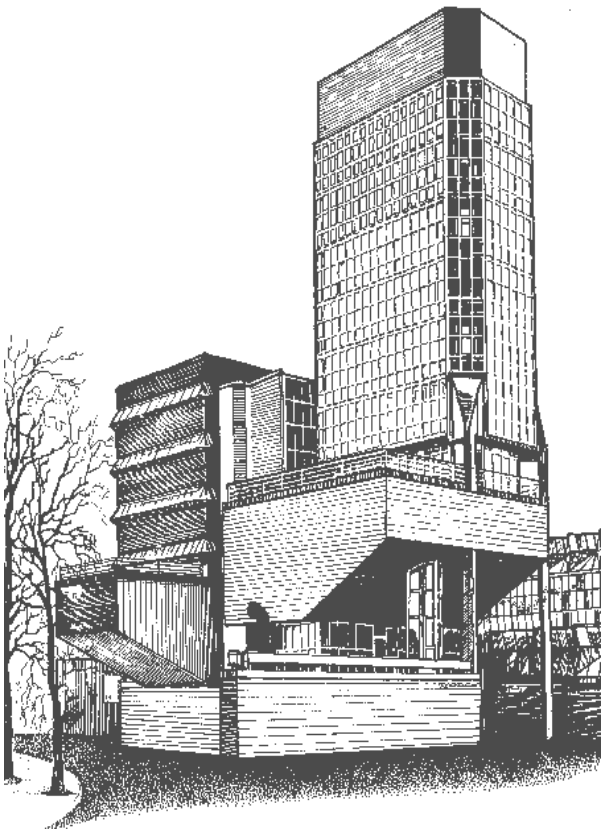
University of Leicester

# DEPARTMENT OF ENGINEERING



GUIDE TO

# POSTGRADUATE TAUGHT COURSES

Session 2009-2010

Contents Page

## 1 INTRODUCTION

Welcome to the University of Leicester and in particular to the Department of Engineering. We hope you will find the postgraduate course you are about to embark upon challenging and relevant and that you benefit from your studies. Equally important though, we hope that you enjoy your year at the University.

This handbook is intended to give you an overview of the course and provide you with the essential information that you need to acclimatise to your new working environment. Specifically it aims to:

- explain the structure of the department;
- draw your attention to the campus wide services provided by the University;
- provide detailed information regarding the academic content of the course and what is expected of you;
- explain the organisation of the teaching within the department and introduce you to the members of staff with whom you will interact most closely.

Make the most of the opportunity and the facilities that the department has to offer and we feel sure that you will have an enjoyable and rewarding year. Good Luck.

The Course Co-ordinators:
Declan Bates
Paul Lefley
David Siddle
Csaba Sinka

## 2 RESOURCES

### 2.1 The Department of Engineering

The Department has 33 academic staff (including 10 Professors) supported by 6 academic-related staff and 27 technical and clerical staff. Engineering is one of the largest Departments at Leicester and has over 250 undergraduate students and 195 postgraduates.

The Department is renowned for its research in the areas of Electrical Power, Radio Systems, Control and Instrumentation, Bio-Engineering, Mechanics of Materials, Thermofluids and Environmental Engineering.

The Department has, for several years, received significant funding from EPSRC but increasingly, with Technology Foresight in mind, this has been with strong industrial collaboration and an awareness of the end user. Currently, the Department has projects with nearly 40 companies.

In teaching, the Department is well known for its unified approach to Engineering. It offers MEng and BEng degrees in General Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Communications and Electronic Engineering and Embedded Systems Engineering; each is accredited by the relevant professional institution and all are recruiting well. The Department is registered with the IET as an approved provider of CPD (Continuing Professional Development).

Many of the staff are involved with consultancy work and the Department has considerable experience in providing short courses for industry.

As a postgraduate student, members of staff you primarily might wish to contact are:

| Function | Name | Room | Ext | email |
|---|---|---|---|---|
| Head of Department | Prof. J.C. Fothergill | E602 | 2547 | jcf@le.ac.uk |
| Postgraduate Tutor (from Jan 2010) | Dr. F.S. Schlindwein | E702 | 5053 | fss1@le.ac.uk |
| Acting Postgraduate Tutor (until January 2010) | Dr S Dodd | S311C | 2869 | sd195@le.ac.uk |
| Course Co-ordinators | Prof. D Bates (Control courses and Advanced Engineering) | E802 | 5642 | dgb3@le.ac.uk |
| | Dr. P. Lefley (Electrical) | E1002 | 2869 | pwl3@le.ac.uk |
| | Dr. C. Sinka (Mechanical) | MA220 | 2555 | ics4@le.ac.uk |
| | Dr. D. Siddle ( Information and Communications Engineering) | R12 | 1365 | drs13@le.ac.uk |
| Chair Staff-Student Committee | Dr. A. McEwan | R9 | 2672 | aam19@le.ac.uk |
| Computing Officer | Mr. A. Norman | R25 | 2563 | nja@le.ac.uk |
| Safety Officer | Mr. P.D. Williams | | 5271 | pdw@le.ac.uk |

Table 1: Departmental Organisation

#### 2.1.1. Communicating with Staff

This is probably best done by email or leaving a note in the staff pigeon-holes which are located in the General Office on the 5th Floor of the Engineering Tower. The General Office hours are: 9:00 a.m. - 12:30 p.m. and 1:30 p.m. - 5:00 p.m. Monday to Friday. Pigeon-holes for taught postgraduate Engineering students are situated on the first floor of the Engineering Tower.

Many members of staff prefer to use e-mail to contact students. E-mail addresses and room numbers of members of staff directly concerned with the Postgraduate Taught Courses are available from the Departmental homepage: http://www2.le.ac.uk/departments/engineering

### 2.1.2 Department Facilities

The Department has a computing suite dedicated to MSc student use, situated in South Block (MSc computing room). This is available outside of normal working hours (i.e. 24 hours per day, 7 days per week). There is also a general user computing facility in R Block. These machines are primarily used for teaching and certain hands-on sessions during which time access is restricted -- otherwise the area is open from 8:30 a.m. - 6:30 p.m.

### 2.1.3 Safety

You will be given an introductory talk within the Department and you will be issued with the Departmental Safety Manual. You should be familiar with the emergency procedures contained within the manual and keep it as additional guidance for any laboratory work which you undertake. Work in laboratories should only commence after consultation with the relevant laboratory/supervising technician.

As a member of the Department you are actively encouraged to report any dangerous incident or potential hazard that you come across to a member of staff. Such reporting is one of the main ways in which the Department can be kept safe and is welcomed.

Further details relating to safety can be found at: www.le.ac.uk/eg/safety

## 2.2 University Facilities

### 2.2.1 University Bookshop

The Bookshop is owned and managed by the University. Established in 1958 the bookshop moved to new premises on the ground floor of the David Wilson Library in April 2008.

All prescribed and recommended texts are kept in stock, so that students can rely on the Bookshop to supply all the books that they are encouraged to buy in the course of their studies. A wide range of paperbacks and books of general interest are also kept in stock. Any book not in stock can be quickly provided to order.

Maps, greeting cards, and a wide range of stationery items are stocked as well as University of Leicester branded merchandise including an ever changing range of clothing.

The opening hours are as follows:

Monday to Friday 9.00 a.m. - 5.30 p.m. (during term-time)
Monday to Friday 9.00 a.m. - 5.00 p.m. (during vacation)
Saturdays 9.00 a.m. - 12.30 p.m. (all year)

The Bookshop is open to the general public as well as to all students. In addition to accepting payment in cash, by cheque, Visa, Mastercard and Maestro, there is a mechanism by which money may be deposited with the bookshop by parents or friends and later used to purchase books and stationery.

Contact details: Telephone: 0116 229 7440
E-mail: bookshop@le.ac.uk

### 2.2.2 IT Services

Support for the University's central computing services is provided by staff in IT Services. The computing service used by most students is referred to as the CFS service and it makes use of Microsoft's Windows operating system to provide access to the Microsoft Office suite of programmes and other software that will help you with your studies.

**Computer Accounts:** When you complete your University registration you will be issued with an email address and a username for accessing the CFS service. NOTE: At the start of a new session special arrangements for registration will be in place and you will require your student (UCAS) number to register.

**The CWIS:** The CWIS is the University's Corporate Web Information Service and a web browser must be used to view the information available. The CFS service has Internet Explorer and when you run this browser on campus the University's "internal" home page will be displayed. Most of the content is provided by University staff and many departments will use this service to disseminate their information.

**Regulations of Use:** Students must abide by Senate's Regulations Concerning the Use of Computing Services. These regulations, which are available on the CWIS, state that "The staff of the University will at all times have authority to maintain good order in the use of the University's computing facilities and may suspend or exclude from their use any person who breaks these Regulations."

**Access to Computers:** Most of our teaching buildings have open access PC Areas where there are computers you can use and some of these rooms have overnight and week-end access. There are also several open access PC areas in the David Wilson Library. NOTE: "The University expects students to use computers in open access PC Areas only for legitimate academic purposes and with consideration for others' needs."

**Resources Protected by Athens:** The University subscribes to a number of database services which are protected by "Athens". To obtain access to these resources you must use your CFS username. NOTE: Support for these external services is provided by staff in the David Wilson Library.

**Remote Access to University Email:** You can use the Outlook Web Access service to obtain secure access to your University email from anywhere in the world. A web browser is required and the address for this service is http://webmail.le.ac.uk/ NOTE: Your CFS username and password will be requested**.**

**Wireless Network Service**: The Wireless Network service is freely available to all members of the University and it provides Internet web browsing and access to your University email and CFS files. You can also access Blackboard, the University's Virtual Learning Environment (VLE), and if registered you can obtain access to the ULTRA service (which runs Linux). NOTE: Your laptop must be suitably configured to connect to the Wireless Network service.

**Halls of Residence Network**: Facilities for internet access are available in all of the study rooms in University accommodation. This residential network, which is provided by a commercial ISP, can be used to access the University's central computing services.

**Printing Facilities:** Registered students may use the printers in our PC Areas. The costs of printing are automatically debited from your 'Print and Copy' account which is created when you register for a computer account. For more information about the printing facilities available please visit the IT Services website (below).

**IT Problems:** If you are on campus and have an IT related problem or query you can visit the Help Zone in the David Wilson Library. This is a combined Library and IT Services one-stop-shop for help and support. You can also contact the IT Service Desk (email: ithelp@le.ac.uk or tel: 0116-252-2253) or your department may have computer support staff who can offer you help.

**ITS Website:** For more information about the services and support available visit the IT Services website at http://www.le.ac.uk/its/

**Contact Details**
IT Service Desk
Open: Monday to Friday, 9:00 - 17:00
Tel: 0116-252-2253
Email: ithelp@le.ac.uk

### 2.2.3 Library Services

**Facilities:**
Using the University Library will make a key contribution to success in your studies. The Library comprises the award winning David Wilson Library on the main campus, and the Clinical Sciences Library at Leicester Royal Infirmary. Both offer inspirational, state-of-the-art services and facilities, comprising in total 1700 study spaces, over 370 student PCs and Wi-Fi throughout both buildings. The David Wilson Library also provides 13 group study rooms bookable only by students, and a Graduate School Reading

Room exclusive to postgraduate students. Self-service photocopiers are available at both libraries and all students have an electronic 'Print & Copy Account' which can be credited to pay for photocopying.

Opening hours are generous; during the Autumn and Spring terms the David Wilson Library is open weekdays from 8am until midnight, and during the summer examination period it opens 24/7. The Clinical Sciences Library is open 24/7 all year round.

Entrance to the libraries requires a Student ID/University Library card which is issued as part of registration. To make full use of the library catalogue you need a Library PIN, which is sent to your University of Leicester email address. For security your card and PIN should not be shared with anyone.

**Library Regulations and Charges**
As a registered student Senate's Library Regulations apply; these can be found at http://www.le.ac.uk/li/about/regulations.html . The Librarian, or any person nominated by the Librarian can apply sanctions, or levy a fine on any user who breaks University regulations.

See http://www.le.ac.uk/li/about/policies.html for current charges and other fees.

**The Library's Collections**
The Library's collections are significant with over 1 million books and journals.

The Library's online catalogue https://library.le.ac.uk enables you to search for books both print and electronic, and printed journals. You can borrow books and journals and issue them at the self service machines in both Libraries. The number of items that you can borrow will depend on which course you are on, see www.le.ac.uk/li/services/borrowing.html for details. Normal loan books can be borrowed for up to four weeks, but may be recalled because another user wants the book. The original due date will be shortened and the book must be returned by the new date. Loans can be renewed using the Library catalogue, email or telephone. Please renew on time to avoid a fine. Books in heavy demand are in short loan, housed in the David Wilson Library Express Zone.

Leicester Digital Library – www.le.ac.uk/li/digital

- Our digital library is tailored to help you through your studies, offering both on and off campus access to electronic books, 18,000 journals, and databases through the internet.
- Subject Rooms provide an ideal starting point for your studies, bringing together the resources in your subject.
- Leicester e-link lists our electronic journals.
- Blackboard has a myLibrary section.

