

## Faculty of Engineering & Technology

### Power System Analysis 1

**Information :**

**Course Code :** EPR 411

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Electrical Power Engineering

**Instructor Information :**

Title	Name	Office hours
Professor	Said Fouad Mohamed Mekhemar	7
Assistant Lecturer	Ahmed Moreab Hussien Mohamed	5

**Area Of Study :**

- 1-Demonstrate understanding of the fundamentals of both normal and abnormal operations of power systems.
- 2-Model the power system through bus admittance and bus impedance matrices.
- 3-Form and solve power flow equations.
- 4-Solve symmetrical fault problems and select suitable circuit breakers.
- 5-Solve unsymmetrical fault problems.

**Description :**

Symmetrical components: Synthesis of unsymmetrical phasor diagrams from their symmetrical components, Symmetrical components of unsymmetrical systems, Power in terms of symmetrical components, Positive, negative and zero phase sequence networks, Unsymmetrical faults: Shunt faults, Series faults, Network matrices: Network topology, System admittance and system impedance matrices, Load flow solutions and control: Load flow equations, The Gauss-Seidel method, Newton-Raphson method and approximations, De-coupled methods, Regulating transformers.

**Course outcomes :**

**a.Knowledge and Understanding: :**

1 -	Demonstrate knowledge and understanding of components and concepts of power systems.
2 -	Describe power system modeling.
3 -	Illustrate and describe solving symmetrical fault problems.
4 -	Illustrate and describe solving unsymmetrical fault problems

**b.Intellectual Skills: :**

1 -	Express ideas in structural and mathematical terms so that quantities evaluation is facilitated
2 -	Ability to apply different alternative solutions
3 -	Decide and choose among different solution alternatives.
4 -	Evaluate obtained results both individually or as a part of team

**c.Professional and Practical Skills: :**

1 -	Testing electrical components
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2 -	Implementation for simple power systems
3 -	Applying solution techniques on simple power systems in the lab.
<b>d.General and Transferable Skills: :</b>	
1 -	Write technical reports in accordance with standard scientific guidelines.
2 -	Work in a self-directed manner
3 -	Work coherently and successfully as a part of a team in the Lab
4 -	Analyze problems and use innovative thinking in their solution.

<b>Course Topic And Contents :</b>			
Topic	No. of hours	Lecture	Tutorial / Practical
Introduction, Power System Modeling and per unit system	12	6	6
Power flow problem; Gauss-Seidel & Newton-Raphson solution methods	18	9	9
Symmetrical fault analysis: Thevenin's & Zbus methods	12	6	6
Symmetrical components, Sequence networks of system elements	18	9	9
Unsymmetrical fault analysis: Thevenin's & Zbus methods	18	9	9

<b>Teaching And Learning Methodologies :</b>
Lectures
Tutorials
Laboratories

<b>Course Assessment :</b>			
Methods of assessment	Relative weight %	Week No	Assess What
Final Written exam	40.00	15	to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied
Mid-Term 1	15.00	11	to assess the skills of problem solving, understanding of related topics
Performance	10.00	14	to assess the performance of the student through overall course
Quiz 1 & Assignments 1	10.00	5	to assess the skills of problem solving, understanding of related topics
Quiz 2 & Assignments 2	10.00	9	to assess the skills of problem solving, understanding of related topics

**Recommended books :**

- 1- Hadi Saadat, Power System Analysis, McGraw-Hill, 2nd edition, 2004
- 2- J. D. Glover, M. S. Sarma and T. J. Overbye, "Power System analysis and Design", Cengage Learning, USA, 5th Edition, 2012.
- 3- J. J. Grainger and W. D. Stevenson, Jr., power system analysis, McGraw-Hill, Int. editions 1994.