UNIVERSITY OF LEICESTER

# Module Specification

## EG2004 Engineering Experimentation and Analysis

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Academic Year
**Occurence:** E
**Coordinator:**
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 90 | | 2 | | |
| 004 | Engagement with Coursework | 10 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Plan and conduct experimental work, and analyse experimental data (using appropriate statistical and theoretical methods).
- Perform quantitative error analyses based on errors in measurements and from other sources, and use these to evaluate the significance of experimental findings.
- Discuss experimental results in the context of relevant background theory and engineering applications.
- Demonstrate an ability to write concise, professional, technical engineering reports of the standard expected in industry.
- Transferable Skills: written communication; problem solving; information handling

### Teaching and Learning Methods

Laboratory practical classes, computer practical classes.

### Assessment Methods

- Lab exercises and reports (70%)
- Formal Report 1 (15%)
- Formal Report 2 (final-15%)
- Reassessment report (100)

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Prereading/;ab preparation activities. Analysis of experimental data using appropriate computational methods; preparation of laboratory reports.

UNIVERSITY OF LEICESTER

# Module Specification

## EG2006 Integrated Engineering Design

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 30

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Rob Thornton
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Design, Build and Test Project | 70 | | | | |
| 004 | Financial Calculation Assignment | 10 | | | | |
| 005 | Business Simulation Performance | 20 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Perform as a member of an effective interdisciplinary engineering team throughout the lifecycle of a project right from application to join the team through to post-testing evaluation of the product, including reflecting on their own learning and development.
- Conceive-design-implement-operate complex engineering systems in an interdisciplinary team using appropriate supporting engineering analysis and considering the trade-off between cost, quality and environmental performance.
- Analyse financial results to determine the health of an engineering business and the success of business strategies and plans
- Produce, implement and continuously improve a sustainable business strategy in a simulated business environment relevant to an engineering product
- Present engineering and business results professionally both verbally and in writing, demonstrating the ability to discuss and defend professional judgements in the context of producing an engineering product which is an optimum business solution.

### Teaching and Learning Methods

Lectures, design classes, computing and hardware practical classes, presentations, simulated CV application, interview and assessment centre-style group activity session, tutorials and general induction sessions.

NOTE: The nature of the assessment in this module is that it is not normally possible for the assessment to be re-taken, therefore failure of the module means termination of a student's course.

### Assessment Methods

- Design, build and test project
- Financial calculation assignment
- Business simulation performance

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Design, build and test; business simulations; group problem based learning.

Last Published: 12 November 2019

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# Module Specification

## EG2006 Integrated Engineering Design

Last Published: 12 November 2019

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# Module Specification

## EG2111 Materials and Structures

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Semester 1
**Occurence:** E
**Coordinator:** Simon Gill
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 90 | | 2 | | |
| 004 | Engagement with Coursework | 10 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Define the mechanical material properties that are used in the analysis, modelling and design of static mechanical systems and compare different groups of engineering materials on the basis of these properies.
- Explain the strengthening mechanisms relevant to materials used in advanced mechanical and aerospace structures.
- Derive performance metrics to enable the selection of appropriate materials for a variety of different engineering applications.
- Analyse the loading on a selection of typical engineering structural elements (including pressure vessels) using common failure criteria to determine their strength in yield, brittle fracture and buckling.
- Apply stress intensity methods to the solution of fracture problems; fatigue laws, including compensations for non-zero mean stresses, to predict the fatigue life of engineering components.

### Teaching and Learning Methods

Lectures, examples workshops, formative coursework activity.

### Assessment Methods

- Examination

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, screencasts and attempting example problems.

