

ECET 211 Electric Machines & Control Spring, 2016

Introduction to the Course

Text Book: Electric Motors and Control Systems, 2nd Edition, by Frank D. Petruzella, published by McGraw Hill, 2015.

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ECET 211 Electric Machines & Control

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Course Description

Class 2-3, Lab 0-2, Cr. 3, P: MA 154

Lecture, demonstration, and laboratory experiments are combined to acquaint the student with the elements of electrical power circuits and machines.

Course Syllabus

Class Format & Activities:

- 1) Lecture: to be posted on every Monday, Wednesday, through Course Web site: <http://www.etcs.ipfw.edu/~lin>
- 2) Other on-demand Video demos from other sources that are related to the course
- 3) Text book readings and exercises, and other references that prepare you for the Exams

Instructor Information and Class Communication

- Paul I-Hai Lin, P.E., Professor of Electrical and Computer Engineering Technology
- Prof. Lin Course Web site: <http://www.etcs.ipfw.edu/~lin> for posted class activities, assignments, etc
- Email: lin@ipfw.edu
- Office Hours
 - Monday 1:00-3:00 PM, 6:00-7:00 PM
 - Tuesday 11:00-12:00 Noon, 5:00-6:00 PM
 - Wednesday 1:00-3:00 PM, 6:00-7:00 PM
 - Thursday 11:00-12:00 Noon

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Grading Policy

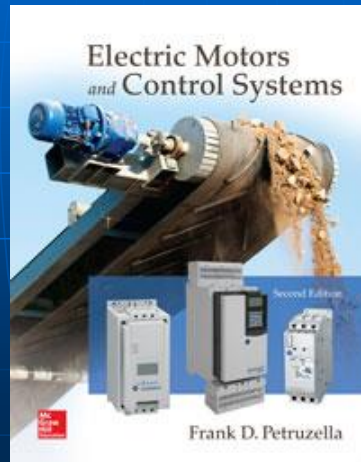
- Three One-Hour Exams (50 minutes) – 40%
- Hw Assignments – 25%
- One Team-Based Course Project (max 3 students in one team) – 10%
- Final Exam (Comprehensive) – 25%
- No late Homework will be accepted.
- No make-up exam will be given.

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Text Book

Text Book: *Electric Motors and Control Systems*, 2nd Edition, 2015, by Frank D. Petruzella, McGraw Hill, ISBN 978-0-07-337381-2; <http://www.mhprofessional.com/product.php?isbn=0073373818>



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ECET 211 Course Outcomes

This course provides non-EET majors with a “demo-base” experience in the experimental approach to electric circuits, electrical machines and controls. A student who successfully fulfills the course requirements will have demonstrated the ability to:

- (1) State and practice the principles of electric safety in workplace (Criterion 3, item i)
- (2) Able to search/learn related domain knowledge and standards from such sources Occupational Safety and Health Administration (OSHA), National Electrical Code (NEC), National Fire Protection Association (NFPA), National Electrical Manufacturers Association (NEMA), International Electrotechnical Commission (IEC), Institute of Electrical and Electronics Engineers (IEEE) (Criterion 3, items g, f)

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ECET 211 Course Outcomes (cont.)

- (3) Understand the operating principles of electric power systems: DC and AC (Criterion 3, items a, b, c, e)
- (4) Able to read circuit board schematic diagrams and identify proper electrical components (Criterion 3, items a, b, c, e)
- (5) Explain the operating principles of electrical machines (DC and AC motors) (Criterion 3, items a, b, c, e)
- (6) Explain types of semiconductor devices used in electrical machines control applications (Criterion 3, items a, b, c, e)
- (7) Connect basic electric machine control circuits (Criterion 3, items a, b, c, e)
- (8) Apply Ohm's law to solve electrical circuit problems (Criterion 3, items a, b, c, e)
- (9) Apply the principles of circuit analysis to calculate current, voltage, resistance, powers, and power factor (Criterion 3, items a, b, c, e)

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Tentative Schedule/Activities

- Electricity Basic: Voltage, Current, Resistance, Ohm's Law
- Electric Circuits: DC Circuits, AC Single-Phase, AC Three-Phase, etc
- Power and Energy in Electric Circuit
- Electrical Power Generation, Transmission, and Distribution

Text Book

Chapter 1. Electrical Safety in Workplace

Part 1: Protecting against Electric Shock

Part 2: Grounding-Lockout-Codes

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Tentative Schedule/Activities

Chapter 2. Understanding Electrical Drawings

Part 1: Symbols – Abbreviations – Ladder Diagrams

Part 2: Wiring – Single Line – Block Diagrams

Part 3: Motor Terminal Connections

Part 4: Motor Nameplate and Terminology

Part 5: Manual and Magnetic Motor Starters

Tentative Schedule/Activities (cont.)

Chapter 3. Motor Transformers and Distribution Systems

Part 1: Power Distribution Systems

Part 2: Transformer Principles

Part 3: Transformer Connections and Systems

Chapter 4. Motor Control Devices

Part 1: Manually Operated Switches

Part 2: Mechanically Operated Switches

Part 3: Sensors

Part 4: Actuators

Tentative Schedule/Activities (cont.)

Chapter 5. Electric Motors

- Part 1: Motor Principle
- Part 2: Direct Current Motors
- Part 3: Three-Phase Alternating Current Motors
- Part 4: Single-Phase Alternating Current Motors
- Part 5: Alternating Current Motor Drives
- Part 6: Motor Selection
- Part 7: Motor Installation
- Part 8: Motor Maintenance and Trouble Shooting

Tentative Schedule/Activities (cont.)

Chapter 6. Contactors and Motor Starters

- Part 1: Magnetic Contactor
- Part 2: Contactor Rating, Enclosures, and Solid-State Types
- Part 3: Motor Starters

Chapter 7. Relays

- Part 1: Electromechanical Control Relays
- Part 2: Solid-State Relays
- Part 3: Timing Relays
- Part 4: Latching Relays
- Part 5: Relay Control Logic

Tentative Schedule/Activities (cont.)

Chapter 8: Motor Control Circuits

Part 1: NEC Motor Installation Requirements

Part 2: Motor Starting

Part 3: Motor Reversing and Jogging

Part 4: Motor Stopping

Part 5: Motor Speed

Chapter 9: Motor Control Electronics

Part 1: Semiconductor Diodes

Part 2: Transistors

Part 3: Thyristors

Part 4: Integrated Circuits (ICs)

Tentative Schedule/Activities (cont.)

Chapter 10: Adjustable-Speed Drives and PLC Installations

Part 1: AC Motor Drive Fundamentals

Part 2: VFD (Variable Frequency Drive) Installation and Programming Parameters

Part 3: DC Motor Drives Fundamentals

Part 4: Programmable Logic Controllers (PLCs)

End of class review

Comprehensive Final Exam starting from 3:30 pm to 4:40 pm (100 minutes), August 5, in Room ET 346 (on Campus)

Summary & Conclusion

Questions?

Contact Prof. Lin through:

- Email: lin@ipfw.edu