ECGR3142 Electromagnetic Devices

Course Description

Principles of operation and basic design features of electromechanical energy converters. Topics Include: The role of the magnetic field in transformers and electrical machines; Generation of induced voltages; Electromechanical torque development; Speed control; Circuit models and machine performance.

Course Objective

The purpose of this course is to prepare students for the analysis, operation, and control of electromechanical devices.

Course Lecturer

Jonathan Bird
Tel: 704-687-8595 Email: j.bird@uncc.edu
Office Hours: Thursday 2-5pm

Lecture Room: Woodward 125
Lecture Time: Monday and Wednesday, 2:00-3:15pm
Office: WH-210F

Teaching Assistant Office Hours

Kiran Uppalapati, Tuesday 10-12 in Woodward 200, email: kuppalap@uncc.edu

Course Prerequisite

ECGR 3121 (Introduction to Electromagnetic Fields) with a grade of C or better

Course Textbook

Slemon G. R., *Electric Machines and Drives*, Addison-Wesley Publishing Company, Inc. 1992

Reference Textbooks

Guru B. S., Hiziroğlu H. R. *Electric Machinery and Transformers*, 3rd Edition, Oxford University Press, 2000

Chapman S. J., *Electric Machinery Fundamentals*, 3rd Edition, McGraw-Hill, 1998

Fitzgerald A. E., Kingsley C., Umans S. D., *Electric Machinery*, 5th Edition, McGraw-Hill, 1992

Sarma M. S. *Electric Machines: Steady-State Theory and Dynamic Performance*, 2nd Edition, CL Engineering, 1994

Class Topics

- Magnetic systems: equivalent magnetic and field circuits, alternating excitation, energy in magnetic fields, hysteresis, eddy currents, core losses.
- Transformers: ideal transformers, equivalent circuit of a transformer, ratings, per unit system, measurements of transformer parameters, transformer parameters.
- Basic principles of electric machines: forces on electric circuits, elementary rotating machines, ferromagnetic actuator, reluctance machines.
- Commutator machines: magnetic systems, rotor windings and commutator, torque and generated voltage, equivalent circuit, steady-state performance, motor operation, generator operation.
- Induction machines: sinusoidally distributed windings, rotating magnetic field, torque production, squirrel cage rotor, equivalent, machines with multiple poles, single phase motors
- Synchronous machines: cylindrical machines, steady state equivalent circuit, operation, starting and excitation of synchronous machines, permanent magnet synchronous machines.

Grading

The final grade will be determined as follows:

Homework's	25%
Project	10%
Test 1, Test 2	35%
Final Exam	30%

Late homework can receive a maximum of 75%. No homework accepted after solutions have been released.