ECE428B POWER SYSTEM STABILITY AND FACTS

B. Tech Semester –VIII (Elective II)

L	T	P	Credits
4	-	-	4

Class Work	:	25 Marks
Theory	:	75 Marks
Total	:	100 Marks
Duration of Exam.	:	3 Hrs.

UNIT I

POWER SYSTEM STABILITY PROBLEM:
Rotor angle stability, voltage stability, short term and long term stabilities, swing equation and its solution techniques.
SYNCHRONOUS MACHINES AND ITS MODELLING:
Power transformation, flux linkage equations, voltage equation, formulation using state-space equations, normalizing voltage and torque eqns., equivalent circuit of synchronous m/c, the flux linkage state-space model. Linearization of the flux linkage model, Simplified linear model block diagram, state-space representation of simplified model.

UNIT II

DYNAMIC STABILITY:
State-space representation, stability of a dynamic system, analysis of stability, Eigen properties of the state matrix, Small signal stability of a single m/c infinite bus system, Effect of excitation systems, power system stabilizer, system state matrix with armature winding.
TRANSIENT STABILITY:
An elementary view of transient stability, numerical integration methods, simulation of power system dynamic response.

UNIT III

VOLTAGE STABILITY:
Basic concept related o voltage stability, voltage collapse, voltage stability analysis, prevention of voltage collapse.
FLEXIBLE AC TRANSMISSION SYSTEM:
FACTS definitions, review of FACTS devices, series compensation in transmission systems, cascade connection of components-shunt and series compensation.

UNIT IV

SUB-SYNCHRONOUS OSCILLATORS:
Turbine generator torsional characteristics, characteristics of series capacitor compensated transmission system, Self excitation, torsional interaction, counter measure to SSR problems, ferro resonance.
FACTS DEVICES:
Series connected controllers- inter line power flow controller(IPFC), thyristor controlled series capacitor(TSSC), thyristor controlled series reactor(TCSR), thyristor switch series reactor(TSSR). Shunt connected controllers- static synchronous compensator(STATCOM), static synchronous generator(SSG), battery energy storage system(BESS), super conducting magnetic energy storage(SMES), static VAR compensator(SVC), thyristor controlled reactor(TCR), thyristor switched reactor(TSR), thyristor switched capacitor(TSC), static VAR generator or absorber, static VAR system(SVS), thyristor controlled braking resistor(TCBR),Combined series-shunt connected controllers- unified power flow controllers(UPFC), thyristor controlled phase shifting transformer(TCPST), interphase power controller(IPC),Combined series-series controllers.

Text Books:

1. Power System Stability and Control by Prabha Kumar: MGH
2. Power System Control and Stability by Anderson and Fouad: Galgotia Publications

Reference Books:

1. Extra high voltage AC Transmission Engg. By Rokosh Das Begamudre
2. Electrical energy theory: An Introduction by O.I. Elgerd: TMH

NOTE:
In the Semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all, atleast one from each unit. All questions carry equal marks.

Approved by UG BOS & FET