Your CFS user name and password, which you get when you register, is needed to access the digital library off campus. For more details on accessing the digital library off campus see http://www.le.ac.uk/li/digital/accessoffcampushelp.htm

**Support**

- For help with using the Library visit our web pages which include opening times,services, introductory podcasts, online tutorials in the David Wilson Library visit the Help Zone on the ground floor for both Library and IT enquiries
- The Help Team are there to offer advice; look out for their blue or purple shirts
- Pick up one of our printed guides in the Library
- Many departments organise introductory sessions to the Library during the first term
- Ask the Information Librarian who specializes in your subject area (see website for details)
- Email or phone our Enquiry Service (see contact details below)

Distance Learners and part-time research students can use the Library's Distance Learning Service, which offers additional help in obtaining material. See www.le.ac.uk/li/distance

Students with dyslexia and other specific learning difficulties, disabilities and long term conditions can make use of additional services and facilities. See www.le.ac.uk/li/disabilities for details.

The Library welcomes feedback from students, and a comment form is available at www.le.ac.uk/library/about/comments.html or in the Libraries.

We look forward to seeing you in the Library.

Contact Details

Web site: www.le.ac.uk/library

David Wilson Library:
email: libdesk@le.ac.uk
Tel: (0116) 252 2043

Clinical Sciences Library:
Email: clinlib@le.ac.uk
Tel: (0116) 252 3104

## 3 COURSE DETAILS, AIMS and STRUCTURE

The course represents twelve months full-time for the MSc degree (September to September the following year). It may also be taken on a part-time basis over a period not exceeding four years. There are also opportunities to take a subset of the course for the award of a Postgraduate Diploma or Postgraduate Certificate. These may also be taken on a part-time basis over a period not exceeding four years.

### 3.1 Embedded Systems and Control

The course will provide the knowledge and skills required of a Professional Engineer to design embedded systems for use in control, diagnostics, monitoring and communications. State-of-the-art techniques in control system design, signal processing and software design will be core elements of the course.

The MSc in Embedded Systems and Control module programme has been scheduled as follows:-

| | Credits | Dates |
|---|---|---|
| Induction | 0 | Week 1 / Semester 1 |
| MATLAB and CAD | 15 | Semester 1 |
| Individual Project | 60 | Semester 2 / Summer |
| Modelling and Classification of Data | 15 | Semester 1 |
| High Reliability Embedded Systems | 15 | Semester 1 |
| Robust Control | 15 | Semester 1 |
| Design of Discrete Systems | 15 | Semester 2 |
| Real-Time Signal Processing | 15 | Semester 2 |
| Embedded Systems for Condition Monitoring and Control | 15 | Semester 2 |
| Nonlinear Control | 15 | Semester 2 |

### 3.2 Information and Communications Engineering

The processing of data and signals digitally together with the communication of such information over fixed and wireless links is of major importance in many aspects of modern engineering. This course aims to develop a good understanding of digital signal processing, radio systems and digital communications together with topics covering real-time implementation of the signal processing techniques. The theoretical aspects of the course will be reinforced with extensive "hands-on" exercises to further develop understanding.

| | Credits | Dates |
|---|---|---|
| Induction | 0 | Week 1 / Semester 1 |
| MATLAB and CAD | 15 | Semester 1 |
| Individual Project | 60 | Semester 2 / Summer |
| Modelling and Classification of Data | 15 | Semester 1 |
| High Reliability Embedded Systems | 15 | Semester 1 |
| Radio Systems | 15 | Semester 1 |
| Design of Discrete Systems | 15 | Semester 2 |
| Real-Time Signal Processing | 15 | Semester 2 |
| Digital Communications | 15 | Semester 2 |
| Radio Communications | 15 | Semester 2 |

### 3.2 Advanced Mechanical Engineering

The course aims to introduce and develop state-of-the-art methodologies and techniques relevant to current and future strategies for the design of mechanical systems and components. Particular attention will be given to the development of investigative, modelling and computational strategies. The course covers fluid dynamics, solid structures, advanced and conventional materials, and control systems.

| | Credits | Dates |
|---|---|---|
| Compulsory Modules: | | |
| Induction | 0 | Week 1 / Semester 1 |
| MATLAB and CAD | 15 | Semester 1 |
| Individual Project | 60 | Semester 2 / Summer |
| Select three modules from: | | |
| Modelling and Classification of Data | 15 | Semester 1 |
| Robust Control | 15 | Semester 1 |
| Advanced Fluid Dynamics | 15 | Semester 1 |
| Advanced Solid Mechanics | 15 | Semester 1 |
| Understanding Surfaces in Engineering | 15 | Semester 1 |
| Select four modules from: | | |
| Design of Discrete Systems | 15 | Semester 2 |
| Real-Time Signal Processing | 15 | Semester 2 |
| Computational Fluid Dynamics | 15 | Semester 2 |
| Advanced Computational Methods in Materials Modelling & Engineering Design | 15 | Semester 2 |
| Nonlinear Control | 15 | Semester 2 |
| Dynamics of Mechanical Systems | 15 | Semester 2 |
| Aerospace Engineering | 15 | Semester 2 |

### 3.4 Advanced Electrical and Electronic Engineering

The course provides a coherent selection of electrical and electronic engineering subjects to advanced level. Module combinations include communications and signal processing through control engineering to electrical machines and drives. The course is ideal for the engineer who wishes to follow a career in the design and implementation of electrical and electronic circuits within the wider engineering environment.

| | Credits | Dates |
|---|---|---|
| Compulsory Modules: | | |
| Induction | 0 | Week 1 / Semester 1 |
| | | |
| MATLAB and CAD | 15 | Semester 1 |
| Individual Project | 60 | Semester 2 / Summer |
| | | |
| Select three modules from: | | |
| Modelling and Classification of Data | 15 | Semester 1 |
| Robust Control | 15 | Semester 1 |
| Radio Systems | 15 | Semester 1 |
| High Reliability Embedded Systems | 15 | Semester 1 |
| Electrical Machines and Drives | 15 | Semester 1 |
| | | |
| Select four modules from: | | |
| Design of Discrete Systems | 15 | Semester 2 |
| Real-Time Signal Processing | 15 | Semester 2 |
| Digital Communications | 15 | Semester 2 |
| Electronically Controlled Motor Drives | 15 | Semester 2 |
| Advanced Computational Methods in Materials Modelling & Engineering Design | 15 | Semester 2 |
| Nonlinear Control | 15 | Semester 2 |
| Introduction to Biomedical Engineering | 15 | Semester 2 |

### 3.5 Advanced Control and Dynamics

This course will provide the knowledge and skills required of a professional engineer to design advanced control systems for complex dynamical systems. The course includes advanced modules on dynamical systems and control theory and also covers the latest techniques for implementing these technologies on a range of high-performance applications.

| | Credits | Dates |
|---|---|---|
| Compulsory Modules: | | |
| Induction | 0 | Week 1 / Semester 1 |
| | | |
| MATLAB and CAD | 15 | Semester 1 |
| Individual Project | 60 | Semester 2 / Summer |
| | | |
| Modelling and Classification of Data | 15 | Semester 1 |
| High Reliability Embedded Systems | 15 | Semester 1 |
| Robust Control | 15 | Semester 1 |
| | | |
| Select three modules in semester 2 are chosen from: | | |
| Design of Discrete Systems | 15 | Semester 2 |
| Real-Time Signal Processing | 15 | Semester 2 |
| Introduction to Biomedical Engineering | 15 | Semester 2 |
| Nonlinear Control | 15 | Semester 2 |
| | | |
| In addition, one module in semester 2 is chosen from: | | |
| Dynamics of Mechanical Systems | 15 | Semester 2 |
| Advanced Engineering Dynamics | 15 | Semester 2 |

### 3.6 Control and Signal Processing

This course will provide the knowledge and skills required of a professional engineer to design control and signal processing systems for complex embedded systems. The course includes modules on advanced control theory and digital signal processing, and also covers the latest software techniques for implementing these technologies on a range of high-performance applications.

| | Credits | Dates |
|---|---|---|
| Compulsory Modules: | | |
| Induction | 0 | Week 1 / Semester 1 |
| MATLAB and CAD | 15 | Semester 1 |
| Individual Project | 60 | Semester 2 / Summer |
| Modelling and Classification of Data | 15 | Semester 1 |
| High Reliability Embedded Systems | 15 | Semester 1 |
| Robust Control | 15 | Semester 1 |
| Design of Discrete Systems | 15 | Semester 2 |
| Real-Time Signal Processing | 15 | Semester 2 |
| Introduction to Biomedical Engineering | 15 | Semester 2 |
| Nonlinear Control | 15 | Semester 2 |

### 3.7 Advanced Engineering

This course provides the student with the opportunity to study subjects from a broad range of Engineering disciplines. For example, the Department offers modules in mechanical, electrical, electronic, software and communications engineering. This wide spectrum of topics enables students to study new areas of interest as well as deepening their knowledge of others. Since industry increasingly uses multidisciplinary teams, an understanding of a variety of Engineering subjects may form a key part of career development.

In addition, three modules in semester 1 and four modules in semester 2 are chosen from all available MSc modules (listed below). Note that some semester 2 modules may have semester 1 prerequisites and timetabling problems may also limit the choice of modules (please see course director for details).

| | Credits | Dates |
|---|---|---|
| Compulsory Modules: | | |
| Induction | 0 | Week 1 / Semester 1 |
| MATLAB and CAD | 15 | Semester 1 |
| Individual Project | 60 | Semester 2 / Summer |
| Select three modules from: | | |
| Modelling and Classification of Data | 15 | Semester 1 |
| Robust Control | 15 | Semester 1 |
| Radio Systems | 15 | Semester 1 |
| High Reliability Embedded Systems | 15 | Semester 1 |
| Electrical Machines and Drives | 15 | Semester 1 |
| Advanced Fluid Dynamics | 15 | Semester 1 |
| Advanced Solid Mechanics | 15 | Semester 1 |
| Understanding Surfaces in Engineering | 15 | Semester 1 |
| Select four modules from: | | |
| Design of Discrete Systems | 15 | Semester 2 |
| Real-Time Signal Processing | 15 | Semester 2 |
| Digital Communications | 15 | Semester 2 |
| Electronically Controlled Motor Drives | 15 | Semester 2 |
| Advanced Computational Methods in Materials Modelling & Engineering Design | 15 | Semester 2 |
| Nonlinear Control | 15 | Semester 2 |

| | | |
|---|---|---|
| Introduction to Biomedical Engineering | 15 | Semester 2 |
| Computational Fluid Dynamics | 15 | Semester 2 |
| Embedded Systems for Condition Monitoring and Control | 15 | Semester 2 |
| Radio Communications | 15 | Semester 2 |
| Dynamics of Mechanical Systems | 15 | Semester 2 |
| Advanced Engineering Dynamics | 15 | Semester 2 |
| Aerospace Engineering | 15 | Semester 2 |

### 3.8 Assessment

The taught modules are assessed by means of written examination papers and a range of continuously assessed work. In addition, MSc students are required to produce an individual project report. See also section 4.

### 3.9 Qualifications Awarded

**Masters**

To be awarded a Master's Degree a candidate must:

(i) obtain a credit-weighted average from 180 credits of not less than 50%;
(ii) have satisfactorily completed all course work requirements, including obtaining a mark of 50% or more in the individual project.

To be awarded a Master's Degree with merit a candidate must:

(i) obtain a credit-weighted average from 180 credits of not less than 60%, including obtaining a mark of 60% or more in the individual project;
(ii) have satisfactorily completed all coursework requirements.

To be awarded a Master's Degree with distinction a candidate must:

(i) obtain a credit-weighted average from 180 credits of not less than 70%, including obtaining a mark of 70% or more in the individual project
(ii) have satisfactorily completed all coursework requirements.
(iii) Borderline candidates may be awarded a distinction at the discretion of the Board of Examiners. Borderline candidates are defined as those with a credit-weighted average of between 67.5% and 70%

**Postgraduate Diploma**

To be awarded a Postgraduate Diploma a candidate must:

(i) obtain a credit-weighted average mark from 120 credits of taught modules of not less than 50%
(ii) have satisfactorily completed all coursework requirements.

To be awarded a Postgraduate Diploma with merit a candidate must:

(i) obtain a credit-weighted average mark from 120 credits of taught modules of not less than 60%
(ii) have satisfactorily completed all coursework requirements.

To be awarded a Postgraduate Diploma with distinction a candidate must:

(i) obtain a credit-weighted average mark from 120 credits of taught modules of not less than 70%
(ii) have satisfactorily completed all coursework requirements.
(iii) Borderline candidates may be awarded a distinction at the discretion of the Board of Examiners. Borderline candidates are defined as those with a credit-weighted average mark between 67.5% and 70%

**Postgraduate Certificate**

To be awarded a Postgraduate Certificate a candidate must:

(i) obtain a credit-weighted average mark from 60 credits of taught modules of not less than 50%
(ii) have satisfactorily completed all coursework requirements.

### 3.10 Resits

i) Candidates who do not obtain the required average mark of 50% in the 180 credits for the MSc (120 credits for the Diploma; 60 credits for the Postgraduate Certificate) will be allowed **one opportunity to resit the following year** all modules for which they obtained a mark of below 50% with the exception of the individual project and any other modules identified in the course handbook.

ii) The mark obtained for resubmitted work or a re-sit will be capped at 50%.

iii) The resits will take place without residence in January, June or September of the following year as appropriate for a given module. Normally there is **no opportunity to resit laboratory based work or course work**. In such a case the resit mark for the module carries forward the original marks for the laboratory and course work.

