

## FLORIDA STATE COLLEGE AT JACKSONVILLE

## COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER:	EST 1511
COURSE TITLE:	Motors and Controls
PREREQUISITE(S):	EET 1084
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:	
<p>This course explores the theory and application of AC and DC motors, types of single-phase motors, three-phase power, three-phase motors, remote and local control, forward and reversing motor starters, and various motor control circuits. DC drives and variable-frequency drives are included with control applications. Wiring and troubleshooting exercises of electric three-phase motor control circuits are emphasized in the laboratory.</p>	
SUGGESTED TEXT(S):	None
IMPLEMENTATION DATE:	Fall Term, 2002 (20031)
REVIEW OR MODIFICATION DATE:	Fall Term, 2006 (20071) Fall Term, 2009 (20101) - Proposal 2009-11

COURSE TOPICS	<u>CONTACT HOURS PER TOPIC</u>
I. Principle of Magnetism	8
A. Electromagnetism	
B. Motor and Generator Principles	
II. Motor & Generator Operation and Application	8
III. Motor Control	20
A. Wiring Diagrams	
B. Control Devices, NEMA & IEC	
C. Control Wiring	
D. Motor Power Wiring	
IV. Variable Frequency Drives	12
A. Theory Review	
B. Principles of Operation	
C. Programming	
D. Wiring	
V. Maintenance & Troubleshooting of Water Bottling equipment	12

PROGRAM TITLE: Engineering Technology Specialization Tract  
Advanced Manufacturing

COURSE TITLE: Motors and Controls

CIP NUMBER: 1615.061300 AS

LIST PERFORMANCE STANDARDS ADDRESSED:

NUMBER(S): TITLE(S):

03.0 DEMONSTRATE A FUNDAMENTAL UNDERSTANDING OF ELECTRONICS AND ELECTRICITY - The student will be able to:

- 03.01 Use appropriate grounding techniques.
- 03.02 Demonstrate knowledge of AC/DC theory.
- 03.04 Solve problems involving electric charge, electric current, potential difference, energy and Ohm's Law.
- 03.05 Solve problems in electric circuits involving work and power.
- 03.06 Solve problems involving series and parallel resistance circuits.
- 03.07 Solve problems involving capacitance in DC circuits.
- 03.08 Solve problems involving magnetic circuits.
- 03.09 Solve problems involving inductance in DC circuits.
- 03.10 Solve A.C. problems involving peak value, instantaneous, average value and RMS value of a sine wave.
- 03.11 Solve problems on factors governing reactance in A.C. circuits.
- 03.12 Solve impedance problems in A.C. circuits.

12.0 OPERATE, TROUBLESHOOT, AND MAINTAIN PNEUMATIC, HYDRAULIC AND ELECTROMECHANICAL COMPONENTS AND/OR SYSTEMS - The student will be able to:

- 12.01 Identify, classify and describe the function of pneumatic, hydraulic and electrical machines and components.
- 12.02 Construct flow diagrams and of pneumatic, hydraulic, and electromechanical systems.
- 12.03 Perform basic operation maintenance of pneumatic, hydraulic and electromechanical components, devices and/or machines.
- 12.04 Troubleshoot errors, faults, and inconsistencies of pneumatic, hydraulic and electromechanical components, machines and/or systems.
- 12.05 Define special applications of electromechanical, hydraulic and pneumatic machines and devices used process sheet metal, plastics, food and beverages, and other materials.
- 12.06 Describe important limitations of electromechanical, pneumatic and hydraulic machinery.
- 12.07 Operate independent pneumatic, hydraulic and electrical machines properly.
- 12.08 Describe the important operating parameters of pneumatic, hydraulic and electrical machines and/systems.
- 12.09 Identify and use appropriate monitoring gages for pneumatic, hydraulic, and electromechanical machines and/or systems.

## LIST PERFORMANCE STANDARDS ADDRESSED:

NUMBER(S): TITLE(S):

- 13.0 IDENTIFY AND IMPLEMENT LEAN CONCEPTS IN MANUFACTURING ENVIRONMENTS - The student will be able to:
- 13.01 Demonstrate product manufacturing requirements and processing flow.
  - 13.02 Demonstrate the role of management in production operations.
  - 13.03 Integrate personnel, hardware, and software capabilities for timely completion of products and product orders.
  - 13.04 Apply manufacturing resources planning, just-in-time concepts to production and process planning.
  - 13.05 Demonstrate good examples of lean manufacturing principles of pull production, perfect first-time quality, waste minimization, continuous improvement, flexibility, and building long lasting relationships with suppliers and customers.
  - 13.06 Implement minimization of wastes in the form of waiting time, inventory, processing, motion, over-production, transportation, and scrap.
  - 13.07 Apply the 5S's: Sort, Set in Order, Shine, Standardize, and Sustain.
  - 13.08 Apply six sigma criteria correctly.
- 14.0 OPERATE INDUSTRIAL AUTOMATION SYSTEMS - The student will be able to:
- 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.
- 15.0 TROUBLESHOOT INDUSTRIAL AUTOMATION SYSTEMS - The student will be able to:
- 15.01 Apply troubleshooting techniques to identify root cause, errors and faults of a problem.
  - 15.02 Isolate systems for troubleshooting.
  - 15.03 Develop a strategy for making system improvements based on troubleshooting activities.
  - 15.04 Identify needed expertise to address the issue.
  - 15.05 Participate in troubleshooting and resolution team effectively.



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: <b>EST 1511</b>	SEMESTER CREDIT HOURS: <b>3</b>
COURSE TITLE: <b>Motors and Controls</b>	

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
	• Principles of Magnetism.	Hands-on test
	• Electromagnetism.	Hands-on test, quizzes, or written test
	• Motor and Generator Principles.	Hands-on exercises, written quizzes or tests.
	• Motor and Generator Application.	Hands-on exercises, written quizzes or tests.
	• Motor control.	Hands-on test
	• Understanding Wiring diagrams and schematics various AC and DC motors.	Hands-on exercises, hands-on tests, written quizzes, and tests
	• Control devices, NEMA and IEC.	Written quizzes and tests
	• Control Wiring.	Hands-on test
	• Motor Power Wiring.	Written quizzes and tests
	• Variable Frequency Drive theory review.	Hands-on exercises, written quizzes or tests.
	• Variable Frequency Drive Principles of Operation	Hands-on exercises, written quizzes or tests.
	• Variable Frequency Drive Programming	Hands-on exercises, written quizzes or tests.
	• Variable Frequency Drive Wiring	Hands-on exercises, written quizzes or tests.
	• Maintenance & Troubleshooting of the Water Bottling equipment.	Hands-on exercises, written quizzes or tests.

Section 6 Name of Person Completing This Form: Darrell J. High Date: 05/09/2008