Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 1	**Lesson Plan for:**	Product Concepts		
	Session Summary:	Overview of the design, structure and function of a product to be manufactured.		
	Objectives:	Describe the elements of a product that determine a manufacturing method. Identify raw material types used in finished products. Determine the most common manufacturing methods.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	Teach the student to identify raw material types and typical methods used for taking that product from raw material to finished product	Web-Enhanced Lecture	Material Identification activity. The student will be presented with a variety of raw materials to identify. Provide a list and samples of different raw materials and associated finished products. Illustrate the typical methods of working with the raw materials. Review the introductory machinability.	http://en.wikipedia.org/wiki/Machinability
	Introduce the student to the most common manufacturing methods.	Web-Enhanced Lecture; Hands-on	Using animations, videos and images, present common manufacturing methods to the student. If time allows have students research manufacturing methods and describe these in class. Cover any method not presented by the students.	Internet research or open source
Evaluation	Instructor observations - identification of raw materials			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 2	**Lesson Plan for:**	Market Feasibility		
	Session Summary:	Introduce the student to concepts of determining market feasibility for a product. Identify research and information analysis methods.		
	Objectives:	Identify different methods of performing market research. State methods for analyzing product feasibility information. Evaluate market demographics from marketing research. Identify factors that affect product viability.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	Explain common methods of performing market research.	Web-Enhanced Lecture	Present examples of methods and services utilized to determine market need and feasibility.	http://www.slideshare.net/karthik121/marketing-research-process
	Illustrate methods for analyzing research information and identifying valid and erroneous data.	Web-Enhanced Lecture; Hands-on	Research project, given a list of desired factors that affect product feasibility, assign each student the task of gathering a piece of the information and return it for the group to analyze and critique when combined with all the other information. Given the sample data, determine positive and negative aspects of the information as it relates to product viability.	Internet research or open source
	Explain typical factors that influence product marketability.	Web-Enhanced Lecture; Hands-on	Present historical examples of common things that affect the market viability of a product.	Internet research or open source
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 3	**Lesson Plan for:**	Engineering Design		
	Session Summary:	Introduce the student to the aspects of taking a product from concept to a clearly defined entity.		
	Objectives:	Identify initial factors used to determine details of a product's design. Describe methods implemented in product design. Compare and contrast different design methods.		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	Shop Essentials - Blueprint Reading 130 Lessons 1-18. Inspection - Interpreting GD&T 310 Lessons 1-20.	ToolingU
	Present common engineering design components held within a blueprint.	Web-Enhanced Lecture	Read/Review Blueprint Reading 130 - Utilize interactive lab to familiarize students with blueprint reading.	ToolingU
	Describe common design methodologies.	Web-Enhanced Lecture	Read/Review Interpreting GD&T 310 - Utilize interactive lab to familiarize student with GD&T documentation.	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Instructor notes - if certificate courses are delivered out of order it is recommended to introduce Intro to GD&T 200 and Blueprint Reading 130 prior to completing Interpreting GD&T 310.

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 4	**Lesson Plan for:**	Prototyping		
	Session Summary:	Introduce the use of prototypes and the different ways a prototype can be implement.		
	Objectives:	Explain the advantages to developing a prototype. Compare advantages and disadvantages of scaled vs. full-size prototypes. Compare advantages and disadvantages of using identical materials vs. substitutes for prototypes.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	Define the purpose of prototypes, the advantages of scaled models, types and reasons for material substitutes.	Web-Enhanced Lecture	Present the information and provide prototype and material examples.	Open - you may have prototype models or use examples found online
	Provide examples of scaled and full-size prototype implementations.	Web-Enhanced Lecture	Provide examples that illustrate different scaling implemented in prototypes.	http://www2.le.ac.uk/departments/physics/place/facilities/workshop/rapid-prototyping
	Provide examples of similar and unrelated materials used in prototype implementations.	Web-Enhanced Lecture	Provide examples that illustrated different materials utilized in prototyping.	http://www.mechanicalengineeringblog.com/1385-prototype-your-invention-idea-prototyping-rapid-prototyping/
	Prototype analysis research and present examples of prototypes that failed.	Hands-on learning	Prototype analysis, have students research a failed prototype to comment on and discuss what was learned.	http://www.redeyeondemand.com/FAQ-Materials.aspx
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 5	**Lesson Plan for:**	Production		
	Session Summary:	Provide an overview of a typical production process.		
