

## FLORIDA STATE COLLEGE AT JACKSONVILLE

## COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER:	EST 1632
COURSE TITLE:	Computer Integrated Manufacturing
PREREQUISITE(S):	EST 1352 and EST 1535
COREQUISITE(S):	None
CREDIT HOURS:	3
CONTACT HOURS/WEEK:	4
CONTACT HOUR BREAKDOWN:	
Lecture/Discussion:	3
Laboratory:	1
Other_____:	
FACULTY WORKLOAD POINTS:	3.67
STANDARDIZED CLASS SIZE ALLOCATION:	24

## CATALOG COURSE DESCRIPTION:

This course is an overview of Computer Integrated Manufacturing illustrating the incorporation of newly developed industrial technology into the manufacturing process, including team coordination, sub-systems, cost/benefits analysis, hard ware and software options. This course is also an in-depth study and application of computer integrated manufacturing equipment, including the use of tactile and light sensors, electronic and pneumatic communications and control systems, and material handling equipment, robots, and CNC equipment. The study and use of work-cells for process planning and group technology for the production of products within the same product line will also be covered.

SUGGESTED TEXT (S):	<u>COMPUTER INTEGRATED MANUFACTURING</u> , by: Peter S. Vail ISBN: 0-534-914654-9
IMPLEMENTATION DATE:	Spring Term, 2003
REVIEW OR MODIFICATION DATE:	Fall Term, 2002 (20031) Fall Term, 2009 (20101) - Proposal 2009-11

COURSE TOPICS	CONTACT HOURS <u>PER TOPIC</u>
I. Introduction to CIM: An Overview	8
A. What Is CIM?	
B. The Goal of CIM	
C. What Is Manufacturing?	
D. Implementation by Decree: The Old Way	
E. Just-in-Time versus Just-in-Case	
F. Feedback Principle	
G. Pareto's Law	
II. Introduction to Productivity and Work	4
A. Measurement and Control	
B. Process Evaluation	
C. Project Planning	
D. Plant-Manufacturing-Industrial Engineering (PMI)	
E. Human Factors	
F. Maintenance	
III. Introduction to CIM Units: Computers	4
A. Programmable Controllers	
B. Micro/Mini/Maxi Computers	
C. Distributed Systems	
D. Interfaces	
E. Networks	
IV. Introduction to the Input/Output for CIM Units - Electronic, Electromechanical, and Mechanical Devices	4
V. Introduction to use of Robot for CIM Units	4
A. Types and Classifications	
B. Components	
C. Applications of Robots	
VI. Introduction to Material Handling for CIM Units	4
A. Automation Equipment	
B. Loaders and Unloaders	
C. Accumulators	
D. Conveyors	
E. Automatic Guide Vehicles	
VII. Introduction of Computer-Aided Functions for CIM Units	6
A. Computer-Aided Manufacturing (CAM)	
B. Computer-Aided Testing (CAT)	
C. Computer-Aided Design (CAD)	
D. Computer-Aided Engineering (CAE)	

COURSE TOPICS (Continued)	CONTACT HOURS <u>PER TOPIC</u>
VIII. Introduction to System Design A. Pareto's Law Applied B. Cell Structure C. Group Technology D. Flexible Manufacturing E. Hybrid Systems F. Integrating Vendors G. Automated Warehouses	6
IX. Introduction to Designing of CIM Data Bases A. GIGO and Sufficiency B. Integrating Software C. Artificial Intelligence and Expert Systems D. Distributed Systems E. Dictionary or Directory F. Distributed Data and Networks G. Access and Security H. Protocol	4
X. Introduction to the Role of Executive Leadership A. Commitment B. Over-design C. Looking at CIM as a Cure-all D. Controlling the Right Things	4
XI. Introduction to Integrating the Technology A. Standards B. Operating Systems C. Languages D. Interfaces E. Hardware	4
XII. Getting the Most Out of the Employees A. Over-the-Wall Mentality B. Individual Reactions to Integration C. Skill Levels and Communications D. Characteristics of the Job E. Superior/Subordinate Relationships F. Changing Group Dynamics G. Quality Circles H. Retraining and Labor Relations	4
XIII. Looking at the Future A. Hardware/Software B. Management Science C. Recap of Main Problem D. Possible Solutions	4