**Note:**
Upon satisfactory completion of the course, candidates will be awarded one qualification only.

### 3.11 Late Submission of Work

The penalty for the late submission of continually assessed work, reports etc. will usually be a deduction of 10% of the available marks for assessment on the first day after the expiry of the deadline and 5% on each of the subsequent 10 working days. Late submission of work in some modules will incur a different penalty. Information will be given by the module co-ordinator.

## 4 INDIVIDUAL PROJECT

The Individual Project defines the difference between the MSc degree and the Postgraduate Diploma award. It has a weighting of 60 credits, which is one third of the degree mark and is therefore a crucial aspect of the course. The Individual Project enables MSc candidates to integrate the knowledge learnt during the course in the practice of an engineering task.

The Individual Project runs from November to July and is comprised of three main stages: project selection, planning and execution.

### 4.1 Project selection (November to December)

During the project selection stage, MSc candidates are invited to talk to academic staff at the Department of Engineering in order to identify a common area of interest. All members of the academic staff propose their own projects, some of which may have a substantial industrial content. These projects are grouped in a list available from the Individual Project Co-ordinator at the end of Week 10. Students shall select a project relevant to their degree. More detailed information will be given at this time.

### 4.2 Project planning and preparation (January to April)

Project planning involves the MSc candidate researching the topic of interest using a variety of resources available on campus, such as the library, the electronic databases, Internet resources, and the project supervisor's own collection of references. The use of external sources is encouraged but the student must have collated and processed the information independently and reference them accordingly. A Project Proposal of no more than 500 words is produced at the end of the project planning stage. Project preparation is also undertaken at this stage which may require some design work and use of the workshop where necessary to prepare for the project execution.

### 4.3 Project execution and reporting (May to July)

The Individual Project is executed from May to July and a project report is produced and submitted at the beginning of August. The report is assessed on the basis of the academic/technical level of the work, the project management and quality control of the activities, and the professionalism with which the report is put together and presented.

The contribution to the Individual Project mark includes supervised work, technical achievement, and the final project report.

Detailed guidelines for the various project stages will be issued at the appropriate times during the course of the year.

Failure to submit a final report within the time limits given in the guide to MSc projects without due reason will result in the candidate being considered for the award of a Postgraduate Diploma.

## 5 STUDENT SUPPORT

Each student will be assigned a personal tutor at the start of the course to act mainly in a pastoral role. Tutorials will be arranged in weeks 2, 6 and 10. The induction week will include a departmental safety briefing and introductory talks relating to the library information/retrieval systems and a description of the departmental computer facilities. Further information regarding the course and its administration may be obtained from the Course Co-ordinators and the Postgraduate Tutor.

You can arrange an appointment to see your tutor privately when necessary. He or she can:

- advise you on general academic matters, assessment procedures and your general academic progress and act as a link between yourself and the Department and University authorities;
- advise you about the support services provided centrally within the University (counselling, welfare, special needs, etc);
- discuss non-academic matters with you, if you so wish;
- speak on your behalf, if necessary, at examiners meetings and appeals hearings;
- provide references, if required.

It is important to let your tutor know of any personal problems which may affect your work. Special consideration can often be given by the appropriate Examination Board, where circumstances justify it, if the Department is informed in a timely manner.

If you cannot get the help you need from your tutor, or you would prefer to discuss a particular problem with someone else, you should contact the Acting Postgraduate Tutor, Dr Stephen Dodd (S Block Room 311C; Tel: (0116) (252) 2869: email sd195@le.ac.uk (until January 2010) or the Postgraduate Tutor, Dr. Fernando Schlindwein (Room E702; Tel: (0116) (252) 5053; e-mail: fss1@le.ac.uk after January 2010). If you need advice urgently and no one else is available you should contact the Departmental Administrator, Tamar Challis (Tel: (0116) (252) 2531).

The Student Support and Development Service (SSDS) provides development and support services in the following areas:

**Learning and Career Development**

### 5.1 Student Development

Whether it's developing the skills you need to succeed on your course, or in your life beyond university, Student Development is here to support and facilitate your academic, professional and personal development.

Visit the Student Development Zone in the David Wilson Library to access our extensive range of resources: we have over 50 different study guide titles and 20 career development guides, so whether it's writing better essays or building a CV, instant advice is available to take away. You can also access these resources from our website along with a range of online resources such as interactive study skills tutorials and videos on developing your career prospects.

One-to-one advice is available via study consultations, research consultations, maths help and careers consultations. You can see our advisors face-to-face in the Student Development Zone or use our website to find out how to access our services remotely. Every term, we have a busy programme of interactive workshops covering a diverse range of topics. Our learning development titles range from avoiding plagiarism to improving your essay writing, to giving effective presentations. Career

development titles cover all the essential areas such as CV writing, job searching, application forms and interview skills.

Student Development provides lots of opportunities for you to develop your employability skills whilst at University. We maintain strong links with employers and advertise their vacancies and work experience opportunities through JOBSonline (on our website). We have a busy programme of employer-led events, from skills workshops to careers fairs, and we organise numerous opportunities for you to make the most of your time at University. Choose from a wide range of volunteering opportunities, work placement schemes and enterprise activities, or take an accredited programme and gain a Leicester Award in Employability skills.

Research postgraduates are catered for with resources, events and training specific to their needs: from Starting your PhD workshops to University-wide events such as the Annual Festival of Postgraduate Research.

To find out more about how Student Development can enhance your success at university and beyond, visit our website.

Contact: Student Development, Student Development Zone, Second Floor, David Wilson Library
Tel: 0116 252 5090
Email: studentdev@le.ac.uk
Website: www.le.ac.uk/studentdevelopment

### 5.2 AccessAbility Centre

The Centre offers a range of services to all University of Leicester students who have specific learning difficulties, such as dyslexia, disabilities or long-term conditions. Staff offer one-to-one support, assessment of dyslexia, the co-ordination of alternative examination arrangements and assistance with applications for the Disabled Students' Allowance. The open access Centre acts as a resource base for students and staff and is a relaxed place for students to work. Its computers are equipped with specialised software for speech output (essay planning software and basic speech output software are on the University wide CFS network). Low-level photocopying, printing and scanning facilities are also available. The Centre welcomes self-referrals as well as referrals from academic staff.

Contact: AccessAbility Centre, AccessAbility Zone, David Wilson Library.
Tel/minicom: 0116 252 5002,
Fax: 0116 252 5513,

Email: accessable@le.ac.uk,
Website: http://www.le.ac.uk/accessability/

### 5.3 Education Unit, Students' Union

The Education Unit is one of the main and crucial services that the Students' Union provides for students. It is overseen by the Academic Affairs Officer and is staffed by two full time members of staff. The Education Unit provides an impartial and confidential service to help and advise students about options available to them on a wide range of topics such as academic appeals, changing courses, leaving University, or simply to offer guidance about where to go and what to do.

The Unit is based within the Student Support Centre on the ground floor of the Percy Gee Building and is open weekdays from 10.00 a.m. till 4.00 p.m. You can either pop in or book an appointment in advance by contacting us on the details below. The service is available for all students and you can be assured that the Education Unit has a policy of treating all casework in the strictest of confidence and will not take any action on issues you raise without your consent.

Phone: 0116 223 1111/1132
E-mail: educationunit@le.ac.uk
Website: http://www.leicesterstudent.org/pages/support/education

## 6 HEALTH

### 6.1 Notification of Ill Health

The following arrangements govern the notification by students of ill health:

Students who suffer a minor illness for a period of less than seven days are required to report this to their departments:

(a) if the illness leads to absence from classes at which attendance is compulsory;
(b) where it might be a contributory factor in a failure to meet course deadlines or to perform up to expectations in any academic assignment.

Students must self-certify their illness using a standard form available from departmental offices, and must report the illness as soon as they are fit to do so.

Where the illness is of more than seven days' duration or is of a non-minor nature, medical advice should be sought and a medical certificate submitted to the University. Students are responsible for collecting medical certificates from the Freemen's Common Health Centre and supplying a copy to their department and to the Registry (for postgraduate taught students and undergraduate students other than MBChB students), the Medical School Office (for MBChB students,), or the Graduate Office (for postgraduate research students). Students registered with other general practices should ensure that their medical certificates are similarly distributed.

The seven-day ruling is suspended by the Freemen's Common Health Centre during the First and Second Semester and September examination periods, when it is the responsibility of students to seek medical help as soon as possible for any ill health experienced during, or near to, the examinations.

It is the responsibility of students who are required to produce medical evidence of fitness to continue or resume study to acquire such evidence by the date specified to them by the Registry, the Graduate Office or the Board of Examiners.

Freemen's Common Health Centre now charges the University for providing medical certificates and reports. Students and tutors may be asked to complete an application form before a letter is written (this request form is submitted to Freemen's Common Health Centre through the Student Welfare Service for audit purposes). Other general practices may charge for providing reports and such charges must be met by the student concerned.

### 6.2 Health and Well Being

Student Counselling Service

The Student Counselling Service provides free and confidential services to all students. Students seek out the Service for a variety of reasons, ranging from difficulties with adjusting to University life, or family/relationship concerns, to stress, depression, anxiety or related issues. Counselling services are primarily short-term. While some students see a counsellor just once or twice, others may go and see them regularly over a period of time. Students who are having difficulties are encouraged to talk them through with a counsellor. This can sometimes prevent them turning into major problems - so if in doubt, go and see them!

Contact: Student Counselling Service, 161 Welford Road (behind the Freemen's Common Health Centre). Office hours 10.00 a.m. to 8.00 p.m., Monday and Thursday, 10.00am. to 5.00pm. Tuesday, Wednesday and Friday. Appointments can be made by telephone, email, or call in and speak to a receptionist in person. Telephone 0116 223 1780.
e-mail: counselling@le.ac.uk, web: http://www.le.ac.uk/counselling/

Student Support (mental wellbeing)

This discreet and confidential service offers one-to-one support to students managing mental health issues at university. The aim of the service is to assist students to lessen the impact these might have on their studies. If required, the service can co-ordinate a network of support from those available both at

the university and in the wider community. It will also, with the students' permission, liaise on their behalf with their Departments or other parts of the University.

Students are welcome to make contact with the service at any point in their course. Pre-entry contact is also encouraged, from prospective students who wish to discuss any support they may require on course. An appointment to meet with an adviser can be made by telephone, letter or email.

The service also provides advice and information to members of the university community who have general concerns about mental health issues.

Contact: Student Support (mental wellbeing), 161 Welford Road (behind the Freemen's Common Health Centre)
Tel: 0116 252 2283
Email: mentalhealth@le.ac.uk
Website: www.le.ac.uk/mentalhealth

Student Healthy Living Service

The Student Healthy Living Service strives to help students enjoy a balanced life; the service helps individuals to identify an approach to life which can improve their wellbeing, enhance study and reach their full potential. The service is committed to the delivery of health and wellbeing activities that support students in developing life skills. As well as supporting academic achievement, these skills are transferable and should prove beneficial through the transition from University to the demands of employment and graduate careers. The Student Health Living Service works closely with the Freemen's Common Health Centre and also provides direction to appropriate health care services. More information can be found on the Healthy Living Service website.

Contact: The Student Healthy Living Service, 161 Welford Road (above Freeman's Common Health Centre).
Telephone 0116 223 1268,
Email healthyliving@le.ac.uk,
Website: http://www2.le.ac.uk/offices/ssds/healthy-living-for-students

### 6.3 Welfare Service

The Student Welfare Centre offers wide ranging support for students. Practical advice and information is available on a wide range of issues.

Financial advice is offered, with information on budgeting and DSS benefits. Students can apply for hardship grants and loans through the Service; Welfare staff can assist with applications to charities and trusts.

For international students, the Student Welfare Service runs various Welcome programmes throughout the year. Information is provided on specific hardship funds, advice is given on immigration, and assistance is given with renewal of visas. The service also co-ordinates HOST visits to British families and hospitality visits to local families in Leicester. International students with children may be eligible for help with childcare costs, which are claimed through the Service.

Welfare Officers can provide materials on health-related issues including alcohol and drugs, meningitis, pregnancy testing, and sexual health.

The Student Welfare Service co-ordinates pastoral care for students living in University residences; the Service recruits and trains the Sub-Wardens and Resident Advisors who provide this support. Postgraduate and mature students are invited to apply for these positions; information and application forms are available on the website. The Service also works closely with the local community to intervene in disputes with neighbours and to improve living conditions for those students who choose private rented accommodation.

A legal advice clinic is held in conjunction with the School of Law.

Contact: Student Welfare Service, 1st Floor Percy Gee Building.

Telephone: 0116 223 1185
Fax: 0116 223 1196
Email: welfare@le.ac.uk
Website: http://www.le.ac.uk/welfare

## 7 POSTGRADUATE REGULATIONS

### 7.1 Important Matters

**Attendance**: Attendance is an essential requirement for a first degree. Full-time students must reside in Leicester or within easy commuting distance of the city for the duration of each term, and all students are normally required to attend such lectures, seminars, practicals and other formal classes as are specified in their course timetables.