Last Published: 12 November 2019

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# Module Specification

## EG2112 Dynamics and Thermofluids

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Semester 1
**Occurence:** E
**Coordinator:** Rafael Morales Viviescas
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 90 | | 2 | | |
| 004 | Engagement with Coursework | 10 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Define main motion descriptors (position, velocity and acceleration) for solid bodies, whose motion can be represented as those of particles, as well as the relation between such descriptors in the following coordinate systems: cartesian, polar and normal and tangential.
- Recognise and correctly apply Newton's laws, principle of work and energy, principle and conservation of (linear and angular) impulse and momentum and conservation of energy to engineering applications.
- Distinguish the different responses associated with single degree-of-freedom vibrating systems (free and forced responses) and explain the infleunce of key parameters, such as damping ratio, natural frequency and initial conditions.
- Explain the physical content and implications of the second law of thermodynamics, including entropy, the Carnot and Brayton cycles and thermla efficiency, applying these to solve engineering problems.
- Evaluate the effects of fluid motion for a viscous internal and external flows, including the defintion and calculation of the effects of boundary layers.

### Teaching and Learning Methods

Lectures, examples workshops, formative coursework activity.

### Assessment Methods

- Examination

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, screencasts and attempting example problems.

Last Published: 12 November 2019

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# Module Specification

## EG2121 Materials Processing

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Semester 2
**Occurence:** E
**Coordinator:**
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 85 | | 2 | | |
| 004 | Industrial Visit Assignment | 15 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Describe the fundamental interactions between microstructure and processing in the determination of the mechanical properties of engineering materials
- Describe the major classes of engineering materials (metals, ceramics, polymers, elastomers, glasses and hybrids) in terms of their structure, characteristic properties and the ways in which they are processed to produce engineering components.
- Analyse the process of phase change using phase diagrams, thermodynamics and kinetics
- Analyse the influence of carbon content, heat treatments and other alloying elements on the properties of steels.
- Describe key engineering manufacturing processes, explain the resulting affect on microstructure and properties and select approporate manufacturing approahes for engineering components.

### Teaching and Learning Methods

Lectures, example classes, formative coursework activity, Industrial visit. Students who are unable to participate in the industrial visit will be provided with generic data to complete the assignment.

### Assessment Methods

- Examination (final)
- Industrial visit assignment
- Examination

### Pre-Requisites

EG2111

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, set problem and example sheets, preparation and analysis of industrial visit data.

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# Module Specification

## EG2122 Applied Engineering Thermodynamics

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Semester 2
**Occurence:** E
**Coordinator:**
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 90 | | 2 | | |
| 004 | Engagement with coursework | 10 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Identify, describe and analyse gas, vapour and combined thermodynamic cycles used for power generation and transport applications, including Otto, Diesel and Rankine cycles.
- Identify and describe major features of different refrigeration and heat pump cycles used for industrial applications.
- Describe exergy, which is the maximum useful work, and perform exergy analysis of closed and open thermodynamic systems.

### Teaching and Learning Methods

Lectures, examples workshops, formative coursework activity.

### Assessment Methods

- Examination

### Pre-Requisites

EG2112

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, set problems, group problem based learning.

UNIVERSITY OF LEICESTER

# Module Specification

## EG2211 Analogue and Digital Electronics

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Semester 1
**Occurence:** E
**Coordinator:** Avinash Bhangaonkar
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 90 | | 2 | | |
| 004 | Engagement with coursework | 10 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Electronic devices: Recognise how semiconducting materials are employed in the fabrication of devices including diodes, bipolar junction transistors, metal oxide insulated gate field effect transistors etc. Perform basic calculations of device characteristics including simulation using ECAD
- Electronic Circuits: Apply electronic devices and apply small signal analysis including ECAD circuit simulation to functional applications including AC rectifiers, current sources, amplifiers and operational amplifiers, oscillators and logic gate circuits.
- Combinational circuits and programmable logic: develop and articulate the functionality of common combinational circuits (multiplexors, line decoders, demux, rom, pal/cpld) and utilise them in complex digital circuits.
- State machines: reason about state machines (Mealy/Moore) and the role they play in building and implementing digital systems; build state diagrams, state tables, combinational logic for computing states; minimise implementations involving state machines, gates, and flip flops
- Digital systems: describe sequential and combinational logic circuits in basic HDL; explain the relationship between languages for digital systems and reconfigurable hardware; present variants of circuits in HDL.

### Teaching and Learning Methods

Lectures, example classes, formative coursework activity.

