliary views, working drawings, sectional views, orthographic drawings along with AutoCAD tools and commands. Current and future trends in the architectural and engineering fields will be examined. Writing assignments, as appropriate to the discipline, are part of the course.

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

#### **Manufacturing Tech TC1 (340MFGT) 163**

##### **Programmable Logic Controls for Robotics**

This course is designed for students who wish to be involved with the architectural and engineering design fields and for those interested in machine control programming. Students will be introduced to the Programmable Logic Controller (PLC) which is a device that is capable of being programmed to perform control functions. The first PLC was introduced in the late 1960s to replace relay logic controls in the automotive industry. Compared to relay logic controls, the PLC's advantages include easy programming and installation, high control speed, hardware and software security, network compatibility, troubleshooting and testing convenience, and high reliability. PLCs are currently used widely in industrial and commercial environments. They can be found in almost any manufacturing facility. There are several manufacturers of PLCs. While the instruction formats may not be the same for different brands, the hardware structures and programming concepts are very similar. This course covers PLC hardware structure, input/output modules, software, and programming. PLC operation and ladder logic programs are discussed.

*Grade of C or better in 340MFGT 164*

2 Laboratory hours. 4 Lecture hours. 5 Credit Hours.

**Offered At:** DA

#### **Manufacturing Tech TC1 (340MFGT) 164**

##### **Industrial Control Systems**

Students will be taught Control Systems Schemes that are used to maneuver industrial equipment. The students will utilize the CAD (learned in previous course) to create electrical, pneumatic and hydraulic control schematics. CAD lessons will also be extended by the use of Blocks and Templates to enhance drafting skill sets. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 162*

2 Laboratory hours. 4 Lecture hours. 5 Credit Hours.

**Offered At:** DA

#### **Manufacturing Tech TC1 (340MFGT) 165**

##### **Robotics Programming**

This course is designed for students who intend to operate or maintain an R30iA or newer FANUC Robot and application technicians (or engineers) who need to design robotic work cells, perform cycle time, reach ability studies, or generate robot path.

*Grade of C or better in 340MFGT 164*

2 Laboratory hours. 4 Lecture hours. 5 Credit Hours.

**Offered At:** DA



**Manufacturing Tech TC1 (340MFGT) 170**

**CAD I**

This course covers part modeling, detailing and assembly design using software such as AutoCAD. The topics include the basic functions needed to use a CAD program to create parts, assemblies and production drawings. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96 or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 171**

**Automated Metrology-Quality Assurance**

This course advances the knowledge and skills of metrology. The use of height gages, Optical Comparators, CMMs, and other tools used to inspect and measure manufactured parts will be taught. GD & T and SPC will be introduced. Hardness testing is covered. Provide preparation for nationally recognized certificate tests, such as Starrett Advanced Measurement Instruments (AMI), Zeiss certification prep. Writing assignments, as appropriate to the discipline, are part of this course.

*Eligibility for MATH 98 and ENGLISH 96 or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 172**

**Quality Systems I**

This is a first course in quality systems and provides training in the use of quality systems and approaches to quality found in manufacturing. The course focuses on the planned and systematic activities implemented in a quality system so that quality requirements for a product or service fulfill the goals of the manufacturer and the customer. Students will learn the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention. Auditing, standard procedures, SPC, GD & T, ISO 9000 and quality improvement processes such as 6-Sigma will be introduced. Lean tools and problem resolution such as root cause analysis will also be introduced. Certification preparation for ASQ will be discussed. Writing and math assignments, as appropriate to the discipline, are part of this course.

*Grade of C or better in of 340MFGT 171 Metrology 2 Beginning Quality Assurance, or consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 188**

**Industrial Electricity I**

This is the first course in DC and AC electricity as applied to industrial circuits. The topics include: electrical safety, fundamentals of electrical circuits including Ohms Law, current, voltage, resistance, and power, single and 3-phase power, troubleshooting electrical circuits, and the basics of programmable logic controllers (PLCs). Writing assignments, as appropriate to the discipline, are a part of the course. Prepare students for industry recognized certification tests, such as Festo Electricity 1, Snap-On meters, Greenlee certs NC3.

