

FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER:	BCT 1881
COURSE TITLE:	Electrical Maintenance
PREREQUISITE(S):	BCT 1609
COREQUISITE(S):	None
CREDIT HOURS:	3
CONTACT HOURS/WEEK:	5
CONTACT HOUR BREAKDOWN:	
Lecture/Discussion:	2
Laboratory:	3
FACULTY WORKLOAD POINTS:	3.5
STANDARDIZED CLASS SIZE ALLOCATION:	24
COURSE DESCRIPTION:	
<p>This course is designed to give students the necessary skills to perform electrical maintenance on various types of residential and commercial installations. Topics include, but are not limited to the following: 1) general power distribution systems for both residential and commercial installations, 2) HVAC requirements, 3) general single-phase motor maintenance, 4) commercial lighting maintenance, and 5) low voltage control systems.</p>	
SUGGESTED TEXT(S):	NCCER Electrical Curriculum, (Books I, II, III, IV), Herman & Smith, <u>Electrical Wiring-Industrial</u> , 11 th Edition, Delmar Publishers
IMPLEMENTATION DATE:	Fall Term, 2004 (20051)
REVIEW OR MODIFICATION DATE:	Fall Term, 2006 (20071) (was BCT 1650)

COURSE TOPICS	<u>CONTACT HOURS PER TOPIC</u>
I. Electrical Safety Precautions	2
A. Shock and Shock Hazards	
B. "Tag and Lock Out" Procedures	
C. General Safety Awareness Information	
II. Industrial Electrical Maintenance	10
A. Power Distribution Equipment	
1. Switchgear	
2. Panels and Panel-boards	
B. Motors and Motor Controls	
1. Motor Types-AC/DC	
2. Components-Rotor, Stator, and Supports	
3. Controllers and Control Centers	
C. Drive Systems	
1. Electrical-Variable Speed Drives (AC and DC)	
2. Mechanical-Belt and Gear	
3. Couplings and Clutches	
D. Lighting Systems	
1. Florescent	
2. Incandescent	
3. Low Voltage Control	
4. High Voltage	
III. Instrumentation	33
A. Introduction	
1. Stages of Production	
(a) Handcrafted	
(b) Mechanized	
(c) Mass	
2. Purposes	
B. Stages of Instrumentation	
1. Mechanical	
2. Pneumatic	
3. Hydraulic	
4. Electrical	
5. Electronic	
C. Measurements	
1. Characteristics	
(a) Static	
(b) Dynamic	
2. Calibration	
(a) Open Loop	
(b) Closed Loop	

COURSE TOPICS (Continued)

CONTACT HOURS
PER TOPIC

3. Response Characteristics
- D. Instrumentation
 1. Measurements of Physical Changes to Materials
 - (a) Gasses
 - (b) Solids
 - (c) Liquids
 2. Measurements by Changes in Materials
 - (a) Solids
 - (b) Liquids
 - (c) Gasses
 - (d) Vapor Pressure
 - (e) Resistance
 - (f) Inductance
 - (g) Capacitance
 - (h) Conductivity
 - (i) Voltage
 - (j) Amperage
 - (K) Frequency
 - (l) Semi-Conductors
 - (m) Logic State
 3. Measurement of Process Variables
 - (a) Temperature
 - (b) Pressure
 - (c) Flow
 - (d) Level
 - (e) Density and Specific Gravity
 - (f) Force, Weight, Stress, and Strain
 - (g) Humidity and Dew Point
 - (h) Viscosity
 - (i) Position, Rotation and Speed
 - (j) Vibration
 - (k) Distance, Length, and Size
 4. Sensing Physical Variables-Sensors
 - (a) Temperature
 - (b) Pressure
 - (c) Flow
 - (d) Level
 - (e) Density and Specific Gravity
 - (f) Viscosity
 - (g) Force, Weight, and Stress
 - (h) Humidity and Dew Point
 - (i) Position, Rotation and Speed
 - (j) Vibration
 - (k) Distance, Length, and Size