### Assessment Methods

- Examination (90%)
- Engagement with coursework (10%)

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, example problems and completing formative coursework activities. Modules may also include activities such as pre-reading for flipped teaching sessions, group problem based learning, viewing screencasts or podcasts and computer simulation or online activities or quizzes.

Last Published: 12 November 2019

# Module Specification

## EG2212 Communications

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Semester 1
**Occurence:** E
**Coordinator:** David Siddle
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 90 | | 2 | | |
| 004 | Engagement with coursework | 10 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Calculate the propagation of electromagnetic waves in a range of scenarios
- Apply the basic concepts of analogue and digital modulation
- Apply the concepts of the transmission of analogue waveforms by digital means
- Undertake calculations concerning the propagation of waveforms along transmission lines

### Teaching and Learning Methods

Lectures, example classes, formative coursework activity.

### Assessment Methods

- Examination (90%)
- Engagement with coursework (10%)

### Pre-Requisites

-

### Co-Requisites

-

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, example problems and completing formative coursework activities. Modules may also include activities such as pre-reading for flipped teaching sessions, group problem based learning, viewing screencasts or podcasts and computer simulation or online activities or quizzes.

Last Published: 12 November 2019

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# Module Specification

## EG2221 Electrical Engineering

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

Lectures
Seminars
Practical Classes & Workshops
Tutorials
Fieldwork
Project Supervision
Guided Independent Study
Demonstration
Supervised time in studio/workshop
Work Based Learning
Placement
Year Abroad
Total Module Hours

**Period:** Semester 2
**Occurence:** E
**Coordinator:**
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Exam | 85 | | 2 | | |
| 004 | Industrial Visit Assignment | 15 | | | | |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Solve engineering problems involving single and three-phase ac circuits, calculation of active, reactive and apparent power in ac circuits, power factor correction.
- Apply engineering principles of magnetic circuits and limitations of magnetic materials to the analysis, design and performance prediction of wound electrical equipment including power inductors and transformers
- Apply the principle of electro-mechanical energy conversion to different three-phase AC electrical machines (synchronous and induction) for prediction of machine characteristics and steady state performance.
- Critique design considerations and industrial applications of AC electrical machines.

### Teaching and Learning Methods

Lectures, examples classes, formative coursework activity, Industrial visit. Students who are unable to participate in the industrial visit will be provided with generic data to complete the assignment.

### Assessment Methods

- Examination (final) (85%)
- Industrial visit assignment (15%)

### Pre-Requisites

-

### Co-Requisites

-

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, example problems and preparing for, and completing industrial practice activity. Modules may also include activities such as pre-reading for flipped teaching sessions, group problem based learning, viewing screencasts or podcasts and computer simulation or online activities or quizzes.

UNIVERSITY OF LEICESTER

# Module Specification

## EG2222 Embedded Systems

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

Lectures
Seminars
Practical Classes & Workshops
Tutorials
Fieldwork
Project Supervision
Guided Independent Study
Demonstration
Supervised time in studio/workshop
Work Based Learning
Placement
Year Abroad
Total Module Hours

**Period:** Semester 2
**Occurence:** E
**Coordinator:**
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 001 | Coursework 1 | 50 | | | | |
| 002 | Coursework 2 (final) | 50 | | | | |
| 003 | Exam | 100 | | 2 | | Y |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Design and discuss software for single-processor embedded systems.
- Design and discuss systems including peripheral devices (for example networking, A/D and D/A conversion) for embedded applications.
- Implement, test, demonstrate, and explain embedded software designs using modern programming techniques.

### Teaching and Learning Methods

Laboratory practical exercises, presentations and discussions during practical classes

### Assessment Methods

- Coursework 1 (50%)
- Coursework 2 (final) (50%)
- Reassessment: Examination (100%)

### Pre-Requisites

-

### Co-Requisites

-

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed background reading, problem solving and follow up work for laboratory practical exercises.