Departments are empowered to authorise short absences for personal reasons, but requests for absences of more than one week must be explicitly approved by the University, and will only be granted if the department is in agreement with the proposal, and if the student concerned takes full responsibility for the completion of outstanding academic work. This procedure also applies if the absence is required for religious reasons, but as students are required to notify the Registry at the beginning of each academic year if there are likely to be religious reasons for any absence during that year, academic departments and administrative offices are expected to utilise this information pro-actively, so that any specific religious needs can be anticipated, and where practicable, met.

**Personal conduct**: The University expects students to conduct themselves with propriety, both in and around the University buildings and also in public places.

**Term-time employment (full-time students)**: Paid employment during term-time should not exceed 15 hours per week. Such part-time work will not be accepted as a mitigating circumstance to excuse absence from classes, late submission of work, or examination failure.

**Examinations**: Examinations are normally scheduled utilising two periods a day for the First Semester examinations (9.30 a.m and 2.30 p.m.), and two slots a day for the Second Semester examinations (9.30 a.m. and 2.30 p.m.). Examinations are held on six days a week, Monday to Saturday, and special arrangements cannot be made to accommodate students' personal preferences, unless these arise from specific religious requirements identified by the student at the commencement of the academic year, or are associated with support measures recommended by the AccessAbility Centre.

The extent to which the timetabling of examinations can be adapted to meet the specific religious requirements of individual students will vary from case to case, but the University will make such alternative arrangements as are in its power, subject to the overriding requirements that the examinations must be scheduled within the published examination periods, and that alternative arrangements introduced for individual students must not disadvantage the majority. Students making requests for special treatment on religious grounds should recognise that measures designed to meet their needs might therefore involve an unavoidable element of inconvenience (for example, the requirement to remain incommunicado for a period of time).

**Neglect of academic obligations**: Unsatisfactory attendance, work and progress may lead to termination of course

**Withdrawal**: Students, who wish to withdraw from the University, either temporarily or permanently, should consult their personal tutor and/or other members of the academic staff, and where applicable, seek advice from Student Development and/or Student Welfare Service. A guidance leaflet on withdrawal and an application form are obtainable from the Reception Desk in the Fielding Johnson Building. Requests for temporary withdrawal and associated conditions of re-entry require the approval of the University.

### 7.2 The University's Regulation on Plagiarism

*Plagiarism*: The action or practice of taking someone else's work, idea, etc., and passing it off as one's own; literary theft (OED).

In the engineering context, plagiarism is the theft of other people's ideas and results, which are then presented as one's own.

**1) University Codes of Practice**

PG: http://www.le.ac.uk/academic/quality/Codes/pgexamining/PGexamscode.pdf

**2) Ensuring students know what is expected of them**

It is better for all concerned that students are taught what is acceptable or not acceptable in terms of working together, copying, referencing etc. than having to apply the penalties indicated below. So,

*As a student and professional engineer in training, you have a responsibility to*:

1. Not cheat or plagiarise. Plagiarism is cheating and the consequences are, as you can see below, very serious. With the quantity of explanatory material and induction provided by the department, there is no excuse for not knowing what constitutes plagiarism and cheating and no excuse for doing it. **No excuses will be accepted**.

2. Attend all induction and tutorial sessions on plagiarism and cheating arranged by the department. Missing these sessions will not be considered an excuse for plagiarism.

3. Read the material provided by the Student Learning Centre on plagiarism and on referencing and citation. Although small quantities of material can be copied, provided it is properly and appropriately referenced, excessive copying (Section 3d) will result in few marks (since there is none of your work to mark).

4. If you are uncertain as to what is or is not allowed (e.g. can the **results** from labs where you have worked in pairs be shared, etc.), ask the member of staff responsible for setting the assignment (or, in the case of projects, your supervisor).

*The department has a responsibility to*:

1. Provide to each student a copy of these guidelines and induction or tutorial material on plagiarism (e.g. on Blackboard or in year handbooks).

2. Direct students to the material on citation and referencing that is available at the Student Learning Centre website.

3. Provide guidelines (preferably in writing) as to what is expected with respect to plagiarism in a particular piece of work (particularly in relation to working together, e.g. if students have worked in pairs in a lab, should the reports be individually written, can the results be shared, etc.).

4. Where necessary, provide consistent feedback on plagiarism and poor scholarship in first and second year laboratory reports. If required, additional training will be given to those marking the reports (particularly PhD students).

5. Give final year (and PGT) students general guidelines on plagiarism and provide an appropriate level of feedback on project proposals and interim reports with regard to the offences discussed here. Project students who provide their supervisor with a draft of their report in plenty of time before the submission deadline may expect some feedback on obvious problems (e.g. unreferenced material). However, it is NOT the responsibility of the supervisor to check for each instance and the non-detection of plagiarism at this stage does not imply that none will be found later.

6. Allow the submission of all major pieces of assessed work (i.e. those comprising a significant proportion of the module marks) through turnitin (in place of or in addition to any other form of submission, e.g. hard copy) or make suitable, alternative, arrangements. Students will not be given access to turnitin reports as a drafting tool and the department does not encourage the use of other, similar, online services.

7. Use the turnitin reports as a **guide** to detecting plagiarism and to subject them to careful interpretation (e.g. since apparent plagiarism can occur in reference lists, where one would expect the material to be similar to other sources) before implementing the procedures outlined below.

### 3) Types of offence

The department has divided cases where work has been copied into four broad categories: cheating, theft of intellectual property, collusion, and poor scholarship. These are explained in more detail below. The first two of these are disciplinary offences and have severe consequences. While the last two categories are less serious, they will often result in poor marks for the exercise. In general, the department considers whether there has been "intent to deceive" in determining the seriousness of the offence.

#### a) Cheating

Examples of cheating include submitting work from a source outside of the cohort of students undertaking the assignment **without** citation (e.g. buying or otherwise obtaining solutions from rent-a-coder or essay banks or submitting work obtained from a previous student) and fabricating results.

In cases of this type, there has been significant intent to deceive and such offences are considered extremely serious and are dealt with using the disciplinary procedures described in Sections 4 and 5.

#### b) Theft of another person's intellectual property (IP)

Examples of theft of IP include copying of the method, results, discussion, or conclusions (or review where this is the main aim of the piece of work) of others (including other students submitting work for the same assignment) **without** citation either with or without their permission.

In cases of this type, there is clear intent to deceive and they are dealt with under the disciplinary procedures described in Sections 4 and 5. A student who has knowingly allowed their work to be copied will also be dealt with under the Disciplinary Procedures. It is important to note that appropriate referencing and citation distinguishes theft of IP from poor scholarship (Section 3d).

It should be noted that there are considerable differences between the traditions in the Arts and in Science as to what can be taken without attribution from other sources. In science subjects, there is a large amount of 'common knowledge' that by general agreement is freely used and never referenced (e.g. Ohm's Law). Students in doubt of what may or may not be used without reference should consult the member of staff responsible for that particular piece of work.

#### c) Collusion – working together when instructed not to

Where there is evidence that students have worked together when asked not to (or in group activities, where different groups have worked together) then the marker will first check, informally, whether a case of theft of intellectual property has occurred. If so, then this should be dealt with under the Section 3b. If not, then the marker will:

1. Divide the marks by the number of individual students (or groups) involved for the parts of the exercise where collusion has occurred. For example, where two students have worked together, each will receive half the awarded marks for the affected work.
2. Provide written feedback to all students concerned stating the reason for the reduced mark and referring them to these guidelines.

### d) Poor Scholarship – significant copying

Where significant quantities of material in a piece of work have been copied verbatim (or with minimal editing), whether this is treated as poor scholarship or theft of IP (Section 3b) largely depends on determining the "intent to deceive" by the student.

If the material is introductory in nature, or forms part of a review then the copied material is usually considered as poor scholarship whether it has been referenced or not. This follows, since there is normally no expectation that these sections contain original results obtained by the student and therefore no "intent to deceive" (an exception is where a review forms a significant part of the assignment). Marks should then be awarded for the student's own work and zero awarded for the copied material (although where the student has drawn on many sources, marks may be awarded for editorial selection, particularly where the work has been properly referenced). For example, an introduction consisting entirely of copied material, with no significant selection on the part of the student, would be given a mark of zero.

Where the copied material is in the method, results, discussion, or conclusion parts (or in a review section where this is the main part of the assignment) then provided it has been properly referenced it can be considered as poor scholarship. Marks are awarded based on an assessment of the work actually done by the student. In projects, this will almost certainly lead to very low marks for that part of the report and, in the case of copying of the results, possibly for technical achievement. If there are no or few references then this should be considered theft of IP (Section 3b) since there is then evidence of "intent to deceive".

In cases of poor scholarship, the marker will:

1. Award the appropriate marks after considering the contribution made by the student (e.g. editorial, selection etc.) to the work.
2. Provide written feedback to the student, emphasising the seriousness of poor scholarship and suggesting ways to avoid it in the future (e.g. by not relying too heavily on a few sources when writing introductions).

## 4) Disciplinary Procedure

1) On discovering potential cheating or plagiarism (i.e. offences for which these disciplinary procedures would be invoked) in continuously assessed work, a marker/module convenor should contact the appropriate exam board chair/secretary.
2) An interview panel is formed, usually consisting of the exam board chair, the module convenor (or project supervisor, as appropriate) and preferably a third member of staff (exam board secretary, senior tutor, year tutor etc).
3) The interview panel will examine the evidence to ensure that the case falls under Section 3a or 3b of this document. The student file(s) should be consulted to see whether the student(s) have previously been disciplined under these procedures.
4) The student(s) should be called for interview by one of the members of the interview panel, but should not be informed at this stage as to the exact reason for this. Where more than one student is involved, then each should be interviewed separately (15 minutes per student is usually sufficient).
5) In the interview, the student(s) concerned will be confronted with the evidence (e.g. turnitin reports, etc.) and be given an opportunity to defend themselves.
6) The interview panel will, using the guidelines given in Section 5, send a recommendation of the appropriate penalties to the Head of Department, who will review it for consistency with other cases and the University regulations. The Head of Department will then inform the student of the outcome, in writing, with copies to the Exam Board Chair and Secretary, the personal/academic tutor, the module convenor, the Year Tutor/MSc coordinator, the Senior Tutor and the Departmental Secretary's file. The letter will describe the proposed penalty, but formally reserve the final decision to the Exam Board (e.g. so that external examiners can comment or subsequently discovered offences be taken into consideration).
7) The Departmental Secretary's file is to be the authoritative record of serious incidents. All correspondence that arises, such as a written response from the student, must be copied to this file. Exam Board Secretaries will consult the file before Exam Board meetings to ensure that they have all relevant paperwork.

8) A member of staff, agreed by the panel (e.g. module convenor or personal tutor), should discuss the outcome with the student, particularly if the student is in a non-graduating year or the offence took place early in a graduating year. Emphasis should be placed on how the student can avoid further cases of cheating or theft of IP (e.g. student learning website, etc.).

**5) Penalties for disciplinary offences**

The university code of practice defines the penalties imposed in clear-cut cases of the academic dishonesty. The following procedure is used to introduce a more graduated approach for first offences, based on prior practice in the department and the current university code (note: there is a slight difference between UG and PGT after the second offence and in dealing with plagiarism in the project for PGT).

- First offence.
  - Interview and severe written warning
  - Module mark penalty: zero awarded for plagiarised work plus subtraction of up to 100% of the remaining module mark. Additional penalties are typically in the range 0 to 20%.
  - Resit/resubmission of failed work allowed if necessary (i.e. if, after the penalty is applied, the module marks are below the pass mark).
- Second offence.
  - Interview and severe written warning as above
  - Module mark returned as zero, resit/resubmission required for purposes of progression.
  - Possible downgrading of degree class (not applied to PGT)
- Third offence (PGT)
  - Interview as above
  - Termination of course
- MSc project
  - *No previous offence*: Failure of project, downgrading to PG Diploma.
  - *Previous offence*: Termination of course.

In the above guidelines, the suggested treatment for the first offence is potentially more lenient than that suggested by the university, but the outcomes for subsequent offences are the same as those specified in the university code of practice.

Note: for the first offence in the first year, if deemed appropriate, the standard University penalty (i.e. failure of the module, resit/resubmission allowed) may be imposed, as this year does not contribute to the final degree classification. It is anticipated that this will deter students from repeating the offence in subsequent years where it would have a significant effect on their final degree mark.

### 7.3 Departmental Regulations

**Attendance**: Attendance is an essential requirement for a postgraduate taught degree. Full-time students must reside in Leicester or within easy commuting distance of the city for the duration of each term, and all students are normally required to attend such lectures, seminars, practicals and other formal classes as are specified in their course timetables.

Departments are empowered to authorise short absences for personal reasons, but requests for absences of more than one week must be explicitly approved by the relevant Faculty Progress Committee, or by the Faculty Sub-Dean acting on the Committee's behalf, and will only be granted if the department is in agreement with the proposal, and if the student concerned takes full responsibility for the completion of outstanding academic work. This procedure also applies if the absence is required for religious reasons, but as students are required to notify the Registry at the beginning of each academic year if there are likely to be religious reasons for any absence during that year, academic departments and administrative offices are expected to utilise this information pro-actively, so that any specific religious needs can be anticipated, and where practicable, met

**Personal conduct**: The University expects students to conduct themselves with propriety, both in and around the University buildings and also in public places.

**Term-time employment (full-time students)**: Paid employment during term-time should not exceed 15 hours per week. Such part-time work will not be accepted as a mitigating circumstance to excuse absence from classes, late submission of work, or examination failure.