*Eligibility for MATH 99 and ENGLISH 96 or consent of Department Chairperson*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 189**

**Industrial Electricity II - Motors**

This course is a study of different types of electrical motors and controls as they are applied to industrial circuits. Topics include safety issues, instrumentation, and the interpretation of ladder or line diagrams. An overview of the different types of motor controls is also provided. The students will be able to troubleshoot and repair problems associated with different motor control applications of the industry. Programmable logic control (PLC) operations is introduced. Students will be prepared to test for industry-recognized certifications, such as Festo Electricity 2, Greenlee NC3. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 188 or consent of Department Chairperson*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 191**

**Industrial Electricity**

A study of DC and AC electricity as applied to industrial circuits. The topics include: fundamentals of circuit analysis, single and three phase circuits; and parameters, safety issues in industrial electricity, such as current, voltage and power and troubleshooting methods using test equipment. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 99 and ENGLISH 96 or Consent of Department Chairperson.*

4 Laboratory hours. 2 Lecture hours. 4 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 195**

**Manual Machining II**

This course is a continuation of the first course in manual machining, 'Intro to Manual Machining'. In this course, students will be taught more advanced skills in using standard manual machines, such as, lathes, mills, drill presses. Fixture design and fabrication techniques will be introduced. Students will be prepared to take nationally recognized certification tests, such as, Starrett NC3 Precision Measuring Instruments (PMI), Advanced Measuring Instruments (AMI) and NIMS. Written and math assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 109, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 207**

**Introduction to MASTERCAM**

This course trains students to use Mastercam software to create programs that will drive computerized machine tools (CNC machines). These "g-code" programs are generated from part geometry created in Mastercam software or in a computer-aided- drawing (CAD) software such as Solidworks. Students will learn to create part geometry, generate toolpaths, assign appropriate tools to the toolpaths, and upload their program to a CNC machine, which will precisely cut the part from metal stock. Student projects will focus on 2-D milling operations. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 140 or Consent of Department Chairperson.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 208**  
**ROBOTICS II - ROBOTC INTEGRATION**

This course provides students the skills needed to program/setup, teach, test, and modify industrial robot programs and vision systems, and integrate with other equipment. Robotic material handling will be introduced. Students will be prepared to earn industry recognized certificates, such as Festo NC3, FANUC, NOCTI. Writing assignments, as appropriate to the discipline, are part of the course.  
*Grade of C or better in 340MFGT 108 Robotics 1 and 340MFGT 288 Industrial Electricity 3 Programmable Logic Controls (PLC's)*  
2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 209**  
**Computer Aided Manufacturing (CAM) I**

This is the first course in computer-aided manufacturing (CAM). The basics of CAM software are studied in this course. Students will use CAM software to create instruction sets for CNC machines. This course will focus on 2D parts. Students will prepare for industry recognized certifications, such as MasterCam certs. Writing and math assignments, as appropriate to the discipline, are included.  
*Grade of C or better in 340MFGT 110 or consent of Department Chairperson*  
3 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 210**  
**Automated Fabrication I**

This course covers the basics of using automated fabrication tools such as; welding robots, CNC laser cutters, CNC brake, CNC punch, CNC pipe profiler, and CNC plasma table. Workflows and tool-chains will be discussed and examined. Project planning and part development will be discussed. Also, students will use skills they have learned throughout the program on a project utilizing fabrication equipment as directed by the instructor. Students will prepare for industry recognized certifications, such as Fabricators and Manufacturers Association (FMA) certifications. Writing assignments, as appropriate to the discipline, are part of the course.  
*Grade of C or better in 340MFGT 108 and 340MFGT 153 or Consent of department chair.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 211**  
**AUTOMATED FABRICATION II**

This course focuses on advanced techniques on automated fabrication tools such as welding robots, CNC laser cutters, CNC brake, CNC punch, CNC pipe profiler, and CNC plasma table. Students will use skills learned throughout the program on a project using advanced fabrication techniques as directed by the instructor. Students will prepare for industry recognized certifications, such as Fabricators and Manufacturers Association (FMA) certifications. Writing assignments, as appropriate to the discipline, are part of the course.  
*Grade of C or better in 340MFGT 210 Automated Fabrication 1.*  
2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 251**  
**Welding III-Advanced Welding**

This is an advanced course covering welding techniques such as robotic welding, pipe welding and flux core welding in which students will further develop welding skills learned in previous classes. Leads to industry recognized certifications, such as Lincoln Electric NC3. They will also build on their pipe welding skills by welding "out of position." Writing assignments, as appropriate to the discipline, are part of the course.  
*Grade of C or better in 340MFGT 108 and 340MFGT 109 and 340MFGT 154 or Consent of Department Chairperson*  
2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 252**  
**Welding IV - Inspection**

In this course, students are exposed to inspection principles in welding, including ultrasonic, visual, and destructive methods. Students will learn to design welding fixtures. This course will prepare students for industry recognized certifications, such as an American Welding Society (AWS) Certified Welding Inspector (CWI) certification and Lincoln Electric NC3.  
*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*  
2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 253**  
**Pneumatics**