UNIVERSITY OF LEICESTER

# Module Specification

## EG2302 System Dynamics and Control

**Academic Year:** 2019/0
**Module Level:** Year 2
**Scheme:** UG
**Department:** Engineering
**Credits:** 15

**Student Workload (hours)**

| | |
|---|---|
| Lectures | |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Andrea Lecchini Visintini
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 003 | Intermediate Class Exercise | 30 | | | | |
| 004 | Exam | 70 | | 2 | | |
| 005 | Exam | 100 | | 2 | | Y |

### Intended Learning Outcomes

On successful completion of the module, students should be able to:
- Define the basic properties of the Laplace transform, and apply it to describe signals and solve ordinary differential equations.
- Formulate simple models of mechanical and electrical systems based on physical principles.
- Analyse the dynamical properties of a SISO (Single-Input Single-Output) dynamical system described by a continuous-time transfer function.
- Discuss the performance specifications of feedback control loops in terms of stability, and robustness in the face of modelling uncertainties.
- Design a simple feedback loop both using the root locus method and the frequency domain approach.

### Teaching and Learning Methods

Lectures and example classes, intermediate coursework assessment.

### Assessment Methods

- Examination
- Intermediate class exercise

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

Directed reading, attempting example problems.

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# Module Specification

## EG3005 Third Year Project

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 30

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 1 |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | 20 |
| Guided Independent Study | 279 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 300 |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Shian Gao
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 001 | Interim Report | 20 | | | | |
| 002 | Technical Achievement | 35 | | | | |
| 003 | Presentation | 15 | | | | |
| 005 | Final Report (Final) | 30 | | | | |
| 006 | Resit Assignment | 100 | | | | Y |

### Intended Learning Outcomes

To integrate the knowledge obtained throughout the undergraduate course in a realistic exercise in the practice of engineering at a professional level; to give the opportunity for individual study and for the development of personal and technical skills; to develop techniques of communication, both oral and written. At the end of this module, students should be able to

(1) discuss in detail a specific project plan to be executed during the 3rd year.
(2) evaluate the progress of their project with respect to the project plan.
(3) organise a schedule for the work remaining to be completed in the project.
(4) give a formal seminar presentation of their projects.
(5) write a project proposal, an interim report and a final report.

### Teaching and Learning Methods

Regular individual meetings with supervisor, seminars and presentations.

### Assessment Methods

Written reports, seminar presentation and oral examination.

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

# Module Specification

## EG3007 Management

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 10

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 22 |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 78 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 100 |

**Period:** Semester 1
**Occurence:** E
**Coordinator:** Marina Marinelli
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 011 | Examination (Final) | 100 | | 2 | | |

### Intended Learning Outcomes

At the end of this module, typical students should be able to:
1. To be able to discuss a range of management topics & methods
2. To define some of the key concepts in these topics showing some knowledge of the specialised vocabulary
3. To be able to discuss some of the key issues facing businesses today
4. To be able to describe the importance of management to engineers

### Teaching and Learning Methods

Lectures. Independent study and reflection based on: lecture notes, personal work experience, current news, library and internet sources, etc.

### Assessment Methods

Formal written examination

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

### Guided Independent Study: Indicative Activities

Last Published: 12 November 2019

UNIVERSITY OF LEICESTER

# Module Specification

## EG3101 Materials 2: Failure Mechanisms and Tribology

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 20

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 42 |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 158 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 200 |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Rob Thornton
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 011 | Examination (Semester 1 - Failure mechanisms) | 50 | | 2 | | |
| 012 | Examination (Semester 2 - Trbology) (Final) | 50 | | 2 | | |
| 013 | Resit examination (Failure mechanisms and Tribology) | 100 | | 2 | | Y |

### Intended Learning Outcomes

Discipline specific knowledge:
By the end of the first part of this module (Failure Mechanisms), successful students will have the ability to:
(1) Qualitatively describe, in detail, the microstructural processes that occur during deformation and failure mechanisms: elastic and inelastic deformation, low and high temperature brittle and ductile fractures, and low-cycle and high-cycle fatigue failures; and therefore identify materials likely to be resistant to each type of failure on the basis of their microstructural mechanisms of mechanical strengthening.
(2) Use deformation and failure mechanism maps to predict the dominant creep and fracture mechanisms that materials are likely to experience under given temperature and stress conditions.
(3) Apply stress intensity methods to the solution of fracture problems involving plane stress and plane strain conditions, uniaxial and biaxial tension, applying appropriate compensations for crack tip plasticity, for a variety of 2D and 3D crack geometries.
(4) Use combinations of major fatigue laws (Paris Law, Basquin Law, Coffin-Manson Law, Miner's Rule), with appropriate compensations for non-zero mean stresses, to predict the fatigue life of engineering components, and be able to describe the limitations of each technique.

