The University Of Sheffield.

Electronic & Electrical Engineering.

EEE262 COURSEWORK YEAR 2

Credits: 30

Course Description including Aims

This module is an academic year laboratory based module containing both set laboratory experiments and more open ended project work. The module aims are

1 To develop skills in experimental technique in a variety of different areas. To inculcate good lab book-keeping practice.

2 To expose students to a variety of measuring instruments ranging from very basic to very sophisticated.

3 To give students some experience of basic device fabrication processes.

4 Further to develop skills in observation of, and interpretation of, the physical behaviour of electronic systems.

5 To begin to appreciate the role of models and modelling in the technical design process, including the role of CAD in design evaluation.

6 Further to develop skills in the reporting and presentation of technical information.

7 To develop a critical attitude in students towards their own observations and those of others.

8 To be aware of experimental errors and of how to estimate their magnitude.

9 To develop the ability to search the literature for relevant information and make critical assessments of that information.

10 To introduce students to the dynamics of team working

11 To give projects the opportunity to work in groups on a problem presented to them by a local industrial company and to report their conclusions to company representatives both orally and in the form of a written report.

Outline Syllabus

AC Machines; Amplifiers; Microprocessors; Semiconductors; Transmission Lines; Signals and Systems (MATLAB based); Design Project; SHIPS industrial project

Time Allocation

150 contact hours of laboratory and project work over 2 semesters.

Recommended Previous Courses

EEE160 “Coursework Year 1” or equivalent practical experience

Assessment

Continuous via various types of report and oral presentation and peer assessment.

Recommended Books

Ellis, S. & Dick, P. *Introduction to Organisational Behaviour* (1st or 2nd ed) McGraw Hill

Kitchin, Duncan	*An introduction to organisational behaviour for managers and engineers :.. - 1st ed.*	Butterworth-Heinemann
Rickards, T	*Creativity and problem solving at work*	Gower

Objectives

On successful completion of this module students will be able to

1 choose appropriate measurement techniques for normal experimental environments
2 use oscilloscopes and other instruments capable of automated measurement, understand the way those measurements are taken and hence appreciate some limitations of automatic measurement systems.
3 use LABVIEW to manage an experiment
4 use MATLAB as a modeling tool
5 fabricate a simple semiconductor device and evaluate its performance
6 make technical design decisions in a design project where cost and time impose constraints
7 report the results of experimental and design work in clear and concise written form
8 present orally the results of project work to a peer group and to industrial visitors
9 search the literature for relevant information and make critical assessments of that information
10 use computer and analytical models in the technical design process
11 maintain an accurate record of their experimental activities in a lab book
12 appreciate and demonstrate some of the qualities that make a graduate employable.
13 understand how groups form, work and fail to work.
14 write an objective description of an industrial problem to be solved, together with the constraints associated with any solution, and a description of the company that provided the problem.
15 harness the creative resources of a group in order to generate ideas and solve problems.
16 communicate effectively both with colleagues and with other engineering professionals using written and oral methods.
17 appreciate the realities of solving technical problems subject to realistic constraints.
18 demonstrate skills in time-management and group working whilst tackling a time-limited task.
19 reflect on their performance to identify strengths and skills developed.
20 Appreciate that creativity can lead to enterprise.

Detailed Syllabus

The first semester's work includes six experiments varying between three and nine hours in length which are conducted in small groups.

1. **AC Machines**: this 9 hour laboratory exercise is concerned with the characterisation and testing of an induction motor and a synchronous motor. An assessed report is required for this laboratory exercise.
2. **Amplifiers**: this 9 hour laboratory exercise looks at the measurement of pulses, the characteristics of op-amp circuits and the design and operation of power-amplifiers (A, B, and A/B). Students attending this laboratory exercise will be marked as being Satisfactory/Un-satisfactory.
3. **Microprocessors**: this 9 hour laboratory involves the design, implementation, and testing of a digital-signal-processing algorithm running on a single-board computer with analogue input and output. An assessed report is required for this laboratory exercise.
4. **Semiconductors**: In this 9 hour laboratory students design, fabricate and evaluate a Schottky diode. An assessed report is required for this laboratory exercise.
5. **Transmission Lines**: In this 3 hour laboratory exercise the characteristics of a transmission line driven by a sinusoidal signal are explored and the idea of reflection and standing waves introduced.

