ECE 487	Power System Analysis	Page 1

Designation	Technical Elective		
Catalog Data	Introduction to the analysis of electric power systems. Modeling of power system components. Transmission line calculations and modeling. Power system configuration. Per-unit quantities. Power system modeling. Introduction to load-flow analysis.		
Prerequisites	ECE 315, ECE 385		
Lecture	Three 50-minute sessions per week		
Laboratory	Four assignments, eight 3-hour sessions in total and two projects, eight hours each		
Committee	M. Daneshdoost, C. Hatziadoniu, G. Galanos	Credit Hours ➔	4

Textbooks

Power System Analysis and Design (with CD-ROM), 3rd Edition, J. Duncan Glover and Mulukutla S. Sarma, Thomson-Engineering, 2001

References

- *Power System Analysis, 2nd Edition*, Hadi Saadat, McGraw-Hill, 2002
- *IEEE Transactions on Power Systems*
- *IEEE Transactions on Power Delivery*

Course Learning Outcomes / Expected Performance Criteria

Upon completion of the course, the students should be able to:

- Produce the positive sequence impedance diagram of a three-phase system. Perform three-phase power calculations. Find the series impedance and shunt susceptance of transmission lines given the physical parameters.
- Model transmission line systems using the short, medium, and long transmission line models. Obtain the line power transfer, reactive power consumption, and voltage profile in varying loading conditions. Design an optimal transmission line system to transmit a specified amount of power.
- Understand and explain the information that can be obtained from a load-flow study. Describe the power flow equations of a small balanced power system. Use Power World Simulator to model a given three phase transmission line system and balanced three-phase power system (generation, transmission, distribution).

Prerequisites by Topic

- Three-phase alternating current circuits
- Phasors
- Electric and magnetic fields
- Complex power
- Transformers and synchronous machines
- Linear algebra

Professional Component {Credit Hours}

Mathematics	-	Sciences	-	General Ed.	-	Eng. Science	2	Eng. Design	2

Course Topics

- Review of three-phase networks, complex power and the per-unit system {10 classes}
- Modeling of transformers and synchronous machines. System modeling. One-line diagrams. Positive sequence impedance diagrams {9 classes}
- Transmission lines. Series impedance. Inductance calculations for all types of transmission lines. Capacitance calculations. Effects of earth, spacing and bundled conductors. Tabular values of line reactance. Design transmission line to specifications {9 classes}
- Transmission lines. Current-voltage relation. Representation of short, medium, and long transmission lines. Reactive power compensation {7 classes}
- Network calculations. Nodal analysis. Bus-admittance matrix. Introduction to load-flow solution using the Newton-Raphson method {8 classes}

Laboratory Topics	Hours
1. Machine synchronization {Two 3-hour lab sessions}	6
2. Three-phase real and reactive power {Two 3-hour lab sessions}	6
3. Transmission Lines {Two 3-hour lab sessions}	6
4. Power Flow {Two 3-hour lab sessions}	6

Projects	Hours
Transmission line modeling	8
Power system modeling	8

CAD and Computer Tools Used

Power World Simulator

Assessment of the Contribution to Program Outcomes

Outcome ➔	1	2	3	4	5	6	7	8	9	10	11	12
Assessed ➔			x	x	x		x	x				

Last Review	Spring Semester 2007		
Course Coordinator	Dr. M. Daneshdoost	Signature	