By the end of the second part of this module (Tribology), successful students will have the ability to:
(1) Qualitatively describe: common metrological techniques used to characterize surfaces, their relative resolutions, magnifications and areas/volumes of observation/measurement; the basic components of surface roughness and the advantages and disadvantages of commonly used roughness parameters.
(2) Describe the assumptions and limitations of Hertzian contact mechanics and the impact of common non-Hertzian effects. Apply Hertzian contact mechanics in determining the stresses and pressure distributions between line, point and elliptical contacts, and be able to select an appropriate contact model for a variety of engineering applications.
(3) Derive mathematical models of abrasive and adhesive wear mechanisms and qualitatively describe the characteristics of other common wear mechanisms (contact fatigue, oxidative wear, erosive and impact wear, fretting).
(4) Characterise the behavior of lubricants and apply empirical techniques in the prediction of bearing life and bearing selection.
(5) Offer surface engineering solutions to common tribological problems.
(6) Evaluate tribological systems in terms of surface characteristics (material pair and roughness), contact geometry (line, point and elliptical contacts), relative motion (rolling or sliding, amplitudes of and directions of motion) and lubrication mechanisms (solid or fluid, boundary, hydrodynamic or elasto-hydrodynamic).

Transferable skills:
(1) Problem solving (by the application of theory and calculation to tribological systems).

# Module Specification

## EG3101 Materials 2: Failure Mechanisms and Tribology

### Teaching and Learning Methods

Lectures, screencasts, examples sheets, surgery hours, directed reading.

### Assessment Methods

Written examination (100%)

### Pre-Requisites

EG2101 Materials 1.

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

# Module Specification

## EG3102 Thermodynamics and Fluid Dynamics 2

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 20

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 44 |
| Seminars | |
| Practical Classes & Workshops | 2 |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 154 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 200 |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Shian Gao
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 011 | Examination (Final) | 80 | | 3 | | |
| 012 | Computer examination | 20 | | 3 | | |
| 013 | Re-sit examination | 100 | | 3 | | Y |

### Intended Learning Outcomes

Fluid Dynamics
At the end of this module, typical students should be able to:
(1) Discuss the effects of compressibility in flows and define the speed of sound and the Mach number
(2) Apply the conservative laws in reduced form to one-dimensional compressible isentropic flows;
(3) Derive the jump conditions through normal and oblique shocks and Prandtl-Mayer expansion fans;
(4) Apply the jump conditions to one and two-dimensional shock-containing flows;

Turbulence and Heat Transfer
At the end of this module, typical students should be able to:
(1) Derive the Reynolds equations for incompressible fluids and understand the concept of turbulence modelling;
(2) Use analytical and finite-difference methods to find solution of steady and non-steady conduction problems;
(3) Evaluate forced convective heat transfer across boundary layers and in tubes;
(4) Perform free convection analysis on surfaces and understand the related turbulence effects;
(5) Perform heat transfer analysis related to pool boiling and film condensation;
(6) Evaluate different heat exchanger types and calculate the overall heat transfer coefficient;
(7) Perform radiation analysis at a surface and conduct radiation exchange calculations.

Thermodynamics
At the end of this module, typical students should be able to:
(1) Perform a general energy analysis of a system.
(2) Perform thermodynamic calculations of gas mixtures.
(3) Perform thermodynamic calculations of combustion, determine flame temperatures.
(4) Use exergy as a measure of work potential for evaluating different energy conversion processes.