**Examinations**: Examinations are scheduled utilising two periods a day for the First Semester examinations (9.30 a.m and 2.30 p.m.), and two slots a day for the September examinations (9.30 a.m. and 2.30 p.m.). Examinations are held on six days a week, Monday to Saturday, and special arrangements cannot be made to accommodate students' personal preferences, unless these arise from specific religious requirements identified by the student at the commencement of the academic year, or are associated with support measures recommended by the AccessAbility Centre.

The extent to which the timetabling of examinations can be adapted to meet the specific religious requirements of individual students will vary from case to case, but the University will make such alternative arrangements as are in its power, subject to the overriding requirements that the examinations must be scheduled within the published examination periods, and that alternative arrangements introduced for individual students must not disadvantage the majority. Students making requests for special treatment on religious grounds should recognise that measures designed to meet their needs might therefore involve an unavoidable element of inconvenience (for example, the requirement to remain incommunicado for a period of time).

**Neglect of academic obligations**: Unsatisfactory attendance, work and progress may lead to termination of course.

**Withdrawal**: Students, who wish to withdraw from the University, either temporarily or permanently, should consult their personal tutor and/or other members of the academic staff, and where applicable, seek advice from the Careers Service and/or Student Welfare Service. A guidance leaflet on withdrawal and an application form are obtainable from the Reception Desk in the Fielding Johnson Building. Requests for temporary withdrawal and associated conditions of re-entry require the approval of the appropriate Faculty Board.

## 8 MISCELLANEOUS

### 8.1 Special Lectures

From time to time members of the department and local sections of professional institutions organise lectures on research or on subjects of general interest. You are encouraged to attend these lectures.

### 8.2 Holidays

**Between the undergraduate Spring and Summer terms, 22 March – 3 May 2010, the MSc students will be allowed up to two weeks holiday. The rest of the time is regarded as time for commencing lab-work for the Individual Project and completion of module assignments.**

During the project period in the summer, holidays may only be taken at the discretion of the project supervisor, i.e. permission must be sought beforehand. However, as a guide, 4 working days would be acceptable. Holidays will not usually be considered as reasons to provide project extensions.

### 8.3 Staff-Student Committee

This is made up of elected representatives of undergraduate and post-graduate students and an equal number of academic staff. It meets about once per semester and provides a forum for the discussion of matters of mutual interest. If you have any suggestions or complaints about the University or the Department you may ask your representative to take them to the committee. A student from the MSc Course would be expected to become involved with the committee.

### 8.4 Mitigating Circumstances

It is the responsibility of students to inform their Departments of any matters (whether of an academic, personal, medical or other nature) which may be relevant to their academic performance, and to supply substantiating evidence, for example, a medical certificate. Such information should be submitted before

the expiry of any departmental deadlines governing the submission of evidence of special circumstances. If no such deadlines exist, the evidence must be submitted as soon as it is available, and in any event before the meeting of the relevant board of examiners is due to take place.

Appeals against degree classification and appeals against termination of course may be disallowed if the appeal is based on mitigating circumstances which the appeals committee believes should have been communicated earlier to the department concerned.

### 8.5 Complaints Procedure

**The University is committed to providing the highest quality of education possible within the limits imposed by the resources available to it, and it strives to ensure that its students gain maximum benefit from the academic, social and cultural experiences it offers. Where students feel that their legitimate expectations are not being met, or where misunderstandings about the nature of the University's provision occur, the University expects that problems will be speedily and effectively dealt with at local level. Its complaints mechanism is based on the assumption that staff will at all times deal thoughtfully and sympathetically with students' problems, so as to minimise the extent to which formal procedures need to be followed.**

Students are expected to utilise the consultative and organisational arrangements in place at departmental and institutional level (these include heads of department**,** the personal tutor system, staff/student committees and the Staff/Student Council, the services of the Students' Union's sabbatical officers and its Education Unit, Hall JCR officials, and various user groups). Students are expected to familiarise themselves with the constitution and membership of those bodies which are intended to represent their interests, and for general complaints about academic matters to avail themselves of the opportunities provided for direct feedback on the performance of individuals or in relation to the provision of services (such feedback might include course questionnaires, comment boxes and user surveys).

If matters cannot be resolved informally**,** students should address any formal complaint in writing to the senior officer responsible for the relevant area of activity.

Senior officers comprise:

The Heads of the Colleges (in relation to academic and other College matters) – in such cases, assistance to the Heads in the consideration of the complaint will be provided by the Heads of College Administration.
The Librarian (in relation to the Library)
The Director of the IT Services (in relation to IT Services)
The Director of Residential and Catering Services (in relation to student accommodation, and the University's catering and conference services)
The Registrar and Secretary (in relation to any aspect of the University's administration and the operation of its administrative offices)
The Academic Affairs Officer of the Students' Union (in relation to the Students' Union; a complaint to the Academic Affairs Officer will initiate proceedings under the Union's own complaints procedure, as set out in the Regulations of the Union).

At this formal stage, the complaint must include full details of the unresolved issue, the attempts made to secure a resolution, and the identification of the desired remedy. The complaint must be accompanied by a complaints form which can be found on CWIS http://www.le.ac.uk/academic/registry/AppealsComplaints/ComplaintsForm.doc . The form requires complainants to provide their personal details (name, address, etc), and a short summary of their complaint and the way in which it has been pursued to date, including the names of those to whom their concerns have been addressed to date. The senior officers have the right to refuse to consider complaints where students have made no attempt to find a negotiated solution.

Students must complain on their own behalf; senior officers will not discuss or correspond about such matters with third parties, including family members, other than in the most exceptional circumstances, and then only with the student's written permission. Anonymous complaints are disallowed. Complaints submitted by e-mail will be accepted by senior officers and will trigger the initiation of formal procedures.

Complainants will, however, be contacted by letter and asked to submit a signed complaints form in order to ensure that the submission is genuinely their own.

Senior officers will immediately acknowledge in writing the receipt of any complaint, and will initiate a review by seeking a written report from the head of the department/section/unit against which the complaint is being issued. So far as is practicable the senior officer will respond to the complainant in full within twenty eight days. The complainant will normally, unless there is a significant practical impediment (for example, because the student is overseas or is for some other reason unable to attend the University), be called for interview during the period of investigation.

The University will respect a complainant's desire for confidentiality unless this impedes the course of the investigation, in which case the complainant will be given the options of pursuing the complaint with a reduced level of confidentiality or accepting the status quo.

**Appeals:** Appeals against the responses of senior officers to formal complaints must be submitted in writing to the Academic Registrar, Fielding Johnson Building, who will immediately acknowledge the receipt of any such appeal and assign a member of the administrative staff of the Academic Office to manage the appeal process. The appeal will be heard by a panel comprising either the Vice-Chancellor or the Senior Pro-Vice-Chancellor (in the Chair) and one other Pro-Vice-Chancellor. Unless the complaint relates to the activities of the Students' Union, the President of the Union, will be invited to attend the appeal as an observer. The panel will interview the student, who may be accompanied by a member of the University of his/her choosing, the senior officer responsible for considering the complaint, and such other parties to the complaint as it feels is necessary, and it will review all the relevant paperwork. The panel is also authorised to request further informal discussion between the parties. So far as is practicable, the appeal process will be conducted, and the outcome announced, within twenty five working days of the receipt of the appeal request, and dates in the University's calendar of meetings will be set aside to facilitate this. The decision of the appeals panel shall be regarded as final.

At the conclusion of the appeal, the student will be sent a completion of procedures letter and details about the Office of the Independent Adjudicator.

Advice on the operation of the complaints procedure can be obtained from the Academic Registrar, Fielding Johnson Building (tel 0116 2522419), or from the Education Unit, Students' Union (tel 0116 2231202, e-mail: educationunit@le.ac.uk). The latter can also provide assistance in formulating complaints, and in supporting students throughout the formal stages of the complaints procedure.

### 8.6 Appeals Procedure

For Postgraduate Taught Students there are two appeals procedures – one relating to course termination and one relating to the award of a lower qualification. Details of these procedures are set out below:

### 1. Review of Decision to Recommend Termination of Course

If a Board of Examiners recommends that a student's course be terminated, for whatever reason, including neglect of academic obligations, the Graduate Office will notify the student in writing of the recommendation and will also advise the student of his or her right of appeal. Students will also be advised that they may seek the help of the Education Unit in the Students' Union in deciding whether they wish to appeal and in formulating their submission.

A student's appeal should be made on the appropriate Appeal Form which should be submitted with supporting evidence to the Graduate Office within two months of the decision to terminate studies being confirmed in writing to the student. The official notification will state the deadline for submitting an appeal. Only the following grounds for appeal will be considered:

A student is in possession of evidence about the reasons for their academic performance which, for good reason, was not available to the Board of Examiners or which was only partially available (for example if additional medical evidence has been obtained)*

There appears to have been a procedural irregularity in the conduct of the examining or assessment process

There appears to be evidence of prejudice or bias in the conduct of the assessment process

Appeals that simply challenge the academic judgement of the examiners will not be considered.

If a student is appealing on the grounds that they are in possession of evidence of circumstances which affected their academic performance, this must be new evidence and they must be able to explain why it was not possible to notify their Department about these circumstances prior to the Board of Examiners.

On receipt of an appeal the Head of the Graduate Office will determine whether the student has demonstrated grounds for appeal in consultation with the Graduate Dean when appropriate and submitted evidence to support their appeal. Where no eligible grounds have been given or where no evidence is submitted to substantiate claims, the student will be advised accordingly and the appeal will either be turned down or the student will be offered the opportunity to submit additional documentary evidence. Where the grounds for appeal are valid and the necessary evidence has been submitted, a report on the student's work and progress and a copy of the relevant Examination Board minutes will be requested from the student's department. This information, along with the student's appeal form and evidence, will be considered by the next available Postgraduate Appeals Panel.

An appeals panel will comprise three members of the academic staff, none of whom will have been directly involved with the student. Panels will normally be chaired by the Graduate Dean.

The student and the relevant Department(s) will be notified of the date and time of the appeal and will be invited to attend. The student will be offered the opportunity to be accompanied to the meeting by a member of the University as defined in Section 2 of the Statutes. The student and Department will be notified in advance of the format of the meeting which will offer the opportunity for both the student and department to make a case to the panel and to answer any questions. If the student chooses to be accompanied to the meeting, their companion will be offered the opportunity to make a statement on the student's behalf but will take no other part in the proceedings unless requested to do so by the Chair.

At the end of the meeting, the Panel will reach its conclusion in private. The student will be notified in writing of the Panel's recommendation and will also be issued with a completion of procedures letter and details of the Office of the Independent Adjudicator.

If a student is unable or chooses not to attend a panel meeting, having been invited and given due notice, the panel will consider all the written evidence and make its recommendation on the basis of this information.

* Note: It is the responsibility of students to inform their departments of any matter (whether of an academic, personal, medical or other nature) that may be relevant to their academic performance, and to supply appropriate evidence. Such information should be given as soon as it is available.

**2. Review of a decision to award a Postgraduate Diploma or Postgraduate Certificate to a student registered on Master's programme**

If a Board of Examiners recommends that a student registered on a Master's programme be transferred to a Postgraduate Diploma during the course of their studies, or be awarded a Postgraduate Diploma/Postgraduate Certificate on completion of their studies, a student will have the right of appeal.

A student's appeal should be made on the appropriate Appeal Form which should be submitted with supporting evidence to the Graduate Office within two months of the decision being confirmed in writing to the student. The official notification will state the deadline for submitting an appeal. Only the following grounds for appeal will be considered:

A student is in possession of evidence about the reasons for their academic performance which, for good reason, was not available to the Board of Examiners or which was only partially available (for example if additional medical evidence has been obtained)*

There appears to have been a procedural irregularity in the conduct of examining or assessment process.

There appears to be evidence of prejudice or bias in the conduct of the assessment process

Appeals that simply challenge the academic judgement of the examiners will not be considered.

If a student is appealing on the grounds that they are in possession of evidence of circumstances which affected their academic performance, this must be new evidence and they must be able to explain why it was not possible to notify their Department about these circumstances prior to the Board of Examiners.

On receipt of an appeal, the Head of the Graduate Office will determine whether the student has demonstrated grounds for appeal in consultation with the Graduate Dean where appropriate and submitted evidence to support their appeal. Where no eligible grounds have been given or where no evidence is submitted to substantiate claims, the student will be advised accordingly and the appeal will either be turned down or the student will be offered the opportunity to submit additional documentary evidence. Where the grounds for appeal are valid and the necessary evidence has been submitted, a report on the student's work and progress and a copy of the relevant Examination Board minutes will be requested from the student's department. This information, along with the student's appeal form and evidence, will be considered by the next available Postgraduate Appeals Panel.

An appeals panel will comprise three members of the academic staff, none of whom will have been directly involved with the student. Panels will normally be Chaired by the Graduate Dean. The student and the relevant Department(s) will be notified of the date and time of the appeal and will be invited to attend. The student will be offered the opportunity to be accompanied to the meeting by a member of the University as defined in Section 2 of the Statutes. The student and Department will be notified in advance of the format of the meeting which will offer the opportunity for both the student and department to make a case to the panel and to answer any questions. If the student chooses to be accompanied to the meeting, their companion will be offered the opportunity to make a statement on the student's behalf but will take no other part in the proceedings unless requested to do so by the Chair.

