The University Of Sheffield.

Electronic & Electrical Engineering.

EEE6009 ADVANCED INSTRUMENTATION

Credits: 10

Course Description including Aims

This unit aims to provide students an introduction to advanced measurements techniques drawn from the research areas of the department. Teaching will be by lectures, demonstration, assignments and hands on measurements.

Outline Syllabus

General measurement uncertainties. Antenna measurements. Controlling a data acquisition device. Semiconductor laser characterisation. Introduction to materials imaging and analysis.

Time Allocation

24 hours

Recommended Previous Courses

MSc entry requirement

Assessment

Continual via 4 assessments, 1 from communications, 1 from machines and drives and 2 from semiconductor group.

Recommended Books

P.J Goodhew, J. Humphreys	*Electron microscopy and analysis*	Taylor and Francis, 2001
J.D. Kraus	*Electromagnetics*	McGraw-Hill, 1991

Objectives

At the end of the course successful students will be able to

1) Calculate the uncertainty of a set of measurements.
2) Calculate the gain of an antenna
3) Create a "virtual instrument" using the NI LabVIEW programming language
4) Use software and hardware to acquire, manipulate and display an analog signal from an external source
5) Experimentally extract important operating characteristics of semiconductor lasers s
6) Use and explain the operation of an optical spectrum analyzer
7) Describe the basic principles behind the operation and application of scanning and transmission electron microscopes
8) Describe the basic principles behind the operation and application of focused ion beam microscopy
9) Make an informed choice with regards to the selection of the most appropriate imaging and analysis technique to apply to solve a particular materials characterisation problem.

Detailed Syllabus

- Semiconductor lasers, their operating characteristics and how these can be measured
- Optical spectrum analyzer
- Using graphical programming software
- Data acquisition and manipulation
- Antenna theory including radiation pattern and gain
- General measurement uncertainties
- Scanning and transmission electron microscopy
- Chemical analysis in the electron microscope
- Introduction to focused ion beam microscopy
- Case studies involving analytical electron and ion beam microscopy