### Teaching and Learning Methods

Lectures, examples sheets, surgery hours.

### Assessment Methods

Formal written examination and Blackboard test.

### Pre-Requisites

EG2102 Thermodynamics and Fluid Dynamics.

### Co-Requisites

## EG3102 Thermodynamics and Fluid Dynamics 2

**Excluded Combinations**

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**Guided Independent Study: Indicative Activities**

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# Module Specification

## EG3103 Mechanics of Structures 2

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 20

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 38 |
| Seminars | |
| Practical Classes & Workshops | 8 |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 154 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 200 |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Mateusz Bocian
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 011 | Examination (sem 1) | 50 | | 2 | | |
| 012 | Examination (sem 2) (Final) | 50 | | 2 | | |
| 013 | Resit examination | 100 | | 3 | | Y |

### Intended Learning Outcomes

Semester 1 covers Elastic Analysis and Semester 2 covers Dynamics of Mechanical Systems.

Elastic analysis provides the students an understanding of linear elasticity problems and an introduction to the finite element method for elastic stress analysis. At the end of the modules students should be able to understand the theory of the finite element method and should have gained practical experience with using a commercial finite element package to solve simple linear elastic problems.

Elastic analysis covers the basic equations in linear elasticity (equilibrium, constitutive law, compatibility of strain) and the finite element method (1D bar and beam element and 2D triangular element formulation, stiffness matrix, assembly, solution) including dynamic analysis. The practical classes include of truss problems (1D), stress concentrations (2D), dynamic analysis problem, and an engineering design problem using finite element analysis.

At the end of this module, students will know how to use the concepts of 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 and to apply these to the analysis of a broad range of engineering dynamics applications. Students will be introduced to analytical dynamics in order to solve advanced engineering applications.

### Teaching and Learning Methods

Elastic analysis: lectures, example questions and practical exercises using a commercial finite element package.
Dynamics of Mechanical Systems: lectures, example questions.

### Assessment Methods

Written examinations at end of each semester (50% each).

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

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# Module Specification

## EG3201 Electrical Power

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 20

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 44 |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 156 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 200 |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Harold Ruiz
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 001 | Examination (Semester 1) | 50 | | 2 | | |
| 002 | Examination (Semester 2) (Final) | 50 | | 2 | | |
| 003 | Resit examination | 100 | | 3 | | Y |

### Intended Learning Outcomes

Power Electronics (Semester 1):
At the end of this module, typical students should be able to:
(1) Explain the basic physical principles of power semiconductor switch structures (diodes, transistors, etc) and their operating behaviours.
(2) Implement appropriate power semiconductor switches and passive components in a switching converter based on design requirements.
(3) Demonstrate the operating principles of basic converter topologies (ac/dc, dc/ac, dc/dc and ac/ac) and solve their operations under steady-states.
(4) Solve non-isolated and isolated dc/dc converters and conduct the converter efficiency analysis.
(5) Calculate and explain dc/dc converters operating in CCM and DCM exploiting the basic closed loop control circuitry.
(6) Analyse the functional principles of ancillary circuits including gate drivers, thermal interface, protection circuits and filters.
Power Systems Analysis (Semester 2):
At the end of this module, typical students should be able to:
(1) Recognize the present and future trends in electric power systems by describing the structure of the electric utility industry, their components, and differences between the American and European practices.
(2) Retain the basic concepts and phasor representations of balanced and unbalanced three-phase networks.
(3) Describe the basic theory, design and different kind of connections for practical three-phase transformers under steady-state conditions and their equivalent representation in the per-unit system.
(4) Implement the two-port network representation for the analysis of short, medium, and long distance three-phase transmission lines for underground and overhead transmission and distribution systems.
(5) Design iterative computer methods for the solution of power-flow problems, estimating the input/output data in the per-unit system.
(6) Construct the bus impedance matrix for the analysis of fault currents.

### Teaching and Learning Methods

Lectures, examples sheets, seminar/assignment/tutorial system, surgery hours.

### Assessment Methods

Assessment will be by end of semester examinations (50% + 50%).