COURSE TOPICS (Continued)	<u>CONTACT HOURS PER TOPIC</u>
<ul style="list-style-type: none"> 5. Decision and Control of Systems <ul style="list-style-type: none"> (a) Types of Controls-Open and Closed Loops (b) Response Characteristics (c) Modes of Control <ul style="list-style-type: none"> (1) On/Off (2) Proportional (3) Proportional-Plus Integral (4) Hybrid (d) Types of Controllers <ul style="list-style-type: none"> (1) Pneumatic (2) Fluidics (3) Hydraulic (4) Electrical (5) Programmable 6. Control Actuators and Valves <ul style="list-style-type: none"> (a) Electrical-Motors (AC and DC) and Solenoids (b) Linear Actuators-Relays (c) Pneumatic-Pressure and Vacuum (d) Hydraulic Actuators (e) Valves <ul style="list-style-type: none"> (1) Jet (2) Flapper (3) Spool 7. Summary of Instrumentation Concepts and Equipments used in Industry Today 	
IV. Troubleshooting Electrical Components and Systems	25
<ul style="list-style-type: none"> A. Test Equipment <ul style="list-style-type: none"> 1. Voltage Testers 2. Multi-meters Analog (Simpson 260) and Digital (Fluke 75) 3. Clamp-on Ammeters 4. Oscilloscopes B. Blueprint Reading <ul style="list-style-type: none"> 1. Floor Plans 2. One-Line Diagrams 3. Schematics 4. Ladder Diagrams 5. Elementary Wiring Diagrams 6. Symbology C. Motor Control Circuits <ul style="list-style-type: none"> 1. Component Identification 2. External Devices 3. Voltage Requirements 	

COURSE TOPICS (Continued)	CONTACT HOURS <u>PER TOPIC</u>
4. System Operation	
D. Lighting Systems	
1. Types	
2. Voltages	
3. Conditions	
E. Precision Measuring Tools	
(1) Dial Indicator (Coupling Alignment)	
(2) Micrometer	
(3) Vernier Calipers	
(4) Calipers-Inside/Outside	
V. Employable Skills	5
A. Communication	
1. Verbal	
2. Writing	
3. Computer	
B. Resumes	
C. Applications	
D. Interviews	
E. Attitude-Self-Confidence	

PROGRAM TITLE: Construction Electricity Management

COURSE TITLE: Electrical Maintenance

CIP NUMBER: 0646030205

LIST PERFORMANCE STANDARD ADDRESSED:

NUMBER(S): TITLES(S):

01.0 IDENTIFY SAFE WORKING CONDITIONS AT THE LABORATORY AND WORKPLACE, AND OBSERVE SAFETY PRECAUTIONS - The student will be able to:

- 01.01 Clean work area and maintain it in a safe condition.
- 01.02 Apply lab policies and procedures for safety including fire safety.
- 01.03 Identify and operate workplace-safety electrical devices.
- 01.04 Identify health-related problems that may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
- 01.05 Demonstrate procedures for disaster situations.
- 01.06 Demonstrate the proper use and care of hand and power tools and equipment.
- 01.07 Demonstrate knowledge of CPR (cardiopulmonary resuscitation) and first aid.
- 01.08 Troubleshoot residential electric circuits.
- 01.09 Drill holes in metal, wood, and concrete for electrical wiring.
- 01.10 Identify and select tools, equipment, materials, and wires to complete a job.
- 01.11 Lay out electrical devices, complying with the appropriate local, state, or national electric codes:
 - a. Conductors and cables
 - b. Standard outlets and switch boxes
 - c. Explain cord connections on major appliances
 - d. Cords, switches, receptacles, and dimmers, including a single-pole switched lighting circuit, a three-way switched lighting circuit, and a four-way combination circuit

02.0 DEMONSTRATE AN UNDERSTANDING OF BASIC DIRECT-CURRENT (DC) ELECTRICAL-CIRCUIT SKILLS -- The student will be able to:

- 02.01 Define the terms "voltage," "current," "resistance," "power," and "energy."
- 02.02 Measure voltage, amperage, and resistance, using a volt-ohm meter (VOM) and a digital volt-ohm meter (DVM).
- 02.03 Analyze and explain a series, series-parallel, and parallel circuit.
- 02.04 Draw each type of circuit and calculate the circuit values.
- 02.05 Explain and apply Ohm's Law.
- 02.06 Compute conductance and resistance of conductors and insulators.
- 02.07 Read and interpret color codes to identify resistors.
- 02.08 Explain voltage dividers (loaded and unloaded).

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

- 03.01 Ask and answer questions coherently and concisely.
- 03.02 Read and follow written instructions and listen to and follow oral instructions.

LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S): TITLES(S):

- 03.03 Give reports orally and in writing.
- 03.04 Read critically in order to recognize assumptions and implications and to evaluate ideas.
- 03.05 Find job-related information in technical literature such as a manufacturer's manual.
- 03.06 Read and interpret the graphs, charts, diagrams and tables.
- 03.07 Communicate job-related information with other trades.
- 03.08 Identify the parts and functions of a computer system.
- 03.09 Identify the uses of the computer, including applications of the computer in school, home and business.
- 03.10 Perform computer activities by preparing documents with the use of word-processing or database-application software.