PROGRAM TITLE: COMPUTER INTEGRATED MANUFACTURING

COURSE TITLE: Computer Integrated Manufacturing

CIP NUMBER: 1615.061300 AS

LIST PERFORMANCE STANDARDS ADDRESSED:

NUMBER(S): TITLE(S):

04.0 DEMONSTRATE PROFICIENCY IN EVALUATING THE EFFICIENCY AND PERFORMANCE OF INDIVIDUAL PRODUCTION LINE EQUIPMENT--The student will be able to

- 04.01 Design the routing, storage and procurement/distribution systems for raw and finished products.
- 04.02 Analyze and utilize statistical data from process control systems.
- 04.03 Describe the relationship of equipment utilization to the manufacturing economy.
- 04.04 Prepare and evaluate justifications for specification deviations.

05.0 DEMONSTRATE PROFICIENCY IN INTEGRATING PRODUCTION EQUIPMENT WITH WORKCELLS, PROGRAMMABLE LOGIC CONTROLLERS AND AREA CONTROLLERS--The student will be able to:

- 05.01 Design analog and digital control systems along with applicable software to specific manufacturing requirements.
- 05.02 Chart and analyze ladder logic diagrams for manufacturing processes.
- 05.03 Develop and analyze flow charts from ladder diagrams and related process controls.
- 05.04 Operate Programmable Logic Controllers with device drivers.
- 05.05 Apply software to workcells and area controllers.
- 05.06 Integrate control systems and equipment with production and production support mechanisms.

06.0 DEMONSTRATE PROFICIENCY IN BAR CODING, AUTOMATIC TRACKING VISION SYSTEMS AND AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS FOR MATERIALS HANDLING--The student will be able to:

- 06.01 Describe automatic inventory accounting and control system.
- 06.02 List the underlying principles and method of controlling work in progress.
- 06.03 Analyze product flow cycle.
- 06.04 Describe warehouse throughput systems.
- 06.05 Implement automated tracking in the laboratory environment.
- 06.06 Describe machine vision applications.
- 06.07 Maintain machine vision and sensing system equipment.

07.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING SOFTWARE APPLICATIONS USED FOR PRODUCTION PLANNING, QUALITY CONTROL AND SHOP FLOOR DATA COLLECTION--The student will be able to:

- 07.01 Apply proficiency in manufacturing software application packages.
- 07.02 Analyze data collection systems for maintaining the progress of each order.
- 07.03 Assign and maintain priorities of individual orders.

08.0 DEMONSTRATE PROFICIENCY IN PROGRAMMING AND CONTROLLING PRODUCTION MACHINES IN A FLEXIBLE AUTOMATION ENVIRONMENT- -The student will be able to:

- 08.01 Define and analyze product manufacturing requirements and process.
- 08.02 Identify the responsibilities of management in produced production.
- 08.03 Integrate personnel, hardware and software capabilities for the timely completion of produce manufacturing.

## LIST PERFORMANCE STANDARDS ADDRESSED: (Continued)

NUMBER(S):

TITLE(S):

- 08.04 Describe the relationship of quality assurance and manufacturing.
- 08.05 Apply the basic principles underlying the relationship between systems design, production and manufacturing engineering.
- 08.06 Apply manufacturing simulation packages used in layout and design of production operations.
- 08.07 Apply manufacturing resources planning and just-in-time concepts in production planning operations.
- 08.08 Apply engineering economy factors in equipment justification.
- 08.09 Apply microprocessor controls to a modern manufacturing system.

09.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING PRODUCTION TEST EQUIPMENT AND INSTRUMENTS--The student will be able to:

- 09.01 Specify, interconnect and operate instruments and test equipment.
- 09.02 Analyze normal and abnormal instrument readings and their probable causes.
- 09.03 Specify and operate Automatic Test Equipment (ATE) procedures, using required software and hardware.
- 09.04 Troubleshoot control systems mechanisms and software.
- 09.05 Repair faults in production equipment and specify external repairs or overhaul requirements.
- 09.06 Align, calibrate and maintain related ATE interfaces and circuits.
- 09.07 Prepare error probability charts and graphs.

