FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

Faculty of Engineering & Technology

Computer Applications in Electric Power Engineering

Information :

Course Code :	EPR 511	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Specialization of Electrical Power Engineering

Instructor Information :

Title	Name	Office hours
Professor	Hossam Eldin Abdallah Talaat	8
Assistant Lecturer	Ahmed Moreab Hussien Mohamed	4

Area Of Study :

Develop the students' knowledge about load frequency control, underfrequency load shedding and SCADA systems.
Prepare students to analyze and solve load frequency control problems manually and using Simulink.
Prepare students to analyze and model the basic power system relationships using bus admittance and bus impedance matrices and solve fault problems manually and using MATLAB.

Description :

Introduction: Simulation of power system components, Formation of power system matrices: Input and transfer matrices, Admittance matrices of the bus bars, Impedance matrices. Large system simulation and programming, Power flow studies concepts and methods: Gauss-Seidel, Newton Raphson, Approximate and fast methods, Separation methods, Distribution factors, Transfer methods, Optimal performance, Generation control, Error analysis. SCADA system. Real system applications.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Outline the techniques of forming and modifying bus admittance and bus impedance matrices.
2 -	Describe the equations applying the bus impedance matrix to calculations of currents and voltages under symmetrical fault condition.
3 -	Explain basic concepts of load frequency control.
4 -	Describe the under-frequency load shedding problem.
5 -	Illustrate the function of each of the main components of a SCADA, Energy Management systems and Smart Grids
b.Intellectual Skills: :	
1 -	Form and modify bus impedance and bus admittance matrices under assumed conditions.
2 -	Apply bus impedance matrix to solve symmetrical fault problems.
3 -	Analyze the load frequency control of a single area during both steady-state & transients.
4 -	Solve the automatic generation control of a multi-area system at steady-state for different operating conditions.

5 -	Analyze under-frequency load-shedding schemes.
c.Professional and Practical Skills: :	
1 -	Develop MATLAB m-files for analyzing systems under symmetrical fault.
2 -	Develop a Simulink model to simulate load frequency control.
d.General and Transferable Skills: :	
1 -	Demonstrate efficient IT capabilities.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction to Computer applications in EPS	5	3	2
Load Frequency Control (LFC) and AGC of a Single-Area System: Modeling, Steady state response, Dynamic response and root-locus.	10	6	4
AGC of a Two-Area System: steady state equations	10	6	4
Application of Simulink to simulate LFC problems	5	3	2
Under-frequency Load Shedding	5	3	2
Power System Bus Matrices: Branch& node admittances	5	3	2
Modifications of Ybus, Network Incidence matrix	5	3	2
Modification of an existing Zbus, Direct determination of Zbus	5	3	2
Fault analysis using Zbus	5	3	2
MATLAB application to solve fault problems	10	6	4
SCADA, Energy Management Systems & Smart Grid	10	6	4

Teaching And Learning Methodologies :

Interactive Lecturing
Discussion / Debate
Problem based Learning
Experiential Learning

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
ÅFinal exam	40.00		
Mid-Term Exam I	15.00		
Mid-Term Exam II	15.00		
o Computer Projects	10.00		
o Quizzes	10.00		
Participation	10.00		

Recommended books :

1- John J. Grainger and William D. Stevenson, Jr., ñpower system analysisò, McGraw-Hill, Int. editions 1994.
2- Hadi Saadat, ñPower System Analysisò, McGraw-Hill, 1999.
3- D. Das, "Electrical Power Systems", New Age Int., 2006.