

## FLORIDA STATE COLLEGE AT JACKSONVILLE

## COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER: BCT 1608

COURSE TITLE: AC Theory

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 24

ALLOCATION:

COURSE DESCRIPTION:

Topics include test equipment, Ohms Law, principles of induction, principles of capacitance, and the principles of magnetism/electromagnetism.

SUGGESTED TEXT(S): NCCER Electrical Curriculum, Books I, II, III, IV  
Meade, Russell L., Foundations of Electronics,  
Latest Edition, Delmar Publishers

Practical Electricity by Nigel

IMPLEMENTATION DATE: Fall Term, 2004 (20051)

REVIEW OR MODIFICATION DATE: Spring Term, 2005 (20062) (was BCT 1959)  
Fall Term, 2008 (20091) - Outline Review 2007

COURSE TOPICS	CONTACT HOURS <u>PER TOPIC</u>
I. Review of DC Theory	10
A. Ohms Law	
B. Sources of Voltage	
C. Circuits	
(1) Series	
(2) Parallel	
(3) Combination	
II. Alternating current introduction	10
A. Terminology	
B. Sources of Voltage	
III. AC Circuits	10
A. Resistors	
(1) Definitions, Symbols & equations (8)	
(2) Measurements	
(3) Effects on AC & DC	
(4) Circuits	
B. Inductors	
(1) Definitions, Symbols & equations (8)	
(2) Measurements	
(3) Effect on AC & DC	
(4) Inductive Reactance (XL)	
(5) Circuits	
C. Capacitors	
(1) Definitions, Symbols, & equations (8)	
(2) Measurements	
(3) Effects on AC & DC	
(4) Capacitive reactance (XC)	
(5) Circuits	
D. Combination of Resistance & Inductance (RL) (8)	
E. Combination of Resistance & Capacitance (RC) (7)	
F. Combination of Resistance, Inductance & Capacitance (RLC) (7)	
IV. AC Power	10
A. Definitions, Symbols & equations	
B. Watts	
C. Volts/amps/reactive (VARs)	
D. Power Factor	
E. Efficiency	
F. True Power	
G. Apparent Power	

COURSE TOPICS (Continued)	CONTACT HOURS <u>PER TOPIC</u>
V. Magnetism & Electro-magnetism	10
A. Magnets	
B. Transformers	
C. Rules for coils	
D. Definitions, Symbols, & Equations	
E. Devices	
VI. Test Equipment	5
A. Ammeters	
B. Voltmeters	
C. Wattmeters	
D. VAR Meters	
E. Multi-meters	
F. Ohmmeters	
VII. Lab Experiments	20
A. Lab Experiments (5)	
B. Parallel RL Circuits (5)	
C. Series RC Circuits (5)	
D. Parallel RC Circuits (5)	
E. Series RLC Circuits (4)	
F. Parallel RLC Circuits (4)	
G. Wattmeters (4)	

PROGRAM TITLE: Construction Electricity  
Management

COURSE TITLE: AC Theory

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 with 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:
- 03.07 Communicate job-related information with other trades.
  - 03.08 Demonstrate appropriate telephone communication skills.
  - 03.09 Identify the parts and functions of a computer system.

## LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S):                    TITLES(S):

03.10 Identify the uses of the computer, including applications of the computer in the school, home and business.

03.11 Perform computer activities by preparing documents with the use of word processing or database-applications software.

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

04.05 Solve basic algebraic formulas related to electricity.

04.06 Solve basic trigonometric functions related to electrical theory.

04.07 Explain basic AC theory and solve related mathematical problems using appropriate test equipment.

04.08 Solve math-related problems from measurements on training aids.

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.

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 EMONSTRATE 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.

PROGRAM TITLE: Construction Electricity  
Management

COURSE TITLE: Electricity I - AC Theory

CIP NUMBER: 0646030205

LIST PERFORMANCE STANDARD ADDRESSED:

NUMBER(S): TITLES(S):

03.0 DEMONSTRATE PROFICIENCY IN ALTERNATING CURRENT (AC) CIRCUITS--The student will be able

to:

