

**STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK**



MASTER SYLLABUS

**COURSE NUMBER – COURSE NAME
ELEC 171 – ELECTRICAL CONSTRUCTION & MAINTENANCE 1
(Certificate Program)**

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Updated by: November 20, 2018

Canino School of Engineering Technology

Department: ENVIRONMENTAL, CIVIL AND CONSTRUCTION TECHNOLOGY

Semester/Year: FALL 2018

- A. **TITLE:** Electrical Construction and Maintenance 1
- B. **COURSE NUMBER:** ELEC171
- C. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

Credit Hours: 7
Lecture Hours: 3 per week
Lab Hours: 8 per week
Other: per week

Course Length: 15 Weeks

- D. **WRITING INTENSIVE COURSE:** Yes No
- E. **GER CATEGORY:** None: Yes: GER
If course satisfies more than one: GER
- F. **SEMESTER(S) OFFERED:** Fall Spring Fall & Spring

G. **COURSE DESCRIPTION:**

This course provides students with hands on training and practical applications of electrical codes as they pertain to maintenance, installation and design of residential electrical systems. Lab will include electrical connections, electrical service entrances, meter applications, branch circuits, lighting circuits, receptacle circuits, GFCI, AFCI, protections with National Electric Code standards. The intent of this course is to prepare students for entry level electrical jobs.

- H. **PRE-REQUISITES:** None Yes If yes, list below:

CO-REQUISITES: None Yes If yes, list below:

I. STUDENT LEARNING OUTCOMES: (see key below)

By the end of this course, the student will be able to:

<u>Course Student Learning Outcome</u> <u>[SLO]</u>	<u>Program Student Learning Outcome</u> <u>[PSLO]</u>	<u>GER</u> <i>[If Applicable]</i>	<u>ISLO & SUBSETS</u>	
a. Ohms law, electrical circuit calculations			3-Found Skills ISLO ISLO	Subsets Subsets Subsets Subsets
b. Series, parallel circuits			2-Crit Think ISLO ISLO	Subsets Subsets Subsets Subsets
c. Power calculations, cost to operate electrical systems			2-Crit Think 3-Found Skills ISLO	Subsets Subsets Subsets Subsets
d. Box fill			2-Crit Think ISLO ISLO	Subsets Subsets Subsets Subsets
e. Combination circuits			3-Found Skills ISLO ISLO	Subsets Subsets Subsets Subsets
f. Residential electric heat systems			2-Crit Think 3-Found Skills ISLO	Subsets Subsets Subsets Subsets

g. Residential electrical service entrances			3-Found Skills ISLO ISLO	Subsets Subsets Subsets Subsets
			ISLO ISLO ISLO	Subsets Subsets Subsets Subsets
			ISLO ISLO ISLO	Subsets Subsets Subsets Subsets
			ISLO ISLO ISLO	Subsets Subsets Subsets Subsets

KEY	<u>Institutional Student Learning Outcomes [ISLO 1 – 5]</u>
ISLO #	ISLO & Subsets
1	Communication Skills Oral [O], Written [W]
2	Critical Thinking <i>Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS]</i>
3	Foundational Skills <i>Information Management [IM], Quantitative Lit./Reasoning [QTR]</i>
4	Social Responsibility <i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i>
5	Industry, Professional, Discipline Specific Knowledge and Skills

*Include program objectives if applicable. Please consult with Program Coordinator

J. **APPLIED LEARNING COMPONENT:** Yes No

If YES, select one or more of the following categories:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Classroom/Lab | <input type="checkbox"/> Civic Engagement |
| <input type="checkbox"/> Internship | <input type="checkbox"/> Creative Works/Senior Project |
| <input type="checkbox"/> Clinical Placement | <input type="checkbox"/> Research |
| <input type="checkbox"/> Practicum | <input type="checkbox"/> Entrepreneurship |
| <input type="checkbox"/> Service Learning | (program, class, project) |
| <input type="checkbox"/> Community Service | |

K. **TEXTS:**

Fletcher, Greg. House Wiring 5th Edition. Clifton Park: Cengage
Standard Text Book of Electricity 6th Edition.