	Objectives:	State the stages of a typical mass production process. Describe the differences between a typical mass production process and a low volume or customized production process.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Quality - Metrics for Lean 230 Lessons 1-16. Process Flow Charting 240 Lessons 1-20.	ToolingU
	Explain a flow-chart style depiction of a typical mass production process from start to finish.	Web-Enhanced Lecture	Present illustrations, photographs or mock-ups of a production process. Identify and briefly explain each stage.	http://www.epa.gov/lean/environment/methods/cellular.htm
	Identify variations of typical mass production processes utilized in lower volume or custom products.	Web-Enhanced Lecture	Present examples of low volume/custom manufacturing processes. Ideally a field trip could be used to observe production and manufacturing processes.	Mock-ups, images or video of production processes. VR Simulations or Second-life could be used for this.
	Present the use, selection and process of lean metrics	Web-Enhanced Lecture	Read/Review Metrics for Lean 230	ToolingU
	Present the use, common methods and advantages of documenting procedures	Web-Enhanced Lecture	Read/Review Process Flow Charting 240	ToolingU
Evaluation	Instructor observation - have students participate in comparing/contrasting the manufacturing processes			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 6	**Lesson Plan for:**	Marketing and Sales		
	Session Summary:	Provide a basic overview of marketing and sales methods and media utilized in various industries.		
	Objectives:	Identify differences in marketing and sales to the general public versus specific segments of the population. Identify differences in marketing and sales to product end users versus customers utilizing a product for inclusion in another product/system.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	Explain tools and methods utilized to grab the attention of a target audience.	Web-Enhanced Lecture	Present resources and examples of market strategies.	Open
	Product selection and application	Hands-on learning	Provide a product example, have students determine a market for that particular product.	Open
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 7	**Lesson Plan for:**	Product Analysis		
	Session Summary:	Provide an overview of determining the characteristics of producing common types of products based upon the materials and cost of the products and the associated characteristics of working with these materials.		
	Objectives:	Identify common material categories utilized in the manufacture of common goods. Compare the relative cost of different material categories. State special characteristics of common production materials with reference to handling and processing those materials.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Materials - Intro to Materials 100 Lessons 1-19. Overview of Plastics Materials 115 Lessons 1-17. Ceramics 250 Lessons 1-17.	ToolingU
	Identify the basic categories of materials and the importance of their properties for manufacturing use.	Web-Enhanced Lecture	Read/Review Intro to Materials 100	ToolingU
	Describe available types and characteristic differences of plastics	Web-Enhanced Lecture	Read/Review Overview of Plastics Materials 115	ToolingU
	Describe the classification and characteristics of ceramics	Web-Enhanced Lecture	Read/Review Ceramics 250	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 8	**Lesson Plan for:**	Production Methods - Assembly		
	Session Summary:	An overview of production organization methodologies. This topic will describe, compare and contrast the function and implementation of assembly line and work cell production formats.		
	Objectives:	Describe the characteristics of an assembly line manufacturing method Describe the characteristics of a work cell manufacturing method Compare and provide advantages and disadvantages of different production sequence methods		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	Quality - Strategies for Setup Reduction 250 Lessons 1-17. Cell Design and Pull Systems 160 Lessons 1-17.	ToolingU
	Introduce operational strategies to reduce time spent in setup and change in production.	Web-Enhanced Lecture	Read/Review Strategies for Setup Reduction 250	ToolingU
	Identify the purpose of cellular and pull systems in manufacturing.	Web-Enhanced Lecture	Read/Review Cell Design and Pull Systems 160	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 9	**Lesson Plan for:**	Production Methods - Inventory		
	Session Summary:	This session will explore incoming raw material and outgoing product inventory management.		
