

FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER:	EST 1540
COURSE TITLE:	Industrial Applications Using Programmable Logic Controllers and Robots
PREREQUISITE(S):	EST 1603
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 explores and teaches the basics of process control and automated manufacturing processes. Topics include programmable logic controllers, discrete and analog I/O, PID loops, materials handling processes, automated three-state conveyor applications, physical, chemical, and electronic principles necessary for sensors to measure or detect changes in the process' physical phenomena. This course also examines the benefits realized using Computer-Integrated-Manufacturing as applied to a production or assembly process.
SUGGESTED TEXT(S):	<u>Programmable Logic Controllers</u> , latest edition, McGraw Hill Higher Education Publishers.
IMPLEMENTATION DATE:	Fall Term, 2002 (20031)
REVIEW OR MODIFICATION DATE:	Fall Term, 2009 (20101) - Proposal 2009-11

COURSE TOPICS	CONTACT HOURS <u>PER TOPIC</u>
I. Industrial Instrumentation	25
A. Introduction to Instrumentation and Automation for Manufacturing	
1. Introduction-Text Overview, History, and Definitions	
2. Manufacturing Process Control Measurement	
B. Review of Electronics Fundamentals	
1. Instrumentation Electronics Fundamentals	
2. Summary/Facts	
C. Review of Instrumentation Concepts	
1. Physical Phenomena used for Measuring	
2. Summary/Facts	
D. Industrial Sensors	
1. Weight and Force Sensors	
2. Rotational Speed Sensors	
3. Position and Motion Sensors	
4. Acceleration and Vibration Transducers	
5. Sinking and Sourcing Proximity Sensors	
E. Decision and Control of the System	
1. The Process Control Loop and Response Characteristics	
2. Review of Microprocessor	
3. Review of Microcomputer	
4. Review of Direct Digital Control Technology	
5. Review of Digital Computer Control	
6. Distributive Control Systems	
F. Control Actuators and Control Valves	
1. Actuators	
2. Final Control Element-Control Valve	
G. Automated Material Handling	
1. Automated Material-Handling Machinery	
2. Handling Bulk Materials	
2. Handling Piece Parts	
3. Assembly and Part Handling	
4. Automated Quality and Position Control	
5. Finished Product Handling Instrumentation	
H. Instrumentation Applied to Manufacturing Machinery	
1. Mechanical Instrumentation	
2. Transfer Line Production Instrumentation	
3. Manufacturing Instrumentation with Numerical Control	
4. Computer Controlled Machines	

COURSE TOPICS	<u>CONTACT HOURS PER TOPIC</u>
<ul style="list-style-type: none"> I. Strategies of Production Automation <ul style="list-style-type: none"> 1. Manufacturing Cells 2. Flexible Manufacturing 3. Robot Classifications 4. Controllers for Robots 5. Power Supply J. Strategy of Automation with Computers <ul style="list-style-type: none"> 1. Computer Integrated Manufacturing (CIM) 2. Identification of Inventory and Storage 3. The Automated Factory 	
<ul style="list-style-type: none"> I. Programmable Logic Controllers (PLC) <ul style="list-style-type: none"> A. Review of The Workings of a Programmable Logic Controller B. Interfacing of the Instruments and sensors to the PLC input cards C. Overview of the different manufactures of Programmable Logic Controllers D. Learning the software for the configuration and programming for two of the most industrial common used types 	14
<ul style="list-style-type: none"> III. Lab Applications - Various Manufacturers PLC Platform Applications <ul style="list-style-type: none"> A. LAN- Data Network for inter-communication B. Luggage Conveyor Program C. Sorter Conveyor Belt Program D. Paint Mixing Program E. Three Speed Fan Motor Program F. Drill Press program G. Level Control Program H. Flow Control Program I. Ozone Addition Control Program J. Water Bottling Conveyor Program K. Water Bottling Product removal Program 	18
<ul style="list-style-type: none"> IV. Electrical Safety <ul style="list-style-type: none"> A. Tag & Lockout Safety B. Shock Hazards C. Lab Safety 	3

PROGRAM TITLE: Engineering Technology
Specialization Tract Advanced Manufacturing
COURSE TITLE: Industrial Applications Using Programmable Logic Controllers and Robots
CIP NUMBER: 1615.061300 AS

LIST PERFORMANCE STANDARDS ADDRESSED:

NUMBER(S): TITLE(S):

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.
- 14.10 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.

16.0 APPLY THE PRINCIPALS OF ROBOTICS TO AUTOMATED SYSTEMS - The student will be able to:

- 16.01 Define the essential components of a robotic system.
- 16.02 Choose appropriate robot equipments for specific tasks.
- 16.03 Describe methods of moving robotic parts.
- 16.04 Choose and implement appropriate sensors for robotic applications.
- 16.05 Choose and install appropriate actuators for robotic applications.
- 16.06 Program robotic devices for restricted movements.



NOTE: Use either the Tab key or mouse click to move from field to field. The box will expand to accommodate your entry.

