Academic Quality Assurance Department

Course Syllabus Form

College	Engineering and Technology		
Department	Electrical Engineering		
Program	Electrical Engineering		
Course Title	**Power System Planning and design**	**Course Number:**	12110531
Year	2023-2024	**Semester:**	Summer
Prerequisite(s)	Electrical Power Systems II		
Instructor	**Prof. Samer Alsadi**		
Instructor's e-mail	s.alsadi@ptuk.edu.ps , samer_sadi@yahoo.com		
Office Hours			
Class Time	08:00-10:00 Sun, Mon,Tus.	**Class Room:**	-
Course description	Demonstrate the ability to model power systems (convert a network one-line diagram into an impedance diagram, model transmission lines, transformers, generators, and loads, model the tap-changing transformer, model the dynamic generator using sub-transient, transient, and steady-state, reactances, Analyze the power flow of a simple interconnected power system with multiple sources and loads. Apply the principles of Gauss-Siedel, Newton-Raphson, and Decoupled power flow methods, calculate the voltage profile, power injections, and line flows of a network, build the bus admittance matrix from network data and a one-line diagram.		
Course Intended Learning Outcomes (CILOs)	**A) Knowledge and understanding** **1-** Describe the elements that make up a power system; **2-** Build basic understandings on modern power system operation; **3-** Model major components of power systems: three-phase power transformers, short, medium and long-transmission lines, loads, generators. Analyze the impact of different loading conditions on a transmission line; **4-** Explain and implement different means for voltage control and reactive power compensation in a power system; **5-** Describe and use per unit system to perform studies in power systems. **6-** Understand the basic concept of load flow analysis; **7-** Determine the optimal dispatch of generation in a power system. **B) Intellectual/Cognitive skills** **1-** Ability to understand the concept of MATLAB programming in obtaining Load curve; **2-** Ability to understand the concept of MATLAB programming in solving parameters and performance of a power transformer; **3-** Ability to understand the concept of MATLAB programming in solving short, medium and long transmission line performances; **4-** Ability to understand the concept of MATLAB programming in solving power flow analysis using Gauss-Siedel and Newton-Raphson methods; **5-** Ability to understand the concept of MATLAB programming in solving optimal dispatch of generation.		

	C) Subject specialization and practical skills **1-** Understand the computer techniques and algorithms used to obtain the transmission line parameters, line performance, compensation , solution of the load flow problem and optimal dispatch of generation; **2-** Identify and formulate engineering problems to solve problems in the field of electrical power engineering; **3-** Specify and evaluate manufacturing of components and equipment related to electrical power and machines. **D) General and transferable skills** **1-** Work cooperatively and effectively in a group **2-** Find information independently
Textbook(s)	"**Power system analysis**", Hadi Saadat, 1999.
Other required material (References):	**1-** "**Power system analysis**", Grainger, John J., William D. Stevenson, and William D. Stevenson. **2-** "**Power system analysis and design**", Gupta, B. R., and S. Chand.
Other Resources used (e.g. e-learning, field visits, periodicals, software, etc.)	Some Electronic resources, Websites related to the course: 1. https://www.youtube.com/watch?v=0T6QT2Pxr-4&list=PLYkE215HOwIYLU28cfGdE-hA7xs1F7PF0

Course Teaching Methods	
Teaching Method	**CILOs**
1- Lecturing	A1-A7
2- Presentation & Discussion	B1-B5; D1-D2
3- Discussion through field visits	C1-C3; D1-D2

Assessment Type	**Details/Explanation of assessment in relation to CILOs**	**Weight**	**Date(s)**
Midterm Exam	A1-A7; B1-B5	30	Week 10
Quizzes	A1-A7 B1-B5; D1-D2 C1-C3; D1-D2	30	During Semester
Assignments			
Presentation			
Final Exam	A1-A7; B1-B5	40	Announced by Registrar
Total		100%	

