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

MASTER SYLLABUS

ELEC 332 INDUSTRIAL POWER ELECTRONICS

Prepared By: Stephen Frempong

SCHOOL OF ENGINEERING TECHNOLOGY
ELECTRICAL ENGINEERING TECHNOLOGY AND ENGINEERING SCIENCE DEPARTMENT
FALL 2018

ELEC 332 – INDUSTRIAL POWER ELECTRONICS

A. TITLE : Industrial Power Electronics

B. COURSE NUMBER: ELEC 332

C. CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)
Credit Hours: 3
Lecture Hours: 2 per week
Lab Hours: 2 per week
Other: per week

Course Length: 15 Weeks

D. WRITING INTENSIVE COURSE: NO

E. GER CATEGORY: NONE

F. SEMESTER OFFERED: FALL and SPRING

G. COURSE DESCRIPTION: This course is designed to prepare students with industrial power electronics skills necessary to function as technologist. Topics include: Solid States Devices, Photo-Electronics, Inverters, Operational Amplifier circuits including integrator and differentiator applications , Open/Closed Loop Feedback Systems, SCRs, TRIACs, Thyristors, Photosensitive devices, Optically Coupled Devices, Motor Direction Control Inverter circuits and techniques used to develop line voltages and frequencies for Variable Speed AC Inductions Motors.
Note: Credit is given to a student who has taken ELEC232 with a (C) grade or better.

H. PRE-REQUISITES: Electronic Circuits (ELEC231) or permission of instructor.

CO-REQUISITES: NONE

I. STUDENT LEARNING OUTCOMES:

Institutional Student Learning Outcome (ISLO's)
(1) Communication Skills (2) Critical Thinking (3) Foundational Skills
(4) Social Responsibility (5) Industry, Professional, Discipline-Specific Knowledge and Skills.

Accreditation Board for Engineering and Technology ABET- Student Outcomes (a-k)

<u>Course Objectives</u>	**ABET-Student Outcomes**	***<u>Institutional</u>* <u>SLO's</u>**
1. Determine the D. C. Base, Collector and Emitter currents in a common emitter mode transistor Circuit.	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.	(2) Critical Thinking (5) Industry, Professional, Discipline-Specific Knowledge and Skills.
2. Determine the output voltage of an non –inverting Operational Amplifier circuit with two voltage sources connected to the non-inverting input.	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.	(2) Critical Thinking (5) Industry, Professional, Discipline-Specific Knowledge and Skills.
3. Determine the gate turn on voltage for a Silicon Controlled Rectifier circuit.	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.	(2) Critical Thinking (5) Industry, Professional, Discipline-Specific Knowledge and Skills.
4. Determine the output waveform (with proper voltage levels) generated by an operational amplifier integrator circuit based on an applied input wave shape.	(c) An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.	(2) Critical Thinking (5) Industry, Professional, Discipline-Specific Knowledge and Skills.
5. Determine the proper 3 phase line voltage for a 60 Hertz rated variable speed AC	(c) An ability to conduct standard tests and measurements; to conduct,	(2) Critical Thinking

induction motor operating at 45 Hertz under a constant Volts/Cycle mode?	analyze, and interpret experiments; and to apply experimental results to improve processes.	(5) Industry, Professional, Discipline-Specific Knowledge and Skills.

J. APPLIED LEARNING COMPONENT: CLASSROOM/LAB

K. TEXT:
Timothy J. Maloney, (2004). *Modern Industrial Electronics. 5th Ed.*
Upper Saddle River, New Jersey: Prentice Hall.

L. REFERENCES: As determined by the instructor.

M. EQUIPMENT: As determined by the instructor.

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:
- Examination
- Quiz
- Homework
- Laboratory Reports.

P. DETAILED COURSE OUTLINE:

I. Bipolar transistor circuits

II. The Operational Amplifier
  A. The Ideal Operational Amplifier
  B. The Inverting Amplifier
  C. The Non-inverting Amplifier
  D. The Voltage Follower
  E. The Differential Amplifier
  F. The Instrumentation Amplifier
  G. The Voltage to Current Converter
  H. The Current to Voltage Converter
  I. The Comparator
  J. The Schmidt Trigger
  K. The Window Detector
  L. The Integrator
  M. The Differentiator
  N. Electrical Characteristics of a Practical Operational Amplifier

III. Thyristors (Four layer devices) $

A. Shockley Diode Characteristics
B. Silicon Controlled Rectifiers
C. Silicon Controlled Switches
D. Diacs Triggering Devices
E. SCR Applications
F. Triacs
G. Triac Applications
H. Controlled Thyristor Switches

IV. Variable-Frequency Inverters (using Volts/Frequency control) for speed control of AC motors

Q. <u>LABORATORY OUTLINE</u>:

1. **Operational Amplifiers**
2. **Comparators and Summing Amplifiers**
3. **Optical couplers**
4. **Motor Direction Control Circuits**
5. **SCR Circuits**
6. **TRIAC Circuits**