The University Of Sheffield.

Electronic & Electrical Engineering.

EEE349 POWER ENGINEERING ELECTROMAGNETICS

Credits: 10

Course Description including Aims

1. To develop an understanding of the physical behaviour of electric and magnetic fields.
2. To develop a mathematical basis for calculating electric and magnetic fields in engineering applications using analytical methods.
3. To apply these ideas to solve practical problems with a particular focus on electrical power applications.
4. To introduce students to numerical methods for calculating fields, including practical experience in using a commercial package for solving power engineering problems.

Outline Syllabus

- Introduction to static electric fields
- Introduction to static magnetic fields
- Introduction to Maxwell's equations
- Application of Maxwell's equations to electrostatic fields
- Application of Maxwell's equations to magnetostatic fields
- Numerical methods for calculating magnetic fields
- Magnetic field calculations in rotating electrical machines
- Low frequency time-varying fields

Time Allocation

24 lectures and 12 hours of tutorial support in support of lectures in weeks
3 hour introductory course to FEMM software
12 hours of timetabled drop-in sessions to assist with FEMM assignment – supported by demonstrators

Recommended Previous Courses

EEE223, MAS241

Assessment

The assessment will consist of two parts:

1. 2 hour written examination (accounts for 70% of final grade).
2. Individual assignment on using the FEMM finite element package to solve one electrostatic and one magnetostatic problem. This will be assessed by submission of a written report detailing results obtained and a 10 minute viva voce examination to explore understanding of the processes involved in the modelling (accounts for 30% of the final grade).

Recommended Books

Hammond, P.	*Electromagnetism for engineers*	Pergamon Press 1986
Cheng, D.K.	*Field and wave electromagnetics*	Addison-Wesley 1989
Demarest, K.R.	*Engineering Electromagnetics*	Prentice Hall, 1998
Hayt, W.H.	*Engineering Electromagnetics*	McGraw-Hill, 1989
Kraus J.D	*Electromagnetics*	McGraw-Hill, 1999

Objectives

On completion of the module successful students will be able to

1. perform a range of vector operations.
2. select and apply appropriate techniques for calculating electrostatic or magnetic fields in a range of practical devices.
3. identify and specify approximate models and boundary conditions for a range of devices.
4. use a finite element package to solve 2D electrostatic and magnetostatic problems in practical electrical power devices
5. appreciate the link between electromagnetic field calculations and the features and design of practical power engineering components, devices and industrial processes.