Course Title	Power Systems: Analysis				
Course Code	ECE410				
Course Type	Compulsory				
Level	Bachelor (1st Cycle)				
Year / Semester	4th Year / 7th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	The objective of this course is to expose students to the fundamental concepts of electrical power systems, analysis and operation of components. Students develop skills for the analysis of power systems and acquire knowledge required to design and assess power systems, considering issues such as operational criteria, cost, relevant national regulations, safety criteria, environmental effect, sustainability and flexibility to suggest alternative solutions.				
Learning Outcomes	Upon successful completion of this course, students should be able to: • Explain the concepts, principles and theories in the analysis of power systems • Define the different parts of a power system and of the mathematical methods used in electrical power system engineering • Perform per-unit calculations • Analyse various types of transformers (single-phase and three-phase) • Apply the various matrix methods related to power systems • Evaluate power flow and control real and reactive power flows • Perform symmetrical component calculations • Analyse fault conditions including both balanced and unbalanced faults. • Model power system components (transformers, transmission lines, generators etc)				
Prerequisites	ECE320	Co-requisites	None		
Course Content	Introduction: Power in single- and three-phase. Overview of phasors. Complex power. Power in balanced three-phase circuits. Power transformers: Transformer, generator and load modelling. The ideal transformer. Equivalent circuit of transformer. The per-unit system definition. Transformer types. Transmission lines: Transmission line design considerations. Conductors. Inductance and capacitance. Transmission-line parameter computation (medium and short				

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<tr><td></td><td>line approximations, ABCD parameters). Transmission-line modelling. Equivalent π circuit.

Power flow analysis:
Problem definition and formulation. Power flow solution. Direct solution using linear algebraic equations (Gauss elimination). Iterative solution using Newton-Raphson (non-linear algebraic equations). Optimal power flow and state estimation. Large systems applications.

Power generation, control, economic dispatch and restructuring:
Generation control and frequency regulation. Generator-voltage control. Turbine-governor control. Load-frequency control. Corresponding models, automatic generation control (AGC), tie-line control. Economic dispatch.

Fault analysis:
General fault analysis. Network fault. Fault analysis techniques. Symmetrical components and sequence networks. Unsymetrical faults.</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>J.D. Glover and M.S. Sarma, Power System Analysis and Design, Thomson Learning

H. Saadat, Power System Analysis Second Edition, McGraw-Hill

A.R. Berger and V. Vittal, Power System Analysis, Prentice Hall</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Examinations</td><td>70%</td></tr><tr><td>Assignments/Lab</td><td>20%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>English</td></tr>
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