	Objectives:	Identify material ordering methods including business-to-business connections and just in time processes. Describe characteristics of material staging methods, both high and low density. Describe elements of finish product staging methods. Describe transit, material and buffer inventory types. State cost factors to different types of inventory.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Quality - Intro to Supply Chain Management 140 Lessons 1-15.	ToolingU
	Discuss the management flow of product supply and information	Web-Enhanced Lecture	Read/Review Intro to Supply Chain Management 140	ToolingU
	Inventory Management Flowchart	Web-Enhanced Lecture; Hands-on	Design a sample plan and flow chart for incoming finished product staging and inventory management. Present when complete.	http://download.cnet.com/windows/inventory-software/
	Examine material ordering methods used in industry.	Web-Enhanced Lecture	Review the variety of inventory software available	http://www.top5freeware.com/inventory-management-software-for-windows
	Define the basic principles of warehouse and inventory management	Web-Enhanced Lecture; Hands-on	Review the purpose and differences between each method	http://log.logcluster.org/mobile/response/warehouse-management/index.html
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 10	**Lesson Plan for:**	Production Methods - Internal Material Flow		
	Session Summary:	This session will explore the internal handling of materials and production components as they pass through the manufacturing process.		
	Objectives:	Describe different inventory types including: work in progress, maintenance, repair and finished product inventory. Identify different methods used for transporting inventory within the manufacturing process.		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	Quality - Approaches to Maintenance 120 Lessons 1-15. Lean Manufacturing Overview 130 Lessons 1-18.	ToolingU
	Discuss the benefits and importance for performing scheduled maintenance	Web-Enhanced Lecture	Read/Review Approaches to Maintenance 120	ToolingU
	Discuss the benefits from lean manufacturing and the impact it has in material flow	Web-Enhanced Lecture	Read/Review Lean Manufacturing Overview 130 - Utilize interactive lab to observe manufacturing methods	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 11	**Lesson Plan for:**	Quality control - Monitoring and Testing		
	Session Summary:	This topic will explore methods implemented for quality control in a manufacturing environment. Incoming raw material and outgoing finished product QC will be examined.		
	Objectives:	Explain the importance of quality control in a manufacturing environment. Identify key elements of procedures used for quality control of incoming raw materials. Identify key elements of procedures used for quality control of finished products. Describe the elements of a quality control system.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Quality - Quality Overview 100 Lessons 1-16.	ToolingU
	Discuss the importance of quality control in product development, production and processing.	Web-Enhanced Lecture	Read/Review Quality Overview 100	ToolingU
	Discuss quality control concerns for incoming raw materials.	Hands-on learning	Present examples of procedures followed to incoming material quality control. Perform basic quality control tests.	Meters, metrology equipment, vision equipment, etc.
	Describe finished product quality control.	Hands-on learning	Present examples of finished product quality control procedures. Perform basic quality control tests.	Meters, metrology equipment, vision equipment, etc.
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 12	**Lesson Plan for:**	Quality Control - Certified Standards		
	Session Summary:	This session will describe the elements that apply to standards for quality control systems.		
	Objectives:	Identify components of ISO 9000 standards. Describe the concept of Total Quality Management. Describe the Six Sigma approach to quality management and improvement.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Quality - ISO 9000 Overview 110 Lessons 1-19. Intro to Six Sigma 170 Lessons 1-16. Conducting an Internal Audit 200 Lessons 1-19.	ToolingU
	Introduce the purpose of quality assurance and management through ISO 9000, the processes and guidelines organizations are committed to following.	Web-Enhanced Lecture	Read/Review ISO 9000 Overview 110	ToolingU
	Discuss Six Sigma five-step process for improvement method	Web-Enhanced Lecture	Read/Review Intro to Six Sigma 170	ToolingU
	Describe why internal audits are performed, the verification during inspection and benefits from conducting audits.	Web-Enhanced Lecture	Read/Review Conducting an Internal Audit 200	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 13	**Lesson Plan for:**	Machines and Process overview - Boring and Machining		
	Session Summary:	This section will illustrate the production processes that require boring, turning and milling and explain the machines used in these processes.		
	Objectives:	Describe the processes of boring, turning and milling. Identify the characteristics and applications of boring, turning and milling machines. Identify the applications of manual versus automated (computer controlled) boring, turning and milling processes. Describe the basic sawing process. Identify the four types of sawing operations that take place in metal working.		