10.0 DEMONSTRATE PROFICIENCY IN CIM SYSTEMS ANALYSIS--The student will be able to:

- 10.01 Describe the concepts of a generic CIM system.
- 10.02 Analyze and identify problems with the operation of industrial computers, controllers and hardware.
- 10.03 Utilize typical screens and files available to shop floor operations for troubleshooting and data collection.
- 10.04 Operate industrial terminals, input/output communications interface devices, etc., found in the manufacturing environment.

11.0 DEMONSTRATE PROFICIENCY IM INSTALLING, MAINTAINING AND UNDERSTANDING NETWORK AND DATA COMMUNICATIONS DEVICES- -The student will be able to:

- 11.01 Identify and apply communications protocols.
- 11.02 Identify and apply networks and classifications.
- 11.03 Identify and apply throughput, memory size/capabilities and standards benchmark.
- 11.04 Identify and apply computer options for sharing directories, files and servers.
- 11.05 Select and apply sensors and feedback devices.
- 11.06 Select and interconnect cabling, repeaters, modems and multiplexers.

12.0 DEMONSTRATE PROFICIENCY IN BASIC USE OF COMPUTER ASSISTED DRAFTING AND DESIGN EQUIPMENT USED IN A MANUFACTURING ENVIRONMENT- -The student will be able to:

- 12.01 Operate CAD systems and hardware.
- 12.02 Apply CAD support software to manipulate interval files, attributes, database exchange files, and set-up.
- 12.03 Apply CAD software to create, edit, and update drawings and files.
- 12.04 Identify and define protocols and software used to download CAD to CAM.
- 12.05 Describe the relationship and functions of CAD in the industrial production environment.

LIST PERFORMANCE STANDARDS ADDRESSED: (Continued)

NUMBER(S):                      TITLE(S):

13.0    DEMONSTRATE PROFICIENCY IN USE OF QUALITY ASSURANCE METHODS AND STATISTICAL PROCESS CONTROL TECHNIQUES--The student will be able to:

- 13.01 Describe the concept of quality assurance in increasing productivity and promoting zero defects.
- 13.02 Apply data collection methods for productivity improvement and reporting.
- 13.03 Analyze productivity data, identify problem areas and evaluate the cause and effect relationship.
- 13.04 Develop and apply quality improvement strategies.
- 13.05 Develop and apply QA methods and techniques for production and product handling in a CIM environment.
- 13.06 Understand process capability and its applications.
- 13.07 Use statistical quality control (SQC) tools and techniques to analyze data.

PROGRAM TITLE: Engineering Technology  
COURSE TITLE: Computer Integrated Manufacturing  
CIP NUMBER: 1615.061300 AS

LIST PERFORMANCE STANDARD ADDRESSED:

NUMBER(S): TITLES(S):

04.0 DEMONSTRATE AN UNDERSTANDING OF SAFETY, HEALTH, AND ENVIRONMENTAL REQUIREMENTS - The student will be able to:

- 04.01 Communicate any new or revised safety procedures.
- 04.02 Update personnel about current safety guidelines.
- 04.03 Wear appropriate Personal Protective Equipment (PPE).
- 04.04 Follow area-posted safety guidelines.
- 04.05 Demonstrate knowledge of, and follow applicable safety laws and regulations and the environment (e.g. Occupational Safety and Health Administration (OSHA)).
- 04.06 Maintain a clean and safe work environment.
- 04.07 Maintain personal protection equipment.
- 04.08 Report unsafe conditions/practices.
- 04.09 Locate emergency exits and alarms.
- 04.10 Comply with company-established safety practices.
- 04.11 Use appropriate fire fighting procedures.
- 04.12 Apply Occupational Safety Health Administration (OSHA) safety standards properly.
- 04.13 Demonstrate knowledge of when a machine or a process should be stopped to investigate or correct a hazard.
- 04.14 Demonstrate knowledge of regulatory agency fines and requirement for corrective actions.
- 04.15 Demonstrate knowledge of government and company procedures, rules and regulations concerning incident investigations.
- 04.16 Demonstrate knowledge of incident reporting procedures.
- 04.17 Use and evaluate information resources such as MSDS (Material Safety Data Sheets).
- 04.18 Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.
- 04.19 Demonstrate knowledge of how to safely identify, handle, monitor and measure hazardous materials.

