Computer Integrated Manufacturing

Unit 1 Overview Computer Integrated Modeling

Computer Integrated Manufacturing	Student will be able to demonstrate the ability to store, retrieve copy, and output drawing files depending upon sy	Students will be able to utilize instructor identified 2D computer sketching functions.	Students will be able to incorporate various coordinate systems in the construction of 2 D geometrical shapes.	Students will be able to calculate the x and y coordinates given a radius and angle.	Students will be able to produce 2D sketches using available sketching features.	Students will be able to apply editing techniques to produce accurate sketches.	Student will be able to understand and apply sketch constraints.	Students will analyze drawings with appropriate inquiry functions.	Students will be able to define sketched objects with dimensions and geometric constraints.	Students will be able to apply necessary sketched features to generate a solid model.	Students will be able to demonstrate the application and modifying of placed features.	Students will be able to develop multi-view drawings such as top, front, right side, isometric, section and auxilian	Students will be able to demonstrate the proper application of annotations and reference dimensions while confo	Students will be able to update model and drawing views using revision specification sheets provided by the inst	Students will be able to create assembly models through the integration of individual parts and sub-assemblies.	Students will be able to generate an assembly drawing, which include Views, Balloons, and Bill Of Materials (BO	Students will be able to recognize the wide array of industry-wide prototyping methods in use.	Students will identify the need for rapid-prototyping.	Students will prepare a prototype model from a drawing data base.
Michigan Grade 9-12 Grade Science Standards Linked																			
SCIENCE GRADE 9-12: http://www.michigan.gov/documents/Biology_HCSE_168202_7.pdf											X								X
STANDARD B1: INQUIRY, REFLECTION, AND SOCIAL IMPLICATIONS											X								X
IRSIB1.1 Scientific Inquiry											X								
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IRSIB1.2f Critique solutions to problems, given criteria and scientific constraints.																			
IRSIB1.2g Identify scientific tradeoffs in design decisions and choose among alternative solutions.																			
IRSIB1.2j Apply science principles or scientific data to anticipate effects of technological design decisions.																			X
IRSIB1.2k Analyze how science and society interact from a historical, political, economic, or social perspective.																			

Unit 2 Programmable Machining

Computer Integrated Manufacturing	Students will be able to explain the history of Computer Controlled Machines charting the growth of NC and how	Students will be able to explain how the application of CNC machines has impacted manufacturing.	Students will be able to explain the advantages and disadvantages of CNC Machining.	Students will be able to chart the evolution of machine tools, controllers, and software used in programmable ma	Students will explore career opportunities and educational requirements within the field of programmable machi	Students will identify the axis relative to various CNC machines.	Students will contrast open and closed loop control systems.	Students will identify the types of drive systems used in CNC machines.	Students will be able to use the CNC control program to indicate the machine position and then contrast that pos	Students will be able to identify and explain the function of the major components of a CNC machine tool.	Students will examine and apply various work holding devices commonly used for CNC machining.	Students will identify various types of tool changers used in CNC machine tools.	Students will define the three primary axes used in CNC machining and explore the remaining axes used in adva	Students will explain the importance of cutting tool materials and how they affect the speed and feed rates used	Students will examine different types of tool holding devices used in CNC machine tools.	Students will be able to select appropriate cutting tools to efficiently, safely and accurately cut parts using a CNC	Students will understand the difference between reference and position points.	Students will understand that CNC machine movements are identified by axes.	Students will understand that the axis system is a worldwide standard for machine movement.	Students will be able to plot points using absolute, relative (incremental) and polar coordinates.	Students will be able to identify Significant Points on geometric shapes (ex. Center point, end point).	Students will be able to identify the optimum location for the Program Reference Zero (PRZ) point.	Students will be able to identify the three categories of machine movement: straight line, curved line, and non-re	Students will be able to complete a preliminary planning sheet to identify necessary work holding devices, cutting	Students will be able to define the term "Alphanumeric Coding."	Students will be able to define the term "G codes."	Students will be able to define the term "M code."	Students will be able to identify the three sections of a program; Initial Commands, Program Body, and Program	Students will be able to write a basic NC part program using necessary G and M codes including remarks that de	Students will be able to explore the advantages and disadvantages of shop floor programming as well as off line
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Unit 2 Programmable Machining (continued)