Students attending this laboratory exercise are marked as being Satisfactory/Un-satisfactory.

6. **Signals and Systems**: This 6 hour laboratory, uses the facilities of MATLAB to investigate the dependency of non-sinusoidal periodic waveforms on the parameters of the harmonics in the frequency spectrum, to observe aliasing of sampled-signals, and investigate first and second order system responses. In-class assessment and log-book record are required.

Intensive workshop: The graduate labour market, Employability, Team roles & team building, Project planning, Introducing the Work Experience Portfolio.

Lecture Series:

1) The Forming of groups, Defining a group, FORMING, NORMING, PERFORMING, STORMING, RE(NORMING)FORMING
2) The forming and function of group culture, definitions of group culture, the house you live in as an example of a culture, general student culture and its function, E.H. Schein; artefacts, values basic assumptions. Culture as the solution to the need for inclusion and identity/control, power and influence/acceptance and intimacy.
3) How do groups cope with anxiety? Friendly Helper/Rational Thinker/Sturdy Battler. Bion's "as if" assumptions. A Gestalt perspective on how individuals prevent adult interaction. A Freudian perspective. Klien and Jung's taxonomy.
4) Communications theory.
5) How do groups fail to function? Social loafing. Ingroup/outgroup (Sherriff and Sherriff). Group Think. Abilene Paradox. The power of the majority. How to win as a minority. Shift to extreme.
6) Group decision making v. Individual decision making.
7) Neurotic organisations.
8) Leadership.
9) Political Processes in organisations – the reconciling of differences.
10) Stress in organisations – the cost to the individual and the organisation.
11) International Cultural Differences.
12) Motivating Groups.

SHIPS industrial project:

1) Introduction to the SHIPS program: what it is, why we do it and how it operates.
2) Collective ideas generation and problem solving ('ideas shower' – formerly known as 'brainstorming') Ideas selection.
3) Project planning: goal setting, milestones, deliverables, time-planning and critical paths.
4) Writing technical reports: knowing the audience, language, structure, graphics.
5) Giving oral presentations: knowing the audience, language, structure, delivery, visual aids.

Brief mention to creativity and its association with opportunities for enterprise.

The second semester's work consists of a design project and an industrial group project. The design project is an extended, 36 hour practical which will allows students to approach designing electronic or electrical devices or systems from a specification. Unlike previous experiments the route chosen to achieve the end results may be completely different from group to group as each group's work is researched and executed independently. The project runs over six weeks and the current list of projects available is:

1. **Microcontroller System Design**: This design exercise is concerned with the hardware and software design of a small microcontroller-based system intended to operate as a programmable lock. The software is implemented and tested using In-Circuit-Emulation and a prototype system. Each group is expected to submit a single report following this design exercise.
2. **Digital Design of a Simple Microprocessor**: This design exercise is concerned with the design and simulation of a small programmable processor based around a Field Programmable Gate Array

(FPGA). Each student is expected to submit a report following this design exercise.

3. **Yagi Antenna Design**: This design exercise is concerned with the design of a Yagi antenna and testing of a prototype in an anechoic chamber. Each group is expected to submit a single report following this design exercise.
4. **RF Amplifier for Cellular Telephones**: This design exercise is concerned with the design and test of a 900MHz amplifier intended for cellular telephones. Each group is expected to submit a single report following this design exercise.
5. **Power Electronics**: This design exercise is concerned with the design, implementation, and test of a Switch Mode DC-DC Converter. Each group is expected to submit a single report following this design exercise.
6. **Brushless DC Motor Design**: This design exercise is concerned with the design, fabrication and test of a 100W brushless DC motor. Each group is expected to submit a single report following this design exercise.
7. **MOSFET Power Amplifier**: This design exercise is concerned with the design and implementation of an audio power amplifier for Hi-Fi applications. Each group is expected to submit a single report following this design exercise and to make an oral presentation.
8. **Surface Acoustic Wave Filter**: This design exercise is concerned with the design, fabrication, and evaluation of a band-pass filter implemented using a Surface-Acoustic-Wave device. Each group is expected to submit a single report following this design exercise.