

## **EE 541- Power Systems Protection II**

### **CREDIT HOURS**

3 Hours

### **CONTACT HOURS (Hours/week)**

Lecture: 2; Tutorial: 2

### **COURSE COORDINATOR**

Dr Rania El Sharkawy

### **TEXT BOOK:**

A.T. Johns and S.K. Salman, "Digital Protection for Power System", latest edition.

### **COURSE DESCRIPTION:**

Static/ digital versus electromechanical relays. Relaying practices. Components, detectors and applications. Hardware of digital relay. Mathematical background for digital protection. Digital O.C. relay. Digital distance relay. Digital protection of rotating machines. Digital protection of transformers. Digital bus bar protection. integration of protection and control in substations. Traveling wave based protection. Recent topics in digital protection.

### **PREREQUISITE:**

EE442

### **RELATION OF COURSE TO PROGRAM:**

Elective

### **COURSE INSTRUCTION OUTCOMES:**

The student is capable of demonstrating the difference between electromechanical and digital relays, and he/ she is also introduced to the mathematical relationships and numerical techniques used in digital protection.

### **TOPICS COVERED:**

- Review of static/digital versus electromechanical relays.
- Components detectors and applications, hardware of digital relays.
- Mathematical background for digital protection.
- Digital relays for motor, transmission line and machine protection.
- Integration of protection and control in substations.
- Traveling wave based protection.

**CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:**

<b>Professional Component Content</b>			
<b>Math and Basic Sciences</b>	<b>Engineering Topics</b>	<b>General Education</b>	<b>Engineering Design</b>
	✓	✓	✓

**RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:**

<b>Student Outcomes</b>		<b>Course Outcomes</b>
<b>a.</b>	An ability to apply knowledge of mathematics, science, and engineering.	
<b>b.</b>	An ability to design and conduct experiments, analyze and interpret data.	
<b>c.</b>	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	✓
<b>d.</b>	An ability to function on multi-disciplinary teams.	
<b>e.</b>	An ability to identify, formulate, and solve engineering problems.	✓
<b>f.</b>	An understanding of professional and ethical responsibility.	
<b>g.</b>	An ability to communicate effectively.	
<b>h.</b>	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal content	
<b>i.</b>	A recognition of the need for, and an ability to engage in life-long learning.	
<b>j.</b>	A knowledge of contemporary issues within and outside the electrical engineering profession.	
<b>k.</b>	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	✓