Division of
WORKFORCE PARTNERSHIPS

Fast Track to CNC Manufacturing - Phase 1

Introduction to Manufacturing Processes (ETME 1020) – 3 credits
75 hours (15 lecture/60 lab)

This course provides students with insight and practical experiences in the set-up and operation of basic machines and measuring tools used in manufacturing processes. Significant emphasis is placed on dealing safely with high-power machinery, materials, laboratory clothing and machine maintenance. Turning, milling, grinding, drilling and precision measurements are covered, developing the students' ability to fabricate mechanical components using traditional machining. Students learn the limitations of traditional machining and prepare for understanding advanced manufacturing technology.

- Calculate machining speeds and feeds for machining operations
- Identify part Datum's
- Identify the three basic machining axes
- Interpret part blueprints for machining speculations and operations
- Produce a project methods sheet
- Safely setup and operate conventional machine tools
- Safely use hand tools and their accessories
- Select the correct cutting tool holders based on the machining operations
- Select the correct cutting tools based on the machining operation
- Use dial indicators in the inspection and setup of projects
- Use precession measuring tools, measuring to a precision of one thousand of an inch

Blueprint Reading and the Machinery's Handbook (ETCN 1100) – 3 credits
60 hours (30 lecture/30 lab)

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 insurance personnel, tool or mold makers, machine designers and mechanical engineers to solve a list of manufacturing problems. This seven-and-a-half week 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. Focus is on problem-solving skills and strategies.

- Identify the different line types used on an industrial blueprint
- Identify the standing ANSI size drawing sheets
- Identify the value of tolerances and dimensions used in industrial blueprint for precision machining
- Understand the components of ANSI size Title Block a standard revision box in the change order system
- Understand the terms associated with the standard views found on industrial blueprints
- Understand thread forms and thread nomenclature found on industrial blueprints
- Use the machinery's handbook as a reference tool to find specific information regarding a manufacturing or machining application problem

Fast Track to CNC Manufacturing - Phase 1 (continued)

Precision Measurement and Geometric Dimensioning and Tolerance (ETCN 1200) – 3 credits
60 hours (30 lecture/30 lab)

This seven-and-a-half week 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 of the geometric symbols in the application of the tolerances also are studied.

- Apply the necessary measuring techniques used to measure orientation tolerance
- Apply the necessary measuring techniques used to measure positional tolerance
- Apply the necessary measuring techniques used to measure profile tolerance
- Apply the rules of maximum and minimum materials conditions when measuring the machined parts or assemblies. As they conform to the rules of limits of size
- Identify the feature control frame and understand the components within
- Understand and apply the correct measurement and set up techniques based on the part geometry
- Understand the relationship between machined features as directed per the feature control frame that dictates fit form or function of the machined parts
- Understand the use of primary, secondary and tertiary datum's

Engineering Graphics (ENGR 1030) – 3 credits
75 hours (30 lecture/45 lab)

This course studies the theory of orthographic projection and the principles of descriptive geometry. Students construct exact drawings of three-dimensional objects including auxiliary views, cross-sections, dimensioning, pictorial drawings and freehand sketching.

- Be proficient in Solidworks graphical software.
- Have a functioning knowledge for solving problems that relate to intersections and developments of complex solid prisms and cones that intersect at oblique angles.
- Represent a three dimensional objects on one drawing plane with multiple views that are mutual perpendicular to each other.
- To acquaint the student to the various fields of engineering and technology.
- To enable the student to apply techniques of problem solving to engineering examples.
- To enable the student to apply the team approach to assigned projects.
- To enable the student to communicate effectively.
- To enable the student to utilize analytical and non-analytical tools to complete homework assignments, lab activities, and team projects.
- To introduce the student to the latest technology.
- Understand the concept of true length of line and the true shape of an oblique plane.
- Understand the significance of a working drawing and proper dimensioning.

Industry and OSHA 10 (ETCN 2400) - 1 credit
10 hours (lecture)

Working safely and a safe working environment is the highest priority in a 21st century advanced manufacturing facility. Students will gain an understanding of OSHA and important details concerning a safe workplace, and receive 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.

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Fast Track to CNC Manufacturing - Phase 2

CNC Machining (ETCN 1300) – 3 credits
75 hours (15 lecture/60 lab)

This course introduces students to CNC 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, as well as precision measurement for all produced parts (Prerequisite: ENGR 1030; ETCN 1100; ETME 1020).

- Be introduced to master cam's machining software program
- Calculate speeds and feeds for CNC machining operations
- Identify cutting tools used for milling turning and wood cutting operations
- Interface with the machine tool controls
- Read and interpret industrial blueprints used in the manufacturing of part programming
- Safely set up and operate the two axis CNC Lathe, Router, and 2-1/2, 3axis milling machines
- Simulate part programs on CNC machining simulation software
- Understand how the Cartesian coordinate system relates to CNC Routing Turning and Milling operations
- Write simple part programs for the two axis CNC lathe and router and milling machines

Advanced Solid Modeling (ENGT-2090) - 3 Credits
60 hours (30 lecture/30 lab)

Advanced Solid Modeling course uses the SOLIDWORKS tool to make 3 dimensional components and add in moving parts and assemblies. This will include mold design, sheet metal design and surfacing. Every lesson and exercise covers real world projects. Students work at their own pace to progress from simple to complex design challenges. All creations start as simple designs and progress step by step to complex models. The lab portion will include discussion of the machine processes used to manufacture built models and will include the Machinery Handbook. (Prerequisite: ENGR 1030)

- Learn how to draw 3D sketches
- Create planes to sketch geometry
- Draw helical models such as springs
- Create models with curved surfaces
- Analyze 3D models for performance and cost
- Create sheet metal parts , flat blank layouts and forming tools
- Draw weldments to create structures
- Create cores and cavities for molds and tooling
- Learn techniques of taking separate components and place in assemblies