

**Faculty of Engineering & Technology**

**Protection and Switchgear in Electrical Power Systems**

**Information :**

**Course Code :** EPR 581

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Electrical Power Engineering

**Instructor Information :**

Title	Name	Office hours
Professor	Hossam Eldin Abdallah Talaat	6
Assistant Lecturer	Mohamed Abdallah Mahmoud Shaheen	8
Assistant Lecturer	Ahmed Moreab Hussien Mohamed	6

**Area Of Study :**

Form students' knowledge about power system protection and switchgear.  
Build students' ability to analyze, design and/or evaluate protection schemes.  
Develop students' skills to perform basic experiments on protective relays.

**Description :**

Fundamentals of Power System Protection. Instrument Transformers. Overcurrent Relays. Radial System Protection. Reclosers and Fuses. Distance Protection of Lines. Differential Relay. Differential Protection of Transformers. Fundamentals of Switching Operations. Transient Recovery Voltage. Circuit Breakers & Arc Extinction. Rated Characteristics of Circuit Breakers.

**Course outcomes :**

**a. Knowledge and Understanding: :**

1 -	Demonstrate the objectives and functional requirements of power system protection.
2 -	Explain the function of protection system components including circuit breakers, instrument transformers, relays, reclosers and fuses.
3 -	Draw basic wiring diagrams of primary and secondary circuits of protection systems.
4 -	Demonstrate the principles of overcurrent, distance and differential relays.
5 -	Compare between different types of switchgear devices.
6 -	Describe, with the help of neat sketches, the switching operations, arc extinction and transient recovery voltage.
7 -	Demonstrate, with the help of neat sketches, the theory of operation and construction of oil, vacuum and SF6 circuit breakers.

**b. Intellectual Skills: :**

1 -	Deduce the response of overcurrent, distance and differential relays.
2 -	Evaluate the performance of protective relays in view of protection requirements.
3 -	Examine the coordination between overcurrent protective devices in transmission lines and radial feeders.
4 -	Analyze the making and breaking process of a circuit breaker.

**c. Professional and Practical Skills: :**

1 -	Evaluate the performance of current transformers with respect to IEC standards.
2 -	Select the proper current and time settings of overcurrent relays on a radial system.
3 -	Select from a manufacturer list the circuit breaker appropriate for a certain application.
4 -	Practice basic experiments on overcurrent and differential relays.

**d. General and Transferable Skills: :**

1 -	Collaborate effectively within multidisciplinary team.
2 -	Work in stressful environment and within constraints.
3 -	Communicate effectively
4 -	Effectively manage tasks, time, and resources.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Fundamentals of Power System Protection	5	3	2
Instrument Transformers	10	6	4
Overcurrent Relays	5	3	2
Radial System Protection	10	6	4
Reclosers and Fuses	5	3	2
Distance Protection of Lines	10	6	4
Differential Relay	5	3	2
Differential Protection of Transformers	5	3	2
Fundamentals of Switching Operations	5	3	2
Transient Recovery Voltage	5	3	2
Circuit Breakers & Arc Extinction	5	3	2
Resistance switching, Capacitance switching.	5	3	2

**Teaching And Learning Methodologies :**

Interactive Lecture
Discussion
Problem-based Learning
Report
Experiential Learning

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Assignment	5.00	9	to assess the skills of problem solving, understanding of related topics.
Final Exam	40.00		

Lab Exper.	10.00	15	to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied.
Mid- Exam I	15.00	7	to assess the skills of problem solving, understanding of related topics.
Mid- Exam II	15.00	11	to assess the skills of problem solving, understanding of related topics.
Oral Exam	5.00		assess the performance of the students during the course
Quizzes	10.00	5	to assess the skills of problem solving, understanding of related topics.

**Course Notes :**

No course notes are required

**Recommended books :**

1. SUNIL S. RAO , %Switchgear, Protection and Power Systems+Khanhanna Publishers, Thirteenth Edition, 2008.
2. J. D. Glover, M. S. Sarma and T. J. Overbye, "Power System Analysis and Design", Cengage Learning, Fifth Edition, 2012.