### Pre-Requisites

EG2201, EG2203

Last Published: 12 November 2019

# Module Specification

## EG3201 Electrical Power

### Co-Requisites

EG2202 - Communications.

### Excluded Combinations

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### Guided Independent Study: Indicative Activities

# Module Specification

## EG3202 Communications 2

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 20

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 24 |
| Seminars | 11 |
| Practical Classes & Workshops | 24 |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 141 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 200 |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** David Siddle
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 011 | Laboratory Exercises | 25 | | | | |
| 012 | Design Exercise | 25 | | | | |
| 013 | Computer-based assessment (Semester 1) | 50 | | 2.5 | | |
| 014 | Resit Examination | 100 | | 2 | | Y |

### Intended Learning Outcomes

On completion of the module, a typical student will have be able to:
1. state the system limitations on radio wave propagation effects due to various environments.
2. advise on the use of antennas and antenna arrays for transmission and reception,
3. explain the principles of operation of a superheterodyne radio receiver
4. distinguish between digital modulation methods, and their distortions due to noise and channel distortions;
6. suggest coding and complex modulation formats to negate the effects of noise and fading, and;
7. state the relevant parameters of voice and picture encoding techniques
8. model various components of a digital communication system using MATLAB and the associated communications blockset;
9. predict the effect of noise and distortion on the digital signal;
10. assess the efficacy of various coding schemes in negating the effects of noise and fading; and choose methods of voice and picture encoding to suit the digital signal to be enhanced
11 apply original thought to the development of practical design within given constraints.
12. demonstrate logical thought through writen communication and
13. use the output of a computational design tool to evaluate designs against given criteria.

### Teaching and Learning Methods

Semester 1 - Lectures, example sheets, surgery hours.
Semester 2 - Seminars, directed reading, laboratory work, design exercise.

### Assessment Methods

2.5-hour Blackboard test (50%).
Laboratory exercises (25%).
Design exercise (25%).

### Pre-Requisites

EG2202 Communications

### Co-Requisites

### Excluded Combinations

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# Module Specification

## EG3202 Communications 2

**Guided Independent Study: Indicative Activities**

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# Module Specification

## EG3204 Programmable Electronics

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 20

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 22 |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 90 |
| Demonstration | 88 |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 200 |

**Period:** Academic Year
**Occurence:** E
**Coordinator:** Timothy Pearce
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 001 | Programming assessment 1 | 25 | | | | |
| 002 | Programming assessment 2 | 25 | | | | |
| 003 | Programming assessment 3 | 25 | | | | |
| 004 | Programming assessment 4 (Final) | 25 | | | | |

### Intended Learning Outcomes

At the end of the first part of this module, typical students should be able to demonstrate understanding of the process of problem solving using computer programming. They should be able to write, compile, and execute code to solve typical engineering problems, and to identify and correct errors in their own and others' code. They should have an understanding of the fundamental principles which underly most modern computer programming languages.

At the end of the second part of this module, typical students should be able to:
(1) demonstrate knowledge of what reconfigurable hardware is, and its relation to software and hardware systems;
(2) demonstrate appreciation of the issues in building and reasoning about (practical) concurrent, communicating systems and the benefits that concurrency offers;
(3) demonstrate an ability to develop inherently concurrent applications within an IDE;
(4) demonstrate competence with the VHDL programming language and associated FPGAs;
(5) apply these principles to the design, analysis and implementation of FPGA circuits.

### Teaching and Learning Methods

Lectures, examples sheets, design assignment, surgery hours.

### Assessment Methods

Assessed laboratory exercises.
Resit by written examination.

