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
Teaching Assistant	Mohamed Abdallah Mahmoud Shaheen	2

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 -	Define different types of power system stability.
2 -	State the swing equation in electrical units and per-unit forms.
3 -	Demonstrate understanding of the equal area criterion.
4 -	Model the power system components for small signal study.
5 -	Define Synchronizing power and Damping coefficients
6 -	Derive the maximum power equation under a given power factor.
7 -	Derive the equations of PV and VQ curves

b.Intellectual Skills: :

1 -	Develop the power angle equation before, during and after fault.
2 -	Evaluate the system transient stability using equal area criterion.
3 -	Analyze the small signal stability of a single-machine infinite bus system.

4 -	Analyze the voltage stability using PV curve.	
5 -	Use VQ curve to select suitable size of shunt capacitors for voltage stability requirements.	
6 -	Apply suitable numerical methods to solve the swing equation.	

c.Professional and Practical Skills: :

1 -	use of PowerWorld Simulator to analyze voltage stability problem.

d.General and Transferable Skills: :

1 -	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
Assignment	5.00		
Final exam	40.00		
Lab Project.	10.00		
Mid- Exam 1I	15.00		
Mid- Exam I	15.00		
Quizzes	15.00		

Course Notes :

http://www.fue.edu.eg

No course notes are required

<u>Recommended books :</u>

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

http://www.fue.edu.eg