Study of the basic principles of pneumatics with emphasis on schematics, valves, actuators, compressors, instrumentation, applications, and troubleshooting. Course also includes the use of supplier catalogs and technical manuals. Writing assignments, as appropriate to the discipline, are part of the course.  
*Eligibility for MATH 98 and ENGLISH 96 or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 255**  
**Industrial Hydraulics**

This course is a study of basic principles of hydraulics. The topics in this course include schematic interpretation, valves, actuators, compressors, line sizing, fluid viscosity and reservoir capacity. This course will also include the use of supplier catalogs and technical manuals. Writing assignments, as appropriate to the discipline, are part of the course.  
*Eligibility for MATH 98 and ENGLISH 96 or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 260**  
**CNC III - Advanced Operations**

This is the 3rd course in CNC. It advances knowledge in CNC machining, such as, the use of "live tooling," linear and circular interpolation, and multi-axis machines. FANUC controls will be studied in this course. Students will use CNC machines to fabricate multiples of the same part to study tool wear and tolerance measurement. Students will prepare for industry recognized certifications, such as Hass, NIMS advanced certifications. Writing and math assignments, as appropriate to the discipline, are part of the course.  
*Grade of C or better in 340MFGT 110 and 340MFGT 160 or consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 270**

**CAD II Detailing**

This is the second class in computer aided drafting and develops skills in applying the proper symbols, tolerance communication and design requirements intended to manufacture or produce the design intent of the drawing package. Drawing details related to welding, piping, threads, fasteners and plant layout are described and practiced through projects and presentations. The design review process is described and consideration is given to product or design manufacturability and maintainability. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 170.*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 272**

**QUALITY SYSTEMS II**

This is the second class in Quality Systems as related to manufacturing and production utilized by various industries. Students will be introduced to quality standards such as ISO and IATF and approaches to quality and quality improvement such as Six Sigma and Lean Manufacturing. The tools of quality improvement utilized in analyzing and resolving complex manufacturing issues will be practiced including root cause analysis, Pareto charting and process flow charting. Analysis tools such as Gauge Repeatability and Reproducibility (GRR) and Process Capability will be studied. Other quality tools such as Failure Modes and Effect Analysis and Standard Process Documentation will also be part of this course. Students will prepare for industry recognized certifications, such as ASQ quality cert. Students will work on projects to apply the tools. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade C or better in MFGT340 172 Quality Systems 1*

3 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 274**

**Materials II - Testing and Analysis**

This second course in materials will focus on materials testing and analysis, including methods such as microscopy, ultrasonic, tensile and impact testing in a lab environment. Destructive testing will include methods such as tensile and impact testing. Non-destructive (ND) testing will include methods such as microscopy, scanning electron microscope, ultrasonic testing, dye penetration testing, and hardness testing. Microscopy is a broad subject so much time will be devoted to it. In addition to the various kinds of testing, students will be introduced to failure analysis. Thermal treatment of materials will be discussed. Identification of process gasses using a mass spectrometer will be introduced. Students will prepare for industry recognized certification tests, such as, Starrett Advanced Measurement Instruments (AMI) NC3, American Welding Society (AWS) Non-Destructive (ND) testing. Writing and math assignments as appropriate to the discipline are a part of this course.

*Grade of C or better in 340MFGT 105 or consent of Department Chairperson*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA, WR

**Manufacturing Tech TC1 (340MFGT) 287**

**Maintenance Technologies I**

Maintenance technicians need to be able to determine causes of problems and perform functions that prevent and eliminate machine downtime and interruptions to production. Failure analysis will be covered. In this class students will learn the methods in which maintenance departments track, monitor, and manage how maintenance work is efficiently performed, such as 5S. Maintenance management systems using preventive and predictive technologies will be studied. Vibration analysis, infrared thermography, shaft alignment, pumps, and piping will also be studied. Group activities in troubleshooting and utilization of preventive techniques will require written documentation and hands-on demonstration of correct operation of monitoring equipment as appropriate. This course will prepare students for industry recognized certifications such as Snap-On torque measurement and NIMS. Writing assignments, as appropriate to the discipline, are part of the course.