	Description	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Metal Cutting - Metal Removal Processes 110 Lessons 1-17. What Is Cutting? 120 Lessons 1-14 . Machines for Metal Cutting 130 Lessons 1-16. Cutting Processes 140 Lessons 1-13. Sawing Fundamentals 155 Lessons 1-17.	ToolingU
	Machine overview	Web-Enhanced Lecture	Provide illustrations of drill presses, mills and lathes and identify basic features.	http://www.jjjtrain.com/vms/; http://techtv.mit.edu/videos/142-machine-shop-1; http://web.mit.edu/2.670/www/Tutorials/Machining/
Learning	Describe the machining processes for metal removal.	Web-Enhanced Lecture	Read/Review Metal Removal Processes 110	ToolingU
	Discuss the fundamentals in cutting	Web-Enhanced Lecture	Read/Review What Is Cutting? 120	ToolingU
	Introduce machines used in a metal cutting process.	Web-Enhanced Lecture	Read/Review Machines for Metal Cutting 130	ToolingU
	Introduce cutting processes	Web-Enhanced Lecture	Read/Review Cutting Processes 140	ToolingU
	Describe the processes, types and characteristics of sawing	Web-Enhanced Lecture	Read/Review Sawing Fundamentals 155	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 14	**Lesson Plan for:**	Machines and Process overview - Presses		
	Session Summary:	This section will introduce various processes used to form parts from different raw materials.		
	Objectives:	Identify the characteristics of extrusion. Compare the processes of rolling and stamping. Identify the sub-tasks of stamping: shearing, punching, drawing and bending.		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	Stamping - Press Basics 110 Lessons 1-15. Press Brake - Press Brake Components 110 Lessons 1-14. Stamping - Punch and Die Operations 120 Lessons 1-16.	ToolingU
	Machine observation	Hands-on learning	Take a field trip. These operations are extremely common in manufacturing facilities. A field trip would allow you to observe factory operations.	Open
	Introduce press types, forming processes, and methods used to construct parts.	Web-Enhanced Lecture	Read/Review Press Basics 110	ToolingU
	Identify components of a press brake and common measuring devises.	Web-Enhanced Lecture	Read/Review Press Brake Components 110	ToolingU
	Discuss different types for metal forming operations	Web-Enhanced Lecture	Read/Review Punch and Die Operations 120	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 15	**Lesson Plan for:**	Machines and Process overview - Molding/Casting		
	Session Summary:	This session will present various molding and casting processes and how they apply to various product manufacturing processes.		
	Objectives:	Identify various raw materials that are appropriate for a casting process. Compare different types of casting processes. Identify mold forming processes such as: injection molding, blow molding, forging and thermo and hydroforming. Identify materials that are appropriate for the different mold forming processes.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Materials - Metal Manufacturing 140 Lessons 1-13.	ToolingU
	Introduce materials and methods used during the production of metals.	Web-Enhanced Lecture	Read/Review Metal Manufacturing 140	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 16	**Lesson Plan for:**	Machines and Process overview - Welding		
	Session Summary:	This session will introduce the different forms of welding and their application.		
	Objectives:	Define the process of welding. Identify different types of welding equipment including arc welding, mig welding, tig welding and friction welding. Identify different types of soldering.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Welding - What is Arc Welding? 110 Lessons 1-18. Arc Welding Processes 120 Lessons 1-16. Soldering - What is Soldering? 110 Lessons 1-13.	ToolingU
	Define arc welding and the available joining processes	Web-Enhanced Lecture	Read/Review What is Arc Welding? 110	ToolingU
	Describe welding types and address the differences between each process.	Web-Enhanced Lecture	Read/Review Arc Welding Processes 120	ToolingU
	Identify the use of soldering, its advantages and differences in the joining process	Web-Enhanced Lecture	Read/Review What is Soldering? 110	ToolingU
Evaluation	Instructor observation - have students identify appropriate welding types for each.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 17	**Lesson Plan for:**	Machines and Process overview - Finishing		
	Session Summary:	This session will introduce the different finishing processes and applications of finishing processes.		