06.0 DEMONSTRATE PROFICIENCY IN USING TOOLS, INSTRUMENTS AND TESTING DEVICES - The student will be able to:

- 06.01 Identify and use hand tools properly.
- 06.02 Identify and use power tools properly.
- 06.03 Use inspection equipment appropriately.
- 06.04 Implement appropriate testing regimes.
- 06.05 Use appropriate measurement tools (e.g., micrometers, tapes. etc).
- 06.06 Use appropriate safety monitoring and testing equipment.

## LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S):            TITLES(S):

- 06.07 Communicate issues with hand sketches.
- 06.08 Use electronic measuring equipment and instruments.
- 06.09 Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.

08.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS - The student will be able to:

- 08.01 Write logical and understandable statements, or phrases, to accurately complete forms commonly used in business and industry.
- 08.02 Read and understand graphs, charts, diagrams, and common table formats.
- 08.03 Read and follow written instructions.
- 08.04 Demonstrate an understanding of; and ability to follow oral instructions.
- 08.05 Answer and ask questions coherently and concisely.
- 08.06 Read critically to identify oversights and assumptions.
- 08.07 Interact with co-workers using appropriate communication tools correctly.
- 08.08 Demonstrate knowledge of technical language and technical acronyms.

09.0 DEMONSTRATE APPROPRIATE MATH SKILLS - The student will be able to:

- 09.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
- 09.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
- 09.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
- 09.04 Use different unit systems appropriately.
- 09.05 Accurately convert between unit systems.
- 09.06 Read and interpret angle measurements.

12.0 DEMONSTRATE PROFICIENCY IN THE PRINCIPLES, CONCEPTS AND APPLICATIONS IN METAL FABRICATION METHODS - The student will be able to:

- 12.01 Understand professionalism in the manufacturing environment.
- 12.02 Understand, use and work with precision numbers.
- 12.03 Interpret mechanical drawings.
- 12.04 Demonstrate the use of geometric dimensioning and tolerancing.
- 12.05 Understand materials, and machining processes.
- 12.06 Demonstrate safe use of hand and power tools.
- 12.07 Identify the use and process in part layout.
- 12.08 Demonstrate a working knowledge of metal forming equipment.
- 12.09 Demonstrate the use of precision steel rulers.
- 12.10 Demonstrate the use of oxy - fuel cutting.
- 12.11 Demonstrate acceptable methods in tungsten inert gas welding.
- 12.12 Demonstrate acceptable methods in gas metal arc welding.
- 12.13 Demonstrate acceptable methods to use a dial indicator.

LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S):            TITLES(S):

12.14 Explain the use of a height gauge to measure stock.

14.0 OPERATE INDUSTRIAL AUTOMATION SYSTEMS - The student will be able to:

14.01 Chart and analyze ladder logic diagrams for industrial automation systems.

14.02 Identify PLC input and output module locations.

14.03 Match wiring harness identification to program addresses for input and output modules.

14.04 Identify active and passive states of each module.

14.05 Interpret flow charts to match field device components with the real devices.

14.06 Identify when a programmable controller is in run or program mode.

14.07 Integrate control systems and equipment with production and production support mechanisms.

14.08 Establish routine operations involving maintenance schedules.

14.09 Perform minor repair to industrial automation systems.

14.10 Integrate control systems and equipment with production and production support mechanisms.

14.11 Demonstrate automatic inventory accounting related monitoring and control systems.

14.12 Implement automatic tracking of materials and products using bar codes, machine vision and sensing, and/or infrared technologies