- 03.01 Solve basic trigonometric problems as applicable to electricity/electronics (prerequisite to AC).
- 03.02 Identify properties of an AC signal.
- 03.03 Identify AC sources.
- 03.04 Analyze and apply principles of transformers to AC circuits.
- 03.05 Analyze polyphase circuits.
- 03.06 Construct polyphase circuits.
- 03.07 Troubleshoot polyphase circuits.
- 03.08 Analyze basic motor theory and operation.
- 03.09 Analyze basic generator theory and operation.
- 03.10 Setup and operate a VOM for AC circuits.
- 03.11 Setup and operate a DVM for AC circuits.
- 03.12 Setup and operate power supplies for AC circuits.
- 03.13 Analyze and measure AC signals using oscilloscope, frequency meters and generators.
- 03.14 Analyze AC capacitive circuits.
- 03.15 Construct AC capacitive circuits.
- 03.16 Troubleshoot AC capacitive circuits.
- 03.17 Analyze AC inductive circuits.
- 03.18 Construct AC inductive circuits.
- 03.19 Troubleshoot AC inductive circuits.
- 03.20 Analyze resistance inductance capacitance (RLC) circuits (series, parallel, complex).
- 03.21 Construct RLC circuits (series, parallel, complex).
- 03.22 Troubleshoot RLC circuits (series, parallel, complex).
- 03.23 Analyze series and parallel resonant circuits.
- 03.24 Construct series and parallel resonant circuits.
- 03.25 Troubleshoot series and parallel resonant circuits.
- 03.26 Setup and operate impedance bridges for AC circuits.
- 03.27 Display and read waveforms.
- 03.28 Insert a capacitor in series in an AC circuit.
- 03.29 Develop a time constant curve.
- 03.30 Insert inductors in series in an AC circuit.
- 03.31 Construct a series RL circuit.
- 03.32 Measure voltage across a resistor and an inductor at varying frequencies in a series RL circuit.
- 03.33 Measure voltage across a resistor and an inductor at various values of resistance in a series RL circuit.

## LIST PERFORMANCE STANDARD ADDRESSED: (Continued)

NUMBER(S):	TITLES(S):
03.34	Measure voltage across a resistor and an inductor at various values of inductance in a series RL circuit.
03.35	Construct a parallel RL circuit.
03.36	Measure current through a resistor and an inductor at varying frequencies in a parallel RL circuit.
03.37	Measure current through a resistor and an inductor at various values of resistance in a parallel RL circuit.
03.38	Measure current through a resistor and an inductor at various values of inductance in a parallel RL circuit.
03.39	Construct a series RC circuit.
03.40	Measure voltage across a resistor and a capacitor at varying frequencies in a series RC circuit.
03.41	Measure voltage across a resistor and a capacitor at various values of resistance in a series RC circuit.
03.42	Measure voltage across a resistor and a capacitor at various values of capacitance in a series RC circuit.
03.43	Construct a parallel RC circuit.
03.44	Measure current through a resistor and a capacitor at varying frequencies in a parallel RC circuit.
03.45	Measure current through a resistor and a capacitor at various values of resistance in a parallel RC circuit.
03.46	Measure current through a resistor and a capacitor at various values of capacitance in a parallel RC circuit.
03.47	Construct a series RLC circuit.
03.48	Measure voltage across a resistor, a capacitor and an inductor at varying frequencies in a series RLC circuit.
03.49	Measure voltage across a resistor, a capacitor and an inductor at various values of resistance in a series RLC circuit.
03.50	Measure voltage across a resistor, a capacitor and an inductor at various values of capacitance in a series RLC circuit.
03.51	Measure voltage across a resistor, a capacitor and an inductor at various values of inductance in a series RLC circuit.
03.52	Construct a parallel RLC circuit.
03.53	Measure current through a resistor, a capacitor and an inductor at varying frequencies in a parallel RLC circuit.
03.54	Measure current through a resistor, a capacitor and an inductor at various values of resistance in a parallel RLC circuit.
03.55	Measure current through a resistor, a capacitor and an inductor at various values of capacitance in a parallel RLC circuit.
03.56	Measure current through a resistor, a capacitor and an inductor at various values of inductance in a parallel RLC circuit.
03.57	Read and interpret color codes to identify resistors.
03.58	Analyze voltage dividers (loaded and unloaded).
03.59	Construct voltage dividers (loaded and unloaded).
03.60	Troubleshoot voltage dividers (load and unloaded).
03.61	Solve network theorem problems using Kirchoff, (V and I), Thevenin, Norton, Superposition and Delta-Wye.



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: <u>BCT 1608</u>	SEMESTER CREDIT HOURS: <u>3</u>
COURSE TITLE: <u>AC Theory</u>	

*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
• Demonstrate alternating-current (AC) circuit skills	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