M.TECH FIRST SEMESTER
ADVANCED POWER SYSTEM PROTECTION

17EEPC1T3   **Credits: 4**
Lecture: 4 periods/week   **Internal Assessment: 40 marks**
                                                        End Semester Assessment: 60 marks

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Course Objective:
To provide an in depth view of modern trends and methods used in electric power system protection, protection system relay types, and its application to protection of machines, transformers and transmission lines.

Course learning outcomes: At the end of the course the student will be able to
1. Discuss basic concepts of static relays and Analyse static relays through block diagram approach.
2. Discuss Principle of Operation of; over current and directional relays, distance protection and pilot relaying.
3. Discuss the application of wavelet transform and Fourier transform to protection system.
4. Discuss the operation of different micro processor based relays and suggest suitable protection system for generator, transformer and transmission lines.

UNIT-I: STATIC RELAYS
Basic construction of static relays, review of electromagnetic relays, static relays, Comparison of Static relays with electromagnetic relays, Amplitude comparator and Phase comparator
Over current relays time current characteristic, current setting, time setting, directional relay, static over current relays.

UNIT-II: DISTANCE PROTECTION
Impedance Relay: operating principle - relay Characteristic -Protective Schemes - Static Impedance Relay - Static reactance relay - static MHO relay - effect of arc resistance, effect of power surges, effect of line length and source impedance on performance of distance relays - Quadrilateral relay – Elliptical relay - Swivelling characteristics.

Pilot Relaying Schemes: Wire pilot protection, circulating current scheme, balanced voltage scheme, transley scheme, carrier current protection, phase comparison carrier current protection, carrier aided distance protection.

UNIT - III: NUMERICAL PROTECTION
Digital relaying algorithms, differential equation technique, discrete fourier transform technique, walsh-hadamard transform technique, rationalized harr transform technique, wavelet transform technique, removal of dc offset.

Microprocessor Based Protective Relays: general block diagram of Microprocessor based protective relays, Microprocessor based over current relay, Microprocessor based distance relays- impedance relay, reactance relay, Mho relay, offset Mho relay.

UNIT-IV: DIGITAL PROTECTION OF AC MACHINES
faults in synchronous generator, protection schemes for synchronous generator, digital protection of synchronous generator. Faults in a transformer, schemes used for transformer protection, digital protection of Transformer

TEXT BOOKS:
1. MadhavaRao T.S, "Power System Protection, Static Relays with Microprocessor Applications" 2nd edition, TMH, 2012
2. Badriram and D N VishwaKarma, "Power System Protection and Switchgear", 2nd edition, TMH, 2014

REFERENCE BOOKS:
1. Ravindranth. B and Chander, "Power System Protection and Switch Gear", 2nd edition, New Age International (P) Ltd., 2014.
2. Ravindra P. Singh, "Switch Gear and Power system Protection", Prentice Hall of India Pvt. Ltd., New Delhi, 2014.