ECE 4335 – Electric Machinery Analysis

Topical Outline

I. **Steady State Synchronous Machines** (Sarma 6.4 thru 6.7 and Chapter 8)

A. Per unit system and rated values
B. Review of basic operation
C. Salient pole machines
D. Design of machine windings and Finite Element Analysis of magnetic fields
E. Machine modeling
    1. Calculation of machine inductances
    2. Open and short circuit tests
    3. Leakage reactance measurement - Potier triangle
    4. Saturation modeling
F. Permanent magnet machines
G. Synchronous reluctance machines
H. Performance characteristics

II. **Dynamics Of Synchronous Machines** (Sarma 10.1 thru 10.4)

A. Coupled circuit (DQ) modeling of AC machines
B. Transient reactances and time constants
C. Transient parameters
D. Transient stability
E. Short circuit and sudden voltage change behavior
F. Constant flux linkage theorem
G. Time domain solution
H. Small signal modeling and block diagram
I. Control of synchronous generators

III. **Induction Machines** (Sarma Chapter 7)

A. Review of basic operation
B. Wound rotor machines
C. Squirrel cage machines
D. Double cage and deep-bar motors
E. Single phase machines
F. Linear induction motors

IV. **Scaling Laws for AC Machines**

V. **Design of Induction Machines** (Sarma 7.7)

A. Factors affecting main magnetizing inductance
B. Factors affecting leakage inductance
C. Slot design
D. Machine resistances, skin effect
E. Thermal design

VI. **Switched Reluctance Machines**