COURSE TITLE:

- Introduction to Electrical Machines, 3 Credit Hours, 4355- ECE331 Fall 2016

PREREQUISITES:

- Analysis of Electrical Circuits, 5090-CE215

LECTURE TIME AND LOCATION:

- Sunday, Tuesday and Thursday 11:00-12:00.

- Wad Elharye B316.

- Classroom Code: munnx9.

OFFICE HOURS:

- Will be announced later

INSTRUCTOR:

- Dr. Eng. Jasem Tamimi, PhD in Control System Engineering.
  Email: jtamimi@ppu.edu, B305.

TEXT BOOK:

- S. Chapman, Electrical machinery fundamentals, 4th ed., McGraw-Hill, 2005.

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.

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. State the construction and the excitation of DC machine

2. State the DC machine operation, circuits, equations and properties.

3. Define the DC machine types: Separately, series, shunt, compound.

4. Speed control of DC machines.

5. Define: Farady's and Lenze laws, Steimentz transformer.

6. Calculate the voltage regulation and electrical properties of the single phase transformer.

7. Apply the no-load and short-circuits tests of the single phase transformer.

8. Define the operating principle of single-phase induction motor.

9. calculate the starting and mechanical characteristic of the single-phase motor.

10. Use controlled-DC drivers for speed control of DC motors.

COURSE DESCRIPTION:

- Introduction to machinery principles, Direct Current (DC) machine fundamentals, DC machine types and control, controlled-DC driver, single phase transformer, single phase motors, and special-jobs machines.

COURSE OUTLINE:

Topics . . . . **Lectures**

1. Chapter One: Introduction to Machinery Principles Electrical machines, transformers, and daily life, a note on units and notation, rotational motion, Newton's law, and power relationships, angular position , angular velocity, angular acceleration, torque, Newton 's Law and rotation. The Magnetic Field: production of a magnetic field, magnetic circuits, magnetic behavior, ferromagnetic materials, energy losses in a ferromagnetic core. Faraday's law-induced voltage from a time-changing. Magnetic field. Production of induced force on a wire. Induced voltage on a conductor moving in a magnetic field. The linear DC machine. 5

2. Chapter eight: DC Machinery Fundamentals A simple rotating loop between curved pole faces. Commutation in a simple four-loop DC machine. Commutation and armature construction in real DC machines. Problems with commentation in real machines. The internal generated voltage and induced torque equations of real dc machines. The construction of dc machines. Power flow and losses in DC machines 4

First exam 1
3. Chapter Nine: DC Motors and Generators: Introduction to dc motors. The equivalent circuit of a dc motor. The magnetization curve of a dc machine. Separately excited and shunted motors. The permanent -magnet dc motor. The series dc motor. The compounded dc motor. 9

5. Chapter three: Introduction to power electronics Basic rectifier circuits. Voltage variation by AC phase control. DC-to-DC power control choppers. 6

4. Chapter two: Transformers: Why transformers are important to modern life. Types and construction of transformers. The ideal transformer. Theory of operation of real single-phase transformers. The equivalent circuit of a transformer. The per-unit system of measurements. Transformer voltage regulation and efficiency. Transformer taps and voltage regulation. The autotransformer. 4

Second exam 1

5. Chapter ten: Single-Phase and Special-Purpose Motors: The universal motor. Introduction to single-phase induction motors. Starting single-phase induction motors. Speed control of single-phase induction motors. The circuit model of a single-phase induction motor. Other types of motors.

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%
Second exam: 20%
Assignments, participation, quizzes and HWs 10%
Final Exam 50%
Total 100%

POLICIES:

- Attendance check will be **only** at the beginning of the class, after that any late student will not be considered as attending student in this class.

- Students with more than **6 missed classes** will have "**WF**" grade in the course.

- No make up exam or quiz 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.

- Students with special needs or conditions or missing class meeting with accepted excuse are welcomed to contact me during office hours

- Using or playing with mobile phones during the classes are **not** allowed.