Faculty of Engineering & Technology

Power System Analysis 2

Information :

Course Code :	EPR 512	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Specialization of Electrical Power Engineering

Instructor Information :

Title	Name	Office hours
Professor	Said Fouad Mohamed Mekhemar	2
Assistant Lecturer	Mohamed Abdallah Mahmoud Shaheen	6

Area Of Study :

Develop the students' knowledge about power system stability and dynamics.
Train students to analyze power system voltage stability problems.
Train students to analyze power system angle stability problems for both small and large disturbances.

Description :

Transients in electrical systems: Types of transients, Equivalent circuits of power system elements, Multi-machine linear systems, Maximum power and loading limit, Modeling of basic elements of electrical systems: Vector diagram representation, Simplified systems, Excitation and speed control systems, Block diagram representation, Simplified criteria of transient stability: Concept of transient stability, Equal area criterion, Numerical solutions of rotor electromechanical equation, Dynamic stability: Analysis of uncontrolled systems, Controlled systems, Power system stabilizers, Voltage stability of loads and power systems: Criteria of voltage stability, Voltage collapse in electrical power .

Course outcomes :

a.Knowledge and Understanding: :	
1 -	a1. Define different types of power system stability.
2 -	a2. State the swing equation in electrical units and per-unit forms.
3 -	a3. Demonstrate understanding of the equal area criterion.
4 -	a4. Model the power system components for small signal study.
5 -	a5. Define Synchronizing power and Damping coefficients
6 -	a6. Derive the maximum power equation under a given power factor.
7 -	a7. Derive the equations of PV and VQ curves
b.Intellectual Skills: :	
1 -	b1. Develop the power angle equation before, during and after fault.
2 -	b2. Evaluate the system transient stability using equal area criterion.
3 -	b3. Analyze the small signal stability of a single-machine infinite bus system.
4 -	b4. Analyze the voltage stability using PV curve.

5 -	b5. Use VQ curve to select suitable size of shunt capacitors for voltage stability requirements.
6 -	b6. Apply suitable numerical methods to solve the swing equation.
c.Professional and Practical Skills: :	
1 -	c1. Use of PowerWorld Simulator to analyze voltage stability problem.
d.General and Transferable Skills: :	
1 -	d1. Demonstrate efficient IT capabilities.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Power System Model for Stability: swing equation, Power-angle characteristics, Vector diagrams	5	3	2
Small Signal Stability of unregulated systems	5	3	2
Small Signal Stability of regulated systems	5	3	2
Transient Stability, Equal Area Criterion	5	3	2
Examples on Equal Area Criterion and Exam I	10	6	4
Introduction to Power System Stability	5	3	2
Numerical solution of swing equation	5	3	2
Transient Stability Enhancement Methods	5	3	2
Maximum Deliverable power for 2-node system and Exam II	10	6	4
PV curve and voltage stability	10	6	4
VQ curve and shunt compensation	10	6	4

Teaching And Learning Methodologies :

Interactive Lecturing.

Problem Solving.

Experiential Learning.

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
ÅFinal exam	40.00		
o Computer Project	10.00		
o In Class Quizzes	10.00		
o Mid-Term exams	30.00		
o Participations	10.00		

Course Notes :

No course notes are required

Recommended books :

1- Hadi Saadat, ñPower System Analysisò PSA Publishing, Third Edition, 2010.
2- Thierry Van Cutsem, Costas Vournas, ñVoltage Stability of Electric Power System", Springer, 1998.