

# ENGINEERING TECH.-CNC (ETCN)

## ETCN 1100 - Blueprint Reading and the Machinery's Handbook (3 Credits)

Detailed manufacturing part prints are the graphical representation of what the finished product should look like and the specifications required to make it. The Machinery's Handbook is the encyclopedia used in the manufacturing environment; a storehouse of practical information used to assist not only CNC machinists, but also quality control personnel, tool or mold makers, machine designers and mechanical engineers to solve a list of manufacturing problems. This course uses these two resources to teach students how to interpret the language of blueprints and find the required information regarding machining processes such as speeds, feeds, cutting tool specifications and limits. The focus is on problem-solving skills and strategies.

Lecture: 2 hours, Lab: 2 hours

## ETCN 1200 - Precision Measurement and Geometric Dimensioning and Tolerance (3 Credits)

This course is designed to develop the student's ability to interpret Geometric Dimensioning and Tolerancing (GD&T) language and accurately and precisely measure manufactured parts and assemblies using micrometers, digital calipers and dial indicators. Language and systems of measurement and GD&T are studied and discussed. Basic handheld comparison tools, precision gages, scaled and precision measuring tools are used to accurately measure parts for both size and geometric form. Students also learn about sine bar use and setup, gage blocks care, surface plate preparation and part fixturing. The feature control frame the geometric symbols in the application of the tolerances are also studied.

Lecture: 2 hours, Lab: 2 hours

**Prerequisite(s):** ETCN 1100

## ETCN 1300 - CNC Machining I (3 Credits)

This course introduces students to CNC programming using flow charts and process operations planning. Fundamental word address (G and M code) industrial standards, practices and terms used in industry are covered. Machine tool axis motion, methods of work piece setup cutting tool, selection cutting tool compensation and canned cycles are reviewed. Students produce manually written part programs for three axis-milling machines and router, and two axis lathes. Review of blueprints, Geometric Dimensioning and Tolerancing (GD&T) terminology, and right angle trigonometry are covered. Students will set-up and operate CNC milling machines and lathes to make assigned parts.

Lecture: 1 hour, Lab: 4 hours

**Prerequisite(s):** ENGR 1030 (may be taken concurrently) and ETME 1020 (may be taken concurrently) and ETCN 1100 (may be taken concurrently)

## ETCN 2100 - Computer Aided Manufacturing (3 Credits)

In this seven-and-a-half week course, students study the essentials of a computer-aided manufacturing system (CAM). This course uses MasterCam, which is an industrial software application, used to draw and create a tool path for CNC machining applications such as milling and turning. Students use CAM software in conjunction with computer-aided drawing files (CAD) to create machined features from a piece of stock material. Topics include using MasterCam to select the correct CNC machine tool, draw solid models, organize and optimize machining operations and time.

Lecture: 1 hour, Lab: 4 hours

## ETCN 2200 - CNC Machining II (3 Credits)

This course is a continuation of the CNC Machining I and Computer-Aided Manufacturing courses. In this course, students will use MasterCam to create toolpaths and code for 3 and 4 axis CNC milling machines and 2 axis CNC lathes. ISO codes will also be written for the 5 axis wire EDM using MasterCam as well as imported files from SolidWorks and AutoCAD. Additionally, students will set up and machine assigned parts on 3 and 4 axis CNC mills, 2 axis CNC lathes and the 5 axis wire EDM.

Lecture: 1 hour, Lab: 4 hours

**Prerequisite(s):** ETCN 1300 (may be taken concurrently) and ETCN 2100 (may be taken concurrently)

## ETCN 2300 - 3D-Modeling and Prototyping (3 Credits)

This course will study the types of Additive Fabrication (AS) or Additive Freeform Fabrication, as it is called in the industry. Topics include the history of Additive Manufacturing, the types of new generation machines used for A.M., and the types of materials, binders, and substrates used with this technology. Other topics include the size constraints, design constraints, and advantages and applications of this technology. The student will use SolidWorks and MasterCam as the manufacturing software to design and produce parts in the manufacturing lab using the Dimension SST 1200es CNC machine tool.

Lecture: 2 hours, Lab: 2 hours

**Prerequisite(s):** ENGR 1030 (may be taken concurrently) and ENGT 2090 (may be taken concurrently)

**ETCN 2400 - Industry and OSHA-10 Seminars**

**(1 Credit)**

Working safely and a safe working environment are the highest priorities. Students will gain an understanding of OSHA and important details concerning a safe workplace, and will earn the OSHA 10-hour card. The OSHA 10-hour card shows employers the student has had a good introduction to the safety concerns foremost in today's general industry workplace. This course will also provide networking opportunities with advanced manufacturing companies using the skills learned and developed in the certificate and A.S. degree programs. Industry leaders visit students in the classroom, describing the growing advanced manufacturing market, and how their skills can be integrated.

Lab: 3 hours

**ETCN 2500 - Computer Numerical Control (CNC) Practicum/Capstone^**

**(4 Credits)**

This course gives students an opportunity to apply knowledge and skills learned in the CNC certificate program in an industrial setting. Students spend 140 hours in a manufacturing environment setting up and operating CNC machine tools under the guidance of full-time employees. This class also has a two-hour meeting requirement which is used to develop a portfolio outlining the types of working experiences acquired in the practicum. Students keep a working journal during the semester which will be used to assist in building their portfolio to chronicle their experience in order to address any problems or concerns that may arise. The Engineering Department provides assistance in matching students in practicum settings.

Lecture: 1 hour, Other: 9 hours

**Prerequisite(s):** ETEE 1800 (may be taken concurrently) or (ETCN 2100 (may be taken concurrently) and ETCN 2200 (may be taken concurrently) and ETCN 2300 (may be taken concurrently))