### Pre-Requisites

### Co-Requisites

### Excluded Combinations

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### Guided Independent Study: Indicative Activities

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# Module Specification

## EG3311 State Variable Control

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 10

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 22 |
| Seminars | |
| Practical Classes & Workshops | 4 |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 74 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 100 |

**Period:** Semester 1
**Occurence:** E
**Coordinator:** Matthew Turner
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 011 | Examination (Final) | 100 | | 2 | | |

### Intended Learning Outcomes

At the end of the module, students should be able to:
(1) define and discuss the basic properties of dynamical systems in state space form;
(2) formulate simple state-space models of electrical or mechanical systems based on physical principles;
(3) apply the concept of linearisation to obtain local linear models of nonlinear systems;
(4) analyse the essential characteristics of a control system such as asymptotic stability, controllability and observability;
(5) design state feedback controllers (based on pole placement and on optimal control), and full-order state observers;
(6) evaluate the effect of controller tuning on the closed-loop response of the plant;
(7) apply basic functionalities of the control software package Matlab in control system analysis and design.

### Teaching and Learning Methods

Lectures, examples sheets, surgery hours, essays, CAD/computing practical classes.

### Assessment Methods

Formal written examination (100%)

### Pre-Requisites

EG1201 Electrical and Electronic Eengineering.
EG2301 Classical Control.

### Co-Requisites

### Excluded Combinations

-

### Guided Independent Study: Indicative Activities

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# Module Specification

## EG3321 Digital Control

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 10

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 22 |
| Seminars | |
| Practical Classes & Workshops | |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 78 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 100 |

**Period:** Semester 2
**Occurence:** E
**Coordinator:** Andrea Lecchini Visintini
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 001 | Examination | 100 | | 2 | | |

### Intended Learning Outcomes

At the end of this module, students should be able to analyse the dynamical properties of simple Engineering system or process that includes digital and/or sampled elements. They should be able to discuss the performance of computer controlled feedback loops, and to analyse the expected performance of the digital implementation of a feedback loop. They should be able to demonstrate knowledge of the simplifications used to obtain a digital control solution and identify possible limitations in the solution proposed.
Syllabus: introduction to computer controlled systems, the Z-transform, difference equations, the Zero Order Hold (ZOH), digital implementation of feedback controllers, frequency response of discrete-time systems, control design n discrete time.

### Teaching and Learning Methods

Lectures, example sheets, surgery hours, directed reading.

### Assessment Methods

End of year examinations (100%)

### Pre-Requisites

EG2301 Classical Control.
EG3110 State Variable Control.

### Co-Requisites

### Excluded Combinations

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### Guided Independent Study: Indicative Activities

Last Published: 12 November 2019

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# Module Specification

## EG3322 Signal Processing I

**Academic Year:** 2019/0
**Module Level:** Year 3
**Scheme:** UG
**Department:** Engineering
**Credits:** 10

**Student Workload (hours)**

| | |
|---|---|
| Lectures | 22 |
| Seminars | |
| Practical Classes & Workshops | 6 |
| Tutorials | |
| Fieldwork | |
| Project Supervision | |
| Guided Independent Study | 72 |
| Demonstration | |
| Supervised time in studio/workshop | |
| Work Based Learning | |
| Placement | |
| Year Abroad | |
| Total Module Hours | 100 |

**Period:** Semester 2
**Occurence:** E
**Coordinator:** Fernando Schlindwein
**Mark Scheme:** UG Module Mark Scheme

| No. | Assessment Description | Weight % | Qual Mark | Exam Hours | Ass't Group | Alt Reass't |
|---|---|---|---|---|---|---|
| 001 | Examination | 100 | | 2 | | |

### Intended Learning Outcomes

This module will provide an understanding of the background theory associated with discrete system analysis followed by a review of design methods associated with the main classes of discrete systems. 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. 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. At the end of this module students should be able to:
• Read and demonstrate understanding of the established literature in the field of discrete-time signal processing.
• Analyse and predict the response of known linear time-invariant discrete systems.
• Design linear time-invariant FIR and IIR filters from either time or frequency domain representations.
• Interpret the spectra of discrete-time signals.
• Design appropriate schemes for the spectral analysis of discrete-time signals.

### Teaching and Learning Methods

Lectures, lecture notes, example sheets, surgery hours.

### Assessment Methods

End of year examinations (100%)

### Pre-Requisites

EG1001 Maths with Computation
EG1201 Electrical and Electronic Engineering

### Co-Requisites

### Excluded Combinations

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### Guided Independent Study: Indicative Activities