

<b>SEMESTER</b> <i>Fifth</i>	<b>DEPARTMENT</b> <i>Power Engineering</i>	<b>COURSE TITLE</b> <i>Protection Devices</i>
<b>COURSE CODE</b> <i>EP505</i>	<b>HOURS: 3</b> <b>UNITS: 3</b>	<b>COURSE SPECIFICATIONS</b> <i>Theoretical Content</i>

**1. Study the Different Types of Faults in Electrical Networks and Functions of Protection Devices.**

- Explain types of faults, causes of faults, consequences of faults and the methods used in protecting the system against them.

**2. The Qualities Required for Protection Systems.**

- Explain the different qualities required from the protective systems:
  - Selectivity and discrimination.
  - Sensitivity.
  - Speed of operation.
  - Reliability.
  - Flexibility.
  - Economic consideration
- Provide the correct selectiveness to protection device and disconnection discrimination using various methods between various types of protection devices.

**3. Demonstrate the Components of Low Voltage Switch-Gear (Under 1000V), the Time-Current Characteristics of Included Various Protection Devices, Construction and Calculations.**

- To determine the time-current characteristic, construction, principles of arc quenching.
- Study over-current and short-circuit protection methods of: Fuses, Circuit breakers and miniature circuit breakers. Residual current circuit breakers.
- Use Calculations for choosing the correct protective device.

**4. Study the Characteristics of Different Protection Devices in Medium and High-Voltage Networks (Over 1000V.) and Their Construction.**

- Get familiar with construction of Fuses, Disconnectors, Peak current limiters, Circuit breakers (Oil CB, Vacuum CB, Air blast CB, and SF6 CB ) and arc quenching principle

for each.

- Use Calculations for choosing the correct protective device.

**5. Study the Different Types of Relays, Their Construction and Calculations, with Current Transformers.**

- Describe the classification of relays. Design and principle of operation Electromagnetic relays, Induction disc relay, Induction cup relay, Permanent magnet moving coil relay, Balanced beam relays, Negative-phase sequence relays, Voltage relays, Time relays, Solid-state relays, Numerical and Microprocessor relays.
- Explains the current transformers, transforming ratio and Burden.

**6. To Demonstrate the Protection Systems Using Digital Computers.**

- Data storage.
- Structure of computerized control system.

**References:**

- 1- *Applied Protective Relaying*, Westinghouse Electric Corporation, Relay-Instrument Division, 1982.
- 2- *ABB Switch Gear Manual, 18th Edition*.
- 3- *Switch Gear Protection and Power Systems*, Sunil S. Rao; Khanna Publishers