	Objectives:	Compare different forms of material conditioning including heat treating, hardening and tempering. State the functionality of different forms of finish preparation including surface smoothing, polishing, deburring and cleaning. Identify the characteristics of different forms of surface coatings including painting and plating.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Materials - Heat Treatment of Steel 230 Lessons 1-18. Coatings - Processes for Applying Coatings 140 Lessons 1-17.	ToolingU
	Present heat treatment methods and the effects varied temperatures will have on the structure of steel.	Web-Enhanced Lecture	Read/Review Heat Treatment of Steel 230	ToolingU
	Identify coating and the appropriate application process of each.	Web-Enhanced Lecture	Read/Review Processes for Applying Coatings 140	ToolingU
Evaluation	Instructor observations - have students describe finishing processes.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 18	**Lesson Plan for:**	Machines and Process overview - Assembly		
	Session Summary:	This section will introduce the student to manual and automated assembly processes and compare the application of them.		
	Objectives:	Identify applications requiring manual assembly. Identify applications that are appropriate for automated assembly. State characteristics used to determine the usage of automated or manual assembly.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Fasteners - Intro to Assembly 100 Lessons 1-14. Tools for Threaded Fasteners 120 Lessons 1-18. Understanding Torque 210 Lessons 1-15.	ToolingU
	Describe three common methods performed during the assembly process.	Web-Enhanced Lecture	Read/Review Intro to Assembly 100	ToolingU
	Identify the appropriate tools and fasteners for use based on the applied function.	Web-Enhanced Lecture	Read/Review Tools for Threaded Fasteners 120	ToolingU
	Define torque and explain the impact of proper and improper use of an applied value.	Web-Enhanced Lecture	Read/Review Understanding Torque 210	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 19	**Lesson Plan for:**	Materials		
	Session Summary:	The section will introduce students to the different types of production materials. Characteristics of common production materials will also be discussed.		
	Objectives:	State the different sources of raw materials including: natural materials, synthetics and engineered materials. Describe the different properties of common raw materials. Explain the properties of common raw materials. Explain the application of common raw materials in different products. Cost		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Materials - Ferrous Metals and Alloys 210 Lessons 1-16. Nonferrous Metals and Alloys 220 Lessons 1-14. Mechanical Properties of Metal 120 Lessons 1-12. Metal Classification 150 Lessons 1-13. Physical Properties of Metal 130 Lessons 1-11. Structure of Metals 110 Lessons 1-15.	ToolingU
	Define classifications and properties for use of ferrous metals and alloys.	Web-Enhanced Lecture	Read/Review Ferrous Metals and Alloys 210	ToolingU
	Define classifications and properties for use of nonferrous metals and alloys.	Web-Enhanced Lecture	Read/Review Nonferrous Metals and Alloys 220	ToolingU
	Explain the mechanical properties of metals and how material condition is changed.	Web-Enhanced Lecture	Read/Review Mechanical Properties of Metal 120	ToolingU
	Identify the classification of metals and their differences for applied use.	Web-Enhanced Lecture	Read/Review Metal Classification 150	ToolingU
	Define the physical properties of metals.	Web-Enhanced Lecture	Read/Review Physical Properties of Metal 130	ToolingU
	Introduce different structures of metals and options to consider when selecting for production.	Web-Enhanced Lecture	Read/Review Structure of Metals 110	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 20	**Lesson Plan for:**	Production Machine Operations - Presses		
	Session Summary:	This topic will discuss the operation of common press types.		
	Objectives:	Explain the general operation of common press types. Identify the application for different press types.		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	Mechanical Systems - Forces of Machines 110 Lessons 1-17. Gear Applications 245 Lessons 1-18. Intro to Mechanical Systems 100 Lessons 1-20. Lubricant Fundamentals 130 Lessons 1-18. Mechanical Power Variables 200 Lessons 1-14. Power Transmission Components 120 Lessons 1-17. Press Brake - Operating the Press Brake 200 Lessons 1-13.	ToolingU
	Describe the effects force and distance have on work produced by the movement of machines.	Web-Enhanced Lecture	Read/Review Forces of Machines 110	ToolingU
	Describe how gears transmit energy through a mechanical system.	Web-Enhanced Lecture	Read/Review ToolingU Gear Applications 245	ToolingU
	Identify types, use and benefits of mechanical systems	Web-Enhanced Lecture	Read/Review Intro to Mechanical Systems 100	ToolingU
	Name types of lubricants, their use and application	Web-Enhanced Lecture	Read/Review Lubricant Fundamentals 130	ToolingU
	Define mechanical variables needed for safe operation and maintenance of machinery.	Web-Enhanced Lecture	Read/Review Mechanical Power Variables 200	ToolingU
	Identify the methods and components necessary for mechanical power transmission	Web-Enhanced Lecture	Read/Review Power Transmission Components 120	ToolingU
	Describe operational recommendations and components of a press brake.	Web-Enhanced Lecture	Read/Review Operating the Press Brake 200	ToolingU
Evaluation	Instructor observations - have students identify main elements of a machine press			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 21	**Lesson Plan for:**	Production Machine Operations - Molding/Casting		
	Session Summary:	This session will explore the operation of molding and casting machinery.		