At the end of the meeting, the Panel will reach its conclusion in private. The student will be notified in writing of the Panel's recommendation and will also be issued with a completion of procedures letter and details of the Office of the Independent Adjudicator.

If a student is unable or chooses not to attend a panel meeting, having been invited and given due notice, the panel will consider all the written evidence and make its recommendation on the basis of this information.

* Note: It is the responsibility of students to inform their departments of any matter (whether of an academic, personal, medical or other nature) that may be relevant to their academic performance, and to supply appropriate evidence. Such information should be given as soon as it is available.

The appeals form can be found at:

http://www.le.ac.uk/ua/ac/registry/studentindex.html

### 8.7 Insurance and Liability

The University has third-party insurance which provides it with indemnity in respect of its legal liability to compensate students who suffer injury, damage to property, etc. where proof of negligence on the part of the University can be established. Students who feel they need insurance cover which would apply in the case of genuine accidents are advised to take out their own policies. There is no cover for general risks to personal property and students are therefore advised to check whether their parents' or family policies provide adequate protection. It not, private insurance arrangements should be made.

### 8.8 Equal Opportunities

The Department endorses the University's Equal Opportunities policies and seeks to implement measures which ensure that all students, from whatever background, are treated fairly and encouraged to fulfil their potential.

## 9 MODULE INFORMATION

### EG 7012 MATLAB and CAD

Objectives

After completing this module, students will:

- be familiar with the basics of the MATLAB environment and be capable of using Matlab in an interactive mode - entering and assigning data to variables and using plotting functions,
- be capable of writing simple programs using, as and when necessary, 'for loops'; 'while loops' and 'if-then-else' construct and user-defined functions.
- be familiar with state-of-the-art CAD tools relevant to their chosen discipline such as the Communications toolbox; SIMULINK, pSpice and SolidWorks;

Overview

Initially all students will be introduced to Matlab as both an interactive medium, a data analysis tool and as a program development environment. The cohort will then be split according to their degree disciplines and be introduced to either Simulink, the Communications toolbox, PSpice or SolidWorks as appropriate.

The introduction to MATLAB will include the following topics

- Scalar variables: assignment of values; scalar arithmetical operators + - */∧
- Arrays (of numbers) : array operations .* and ./
- Loops: typical 'for' and 'while' loops
- Branching statements: 'if- then-else' and 'switch'
- In-built functions: sine, cosine, tangent, sqrt, logarithm …
- User-defined functions
- Plotting commands

The other CAD topics will be introduced during the module.

Assessment

Individual examination of all aspects by 3 hr practical examination (70%) and continuous assessed work (30%).

**A.J. Stocker**
D.G. Bates
I. Bromley
D.W. Gu
A. Rona
A. Willby

## EG 7013 Modelling and Classification of Data

### Objectives

The overall objective is to reveal the wide range of methods available to extract information from experimental data. In particular the course aims to familiarise students with statistical, deterministic and chaotic models of data generation and to consider statistical, fuzzy and neural network schemes of pattern recognition. At the end of the course the students should be able to appreciate the rich variety of existing techniques, to be familiar with the literature and to be able to follow research papers in selected areas. The course is ideal for research training and for understanding state-of-the-art current practice.

### Overview

Subjects studied will be selected from the following list of topics:

- Data generation models; stochastic, deterministic (chaotic)
- Data classification methods; statistical pattern recognition, fuzzy methods, neural networks
- Information theory, probability, and entropy
- Prediction; linear prediction, Wiener filters, Kalman filters
- Neural Networks
- Statistical pattern recognition
- Fuzzy logic methods

### Assessment

The module will be assessed by means of a two-hour examination (50%) and 2 technical reports (50%).

### Recommended Reading

Duda, R.O., Hart, P.E. & Stork, D.G. Pattern Classification, John Wiley, 2001.
MacKay, D., Information Theory, Inference, and Learning Algorithms, Cambridge University Press, 2003.
Bishop, C.M., Pattern Recognition and Machine Learning, Springer, 2006.
Sivia, D.S., Data Analysis: A Bayesian Tutorial, Clarendon Press, 1996.
Schalkoff, R., Pattern Recognition: Statistical, Structural and Neural Approaches, John Wiley, 1992.
Morrison, D. F., Multivariate Statistical Methods, 2nd Ed., McGraw-Hill Int., 1978.
Bishop, C.M., Neural Networks for Pattern Recognition, OUP, 1995.

**M.J. Ison**
T.C. Pearce

## EG 7014 High-Reliability Embedded Systems

### Objectives

By the end of the module, students are able to do the following:

- Design hardware and software for embedded applications based on microcontrollers.
- Design single-processor embedded systems.
- Understand the development cycle of embedded systems.

### Overview

This module is concerned with the design and implementation of software and hardware for embedded systems constructed using a single rocessor. The key focus of the module is on the production of applications that are cheap, modular and highly reliable; based on time-triggered system architectures.

### Course Format

In keeping with its advanced nature, this course takes the form of:

- A series of lectures focusing on the hardware and software design aspects of embedded systems, with particular attention paid to reliability and code reuse.
- A set of guided design exercises, involving the creation of small embedded applications.

### Assessment

The course will be examined on the basis of a number of exercises (100%).

### Recommended Reading

Pont, M.J., Embedded C, Addison-Wesley, 2002, ISBN: 020179523X.

Pont, M.J., Embedded C [Chinese translation], Pearson Education Taiwan, 2004,
ISBN: 986-7491-52-1.

M. J. Short

## EG 7015 Robust Control

### Objectives

At the end of this course students should:

- Understand the classical approach to robust control based on loop shaping and the Nyquist stability criterion;
- Understand the extension of the classical approach to robust control which makes use of H-infinity methods and robust stabilisation
- Understand the factors which limit the performance of feedback control systems;
- Be able to design robust control systems using state-of-the-art software in the Matlab environment;
- Have further developed their written communication skills by preparing a technical formal design study report.

### Overview

This course is concerned with the design of practical feedback controllers. Feedback is used in a control system to change the dynamics of the plant or process, and to reduce the sensitivity of the system to signal uncertainty (disturbances and noise) and model uncertainty. If the performance specifications are achieved in the presence of the expected uncertainties, then the control is said to be robust. The course will re-examine the classical approach to robust control based on loop shaping and the Nyquist stability criterion; it will present the latest (H-infinity) methods and tools for loop-shaping control and robust stabilisation; and it will describe the inherent limitations to performance. The treatment will be mainly for scalar (single-input, single-output) systems but the extension to multivariable (multi-input, multi-output) systems will also be discussed. Extensive use will be made of Matlab.

### Assessment

The assessment will be based on a design study (100%)

### Recommended Reading

Skogestad, S., Postlethwaite, I., Multivariable Feedback Control, John Wiley, 1996.

D. Bates

## EG 7016 Design of Discrete Systems

### Overview

This module will provide an understanding of the background theory associated with discrete system analysis followed by an in depth review of four design methods associated with the two main classes of discrete system in the areas of time and frequency domain design. There will be a structured series of lectures and exercise classes. The course will start with a review of the fundamental principles of data conversion and the background theory of discrete signals and systems. Some familiarity with continuous linear system theory and complex algebra will be assumed. Students will acquire a working knowledge of discrete system analysis and design techniques and will be able to read and understand the extensive literature in this field. There will be a review of some techniques of signal processing used in industry and research, which will link the material of this module to that of the Real Time Signal Processing module.

### Contents

The following topics will be covered:

- Data conversion
- Discrete-time signals
- Errors in the quantization process
- Difference equations and convolution sums.
- The z-transform
- Pole-zero representation of discrete-time systems
- Transfer function of discrete-time systems
- Frequency response of discrete-time systems
- Design of discrete systems from time domain specifications.
- Design of discrete systems from frequency domain specifications
- Realisation of discrete system designs
- Introduction to discrete control systems
- Design of digital spectrum analysers
- Time Frequency analysis and Gabor Transform
- Wavelet Transform with applications.
- Case studies and examples

### Assessment

The module will be assessed by means of an examination (100%).

### Recommended Reading

Paul A. Lynn & Wolfgang Fuerst, Introductory Digital Signal Processing with Computer Applications, Revised Edition, John Wiley \& Sons, (1994),

Alan V. Oppenheim & Ronald W. Schafer, Discrete-Time Signal Processing, Int. Ed., Prentice-Hall, (1989).

**R. Quian Quiroga**
F.S. Schlindwein

## EG 7017 Real-Time Signal Processing

### Objectives

The objective of this course is to give students a deep understanding of the practical issues of real-time digital signal processing.

### Background

The background assumed is familiarity with the fundamentals of Digital Signal Processing and general ideas of programming. Both C and Assembly language will be used and some previous knowledge is assumed of C. No prior knowledge of DSP chips or Assembly is assumed.

### Course Format

The course will be organised around a set of laboratory sessions using a modern DSP chip and a PC and analysing real signals in real-time. The sessions will exploit some of the following central themes:

- Sampling: Interrupt based A/D sampling; programming the sampling frequency; control of A/D and D/A; effects of finite word length.
- Real-time implementation of FIR filters: Finding the coefficients and implementing low-pass, high-pass, band-pass, and band-reject FIR filters.
- Real-time implementation of IIR filters: A simple extension of the fundamental implementation covered on the previous session.
- Real-time implementation of FFTs: Exploiting a given algorithm and measuring its performance.
- Real-time implementation of adaptive filters: An adaptive filter is essentially a digital filter with self-adjusting characteristics. An adaptive system can 'learn' the signal characteristics and automatically track slow changes. This topic will concentrate on the techniques that are widely used to adjusting the filter coefficients for optimality, with the mathematical theory covered, followed by discussions on how these algorithms are implemented.

At the end of the course the students should be very familiar with the practical implementation of real-time systems and be able to implement them starting from the specified difference equation. The course is ideal for research students and engineers who will deal with both real-time and off-line implementations of digital filter and/or the implementation of control systems.

### Assessment

50% Continuous Assessment (lab report, design exercise, essays), and 50% Individual examination.

### References

Laplante, P.A., "Real-time systems design and analysis : an engineer's handbook", IEEE Press, 1997.

Oppenheim, A.V., Schafer, R.W., "Discrete-Time Signal Processing", (1989), Prentice Hall.

Kay, S.M. and Marple Jr. S.L., "Spectrum Analysis – a Modern Perspective", Proc. IEEE, vol. 69, N.11, pp 1380-1419. 1981

Ifeachor Jervis, "Digital Signal Processing, a practical approach", Addison Wesley, 1993

Sterns, S.D., "Adaptive Signal Processing", Prentice -Hall, 1985

F.S. Schlindwein

## EG 7018 Embedded Systems for Condition Monitoring and Control

### Objectives

By the end of the module, students are able to do the following:

- To design and implement reliable multi-processor embedded systems based on small, industry standard, microcontrollers;
- To understand some of the safety implications involved in the design and implementation of embedded control and CMFD applications.

### Overview

This module is concerned with the design and implementation of software (and a small amount of hardware) for resource-constrained embedded systems constructed using one or more processors.

### Course Format

In keeping with its advanced nature, this course takes the form of:

- A series of discussions about particular systems;
- A set of guided design exercises, involving the creation of small embedded applications.

### Assessment

The course will be examined on the basis of submitted project and essay work (100%).

### Pre-requisite

EG 7014 – High-Reliability Embedded Systems.

### Recommended Reading

Pont, M.J., Patterns for Time-Triggered Embedded Systems, Addison-Wesley, 2001.

Pont, M.J., Embedded C, Addison-Wesley, 2002.

Pont, M.J. (2004) "Patterns for Time-Triggered Embedded Systems: Building reliable applications with the 8051 family of microcontrollers" [Chinese translation], Chinese Electric Power Press [762 pages] ISBN: 7-5083-2206-1.

Pont, M.J. (2004) "Embedded C" [Chinese translation], Pearson Education Taiwan. ISBN: 986-7491-52-1.

Pont, M.J. (2003) "Embedded C" [Chinese translation], Chinese Electric Power Press [282 pages] ISBN: 7-5083-1814-5.

M.J. Short

## EG 7020 Individual Project

### Objectives

This module gives an opportunity for individual study and for the development of personal and technical skills. The Individual Project enables the student to integrate the knowledge obtained throughout the MSc course in a realistic exercise in the practice of engineering at a professional level. At the end of the module, students will also have acquired communication skills, both oral and written.

### Overview

The Individual Project is a major part of the MSc course and will occupy approximately one third of the student's time. The project is an organised activity that aims to deliver an example of professional engineering work. At the beginning of the project, the objectives of the project will be defined, followed by an assessment and implementation of the means of achieving the objectives, and concluded by clear communication, both written and oral, of the results. The core of the project, the practical activity directly concerned with achieving the objectives, depends on the nature of each project and the project supervisor is the main reference point for this.

The project may be initiated by the student or selected from a list of topics offered by academic staff. The project can be theoretical, experimental, analytical or design and often consists of an investigation into a problem of current industrial interest or the development of either a piece of equipment or a design aid. Many projects are related to sponsoring companies or to the research interests of the supervisor.

### Assessment

This module is 100% continuously assessed

### Recommended Reading

Kirkman, J., Good style for scientific and engineering writing, Pitman, 1980.
Barrass, R., Scientists must write, Chapman & Hall, 1978.
Ellis, R., Hopkins, K., How to succeed in written work and study, Collins, 1985.

