MOHAWK VALLEY COMMUNITY COLLEGE

UTICA AND ROME, NEW YORK

ELECTRICAL MACHINERY AND CONTROLS 2

ET232

CATALOG DESCRIPTION:

### ET232 Electrical Machinery and Controls 2 C-3, P-4, Cr-5

This course is designed to combine related information pertaining to AC machinery, electromechanical controllers, transducers, and electronic controls with the practical skills of equipment selection, installation, wiring, troubleshooting, and maintaining the machinery control systems currently used by industry. Topics include single and multiphase alternators, motors, transformers, and meters. Methods of machinery control include across-the-line starters, control relays, voltage and current transformers, limit switches, electronic switching, and speed or rotation sensors. Prerequisite: ET102 Technical Electricity 2, ET131 Electrical Machinery and Controls 1.

Student learning outcomes:

Upon the conclusion of this course, the student will be able to:

* Analyze motor action and perform numerous characteristic calculations involving them (b)
* Design, analyze and troubleshoot electrical motor control circuits using discrete devices (c).
* Develop electrical motor theories and apply them in a laboratory environment.
* Use AC & DC motor drives to control and manipulate motor functions (e).
* Analyze the use of PLCs for motor control applications.
* Analyze servo motor control technologies and applications.

DETAILED COURSE OUTLINE:

1. Magnetics (3 periods)

1. General Principles
2. Magnetic Fields
3. Reluctance
4. Permeability
5. Hysterisis
6. Eddy Currents

# 2. Transformer Principles

(4 periods)

1. Intro
2. Construction
3. No Load Conditions
4. Transient Behavior
5. Voltage Regulations
6. Windings
7. Impedance

# 3. Transformer Connections (5 periods)

1. Autotransformers
2. Buck Boost
3. Three Phase
4. Instrument Transformers
5. Harmonics

4. Three Phase Induction Motors (6 periods)

1. Introduction
2. Reversal
3. Construction
4. Slip
5. Synchronous Speeds
6. Air Gaps
7. Pull Up torque
8. Losses

# 5. Classifications

(3 periods)

1. NEMA Tables
2. Performance
3. Stator Voltages
4. Torque-Speed
5. Wound Rotors
6. Nameplates

# 6. Single Phase Induction Motors

(3 periods)

1. Quadrature
2. Capacitor Start
3. Reversing
4. Shaded Pole
5. Single Phasing
6. Locked Rotor Torque

7. Specialty Machines (5 periods)

1. Reluctance Motors
2. Construction
3. V Curves
4. Shaft Load, Power Angle, and Torque
5. Motor Losses
6. Salient Pole Motor

TEST (1 Period)

8. Synchronous Generator (3 periods)

1. Motor to Gear Transition
2. Power Equations
3. Paralleling Motors
4. Regulation

9. Direct Current Machines (3 periods)

1. Commutation
2. Layout
3. Basic DC Motor
4. Compensate Windings
5. Armature Reaction
6. Starting
7. Interpoles
8. Developed Torque

10. Synchronous Motors (3 periods)

1. Synchronous Motor Starting
2. Shaft Load, Power Angle, and Starting
3. Field Excitation
4. Magnet Power

11. DC Current Generator (3 periods)

1. Self Excited
2. Load Voltages
3. Series Compounds
4. Reverse Current Trip
5. Rheostats

12. Control of Electric Motors (2 periods)

1. Overload Protection
2. Counter EMF
3. Reversing
4. Solid State Controllers
5. Programmable Controllers
6. Definite Time Starters
7. Two Speeds

14) Test (1 period)

LABORATORY EXPERIMENTS:

Students should submit technical reports for the laboratory exercises. Appropriate graphs,

tables, and subsequent analysis are expected along with proper spelling and grammar.

1. Safety Procedures, Lab Introduction
2. The AC Motor, Description and End Plate, Introduction to components
3. Transformer Circuits
4. Three Phase Circuits
5. Three Phase Circuits
6. PowerFlex Drive Circuits
7. PowerFlex Drive Circuits
8. PowerFlex Drive Circuits
9. PLCs and Powerflex Drives
10. Other Drives
11. Proximity Switches
12. Motion Control
13. Motion Control
14. PLC Produced and Consumed Tagging