Computer Integrated Manufacturing	Students will be able to create a simple NC part program using a text editor and a CAM package.	Students will be able to employ a CAD/CAM/CNC software solution to create a part.	Students will be able to analyze, identify and correct errors found in NC part program files.	Students will be able to use simulation software to graphically verify NC program operation.	Students will be able to perform a "Dry Run" to verify the machine setup and program operation.	Student will be able to demonstrate the ability to safely setup, maintain and operate a CNC machine center usin	Students will be able to analyze part geometry to select appropriate cutting tools and fixturing devices needed to	Students will be able to setup and edit the tool library of a CNC control program providing offset values and tool	Students will be able to calculate and verify appropriate spindle speeds and feed rates specific to each cutting to	Students will be able to safely and accurately fixture a part in a CNC machine and set the program reference zer	Students will be able to verify NC part programs using a simulation software before machining the part on a CNC	Students will be able to list and demonstrate all possible methods of disabling a CNC machine in the event of an	Students will follow a safety checklist prior to running an NC part program on a CNC machine. See Safety Check	Students will be able to Perform a Dry Run to verify the machine setup and program operation.	Students will be able to operate a CNC machine to cut a part to specifications.	Students will be able to measure using standard and metric systems.	Students will be able to convert measurements between metric and standard inch systems.	Students will be able to read technical drawings identifying and understand the dimensional tolerances and limits	Students will be able to make precision measurements to the degree of accuracy required by plan specification	Students will understand how comparison instruments can be used to check dimensions, compare shapes, indic	Students will be aware of advanced and automated measurement systems that are applied in industry. (ex. Coor	Students will be aware of the importance of precision measurement in SPC and quality control.	Students will be able to define the acronym CAM and explain what the purpose of a CAM package is.	Students will demonstrate their ability to operate the user interface of a CAM package and access help using ap	Students will be able to perform basic file operations using a CAM package such as saving, opening, printing and	Students will demonstrate an ability to import and export CAD files using a CAM package.	Students will setup a CAM package by editing the material and tool libraries, defining stock sizes, selecting the a	Students will define and apply the fundamental and advanced milling and turning procedures used in CAM pack	Students will use a CAM package to generate and edit tool paths by applying appropriate machining processes t
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Unit 3 Introduction To Robotics

Computer Integrated Manufacturing	Students will explore the chronological development of automation leading to robotics.	Students will investigate career opportunities in the robotics career fields.	Students will demonstrate the development of robotics from Science Fiction.	Students will identify a minimum of four dangerous and repetitive jobs that robots are used for.	Students will formulate a definition of a robot.	Students will be able to classify different types of Robots.	Students will evaluate the positive impact robots have on manufacturing.	Students will discuss the social implications of robots.	Students will identify and compare the four classifications of robots.	Students will investigate a classification of robot.	Students will design and build a working model of a robot.	Students will identify and report specifications and work envelopes of robots.	Students will identify and sketch the mechanical components to a robot.	Students will design and develop an end effector.	Students will demonstrate their understanding of the way end effectors are specific to a process.	Students will understand the various drive systems used in robotics and analyze the advantages and disadvanta	Students will understand the basic components of robot controllers.	Students will demonstrate an understanding of control techniques and computer simulations.	Students will design and build a feed system with sensors.	Students will program a robot to perform several tasks.	Students will program a robot to solve a materials handling problem.	Students will recognize the need for end of arm tooling and how this tooling affects the robots operation.	Students will understand the necessity for specialty tooling applications in robotics.	Students will prepare and document a presentation on end of arm tooling.	Students will analyze and generate the solution to a robotic manufacturing problem
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Unit 4 Computer Integrated Manufacturing

Computer Integrated Manufacturing	Students will understand how the individual components of a flexible manufacturing system are interrelated.	Students will recognize the benefits and problems associated with CIM technology and how they affect the manu	Students will identify some basic characteristics of a manufacturing operation that lend themselves to computer	Students will identify some of the typical components and sub systems that make up an automated machining, a	Student will identify the three categories of CIM manufacturing systems.	Students will compare and contrast the benefits and drawbacks of the three categories of CIM manufacturing sy	Students will compare and contrast the benefits and drawbacks of the three categories of CIM manufacturing sy	The students will be able to identify the components of a FMS.	Students will identify and study the relationship between a CNC milling machine interface and a jointed arm robo	Students will explore the individual components used in selected CIM systems.	Students will analyze and select components for a CIM system for a specific industrial application.	Students will analyze the various applications of a Programmable Logic Controller as related to its use in a C	Students will understand the difference between a PLC and a computer with interface.	Students will recognize and understand the necessary safety precautions associated with a fully automated CIM	Students will recognize and explain the significance of teamwork and communication when they combine the de	Students will demonstrate how their individual components work together to form a complete CIM system.	Students will assemble and test their individual component designs by integrating them into a complete miniatur
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