M.TECH FIRST SEMESTER

EEPC1T4 REACTIVE POWER COMPENSATION AND MANAGEMENT Credits: 4

Lecture: 4 periods/week **Internal assessment: 30 marks**
Semester end examination: 70 marks

Objective:

This subject delas with load side compensation, reactive power compensation and transmission system and reactive power co-ordination. This subject also deals with demand side management, distribution side reactive power management, user side reactive power management and reactive power management in electric traction and furnaces.

Learning Outcomes:

1. Upon completion of study of the course student should be able to understand the need of load compensation, reactive power compensation in transmission system.
2. Upon completion of study of the course student should be able to understand reactive power co-ordination, modeling, planning, demand side management and distribution side reactive power management. i.e economic planning, capacitor placement
3. Student can able to understand the reactive power control requirements in traction system and arc furnace.

UNIT I: Load Compensation

Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing – Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads- examples.

UNIT II: Steady – state reactive power compensation in transmission system:

Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation – examples

UNIT III: Transient state reactive power compensation in transmission systems:

Characteristic time periods – passive shunt compensation – static compensations- series capacitor compensation –compensation using synchronous condensers – examples

UNIT-IV: Reactive power coordination:

Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of power supply – disturbances- steady –state variations – effects of under voltages – frequency – Harmonics, radio frequency and electromagnetic interferences

UNIT-V: Demand side management:

Load patterns – basic methods load shaping – power tariffs- KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels

UNIT-VI: Distribution side Reactive power Management:

System losses –loss reduction methods – examples – Reactive power planning – objectives – Economics Planning capacitor placement – retrofitting of capacitor banks

UNIT-VII: User side reactive power management:

KVAR requirements for domestic appliances – Purpose of using capacitors – selection of capacitors – deciding factors – types of available capacitor, characteristics and Limitations

UNIT-VIII: Reactive power management in electric traction systems and arc furnaces:

Typical layout of traction systems – reactive power control requirements – distribution transformers- Electric arc furnaces – basic operations- furnaces transformer –filter requirements – remedial measures – power factor of an arc furnace

Reference Books:

1. Reactive power control in Electric power systems by T.J.E.Miller, John Wiley and sons, 1982 (Units I to IV)
2. Reactive power Management by D.M.Tagare,Tata McGraw Hill,2004.(Units V toVIII)