S.Gao

## EG 7021 Radio Systems

### Objectives

At the end of the course students should have a broad appreciation of a wide range of radio system applications and have developed a basic understanding of their modes of operation, the equipment requirements and limitations and the radio propagation mechanisms. They should also have developed an in-depth understanding of the operation of several of the systems discussed in the course.

### Overview

A range of radio system applications will be examined in this course, concentrating on the areas of communications, radar, remote sensing and navigation. International regulation of radio spectrum usage will also be considered.

A wide range of topics will be included to give a broad appreciation of the applications of radio systems. Several topics will be covered in depth, examining both the propagation mechanisms and the system techniques. Specifically, the following areas will be addressed:

- Communications: Personal communications, broadcast systems, point-to-point and network systems channel evaluation, frequency management, equalisation, security;
- Target location: Line of sight radar, over the horizon (OTH) radar, direction finding, stealthing;
- Remote sensing: Satellite-to-ground radar, seastate radar, meteorological radar, geophysical radars (e.g. CUTLASS), ionosondes (vertical and oblique), ground penetrating radar;
- Navigation: Global positioning system (GPS), phase interference systems (e.g. Omega);
- Regulation: International Telecommunications Union (ITU) and national legislation.

### Course Format

The course material will be delivered through lectures and computer-based laboratory exercises.

### Assessment

Assessment will be by marks awarded for laboratory work (30%) and end-of-module examination (70%).

### Recommended Reading

A lists of recommended textbooks and references will be provided during the module.

**E.M. Warrington**
A.J. Stocker

## EG 7022 Digital Communications

### Objectives

This module addresses many of the topics that need to be considered in the design of digital communications systems. At the end of the module students should have developed a broad understanding of digital communication systems together with an appreciation of the limitations of these systems and the techniques employed to mitigate the limitations.

### Overview

The module will be delivered through a series of seminars and practical sessions. The theoretical aspects of the module will be complemented with extensive practical exercises using MATLAB based computer modelling.

Subjects which will be studied include:

- Introduction to MATLAB and the Communications Toolbox;
- Baseband digital transmission;
- Digital transmission through bandlimited channels;
- Digital transmission via carrier modulation;
- Channel capacity and coding;
- Digital communications through fading multipath channels.

### Assessment

Assessment will be by marks awarded for laboratory work (30%), individual project (30%) and by a written examination (40%).

### Recommended Reading

Öberg, T., Modulation, Detection and Coding, Wiley (2001)
Bateman, A., Digital Communications, Addison-Wesley (1998)
Proakis, J.G,, Digital Communications, McGraw-Hill.
Proakis, J.G, Salehi, M., Contemporary Communication Systems Using MATLAB, Brooks/Cole.

**E.M. Warrington**
D. Siddle

## EG 7023 Radio Communications

### Objectives

At the end of the module students should have developed a broad understanding of the requirements for the planning and operation of a number of radio communication systems together with an appreciation of the limitations of these systems. A deeper understanding of several of the topics discussed during the module will also have been gained.

### Overview

In this module some of the points which should be considered in the design of modern operational radio communication systems will be addressed. In particular, service planning and propagation prediction tools will be introduced for a number of systems and at a range of different radio frequencies. Some of the topics on radio communications which were presented in the module 'Radio Communication Systems' will be examined in more depth.

The module will be delivered through a series of lectures, seminars and practical sessions. Students will each be expected to research several topics, via appropriate texts and web-based resources, and to present their findings in the form of a report and short talk, the latter of which will take place during seminars. The theoretical aspects of the module will be complemented with extensive practical exercises using both state-of-the-art modelling packages and prediction tools, and data taken 'off-air'.

Subjects which will be studied include:

Propagation:

- Radio channel characteristics: For example, the effect of the ionosphere on HF communication systems;
- Simulation: By understanding the physical mechanisms which affect radio propagation enables their effects can be simulated;
- Predictions: The ability to predict the behaviour of radio systems is crucial to the design of communication systems.

Systems:

- Point-to-point and network: For example, indoor wireless networking;
- Mobile and personal: The now ubiquitous mobile phone is a good example;
- Broadcasting: Even in the age of the internet, radio (and television) broadcasting continues to be of importance.

### Assessment

Assessment will be by marks awarded for the individual presentations and practical work (60%) and by an end-of-module examination (40%).

### Pre-requisite:

EG 7021 Radio Systems

### Recommended Reading

Davies, K., Ionospheric Radio, Peter Peregrinus, (1990)
Shankar, P.M., Introduction to Wireless Systems, Wiley, (2002)

A full reading list will be given during the module

D.R. Siddle

## EG 7026 Advanced Fluid Dynamics

### Objectives

Students will be exposed to a range of contemporary developments in fluid dynamics. This exposure will include research activities in theoretical, computational and experimental fluid dynamics.

### Overview

Experimental fluid dynamics: Current approaches in experimental fluid dynamics for flows in water and in air at low and high speeds. Difficulties of measurements and techniques for turbomachines and blading. Advanced anemometry techniques. Unsteady flows, conditional and phase averaging. Temporal and frequency domains, wavelets. Nonlinear dynamics and chaos.

Turbulence: Discussion of transport properties of fluids. Laminar flow. Instability and transition to turbulence in boundary layers and free shear layers. Intermittency and turbulent spots. Turbulence in fluids. Eddy viscosity and the k-epsilon model.

Computational Fluid Dynamics: The Finite Volume Method. Flow computation and related difficulties. The SIMPLE algorithm and its variants. Turbulence computation. Computational models for turbulent flows. CFD assignment and Fluent.

Computation of two-phase flow: Introduction to two-phase flow. Two-phase flow patterns and flow pattern maps. Homogeneous flow. Pressure drop for separated flow. Volume of fluid (VOF) model. Mixture (slip) model. Eulerian model.

### Recommended Reading

Douglas, J.F., Gasiorek, J.M. and Swaffield, J.A., *Fluid Mechanics,*
$4^{th}$ edition, Prentice Hall (2001)

Abbott, M.B. and Basco, D.R., *Computational Fluid Dynamics: An Introduction for Engineers,* Longman (1989)

Versteeg, H.K. and Malalasekera, W., *An Introduction to Computational Fluid Dynamics,* Longman (1995)

Whalley, P. B., *Two-phase flow and heat transfer,* Oxford Science Publications (1996)

### Assessment

This module will be assessed on the basis of a two hour examination and submitted coursework.

S. Gao

## EG 7028 Understanding Surfaces in Engineering

### Aims

To gain practical experience of the way in which surface engineered components respond to mechanical contact; to study methods to characterise the mechanical properties of surface engineered components; to gain an appreciation of the ways in which theoretical models can be used to model surface roughness and contact between surfaces.

### Objectives

- To teach the experimental techniques relevant to determining the mechanical properties of surfaces. This will be specifically targeted at developing experimental test methodologies and good experimental practice relevant to an engineer.
- To develop an understanding of the important factors in processing experimental results and data and develop an understanding of the implications of the results with particular relevance to surface engineering and optimising properties such as wear resistance.
- To develop an understanding of the strengths and weaknesses of models for surface roughness and surface contact, concentrating on profile and plane strain situations.

### Overview

Mechanical properties of surfaces (20 hours)
Indentation Testing, Scratch Testing, Reflected Light Microscopy, Residual Stress in Coatings, Introduction to SEM, Advanced SEM Theory, Introduction to X-ray Microanalysis, Theory of X-ray Microanalysis, Coatings Tribology.

Surface Roughness (4 hours)
Methods for quantifying aspects of surface roughness, including autocorrelation function and spectral density function, fractal surfaces. Availability of solutions for plane elastic contact problems: point loads, patch loads, sinusoidal surfaces, random surfaces.
Is complete contact between surfaces possible? Significance of lateral constraints and friction. Typical solutions for rigid-plastic materials.

### Assessment

This module will be examined on the basis of submitted coursework (100%).

**S.V. Hainsworth**
W. Manners

## EG 7029 Computational Fluid Dynamics

### Objectives

By the end of this module, students will have gained the following skills:

- Select an appropriate numerical modelling strategy to capture the defining flow features of typical geometries (e.g. sudden expansions, valves, turbine blade passages).
- Design and implement a flow model using a numerical method available at the University of Leicester.
- Appreciate the effects of flow unsteadiness on engineering designs.

### Overview

The course start with a firm grounding on the flow governing equations, applicable to incompressible and compressible flows, which are solved in a computational fluid dynamics scheme. This forms a firm basis from which to address current numerical techniques to obtain discrete flow models.

The fundamental steps to obtain a simple Computational Fluid Dynamic (CFD) model are covered for a simple geometry, using a numerical method available at the University of Leicester. Hands-on training in CFD is provided in this context. Each student is then encouraged to select a flow problem of scientific or industrial interest to model. Students develop and validate their models in a series of guided sessions and present their progress at weekly meetings. This exercise exposes the most common problems encountered while developing a fluid dynamic numerical model, such as the numerical stability constraints, verification and validation issues, the selection of an appropriate numerical mesh density, and the appropriate selection of boundary conditions.

The module seminars are supported through the Blackboard virtual learning environment. The physics of the predicted flows by each candidate is discussed in the weekly seminars with an emphasis on understanding the performance and the limitations of the CFD tool. The role of CFD in modelling these flows is then considered in the context of engineering design.

### Course format

In keeping with its advanced nature, this course takes the form of:

- a series of discussion on CFD models and methods.
- a set of guided design exercises, involving the creation of a representative CFD model.
- hands-on practical sessions on the CFD package.

### Assessment

The course will be examined on the basis of a submitted CFD coursework (100%).

### Pre-requisite

EG 7026 - Advanced Fluid Dynamics

### Recommended books

The American Institute of Aeronautics and Astronautics (AIAA), Guide for the verification and validation of Computational Fluid Dynamics simulations, AIAA publication number G-077-98, 1998.
Anderson, J.D.Jr., Computational Fluid Dynamics: the basics with applications, McGraw-Hill, 1995, ISBN 0070016852

A. Rona

## EG 7031 Advanced Computational Methods in Materials Modelling & Engineering Design

### Aims

The aim of this course is to introduce the students to the theoretical and practical aspects of linear and non-linear finite element analysis.

### Objectives

The objectives of this course are:

- To develop the students understanding of the fundamental concepts which underpin the finite element method, including strategies based on minimization of the total potential energy and Galerkin's weighted residual methods.
- For the student to develop an understanding of the structure of a finite element model and to identify the type of input information that is required to solve a practical problem.
- For the student to be able to set up and solve a range of linear problems, including small strain linear elastic problems and transient and steady state heat conduction.
- For the students to understand the extension of the method to non-linear material behaviour and to be able to develop computational strategies based on Newton and modified Newton methods.
- For the students to gain a working knowledge of a practical commercial finite element package and to be able to solve a range of engineering problems.

### Overview

The finite element method is used extensively in research and engineering practice to solve a wide range of practical problems. This course will introduce the students to the theoretical concepts which can be employed to develop a self-consistent finite element approach. Initially the focus will be on linear problems commonly encountered in engineering practice. General strategies will be developed which can be applied to a wide range of different types of material behaviour and engineering problems.

The extension of the method to transient and non-linear behaviour will be presented and a number of strategies will be presented which can be applied to different classes of material and component behaviour. Multiphysics problems, such as electro-thermo-mechanical problems, will also be considered.

Students will be able to apply the concepts introduced in this course to a range of engineering problems. Applications will be taken from structural mechanics, materials processing and electrical engineering

### Assessment

Completion of three exercises on (1) Heat conduction, (2) Linear Elasticity and (3) Non-linear and multiphysics problems.

S.P.A. Gill

## EG 7034 Electrical Machines and Drives

### Objectives

This course teaches the design, construction and operation of electrical machines and drives including many of the detailed aspects of operation which are neglected in BEng undergraduate courses. Students will be able to make more detailed calculations and predictions of the operation of machines under dynamic conditions and when connected to electronic drives.

### Overview

Introduction Definition of machine and drive. Revision of mechanical principles. Mechanical loads and their characteristics.

The basics of electromagnetic torque production for singly and doubly excited systems.

Application of matrix methods to electrical networks, Voltage equation, Impedance matrix, Linear transformations in electric circuit analysis.

Choice of transformation - Invariance of power, symmetrical components. Application to single phase transformer.

The primitive machine. Frames of reference and sign conventions. Voltage equation. Impedance matrix, transformer and rotational emfs. Impedance matrix decomposition.

Linear transformations, 3-phase to 2-phase, 2-phase to stationary axes, Brush shift.

The form of the transient impedance matrix, Fundamental torque equations.

Summary. Overview of Machine Analysis.

Application to DC and other commutator machines, separately excited, compound and series connections.

Inter-connected DC machines. Motor and generator, metadyne transformer.

Analysis of two pole synchronous machine with salient poles. Reduction to primitive machine, impedance and torque equations. Excitation and reluctance torque.

Poly-phase induction machines. Reduction to primitive machine, impedance and torque equations. Reading Assignment 2.

State-space model and simulation of induction motor performance. Start-up dynamics, load application, terminal short circuit.

Incorporation of saturation, slip dependence of rotor parameters, eddy current loss, phase sequence reversal and incorporation of mechanical system models.