	Objectives:	Identify the stages of a molding operation. Identify the stages of a casting operation.		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	Materials - Principles of Injection Molding 255 Lessons 1-20. Principles of Thermoforming 265 Lessons 1-16.	ToolingU
	Define injection molding forms and their process	Web-Enhanced Lecture	Read/Review Principles of Injection Molding 255	ToolingU
	Describe different forming techniques in casting	Web-Enhanced Lecture	Read/Review Principles of Thermoforming 265	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 22	**Lesson Plan for:**	Production Machine Operations - Drilling/Boring		
	Session Summary:	This session will explore the different types of machines used for drilling/boring operations.		
	Objectives:	Describe the typical features of hand-held drilling tools. Describe the typical features of drill presses. Describe the typical features of engine lathes. Describe the typical features of CNC lathes.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Manual Machining - Overview of Manual Mill Setup 200 Lessons 1-16. Overview of Engine Lathe Setup 205 Lessons 1-20. Holemaking on the Mill 230 Lessons 1-15. CNC - Basics of the CNC Turning Center 120 Lessons 1-15. Basics of the CNC Swiss-Type Lathe 135 Lessons 1-15.	ToolingU
	Describe proper setup and operation of milling machine	Web-Enhanced Lecture	Read/Review Overview of Manual Mill Setup 200	ToolingU
	Discuss lathe operation and setup	Web-Enhanced Lecture	Read/Review Overview of Engine Lathe Setup 205	ToolingU
	Define different types of holemaking operations and processes	Web-Enhanced Lecture	Read/Review Holemaking on the Mill 230	ToolingU
	Introduce the turning process and components of a lathe	Web-Enhanced Lecture	Read/Review Basics of the CNC Turning Center 120	ToolingU
	Identify common components and machine operations of Swiss-type lathe	Web-Enhanced Lecture	Read/Review Basics of the CNC Swiss-Type Lathe 135	ToolingU
Evaluation	Instructor observations - have students identify the basic operational controls of hand drills, drill presses and engine lathes.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 23	**Lesson Plan for:**	Production Machine Operations - Machining		
	Session Summary:	This session will explain the capabilities and features of lathes and mills.		
	Objectives:	Describe the operation and basic settings of an engine lathe. Describe the operation and setup of a CNC lathe. Describe the operation and basic setup of a manual mill. Describe the operation and setup of a CNC mill.		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	Manual Machining - Manual Mill Operation 220 Lessons 1-18. Basics of the Engine Lathe 115 Lessons 1-17. Basics of the Manual Mill 110 Lessons 1-14. Benchwork and Layout Operations 210 Lessons 1-15. Engine Lathe Operation 225 Lessons 1-23.	ToolingU
	ToolingU Reading Assignment	Online learning	CNC - Basics of the CNC Machining Center 130 Lessons 1-16. CAD/CAM Overview 160 Lessons 1-20. CNC Coordinates 140 Lessons 1-16. CNC Offsets 210 Lessons 1-18. CNC Specs for the Lathe 225 Lessons 1-18. CNC Specs for the Mill 220 Lessons 1-17. History and Definition of CNC 100 Lessons 1-13. Part Program 150 Lessons 1-14.	ToolingU
	Identify five common operations performed on a manual mill.	Web-Enhanced Lecture	Read/Review Manual Mill Operation 220	ToolingU
	Describe the basic purpose and parts of an engine lathe	Web-Enhanced Lecture	Read/Review Basics of the Engine Lathe 115	ToolingU
	Define the primary functions and parts in a milling machine	Web-Enhanced Lecture	Read/Review Basics of the Manual Mill 110	ToolingU
	Introduce machining preparations	Web-Enhanced Lecture	Read/Review Benchwork and Layout Operations 210	ToolingU
	Discuss common engine Lathe operations performed	Web-Enhanced Lecture	Read/Review Engine Lathe Operation 225	ToolingU
	Discuss the necessary setup and functions of CNC mills	Web-Enhanced Lecture	Read/Review Basics of the CNC Machining Center 130	ToolingU
	Define CAD and CAM, its use, process and primary advantages in design and development	Web-Enhanced Lecture	Read/Review CAD/CAM Overview 160	ToolingU