*Eligibility for MATH 98 and ENGLISH 96, or Consent of Department Chairperson.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 288**

**Industrial Electricity III - PLC's I**

This course covers the basic concepts and skills needed to program and use Programmable Logic Controllers (PLCs) in automated systems in industry. The topics include an overview of basic terminology, ladder logic programming, memory structure, and processing. Students will learn to use PLCs to control electro-mechanical devices, pneumatic actuators, and other industrial components, and will be introduced to sensors. Writing assignments, as appropriate to the discipline, are part of the course. Prepares students for nationally recognized certifications, such as Festo PLC's 1 and sensors NC3.

*Grade of C or better in 340MFGT 188 and 340MFGT 189 or consent of Department Chairperson*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

**Manufacturing Tech TC1 (340MFGT) 289**

**INDUSTRIAL ELECTRICITY IV - PLC'S II**

This is the second class in PLC programming and control systems, and students will build on prior knowledge gained in motors and controls and PLC 1 courses. Building on the previous class, students will gain hands-on knowledge of how to program, modify programs, add to existing programs, and troubleshoot existing PLC control systems. Utilizing PLC systems of increasing complexity, students will learn the components and programming of industrial equipment. Programming touch screen displays, and PLC interface with various types of external equipment such as conveyors, scales, metal detectors and sensors are discussed and demonstrated. Students will modify existing programs in a manufacturing cell or system to correct issues or add functionality. Students will prepare for industry recognized certification tests, such as Festo PLC2, Sensors NC3. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 288 Programmatic Logic Controllers (PLC) or consent of department chair.*

2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

### **Manufacturing Tech TC1 (340MFGT) 290**

#### **Process Technology I**

This is an introductory class on process control technology. Students will focus on major parameters used in industry to measure the status of a process—temperature, pressure, level and flow, and Ph analysis. The class defines the parameters and how they are used and controlled, and the system components in those control systems. Students will learn about their application in manufacturing, and the instrumentation used to measure them. Thermocouples, pressure, level, and flow sensors will be introduced and used to measure parameters. proportional/Integral/Derivative (P. I. D.) computer control is introduced. Physical principles governing the parameters will be introduced, such as the gas laws. Writing and math assignments as appropriate to the discipline are a part of this course. Course can lead to NIMS Certification.

*Eligibility for Math 98 Beginning Algebra with Geometry and English 96 Aligned Reading and Composition, or Consent of Department Chairperson.*  
2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

### **Manufacturing Tech TC1 (340MFGT) 291**

#### **Programmable Logic Controllers**

This course covers the basic concepts and skills needed to program and use programmable logic controllers (PLC's) in automated systems in industry. The topics include an overview of basic terminology, ladder logic programming, memory structure, and processing. Students will use PLC's to control electro-mechanical devices, pneumatic actuators, and other industrial components. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 191 or Consent of Department Chairperson.*  
2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

### **Manufacturing Tech TC1 (340MFGT) 292**

#### **Principles of Mechanisms**

This course covers the basic principles of industrial mechanisms. The motion characteristics of drive mechanisms, bearings, lubricants, cams, gears, pulleys are covered in the context of manufacturing processes and factory automation. Troubleshooting and maintenance procedures used in industrial settings are stressed throughout. Students completing the course will be prepared to earn the Manufacturing Skill Standard Council's Maintenance Awareness module of the Certified Production Technician credential. Writing assignments, as appropriate to the discipline are part of the course.

*Eligibility for Math 99 or Consent of Department Chairperson.*  
2 Laboratory hours. 2 Lecture hours. 3 Credit Hours.

**Offered At:** DA

### **Manufacturing Tech TC1 (340MFGT) 295**

#### **Electrical Motor Controls**

A study of different types of electrical motor controls as they are applied to industrial circuits. The topics include safety issues, instrumentation, and the interpretation of line diagrams. An overview of different types of motor controls is also provided. The student will be able to troubleshoot and repair problems associated with different motor control applications of the industry. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 191 or Consent of Department Chairperson.*  
4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA

### **Manufacturing Tech TC1 (340MFGT) 297**

#### **Advanced Mechanical Systems**

This course builds on the concepts elaborated in 340MFGT 292-Principles of Mechanisms. Topics include: Mechanical Drive Systems, Basic & Key Fasteners, Power Transmission Systems, V-Belt Drives, Chain Drives, Heavy Duty V-Belt Drives, V-Belt Selection and Maintenance, Lubrication Concepts, and Torque and Power Measurement. Students will also learn how to select the proper hand and power tools, ratchets, torque, wrenches, and torque settings for equipment assembly. Writing assignments, as appropriate to the discipline, are part of the course.

*Grade of C or better in 340MFGT 292 or Consent of Department Chairperson.*  
4 Laboratory hours. 1 Lecture hours. 3 Credit Hours.

**Offered At:** DA