

M.TECH SECOND SEMESTER

EEPC2T6A

VOLTAGE STABILITY (ELECTIVE-IV)

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks
Semester end examination: 70 marks

Objective:

In this course it is aimed to understand the reactive power flow and voltage stability in power system, influence of voltage stability by loads, reactive power compensation. It gives the concept of voltage stability, static indices voltage stability margin and methods of improving aspects.

Learning outcomes:

1. Upon completion of the course student should be able to understand the reactive power flow and voltage stability in power system.
2. Understand the influence of different types of loads on voltage stability and reactive power compensation
3. At the end of the course student understand the voltage stability indices, voltage stability margin and methods of improving voltage stability and practical aspects.

Unit 1 : Reactive Power flow and voltage stability in power systems: Physical relationship indicating dependency of voltage on reactive power flow - reactive power transient stability; Q-V curve; definition of voltage stability, voltage collapse and voltage security. Voltage collapse phenomenon, Factors of voltage collapse, effects of voltage collapse, voltage collapse analysis. Reasons for aggravation of the problem.

Unit 2 : Power system loads : Load characteristics that influence voltage stability such as – Discharge lighting, Induction motor, Air conditioning and heat pumps, Electronic power supplies, Over Head lines and cables.

Unit 3 : Reactive Power compensation : Generation and absorption of reactive power – Reactive power compensators & voltage controllers : - shunt capacitors, synchronous phase modifier – static VAR system – on load tap changing transformer, booster transformers.

Unit 4 : Voltage stability static indices : Development of voltage collapse index – power flow studies – singular value decomposition – minimum singular value of voltage collapse – condition number as voltage collapse index.

Unit 5 : voltage stability margins & Improvement of voltage stability: Stability margins, voltage stability margin of un compensated and compensated power system . Dynamic voltage stability – voltage security.

Unit 6 : Mid term and long term stability – nature of system response to severe upsets – distinction between midterm and long term stability – power plant response during severe upsets – simulation of long term dynamic response – case study of severe system upsets.

Unit 7 : Power system security: system state classification – security analysis – contingency analysis – sensitivity factor – power system voltage stability

Unit 8: Methods of improving voltage stability, transient stability enhancement, small signal stability enhancement, power system stabilizer, supplement control of static VAR compensator.

References:

1. Performance operation and control of EHV power transmission SystemsA chakrabarti, D.P.Kothari, A.K. Mukhopadhyay, A.H. Wheeler publishing, 1995.
2. Power system Voltage stability - C.W. Taylor , Mc. Graw Hill, 1994
3. Modern power system analysis by D.P. Kotari and I.J. Nagarath - TMC
4. Power system stability and control by Prabha Kundur – TMC