FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER:	EST 1535
COURSE TITLE:	Automated Process Control
PREREQUISITE(S):	EST 1520 and EST 1540
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 introduces the modern approach to control theory, and the ideas of controllability. The popular Proportional plus Integral plus Derivative (P.I.D.) control scheme is covered in detail. Other topics covered: Laplace transforms, frequency domains, control of a second-order system, and compensating networks such as lead, lag, and lead-lag. Lecture and lab assignments provide experience with sensors, level control, flow control, pressure control, temperature control, DAC and ADC conversion, digital set point applications, and analog processing. The Allen-Bradley and Siemens processors will be used as the process controllers with a process control trainer to design, construct, interface, program and troubleshoot control circuits and systems.

SUGGESTED TEXT (S):	Control Systems – Continuous and Discrete, By: Victor J. Bucek; ISBN: 0-13-171752-9
IMPLEMENTATION DATE:	Fall Term, 2002 (20031)
REVIEW/MODIFICATION DATE:	Fall Term, 2009 (20101) – Proposal 2009-11

COURSE TOPICS	CONTACT HOURS PER TOPIC
I. Introduction to Continuous Control Systems	6
A. Definition of a Continuous Control System	
B. Closed-Loop Control	
C. Open-Loop Control	
II. Introduction to Laplace Transforms	8
A. Derivation of Required Laplace Transforms	
B. Properties of Laplace Transforms	
C. Inverse Laplace Transforms	
D. Differential Equations	
E. Analog Simulation	
III. Introduction to Transfer Functions	6
A. Definition of a Transfer Function	
B. Properties of Transfer Function in the Laplace Domain	
C. The s-Plane	
D. The Characteristic Equation of a Component	
IV. Introduction to Stability	8
A. Definition of Stability	
B. Stability and Pole Locations	
C. Stability and the Routh Table	
D. Stability and Frequency Response	
V. Introduction to Block Representation of Control Systems	6
A. Definition of Terms	
B. Closed-Loop Transfer Function for Canonical Form	
C. Block Reduction of Complicated Systems	
D. Application of the Superposition Theorem	
VI. Introduction to Second-Order Systems	6
A. Formal Definition of a Second-Order System	
B. Damping Ratio	
C. Step Response	
D. Examples of Second-Order Systems	
VII. Introduction to Continuous Proportional	8
A. Integral Derivative (P.I.D.) Control	
B. Proportional Control	

COURSE TOPICS (Continued)	CONTACT HOURS PER TOPIC
C. Derivative Control	
D. Integral Control	
E. Proportional Derivative Control	
F. Proportional Integral Control	
G. Proportional Integral Derivative Control	
VIII. Introduction to Design and Analysis of	8
A. Continuous Control Systems	
B. Root-Locus Analysis and Design	
C. Bode Analysis and Design	
D. Lead Compensator	
E. Lag Compensator	
F. Lead-Lag Compensator	
G. Derivative Feedback	
H. Feedforward Compensation	
IX. Introduction to State-Variable Analysis	4
A. Signal-Flow Diagrams	
B. State Equations	
C. Solution of the Stare-Vector Equation	
D. Transfer Functions in State Space	
E. Controllability and Observability	

PROGRAM TITLE: Engineering Technology Specialization Tract
Advanced Manufacturing

COURSE TITLE: Automated Process Control

CIP NUMBER: 1615.061300 AS

LIST PERFORMANCE STANDARDS ADDRESSED:
NUMBER(S): TITLE(S):

05.0 DEMONSTRATE PROFICIENCY IN USE OF QUALITY ASSURANCE METHODS, QUALITY CONTROL CONCEPTS - The student will be able to:

- 05.01 Monitor processes for quality.
- 05.02 Inspect product for quality.
- 05.03 Document quality measurements or observations by filling out quality charts and records.
- 05.04 Compare process measurements to standards.
- 05.05 Identify root causes using standard techniques.
- 05.06 Identify Corrective Action and Preventive Action.
- 05.07 Describe the concept of quality assurance in increasing productivity and promoting zero defects.
- 05.08 Apply data collection methods for productivity improvement and reporting.
- 05.09 Analyze data using tools and techniques for productivity and quality problems.
- 05.10 Analyze data using tools and techniques for cause and effect relationships.
- 05.11 Develop and apply quality improvement strategies.
- 05.12 Demonstrate an understanding of a quality process's capability and its applications.
- 05.13 Demonstrate knowledge of how to implement quality assurance principles and methods.
- 05.14 Demonstrate knowledge of quality assurance checks for inspections.
- 05.17 Demonstrate knowledge of standard industry practices regarding inventory control methods and procedures.

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.

Florida State College At Jacksonville

Course Learning Outcomes & Assessment For All College Credit Courses

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: EST 1535	SEMESTER CREDIT HOURS: **3**
COURSE TITLE: **Automated Process Control**	

Section 2

TYPE OF COURSE: (Click on the box to check all that apply)

- ☐ **AA Elective**
- ☒ **AS Required Professional Course**
- ☐ **College Prep**
- ☐ **AS Professional Elective**
- ☐ **AAS Required Professional Course**
- ☐ **Technical Certificate**
- ☐ **Other** ____
- ☐ **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:

- ☐ **Communications**
- ☐ **Social & Behavioral Sciences**
- ☐ **Mathematics**
- ☐ **Natural Sciences**
- ☐ **Humanities**

Section 4

INTELLECTUAL COMPETENCIES:

- ☒ **Reading**
- ☒ **Speaking**
- ☒ **Critical Analysis**
- ☒ **Quantitative Skills**
- ☒ **Scientific Method of Inquiry**
- ☒ **Writing**
- ☒ **Listening**
- ☐ **Information Literacy**
- ☐ **Ethical Judgment**
- ☒ **Working Collaboratively**

Section 5 **LEARNING OUTCOMES**		**METHOD OF ASSESSMENT**
•	Analyze data using tools and techniques for productivity and quality problems.	Hands-on application exercises, written quizzes, tests, or simulation software exercises
•	Chart and analyze ladder logic diagrams for industrial automation systems.	Hands-on application exercises, written quizzes, tests, or simulation software exercises
•	Demonstrate an understanding of a quality process's capability and its applications.	Hands-on application exercises
•	Analyze data using tools and techniques for cause and effect relationships.	Hands-on application trouble shooting exercises
•	Interpret flow charts to match field device components with the real devices.	Written quizzes, tests, and simulation hardware exercises
•	Describe the concept of quality assurance in increasing productivity and promoting zero defects.	Written quizzes, tests, and simulation hardware exercises
•	Integrate control systems and equipment with production and production support mechanisms.	Hands-on application exercises, written quizzes, tests, or simulation hardware exercises
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Section 6 Name of Person Completing This Form: Evan Kuharich Date: 04/30/08