Academic Quality Assurance Department

Course Syllabus Form

Course Intended Learning Outcomes (CILOs)										
CILOs	**Mapping to Program ILOs**									
On successful completion of the course, students will be able to:	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**I**	**j**
A) Knowledge and understanding										
1- Describe the elements that make up a power system;										
2- Build basic understandings on modern power system operation;										
3- Model major components of power systems: three-phase power transformers, short, medium and long-transmission lines, loads, generators. Analyze the impact of different loading conditions on a transmission line;										
4- Explain and implement different means for voltage control and reactive power compensation in a power system;										
5- Describe and use per unit system to perform studies in power systems;										
6- Understand the basic concept of load flow analysis;										
7- Determine the optimal dispatch of generation in a power system										
B) Intellectual/Cognitive skills										
1- Ability to understand the concept of MATLAB programming in obtaining Load curve;										
2- Ability to understand the concept of MATLAB programming in solving parameters and performance of a power transformer;										
3- Ability to understand the concept of MATLAB programming in solving short, medium and long transmission line performances;										
4- Ability to understand the concept of MATLAB programming in solving power flow analysis using Gauss-Siedel and Newton-Raphson methods;										

5- Ability to understand the concept of MATLAB programming in solving optimal dispatch of generation.											
C) Subject specialization and practical skills											
1- Understand the computer techniques and algorithms used to obtain the transmission line parameters, line performance, compensation , solution of the load flow problem and optimal dispatch of generation;											
2- Identify and formulate engineering problems to solve problems in the field of electrical power engineering;											
3- Specify and evaluate manufacturing of components and equipment related to electrical power and machines.											
D) General and transferable skills											
1- Work cooperatively and effectively in a group											
2- Find information independently											

Course Weekly Breakdown

Week	Date	Topics Covered	CILOs	Lab Activities	Assessment
1	20/9	**The power system (an Overview)** **1.1** Introduction **1.2** Modern power system 1.2.1 Generation 1.2.2 Transmission	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
2	27/9	**The power system (an Overview)** **1.2** Modern power system 1.2.3 Distribution 1.2.4 Loads	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
3	4/10	**Basic Principles** **2.1** Power in single phase ac circuit **2.2** Complex Power **2.3** The complex power balance **2.4** Complex power flow	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final

4	11/10	**Network Calculations and Power Load Flow Analysis:** **3.1** Power Transformer **3.2** Equivalent circuit of a transformer **3.3** Determination of equivalent circuit parameters **3.4** Transformer Performance	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
5	18/10	**Network Calculations and Power Load Flow Analysis:** **3.5** The per unit system **3.6** Change of Base	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
6	25/10	**Line model and performance** **4.1** Short-line model **4.2** Medium-line model **4.3** Long-line model Inductance of single Phase Lines	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
7	1/11	**Line model and performance** **4.4** Voltage and current waves **4.5** Surge impedance loading **4.6** Complex power flow Through TL	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
8	8/11	**Line model and performance** **4.7** Power Transmission Capability **4.8** Line compensation **4.9** Line performance program	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
9	15/11	**Power Flow Analysis** **5.1** Power Flow Solution **5.2** Gauss-Seidel power flow Solution	A1-A7 B1-B5; D1-D2; C1-C3		In Midterm, Final
10	22/11	**Power Flow Analysis** **5.3** Line flows and losses **5.4** Tap changing Transformers **5.5** Power Flow programs **5.6** Data preparation	A1-A7 B1-B5; D1-D2; C1-C3		In Final
11	29/11	**Power Flow Analysis** **5.7** Newton-Raphson power Flow solution **5.8** Power flow analysis using Simulink	A1-A7 B1-B5; D1-D2; C1-C3		In Final

12	6/12	**Optimal Dispatch of Generation** **6.1** Introduction **6.2** Operating cost of a thermal plant	A1-A7 B1-B5; D1-D2; C1-C3		In Final
13	13/12	**Optimal Dispatch of Generation** **6.3** Economic dispatch neglecting losses and no generation limits	A1-A7 B1-B5; D1-D2; C1-C3		In Final
14	20/12	**Optimal Dispatch of Generation** **6.4** Economic dispatch neglecting losses and including generation limits **6.5** Economic dispatch including losses	A1-A7 B1-B5; D1-D2; C1-C3		In Final
15	27/12	**Optimal Dispatch of Generation** **6.6** Derivation of Loss formula	A1-A7 B1-B5; D1-D2; C1-C3		In Final
16	04/01	FINALS			

Prepared by:	**Prof. Samer Alsadi**	**Signature**	
Head of Department	**Dr. Nabeel Tanneh**	**Signature**	
Date	**21-07-2024**		