COURSE OUTLINE

ELEC 172-ELECTRICAL CONSTRUCTION & MAINTENANCE II
(Certificate Program)

Prepared By: Michael Spearance
A. **TITLE:** Electrical Maintenance & Construction II

B. **COURSE NUMBER:** ELEC 172

C. **CREDIT HOURS:** 7

D. **WRITING INTENSIVE COURSE:** No

E. **COURSE LENGTH:** (15 weeks)

F. **SEMESTER(S) OFFERED:** Spring Semester

G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**
   3 lecture hours per week, 4 - 2 hour Labs per week

H. **CATALOG DESCRIPTION:** Continuation of Electrical Construction and Maintenance I. Includes additional instruction in basic AC system theory, three phase circuits, motors - motor control, transformer theory - connections. Laboratory projects include diagnosis of electrical equipment, motors - motor starters, transformer connections and raceway installations for Commercial Electrical applications. Certificate/ AAS Elective Credit

I. **PRE-REQUISITES/CO-REQUISITES:** ELEC 171, ELEC173, MATH 101 or Math 106, SOET 101

J. **GOALS (STUDENT LEARNING OUTCOMES):**
   By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tbody>
<tr>
<td>a. Explain current flow for a given circuit</td>
<td>2. Crit. Thinking</td>
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<td>3. Communication</td>
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<td>b. Design and analyze motor circuit sizing</td>
<td>2. Crit. Thinking</td>
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<td></td>
<td>3. Prof. Competence</td>
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<tr>
<td>c. Design and analyze transformer circuits</td>
<td>1. Crit. Thinking</td>
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<td>3. Prof. Competence</td>
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<tr>
<td>d. Design and analyze multi-phase circuits</td>
<td>2. Crit. Thinking</td>
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<td>3. Prof. Competence</td>
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L. **REFERENCES:** 2011 National Electric Code Book

M. **EQUIPMENT:** supplied by college motors, transformers, conduit benders, motor starters and electrical conductors

N. **GRADING METHOD:** A-F

O. **MEASUREMENT CRITERIA/METHODS:**
   - Exams
   - Quizzes
   - Papers
P. DETAILED COURSE OUTLINE:

I. Alternating Current Principles
   A. A-C Power
      1) Three Phase
      2) Single Phase

II. Polyphase Circuits
    A. Introduction to Delta Connections
       1) How coils are connected in Delta
       2) Meaning of the term Delta
    B. Current relationships in a Delta Connection
    C. KVA Capacity of a Delta Connection
    D. Closed Delta Transformer Bank
       1) Connection of primary & secondary windings
    E. Single Phase Transformers Connected in WYE
       1) How coils are connected in wye
       2) Meaning of term wye
    F. Wye-Wye Connected Transformer Banks
    G. Delta-Wye Connected Transformer Banks

III. Transformers
     A. Applications of Transformers
     B. Construction Of Transformers
     C. Elementary Principles of Transformers
     D. Polarity
     E. Single Phase Connections
     F. Transformer Cooling

IV. Single Phase Motors
    A. Construction of Split Phase Motor
    B. Principles of Operation of Split Phase Motor
    C. Principles of Operation of Capacitor Start Motor

V. Three Phase Motors
   A. Construction of Motor
   B. Principle of Operation
   C. Rotor Field
   D. Stator Windings
   E. Starting Current
   F. Reversing Rotation

VI. A-C Motor Controls
    A. Starting Squirrel Cage Motors
    B. Across the Line Magnetic Motor Starters
    C. Motor Reversing

VII. System and Equipment Grounding
A. Grounding Defined
B. Definition of Voltage to Ground
C. Identification of Grounded Conductors
D. Methods of Equipment Grounding

VIII. Conductors and Raceways
A. Conductor insulation
B. Effects of Heat on Conductors
C. Conductor Material
D. Overcurrent Protection
E. Fuses and Circuit Breakers
F. Voltage Drop Calculations
G. Function of Raceways
H. Types of Raceways

VIII. Lighting
A. Incandescent
B. LED
C. Vapor Lamp
D. Fluorescent Lamp
E. Illumination

IX. Commercial Electrical System
A. Generating Station to Substation
B. Distribution of Power
C. Service Entrance Equipment
D. Feeders and Sub feeders
E. Branch Circuits

Q. LABORATORY OUTLINE:

LAB NUMBER:
1) Drill, Tap and Caliper Measurements
2) Metal Clad Cable #1
3) Metal Clad Cable #2
4) Metal Clad Cable #3
5) Electric Water Heater
6) 120 Volt Relay Circuit
7) Water Tower Control Circuit
8) Single Phase Transformers Step Up- Step Down
9) Single Phase Transformer Three Wire Secondary
10) EMT Raceway cutting, Reaming
11) EMT Raceway Bending #1
12) EMT Raceway Bending #2
13) EMT Raceway Bending #3
14) Three Phase Transformers Delta to Wye
15) Three Phase Transformers Wye to Delta
16) Three Phase Transformers Wye to Wye
17) Three Phase Transformers Delta to Delta
18) Three Phase Motor Testing
19) Three Phase Load Testing
<table>
<thead>
<tr>
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<th>Description</th>
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<tbody>
<tr>
<td>20</td>
<td>Photo Eye Control 120 Volt Load</td>
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<tr>
<td>21</td>
<td>Photo Eye Control 208 Volt Load</td>
</tr>
<tr>
<td>22</td>
<td>120 Volt Holding Circuit</td>
</tr>
<tr>
<td>23</td>
<td>Motor Starter Two Wire Control</td>
</tr>
<tr>
<td>24</td>
<td>Motor Starter Three Wire Control</td>
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