Brushless DC motors, operation, construction, design and analysis. Back-emf and torque characteristics. Radial and axial flux machines. Brushless permanent magnet generators.

Switched Reluctance Motors, operation, design, construction, analysis. Stator and rotor pole numbers and relationship to number of phase windings. Power electronic control.

### Assessment

The assessment will consist of a 2-hour examination, and a marked assignment.

### Recommended Reading

B.S.Guru & H.R.Hiziroglu, Electric Machinery & Transformers, 3rd ed., O.U.P., 2001
J.Hindmarsh, Electrical machines and drives systems, Butterworth-Heinemann, 1996
D.O'Kelly, Performance and Control of Electrical Machines, McGraw-Hill, 1991
Gieras and Wing: Permanent Magnet Motor Technology, 2nd ed., CRC Press, 2002

S. Dodd
P. W. Lefley

## EG 7035 Electronically Controlled Motor Drives

### Objectives

This course provides a theoretical and practical treatment of the complete electronic drive system; (including conventional dc drives as well as modern ac drives) including the mechanical part, the electrical machine, the power converter and the control. It will provide the necessary skills for those students wishing to pursue a career in industrial drives. This course consists of lectures, continually assessed projects and CAD simulations.

### Overview

PART A – High Power Circuits
The application of thyristors and GTOs in three phase ac regulators, phase controlled rectifiers, line commutated inverters and pwm inverters. Appropriate analysis for phase angle control, pwm pattern generation for harmonic minimization. The dc link converter, current and voltage-fed types, bi-directional power flow. Use of modern devices, IGBTs and MOSFETs.

PART B – Electric Motor Drives
To study the application of high power semiconductors to the control of electrical machines. Speed and torque control of dc and ac motors. Stator and rotor control of induction motors. Generation and braking. Flux vector control. Control of dc machines, brushless dc motors, stepper motors and switched reluctance motors. Design of low cost electronically controlled drives for high volume manufacture.

### Assessment

The assessment for this module will be based on a two hour examination.

### Pre-requisite

EG 7034 Electrical Machines and Drives

### Recommended Reading

Mohan, Undeland & Robbins, Power Electronics, Converters, Applications and Design, Wiley 1995.
Lander, C.W., Power Electronics, McGraw-Hill 1993
Sen P.C., Principles of Electric Machines and Power Electronics, 2nd Edition, Wiley 1997

P.W. Lefley

## EG 7036 Introduction to Biomedical Engineering

### Overview

At the end of this module students will be able to discuss the basic principles of the following:

- Define of Biomedical Engineering and state the role of the Biomedical Engineering in Society; be aware of some of the historical landmarks in the development of the Biomedical Engineering;
- Define Biopotentials and discuss the genesis and characteristics of some of the main electrical signals used for diagnostics, including the EMG, the ECG and the EEG;
- Describe basic cardiac electrophysiology and correlate the mechanical and electric events;
- Demonstrate understanding and some familiarity with basic Biomedical Instrumentation;
- Discuss the characteristics of some sensors and transducers using in Biomedical Engineering and the design of instrumentation amplifiers and filters for biological signals;
- Discuss the choice of particular types/families of filters (Butterworth, Chebyshev, Bessel, elliptic) for specific applications in Biomedical Engineering;
- Demonstrate awareness of electrical safety for patients;
- Discuss the mechanisms of regulation of the cardiac rhythm
- Comprehend different neuronal recording methods and be able to select a method for a particular scientific/clinical application.
- Identify the issues involved in spike sorting and understand how the different methods deal with these.
- Demonstrate an understanding of the statistical methods applied to spike train analysis and how they should be applied in a practical setting.
- Discuss the basic principles of the recording of EEG signals; ability to discuss noise sources and artefacts in EEG recording;. discuss Fourier transform of EEG recordings and frequency bands and their correlates to normal and pathological brain functions;
- Describe the characteristics of EEG in epilepsy and discuss methods used for the localization of the epileptic focus; discuss prediction of epileptic seizures;
- Define evoked potentials and demonstrate ability to record evoked potentials; Describe and discuss clinical applications of this technique.
- Demonstrate ability o discuss the use of wavelets for the study of evoked potentials, including the denoising of single trial responses.

### Assessment

100% continuous assessment based on projects, seminars, computer-based exercises and essays/reports.

### Recommended Reading

The Biomedical Engineering Handbook, Bronzino, Joseph D, CRC Press in cooperation with IEEE Press, 1995. ISBN: 0849383463

Design for Biomedical Engineers, Webster, John G., John Wiley & Sons Inc, 2004. ISBN: 0471429422

Introduction to Biomedical Engineering, Domach, Michael M., Pearson/Prentice Hall, 2004. ISBN: 0130619779

Introduction to Biomedical Engineering, Enderle, John D. (John Denis), Elsevier Academic Press, 2005. ISBN: 0122386620

**F.S. Schlindwein**
R. Quian Quiroga
T.C. Pearce

## EG 7037 Advanced Solid Mechanics

### Module aim and learning outcomes

Aim: to develop an understanding for the general structure behind computational stress analysis and, in particular, the various constitutive laws that have to be used in the analysis. This module prepares the students for using modern commercial finite element packages.

Learning objectives: students should be able to select the appropriate constitutive law and understand the required material data in a structural design/analysis.

### Module content:

*1. General Framework for Computational Stress Analysis*
Review of fundamental elements of stress analysis – equilibrium, compatibility, constitutive law and boundary conditions; Review of variational formulation for stress analysis – virtual work and minimum potential energy principles; Overview of finite element method – piecewise approximation and stiffness matrix.

*2. Linear constitutive laws*
Review of generalised Hooke's law; General structure of constitutive laws; Anisotropic constitutive law for composite materials; Thermoelasticity.

*3. Nonlinear constitutive laws*
Nonlinear elasticity; Plasticity for incompressible and compressible solids.

*4. Timedependent constitutive laws*
Viscoelasticity, viscoplasticity and creep

### Methods of assessment and weighting

Assignment one (a collection of problem solutions) 40%; Assignment two (a major report) 60%.

### RECOMMENDED BOOKS

1. Robert M Jones, ***Mechanics of Composites Materials*****,** Scripta Book Company.

2. Irving H. Shames, Francis A. Cozzarelli, ***Elastic and Inelastic Stress Analysis***, Prentice Hall

3. J. Lemaitre and J. –L. Chaboche, ***Mechanics of Solid Materials***, Cambridge University Press, ISBN 0521 477851.

J. Pan

## EG 7038 Aerospace Materials

### Aims

The aim of this course is to introduce the students to the aeroscpace materials, including light metals, composites, high temperature materials and single-crystal technology used in modern aero-engines.

### Objectives

- To develop a fundamental understanding of the interaction among microstructure, processing and properties of aluminium and titanium alloys, high temperature Ni-base alloys and composites used in structural aerospace components.
- To understand the physical metallurgy of the above alloys and the design and manufacturing of composites.
- To understand the influence of alloy chemistry and processing methods on the structure of the materials and properties of the components.
- To gain a solid understanding of single crystal technology for manufacturing aero-engine turbines.

### Overview

Innovation within the aerospace industry is becoming increasingly dependent on the use of new materials. Engineering graduates with a strong background in aerostructural engineering will be at the forefront of these developments. Aerospace Materials module will provide you with the fundamental technical knowledge and skills needed to work at the interface between pure science and engineering; develop new materials and new technologies; and contribute to the international aerospace industry of the future.

This course is taught jointly by Dr. Dong, Prof. Atkinson and Prof. Hainsworth in the Mechanics of Materials Group. This will give you the opportunity to study a comprehensive range of topics in structural materials, informed by the latest research and delivered by internationally-recognised experts in their fields.

### Assessment

This module will be assessed by means of a two-hour examination (70%) and 3 technical report on light alloys, composites and high temperatures (30%).

### Recommended Reading:

Michael Ashby, David Jones, Engineering Materials 2, Butterworth-Heinemann, (1998)
D.T.J. Hurle, Handbook of Crystal Growth, 1 Fundamentals, North-Holland, 1993
Roger C. Reed, the Superalloys, Cambridge, 2006
Ian Polmear, Light Alloys: from traditional alloys to nanocrystals, 2005

**H. Dong**
H. Atkinson
S. Hainsworth

## EG 7040 Nonlinear Control

### Objectives

At the end of this module students should:

- be able to analyse an engineering process to determine if linear theory is adequate for controller development or if nonlinear tools are more appropriate
- understand the limitations of linear control methods
- be able to demonstrate the application of nonlinear analysis techniques
- identify and analyse appropriate nonlinear control strategies
- be able to demonstrate knowledge of the likely robustness of the proposed solution

### Overview

This module will describe advanced procedures for the design of nonlinear controllers for nonlinear systems. There will be a structured series of lectures, laboratory and exercise classes followed by a design study. As in the previous related modules, the software package Matlab and its accompanying tool-boxes will be used extensively.

The following topics will be covered:

Development of tools for nonlinear system analysis including:
• the phase plane analysis method (plus a discussion of limit cycles)
• the fundamentals of Lyapunov theory
• describing function analysis
• an introduction to passivity theory

Nonlinear control system design methods including:
• the design and inherent advantages of variable structure control systems
• sliding mode control theory and an assessment of its inherent robustness properties
• constructive Lyapunov design methods

Case studies will include the development of nonlinear controllers for a two link robot manipulator and various electric motors.

### Assessment

The module will be assessed by means of a two-hour examination (50%) and a design study (50%).

### Recommended Reading

C. Edwards & S.K. Spurgeon, “Sliding mode control: theory and applications”, Taylor & Francis (1998)
J-J.E. Slotine & W. Li, “ Applied nonlinear control”, Prentice Hall (1991)
H.K. Khalil, “Nonlinear systems” (2nd Ed.) Prentice Hall (1996)

C. Edwards

## EG 7050 Advanced Engineering Dynamics

### Objectives

To introduce the fundamental concepts and methods of advanced analytical dynamics. At the end of this module, students should be able to understand and apply the most important methods and tools from theoretical analytical dynamics to a range of different engineering systems.

### Overview

Subjects studied will be selected from the following list of topics:

- Generalized coordinates and degrees of freedom
- Holonomic and non-holonomic constraints
- Virtual displacements and generalized forces
- D'Alembert's principle and virtual work
- Lagrange's equations
- Hamilton's principle

### Assessment

The module will be assessed by means of a two-hour written examination (100%).

### Recommended Reading

Ying, Advanced Dynamics, AIAA, 1997

Williams, Fundamentals of Applied Dynamics, Wiley, 1996

Ginsberg, Advanced Engineering Dynamics, Cambridge, 1995

Wells, Lagrangian Dynamics, Schaum's Outline Series, 1967

E. Prempain

## EG 7060 Dynamics of Mechanical Systems

### Objectives

To apply the fundamental concepts of Newtonian mechanics in order to gain a sound understanding of the dynamics of mechanical systems. To introduce a broad range of analytical tools with which to analyse, model and design complex mechanical systems. At the end of the course students should be able to understand how to apply analytical tools and methods to mechanical systems from a broad range of application domains: e.g. robotics, aircraft/spacecraft/vehicles dynamics, etc

### Overview

Subjects studied will be selected from the following list of topics:

- Kinetics of rigid bodies in planar motion
- Kinematics of rigid bodies in three dimensions
- Kinetics of rigid bodies in three dimensions
- Euler's equations of motion for a rigid body
- Vibrations of two degree-of-freedom systems
- Vibrations of multi degree-of-freedom systems

### Assessment

The module will be assessed by means of a two-hour written examination (100%).

### Recommended Reading

Meriam and Kraige, Engineering Mechanics – Dynamics, John Wiley, 1998.

Beer and Johnston, Vector Mechanics for Engineers – Dynamics, McGraw-Hill, 1990

Meirovitch, Fundamentals of Vibrations, McGraw-Hill, 2001

Ying, Advanced Dynamics, AIAA, 1997

D. Bates

## APPENDIX A Example Self Certification Form

**DEPARTMENT OF ENGINEERING**

**NOTIFICATION OF ILL-HEALTH/ABSENCE**

**PLEASE READ THE NOTES ON THE REVERSE SIDE OF THIS FORM BEFORE COMPLETING THE SECTIONS BELOW**

| | |
|---|---|
| **SURNAME** | |
| **OTHER NAMES** | |
| DEGREE | MSc. in |

**Written permission for prolonged absence (not medical) during term time should be obtained from the Head of Department.**

| | |
|---|---|
| Did you visit your doctor/dentist/hospital? | YES/NO |
| Did you receive any medication/treatment? | YES/NO |

**Please attach any medical evidence you have to support this.**

Give brief details of your illness/reason for absence:

| | | |
|---|---|---|
| Date sickness began | | |
| Date sickness ended | | |

Give brief details of practical classes, laboratory sessions etc. you have missed:

| Date | Time | Session missed | Staff member |
|---|---|---|---|
| | | | |

Give brief details of any coursework 'hand-in' dates you have missed:

| | |
|---|---|
| Your signature | |
| Date | |

**Please hand this form in to the General Office on the 5th Floor**
**All relevant staff will be notified of your absence.**

**MY PROGRAMME**

My modules for this year are:

| Module Number | Module Title |
|---|---|
| EG 7012 | MATLAB and CAD |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

Compiled and edited by Dr. P.W. Lefley