

**University of Arkansas - Fort Smith**  
**5210 Grand Avenue**  
**P. O. Box 3649**  
**Fort Smith, AR 72913-3649**  
**479-788-7000**

## **General Syllabus**

### **ELEC 3934 Inverter/Vector Drive Systems Applications**

Credit Hours: 4

Lecture Hours: 1

Laboratory Hours: 6

Prerequisites: Consent of department head

Effective Catalog: 2018-2019

#### **I. Course Information**

##### **A. Catalog Description**

Covers the design, selection, programming, tuning and troubleshooting of inverter and open/closed loop vector motors/drives and related control systems. Emphasis is on the design, programming and troubleshooting of inverter/vector motors/drives systems used in typical industrial automated systems.

##### **B. Additional Information**

This course is an upper division, technical elective for Bachelor of Applied Science degree students and Organizational Leadership students with the required prerequisites. It may also be taken by working engineers/technicians to upgrade their inverter/vector drives knowledge, if they meet the required prerequisites.

#### **II. Student Learning Outcomes**

##### **A. Subject Matter**

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

1. Select/program/tune inverter motor/drives for closed loop HVAC & fan/pump applications.
2. Select/program/tune open loop vector drives for constant speed/torque applications.
3. Select/program/tune vector drives for constant speed/torque/horsepower applications.
4. Setup and tune vector drives for closed loop control of speed/torque with minimum error.
5. Design & program PLC for process control of motor/drive using 0-10v or

- 4-20ma signals.
- 6. Setup & program drive for RS-232/485 and Ethernet TCP/IP network communication.
- 7. Network drives for PLC/PC control and data acquisition using ModBus & Ethernet.
- 8. Troubleshoot wiring/programming of inverter & open/closed loop vector drives systems.

## B. University Learning Outcomes

This course enhances student abilities in the following areas:

### Analytical Skills

**Critical Thinking** – Student will identify and **solve** problems drawn from a variety of typical automated control systems.

**Quantitative Reasoning** – Students will calculate motor torque/speed requirements for typical control applications and will select proper motor/drive voltage and amperage rating. Students will calculate horsepower, torque, rpm, motor voltage/amperage, wire gauge size and circuit breaker/fuse size. Students will also program the drive/motor parameters to maintain pressure, flow, temperature, torque or speed with minimum error to match the requirements of the application.

## III. Major Course Topics

- A. Inverter & open/closed loop vector drives capabilities & applications
- B. Selection/programming inverter motor/drives for HVAC & fan/pump applications
- C. Selection/programming open loop vector drives for constant torque applications
- D. Selection/programming vector drives for constant torque/horsepower applications
- E. Tuning vector drives for optimum speed/torque response with minimum error
- F. Wiring design for low level analog signals (24v, 0-10v, 4-20ma, encoder, resolver)
- G. Comparison of DC & AC motors/drives and DC to AC conversion design considerations
- H. Design/wiring/programming of PLC for motor drive interface and control
- I. RS-232/485 and Ethernet TCP/IP network wiring standards and communication protocols
- J. Networking drives using ModBus & Ethernet for PLC/PC control and data acquisition
- K. Troubleshooting inverter & open/closed loop vector drives systems