

SEMESTER <i>Fifth</i>	DEPARTMENT <i>Power Engineering</i>	COURSE TITLE <i>Protection Devices</i>
COURSE CODE <i>EP505</i>	HOURS: 3 UNITS: 3	COURSE SPECIFICATIONS <i>Theoretical Content</i>
1. Study the Different Types of Faults in Electrical Networks and Functions of Protection Devices. <ul style="list-style-type: none"> ➤ 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. <ul style="list-style-type: none"> ➤ Explain the different qualities required from the protective systems: <ul style="list-style-type: none"> ▪ 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. <ul style="list-style-type: none"> ➤ 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. <ul style="list-style-type: none"> ➤ 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