Section 1 COURSE PREFIX AND NUMBER: EST1540	SEMESTER CREDIT HOURS: 3
COURSE TITLE: Industrial Applications Using PLC's and Robots	

Section 2 TYPE OF COURSE: (Click on the box to check all that apply) <table style="width: 100%; margin-top: 10px;"> <tr> <td><input type="checkbox"/> AA Elective</td> <td><input checked="" type="checkbox"/> AS Required Professional Course</td> <td><input type="checkbox"/> College Prep</td> </tr> <tr> <td><input type="checkbox"/> AS Professional Elective</td> <td><input type="checkbox"/> AAS Required Professional Course</td> <td><input type="checkbox"/> Technical Certificate</td> </tr> <tr> <td colspan="3"><input type="checkbox"/> Other _____</td> </tr> <tr> <td colspan="3"><input type="checkbox"/> General Education: (For General Education courses, you must also complete Section 3 and Section 7)</td> </tr> </table>	<input type="checkbox"/> AA Elective	<input checked="" type="checkbox"/> AS Required Professional Course	<input type="checkbox"/> College Prep	<input type="checkbox"/> AS Professional Elective	<input type="checkbox"/> AAS Required Professional Course	<input type="checkbox"/> Technical Certificate	<input type="checkbox"/> Other _____			<input type="checkbox"/> General Education: (For General Education courses, you must also complete Section 3 and Section 7)		
<input type="checkbox"/> AA Elective	<input checked="" type="checkbox"/> AS Required Professional Course	<input type="checkbox"/> College Prep										
<input type="checkbox"/> AS Professional Elective	<input type="checkbox"/> AAS Required Professional Course	<input type="checkbox"/> Technical Certificate										
<input type="checkbox"/> Other _____												
<input type="checkbox"/> General Education: (For General Education courses, you must also complete Section 3 and Section 7)												

Section 3 (If applicable) INDICATE BELOW THE DISCIPLINE AREA FOR GENERAL EDUCATION COURSES: <table style="width: 100%; margin-top: 10px;"> <tr> <td><input type="checkbox"/> Communications</td> <td><input type="checkbox"/> Social & Behavioral Sciences</td> <td><input type="checkbox"/> Mathematics</td> </tr> <tr> <td><input type="checkbox"/> Natural Sciences</td> <td><input type="checkbox"/> Humanities</td> <td></td> </tr> </table>	<input type="checkbox"/> Communications	<input type="checkbox"/> Social & Behavioral Sciences	<input type="checkbox"/> Mathematics	<input type="checkbox"/> Natural Sciences	<input type="checkbox"/> Humanities	
<input type="checkbox"/> Communications	<input type="checkbox"/> Social & Behavioral Sciences	<input type="checkbox"/> Mathematics				
<input type="checkbox"/> Natural Sciences	<input type="checkbox"/> Humanities					

Section 4 INTELLECTUAL COMPETENCIES: <table style="width: 100%; margin-top: 10px;"> <tr> <td><input checked="" type="checkbox"/> Reading</td> <td><input checked="" type="checkbox"/> Speaking</td> <td><input checked="" type="checkbox"/> Critical Analysis</td> <td><input checked="" type="checkbox"/> Quantitative Skills</td> <td><input checked="" type="checkbox"/> Scientific Method of Inquiry</td> </tr> <tr> <td><input checked="" type="checkbox"/> Writing</td> <td><input checked="" type="checkbox"/> Listening</td> <td><input type="checkbox"/> Information Literacy</td> <td><input type="checkbox"/> Ethical Judgment</td> <td><input checked="" type="checkbox"/> Working Collaboratively</td> </tr> </table>	<input checked="" type="checkbox"/> Reading	<input checked="" type="checkbox"/> Speaking	<input checked="" type="checkbox"/> Critical Analysis	<input checked="" type="checkbox"/> Quantitative Skills	<input checked="" type="checkbox"/> Scientific Method of Inquiry	<input checked="" type="checkbox"/> Writing	<input checked="" type="checkbox"/> Listening	<input type="checkbox"/> Information Literacy	<input type="checkbox"/> Ethical Judgment	<input checked="" type="checkbox"/> Working Collaboratively
<input checked="" type="checkbox"/> Reading	<input checked="" type="checkbox"/> Speaking	<input checked="" type="checkbox"/> Critical Analysis	<input checked="" type="checkbox"/> Quantitative Skills	<input checked="" type="checkbox"/> Scientific Method of Inquiry						
<input checked="" type="checkbox"/> Writing	<input checked="" type="checkbox"/> Listening	<input type="checkbox"/> Information Literacy	<input type="checkbox"/> Ethical Judgment	<input checked="" type="checkbox"/> Working Collaboratively						

	Section 5 LEARNING OUTCOMES	METHOD OF ASSESSMENT
•	Chart and analyze ladder logic diagrams for industrial automation systems.	Hands-on, application, or software/hardware exercises
•	Identify PLC input and output module locations.	Hands-on applications exercises
•	Identify when a programmable controller is in run or program mode.	Hands-on application exercises
•	Interpret flow charts to match field device components with the real devices.	Hands-on applications exercises
•	Integrate control systems and equipment with production and production support mechanisms.	Hands-on, application, or software/hardware exercises.
•	Apply troubleshooting techniques to identify root cause, errors and faults of a problem.	Hands-on, trouble shooting exercises.
•	Isolate systems for troubleshooting	Hands-on, trouble shooting exercises. Written tests.
•	Develop a strategy for making system improvements based on troubleshooting activities.	Trouble shooting exercise group discussions.
•	Define the essential components of a robotic system.	Written tests, quizzes.
•	Describe methods of moving robotic parts.	Written tests, quizzes
•	Program robotic devices for restricted movements.	Hands-on, application, or software/hardware exercises

Section 6 Name of Person Completing This Form: <u>Evan Kuharich</u>	Date: <u>04/30/08</u>
--	-----------------------