L. **REFERENCES:**

National Electric Code Book 2017

M. **EQUIPMENT:** None Needed: Lab Computers, Benders, Meters and specialty equipment

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

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- Exams
- Quizzes
- Papers
- Participation

P. **DETAILED COURSE OUTLINE:**

I. **ELECTRICAL COMPONENTS & SYMBOLS**

- A. Residential Electrical
- 1) switches
 - 2) receptacles
 - 3) lighting

II. **ELECTRICAL THEORY & OHMS LAW**

- A. Nature of Electricity
- 1) displacement of electrons
 - 2) current: unit of measurement
 - 3) EMF: electrical pressure, voltage

- 4) **resistance**
- a) **opposition to current flow**
- b) **unit of measurement**
- c) **instrument- ohmmeter**

III. ELECTRICAL CIRCUITS

A. Series Circuit

- 1) **definition**
- 2) **voltage drop**
- 3) **current flow**
- 4) **total resistance**

B. Parallel Circuit

- 1) **definition**
- 2) **electrical characteristics**
 - a) **voltage**
 - b) **current**
 - 3) **resistance**
 - a) **equal resistors**
 - b) **two resistors**
 - c) **unequal resistors**

C. Series-Parallel circuits

- 1) **equivalent circuit**

D. Short circuit

- 1) **accidental path of current flow to ground**

E. Ground fault

- 1) **a form of short circuit hot phase touching earth ground**

F. Open circuit

- 1) **a break in circuit no current flow**

IV. ELECTRICAL ENERGY & POWER

A. Work

- 1) **definition**
- 2) **factors involved**
- 3) **formula**
 - a) **work = force x distance**
- 4) **units of work**

B. Power

- 1) **definition**
 - a) **rate of doing work**
 - b) **power is work (ft. lbs./ time)**

C. Units of Power

- 1) **Ft. lbs. / min.**
- 2) **horsepower**
- 3) **watts**

D. Measurement of Electrical Power

- 1) **ammeter-voltmeter**

- a) **$P = E \times I$**

- 2) **wattmeter**

E. Electrical Energy

- 1) power x time
- 2) measure with watt hour meter

V. METERS

A. Ammeter

- 1) movement of indicator needle
- 2) ammeter applications
- 3) multi range settings

B. Voltmeter

- 1) voltage levels
- 2) voltmeter applications
- 3) multi range settings

C. Ohmmeter

- 1) principal of operation
- 2) ohmmeter applications

VI. ELECTRICAL CONDUCTORS

A. Introduction

- 1) types of conductors
- 2) resistivity
- 3) American wire gauge

B. Conductor resistance

- 1) total circuit resistance
 - a) voltage drop
 - b) current totals

C. Cross sectional area

- 1) measurement
- 2) circular mils
- 3) numerical method for conductor sizing

D. Resistance of Conductors

- 1) resistivity for copper 10.4 ohms/ mil
- 2) resistivity for aluminum 21 ohms/ mil

E. Voltage drop single phase

- 1) effects on electrical load
- 2) resistance drop
 - a) $E = I \times R$
 - b) $DVD = 2 \times K \times L \times I / CM$
 - 3) factors effecting voltage drop
 - a) load
 - b) inrush current
 - c) conductor size

VII. MAGNETISM & ELECTROMAGNETISM

A. nature & theory

B. applications

C. polarity

- D. magnetic materials
- E. electromagnets
 - 1) construction
 - 2) factors effecting strength
 - a) current
 - b) number of turns
 - c) reluctance

VIII. INDUCTION & GENERATION of EMF

- A. induced EMF
 - 1) cutting lines magnetism
 - 2) relationship of current direction through magnetic field
 - a) Flemings rule
 - 3) factors affecting magnitude of induced elf
- B. lens law
- C. self-induced EMF
- D. self-induction of a coil
- E. operation of a simple ac generator

Q. LABORATORY OUTLINE: None Yes

- 1 Wire connections & splices
- 2 Crimp & ring terminals
- 3 Box & switch identification
- 4 Duplex receptacle & switch termination
- 5 Voltage testing power supply
- 6 Digital meter resistance measurements
- 7 Series resistor circuits
- 8 Parallel resistor circuits
- 9 Series-parallel circuits
- 10 Design build resistor circuits
- 11 Light, switch, feed at switch
- 12 Light, switch, feed at light
- 13 Light, switch, hot receptacle feed at switch
- 14 Double pole switch controls 240 v receptacle
- 15 Single- three way lighting dimmers
- 16 Bath ceiling fan- light- exhaust
- 17 Light, switch hot receptacle feed at light
- 18 Three way switch control feed at switch
- 19 Three way switch control feed at light
- 20 Light, two three ways, hot receptacle feed at receptacle
- 21 Light, two three ways, one four way feed at first three way switch
- 22 Light, two three ways, one four way feed at light
- 23 Light, switch, split wired receptacle feed at switch
- 24 Light, switch, duplex receptacle feed at light
- 25 Bathroom vanity light- GFCI receptacle-exhaust fan-light switch control
- 26 100 amp overhead service
- 27 100 amp underground service
- 28 Door chime with two push buttons