

**Palestine Polytechnic University**  
**College of Engineering**  
**Department of Mechanical Engineering**  
**Electrical Machines Systems**

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**COURSE TITLE:** Electrical Machines for Conditioning and Refrigeration Engineering, 3 Credit Hours, 4928 (ECE 438), Spring 2017

**PREREQUISITES:**

- Analysis of Electrical Circuits 5090 (ECE 215)

**LECTURE TIME AND LOCATION:**

- Monday and Wednesday 09:30-10:45.
- Wad Elharye B316.
- Google classroom code: rlqf58.

**OFFICE HOURS:**

- Will be announced later

**INSTRUCTOR:**

- Dr. Eng. Jasem Tamimi, PhD in Control System Engineering.  
Email: [jtamimi@ppu.edu](mailto:jtamimi@ppu.edu), B209.  
Web.: <http://staff.ppu.edu/jtamimi>.

**TEXT BOOK:**

- Wildi, T., Electrical Machines, Drives and Power Systems, 5<sup>th</sup>/6<sup>th</sup> ed., 2002/2010, Prentice Hall.
- Selected Martials from handbooks from (e.g. Siemens and Klockner Moeller)

**REFERENCES:**

- G. Mcpherson and R. Laramore, An Introduction to electrical machines and transformers, 2th ed., John Wiley and Sons, 1990.
- A. E. Fitzgerald, C. Kingsley and S.D. Umans, Electrical machinery, 6th ed., McGraw-Hill, 2003.
- S. Chapman, Electrical machinery fundamentals, 4th ed., McGraw-Hill, 2005.

**ADDITIONAL MATERIALS OR EQUIPMENT NEEDED FOR THE COURSE:**

Will be announced during the course.

**INTENDED LEARNING OUTCOMES:** After completing this course students should be able to:

1. Define and magnetic circuit components and variables; reactance, magnetomotive force, flux, flux density, permeability, relative permeability. Topic 1.
2. State the construction and the excitation of DC machine. Topic 2.
3. State the DC machine operation, circuits, equations and properties. Topic 3.
4. Define the DC machine types: Separately, series, shunt, compound. Topic 3.
5. Speed control of DC machines. Topic 3.
6. Analyse the efficiency and losses in DC machine (motor). Topic 4.
7. State the construction of the three-phase induction machine. Topic 6.
8. Select the desired induction motor for several application. Topic 7.
9. Dealing with traditional ON/OFF control in electrical applications. Topic 8.
10. Define the solid state electrical drive components. Topic 10.
11. Define: diodes, thyristor, rectifiers (controlled and uncontrolled) and (1 and 3-phase), DC chopper, AC converters, inverters, 1-phase transformer and 1-phase motor. Topic 10.

**COURSE DESCRIPTION:** Electromagnetism, Direct-Current Generators, Direct-Current Motor, Three-Phase Induction Motors, Conventional Motor Control, Solid State Drivers, Single-phase Induction Motor and Single-phase Transformer.

**COURSE OUTLINE: Topics ..... Lectures**

1. Chapter Two: Fundamentals of Electricity, Magnetism and Circuits:
  - Electrical Machine Taxonomy and Electrical Circuit Analysis Review: Sections 2.1 to 2.15 and 2.32 to 2.38.....1
  - Electromagnetism: Sections 2.16 to 2.30 ..... 1
2. Chapter Four: Direct-Current Generators:
  - Construction of Direct-Current Generator: Sections 4.23 to 4.28.....1
3. Chapter Five: Direct-Current Motor: Sections 5.1 to 5.13 and 5.19 to 5.24 .....4
4. Chapter Six: Efficiency and Heating of Electrical Machines: Sections: 6.1 to 6.4 and 6.10..1
5. First Exam ..... 1
6. Chapter Thirteen: Three-Phase Induction Motors: Sections 13.1 to 13.14 .....4
7. Chapter Fourteen: Selection and Application of Three-Phase Induction Motors: Sections 14.1 to 14.7.....4

8. Chapter Twenty: Basics of Industrial Motor Control: Sections 20.1 to 20.12 and other slides materials .....	4
9. Second Exam .....	1
10. Selected Topics: Sections: 9.1 to 9.4, 18.1, 18.7, 18.10, 21.3, 21.4, 21.7-21.10, 21.15, 21.16, 21.20, 21.21, 21.37, 23.1, 23.7, and 23.8 .....	4

## TEACHING METHODS:

- Lectures: The concepts, theorem with their proofs and interpretation, circuit-solving techniques,... will be explained using simple class materials, e.g., blackboard and pin. Then problems and case studies will be solved using blackboard and pin in the class by the teacher, these problems are entitled with "Examples", other problem will be solved by the student in the class these problems are entitled with "Quizzes". The in Class quizzes can be also solved within groups in the lecture.
- Single Assignments: Student must solve and hand out some selected problems in the textbook in a specified deadline.
- Groups' Assignments: The class will be divided into groups (each group 2-3 students), each group will have several tasks concerning the electrical circuit network.

## ASSESSMENT MEASURES AND GRADING SYSTEM:

- Written exams, Assignments, homework, quizzes.

## GRADING SYSTEM:

First exam: .....	20% , 7 <sup>th</sup> Week
Second exam: .....	20%, 12 <sup>th</sup> Week
Assignments, participation, quizzes and HWs .....	10%
Final Exam .....	50%
Total .....	100%

## POLICIES:

- Attendance check will be done through attendance check-list, so please sign it with your original signature each class and do not sign instead of any other colleague. All students who use fake signatures will be penalized.
- Please do not attend the class if you are late with more than 15 minutes.
- Students with more than **6 missed hours** will have "**WF**" grade in the course.
- No makeup exam (first or second), quizzes or homework will be hold.
- **Only** a persuading excuse can be accepted for a missed exam.
- The grade of the missed exam with accepted excuse will be the the average of the other non-missed exams as well as the mean of the students' grades in the missed exam.
- Using or playing with mobile phones during the classes are **not** allowed.