04.0 APPLY ELECTRICITY-RELATED BASIC MATH - The student will be able to:

- 04.01 Solve basic math problems related to electrical work.
- 04.02 Convert units of measurements between the English system and the metric system.
- 04.03 Use scientific notation.
- 04.04 Demonstrate proficiency with a calculator.
- 04.05 Solve basic algebraic formulas related to electricity.
- 04.06 Solve basic trigonometric functions related to electrical theory.

05.0 DEMONSTRATE AN UNDERSTANDING OF BASIC ELECTRICITY - The student will be able to:

- 05.05 Explain molecular action as a result of temperature extremes, chemical reaction, and moisture content.
- 05.06 Draw conclusions or make inferences from data.
- 05.07 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric, and piezo electric means.
- 05.08 Identify blueprint symbols.

06.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able To:

- 06.01 Conduct a job search and identify career-growth and advanced-training opportunities, including apprenticeship programs.
- 06.02 Secure information about a job.
- 06.03 Identify documents that may be required for a job application.
- 06.04 Complete a job-application form.
- 06.05 Demonstrate competence in job-interview techniques.
- 06.06 Demonstrate productive work habits and positive attitudes.
- 06.07 Demonstrate knowledge of how to make job changes appropriately.
- 06.08 Identify ethical practices and responsibilities.
- 06.09 Demonstrate acceptable personal and professional hygiene.
- 06.10 Apply the principles of time management, work simplification, and teamwork when performing assigned tasks.
- 06.11 Explain the importance of taking pride in the quality of work performed.

LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S): TITLES(S):

- 06.12 Describe the importance of a drug-free workplace and the industry's policies toward drug use.
- 06.13 Describe the ramifications of a poor driving record on employability opportunities and maintaining a good driver's record.
- 06.14 Describe "Right-to-Know" Law as recorded in (29 CFR.1910.1200).

07.0 READ AND INTERPRET BASIC ELECTRIC CODES -- The student will be able to:

- 07.01 Describe the importance of following the local, state and national electric codes.
- 07.02 Read and interpret basic electric codes, wiring plans and specifications.
- 07.03 Identify licensure requirements for electrical occupations.

08.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP -- The student will be able to:

- 08.01 Define "entrepreneurship".
- 08.02 Describe the importance of entrepreneurship to the American economy and the role of small business in the free-enterprise system.
- 08.03 List the advantages and disadvantages of business ownership.
- 08.04 Identify the risks involved in the ownership of a business.
- 08.05 Identify the personal characteristics of a successful entrepreneur.
- 08.06 Identify the business skills (including computer skills) needed to operate a small business efficiently and effectively.

09.0 DEMONSTRATE POSITIVE CUSTOMER-RELATIONS SKILLS -- The student will be able to:

- 09.01 Exercise self-control.
- 09.02 Identify and demonstrate appropriate responses to criticism.
- 09.03 Recognize basic human-relations skills as they relate to success in the electrical industry.
- 09.04 Resolve customer complaints in a positive, professional manner.
- 09.05 Demonstrate respect for customer property by cleaning the work area after duties are completed.

11.0 DEMONSTRATE ALTERNATING-CURRENT (AC) CIRCUIT SKILLS -- The student will be able to:

- 11.01 Identify the physical and electrical characteristics of capacitors and inductors
- 11.02 Demonstrate proficiency in measuring, testing and connecting a transformer.
- 11.03 Apply the principles of transformers to AC circuits.
- 11.04 Identify the properties of an AC signal.
- 11.05 Identify AC sources.
- 11.06 Analyze and apply the principles of transformers to AC circuits.
- 11.07 Analyze polyphase circuits.
- 11.08 Install a simple polyphase circuit.

LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S): TITLES(S):

- 13.0 DEMONSTRATE PROFICIENCY IN COMMERCIAL WIRING -- The student will be able to:
- 13.01 Read and interpret a commercial wiring plan and specifications.
 - 13.02 Draw a commercial electrical-wiring plan.
 - 13.03 Select tools, equipment, materials, and wires to complete a job.
 - 13.04 Install the following according to the plan and specifications, complying with appropriate electric codes:
 - a. Wire mold
 - b. Conduit, duct, and raceway systems
 - c. Conductors in a conduit
 - 13.05 Describe the difference between a residential and a commercial lighting circuit.
 - 13.06 Construct control circuits from schematics.
 - 13.07 Describe high-voltage (over 600V) wiring requirements.
 - 13.08 Demonstrate knowledge of installing wiring in hazardous areas.
 - 13.09 Explain a commercial three-phase receptacle circuit, and an emergency-lighting system.
 - 13.10 Explain commercial-service-entrance requirements.
- 14.0 DEMONSTRATE SPECIALIZED ELECTRICAL SKILLS -- The student will be able to:
- 14.01 Explain solid-state control devices.
 - 14.02 Explain data cable installation according to the plan and specifications.
 - 14.03 Discuss fiber-optics installation requirements.
- 15.0 DEMONSTRATE COMPETENCY IN PROGRAMMABLE LOGIC CONTROLLERS (PLCS) -- The student will be able to:
- 15.01 Name the basic components of a PLC.
 - 15.02 Explain the operation of the following:
 - a. Input modules
 - b. Output modules
 - c. Power supply
 - d. Central processing unit (CPU)
 - e. Programming device
 - 15.03 Explain typical memory structure and the terms ROM, RAM, EEPROM, Bit, Byte, Word, and Double-word.
 - 15.04 Explain the following numbering systems and demonstrate ability to convert from one to another.
 - a. Decimal
 - b. Binary
 - c. Octal
 - d. Hexadecimal
 - 15.05 Explain how digital logic gate devices are used in programming.
 - 15.06 Connect, test, and operate the following input devices to the PLC:
 - a. Pushbuttons (NC and NO)
 - b. Proximity switches (capacitive and inductive)

LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S): TITLES(S):

- c. Photo-eyes (NC and NO)
 - d. On/Off switches
 - e. Analog (4-20 ma and 0-10V) devices
- 15.07 Connect, test, and operate the following output devices:
- a. Indicate lights
 - b. Magnetic motor contractors
 - c. Solenoid operated valves
- 15.08 Demonstrate the ability to access the PLC software and monitor an operating program.
- 15.09 Write, debug, download, and run the following application programs:
- a. Basic start/stop operation
 - b. Forward/reverse operation
 - c. Timed sequence operation
 - d. Counting operation
 - e. Shift register operation
 - f. Word transfer operation
 - g. Analog input/output operation
 - h. Jump instruction operation
 - i. Set-reset operation
 - j. Compare values operation
 - k. Compute values operation
- 15.10 Demonstrate the ability to address inputs and outputs in programming language.
- 15.11 Demonstrate the ability to edit an existing operation program, document changes, and save changes to a file.



**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.

<i>Section 1</i>	
COURSE PREFIX AND NUMBER: BCT 1881	SEMESTER CREDIT HOURS: 3
COURSE TITLE: Electrical Maintenance	

Section 2

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

<input type="checkbox"/> AA Elective	<input type="checkbox"/> AS Required Professional Course	<input type="checkbox"/> College Prep
<input type="checkbox"/> AS Professional Elective	<input checked="" type="checkbox"/> AAS Required Professional Course	<input checked="" 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:

<input type="checkbox"/> Communication	<input type="checkbox"/> Social & Behavioral Sciences	<input type="checkbox"/> Mathematics
<input type="checkbox"/> Natural Sciences	<input type="checkbox"/> Humanities	

Section 4

INTELLECTUAL COMPETENCIES:

<input checked="" type="checkbox"/> Reading	<input type="checkbox"/> Speaking	<input type="checkbox"/> Critical Analysis	<input type="checkbox"/> Quantitative Skills	<input 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

<i>Section 5</i>	
LEARNING OUTCOMES	METHOD OF ASSESSMENT
• Install residential wiring.	NCCER Module Certification Score 70% or better
• Communicate effectively.	NCCER Module Certification Score 70% or better
• Apply electricity-related basic math.	NCCER Module Certification Score 70% or better
• Demonstrate an understanding of basic electricity.	NCCER Module Certification Score 70% or better
• Read and interpret basic electric codes.	NCCER Module Certification Score 70% or better
• Demonstrate proficiency in electrical math problems.	NCCER Module Certification Score 70% or better
• Demonstrate specialized electrical skills.	NCCER Module Certification Score 70% or better
• Demonstrate an understanding of entrepreneurship.	NCCER Module Certification Score 70% or better
• Demonstrate employability skills.	NCCER Module Certification Score 70% or better
• Identify safe working conditions and observe safety precautions.	NCCER Module Certification Score 70% or better

Section 6

Name of Person Completing This Form: **Jim Yurko**