	Define Cartesian coordinate system and its applied use in CNC machines.	Web-Enhanced Lecture	Read/Review CNC Coordinates 140	ToolingU
	Define offsets, its purpose and how positioning a cutting tool is important for machine operation.	Web-Enhanced Lecture	Read/Review CNC Offsets 210	ToolingU
	List three factors to consider when selecting a CNC lathe to perform a job.	Web-Enhanced Lecture	Read/Review CNC Specs for the Lathe 225	ToolingU
	Describe three areas of influence when selecting CNC mill for operation	Web-Enhanced Lecture	Read/Review CNC Specs for the Mill 220	ToolingU
	Describe how CNC machines have impacted part creation in manufacturing.	Web-Enhanced Lecture	Read/Review History and Definition of CNC 100	ToolingU
	Define how CNC machine uses part programs to perform the necessary machining operations.	Web-Enhanced Lecture	Read/Review Part Program 150	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 24	**Lesson Plan for:**	Production Machine Operations - Welding		
	Session Summary:	This session will examine the procedures and requirements for basic welding operations.		
	Objectives:	Compare capabilities of different welding operations. Identify the settings required for arc welding. Identify the settings required for MIG welding. Identify the settings required for TIG welding. Identify the basic procedures that apply to the common forms of welding.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Welding - What is Oxyfuel Welding?100 Lessons 1-14. Oxyfuel Welding Safety 105 Lessons 1-16. Overview of Weld Types 130 Lessons 1-17.	ToolingU
	Define oxyfuel welding processes as it applies to metals	Web-Enhanced Lecture	Read/Review What is Oxyfuel Welding?100	ToolingU
	Identify proper procedures for oxyfuel welding	Web-Enhanced Lecture	Read/Review Oxyfuel Welding Safety 105	ToolingU
	Discuss guidelines for consideration when selecting a joint and weld type.	Web-Enhanced Lecture	Read/Review Overview of Weld Types 130	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 25	**Lesson Plan for:**	Production Machine Operations - Finishing		
	Session Summary:	This session will explore the different machines utilized in common finishing operations.		
	Objectives:	Describe the basic procedures involved in hand and robotic painting. Describe the basic operation of common hand surface preparation tools. Describe the basic operation of common finish preparation machines. Describe the basic operation of common plating/coating machines.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Coatings - Surface Preparation for Coatings 120 Lessons 1-20.	ToolingU
	Identify common surface types, preparation, technics and reason why coating may not adhere to a surface.	Web-Enhanced Lecture	Read/Review Surface Preparation for Coatings 120	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 26	**Lesson Plan for:**	Production Machine Operations - Advanced Intelligence Automation		
	Session Summary:	This session will explore the application of robotic and vision systems in Manufacturing		
	Objectives:	Identify characteristics of robots Describe applications of robotic systems Describe common robot types Describe robotic tooling options Describe the function of vision systems Identify vision system applications		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Robotics - Intro to Robotics 110 Lessons 1-17. Applications for Robots 130 Lessons 1-13. End Effectors 125 Lessons 1-13. Vision Systems 250 Lessons 1-14.	ToolingU
	Define industrial robots, typical features and operational functions they performed.	Web-Enhanced Lecture	Robotics - Intro to Robotics 110	ToolingU
	Describe the primary benefits and common applications used in manufacturing.	Web-Enhanced Lecture	Robotics - Applications for Robots 130	ToolingU
	Describe specialized tasks performed by end effectors in robotic tooling.	Web-Enhanced Lecture	Robotics - End Effectors 125	ToolingU
	Discuss the purpose and applied use of vision systems	Web-Enhanced Lecture	Robotics - Vision Systems 250	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 27	**Lesson Plan for:**	Production Machine Operations - Programmable Logic Controllers (PLCs)		
	Session Summary:	This section will explore the role and operation of PLCs in the manufacturing process.		
	Objectives:	The student will be able to define PLCs Identify the main components of a PLC system Describe the basic operation of a PLC State the application of PLC inputs and outputs Identify common input and output devices.		
	Description	***Delivery Method***	***Activity***	***Materials***
Learning	ToolingU Reading Assignment	Online learning	PLCs - Intro to PLCs 200 Lessons 1-17. Hardware for PLCs 210 Lessons 1-15.	ToolingU
	Describe basic components and functions of programmable logic controllers (PLCs)	Web-Enhanced Lecture	Read/Review Intro to PLCs 200	ToolingU
	Identify common PLCs, differences between the devices and additional equipment used.	Web-Enhanced Lecture	Read/Review Hardware for PLCs 210	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 28	**Lesson Plan for:**	Production Monitoring - Monitoring		
	Session Summary:	This session will explore the processes involved in monitoring a production operation.		
	Objectives:	Describe the necessity for data gathering in a production operation. Describe the importance of baseline testing in a production operation. Describe the importance of measuring tools in monitoring production. Describe the measuring characteristics of common tools used in monitoring production such as vision systems, calipers and micrometers.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Shop Essentials - Blueprint reading 130 Lessons 1-18 (assigned). Interpreting Blueprints 230 Lessons 1-16. Quality - Troubleshooting: Identifying Problems 180 Lessons 1-13.	ToolingU
	Review the three elements held within a blueprint.	Web-Enhanced Lecture	Read/Review Blueprint reading 130	ToolingU
	Discuss common features found on blueprints and describe how to inspect the specifications.	Web-Enhanced Lecture	Read/Review Interpreting Blueprints 230	ToolingU
	Describe the series of steps used to troubleshoot problems and address action.	Web-Enhanced Lecture	Read/Review Troubleshooting: Identifying Problems 180	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 29	**Lesson Plan for:**	Production Monitoring - Quality Control		
	Session Summary:	This session will explain the usage of data measurements and comparisons along the different stages of a production process and how to use them for Quality Control and Improvement.		
	Objectives:	Describe how to use information to determine failure rates in production. Demonstrate how to collect data to help isolate the source of quality problems in a production operation.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Inspection - Basic Measurement 110 Lessons 1-18. Linear Instrument Characteristics 115 Lessons 1-15. Calibration Fundamentals 210 Lessons 1-20.	ToolingU
	Discuss the study of metrology and common devices used to measure and inspect part specifications.	Web-Enhanced Lecture	Read/Review Basic Measurement 110	ToolingU
	Describe the change or differences in measurements based upon the instrument used.	Web-Enhanced Lecture	Read/Review Linear Instrument Characteristics 115	ToolingU
	Discuss the need for accurate measurements and calibration standards	Web-Enhanced Lecture	Read/Review Calibration Fundamentals 210	ToolingU
Evaluation	Instructor observations, assign homework or quiz.			

Degree/Diploma:	**Diversified Manufacturing Technology**			
Course:	**Introduction to Manufacturing Technology**			
Session 30	**Lesson Plan for:**	Finished Product Logistics - Product Delivery and Customer Interaction		
	Session Summary:	This session will explore the logistics of product delivery and the value and costs involved with customer integrations and product warranties.		
	Objectives:	State cost factors involved with product support. Describe the different capabilities of common carrier methods. State product characteristics that affect delivery methods, such as hazards, sizing and weight.		
Learning	***Description***	***Delivery Method***	***Activity***	***Materials***
	ToolingU Reading Assignment	Online learning	Supervisory Essentials - Basics of Manufacturing Costs 140 Lessons 1-17. Essentials of Communication 120 Lessons 1-14.	ToolingU
	Define costs and categories related to production and marketing of this product.	Web-Enhanced Lecture	Read/Review Basics of Manufacturing Costs 140	ToolingU
	Identify three main components in communication	Web-Enhanced Lecture	Read/Review Essentials of Communication 120	ToolingU
	Mock business meeting	Hands-on learning	Using a previously covered topic as approved by the instructor, each student will plan and lead a meeting to discuss that topic. IE: A student could choose to deliver a product introduction type of presentation for a particular type of welder.	Open
Evaluation	Instructor observations, assign homework or quiz.			