UNIVERSITY OF LEICESTER

Module Specification

EG2001 Computer-based Modelling

Academic Year:	2018/9
Module Level:	Year 2
Scheme:	UG
Department:	Engineering
Credits:	10

Student Workload (hours)

Lectures	22
Seminars	
Practical Classes & Workshops	11
Tutorials	
Fieldwork	
Project Supervision	
Guided Independent Study	67
Demonstration	
Supervised time in studio/workshop	
Work Based Learning	
Placement	
Year Abroad	
Total Module Hours	100

Period:	Semester 1
Occurence:	E
Coordinator:	Stephen Garrett
Mark Scheme:	UG Module Mark Scheme

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

Intended Learning Outcomes

At the end of this module, typical students should be able to:
(1) demonstrate the basic principles of vector calculus, vector integrals and partial differential equations.
(2) identify appropriate analytical techniques to solve certain engineering problems.
(3) derive and apply the appropriate finite difference method to solve more complex engineering problems.
(4) evaluate the effect of changing parameters, such as time step and number of nodes, on the stability and computation time/loading and defining stbility criteria for particular finite difference methods.

Teaching and Learning Methods

Lectures, examples sheets, surgery hours, computing practical classes.

Assessment Methods

Formal written examination (100%)

Pre-Requisites

EG1001 - Maths with Computation

Co-Requisites

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG2003 Experimentation 2

Academic Year: 2018/9
Module Level: Year 2
Scheme: UG
Department: Engineering
Credits: 10

Student Workload (hours)

Lectures	
Seminars	
Practical Classes & Workshops	70
Tutorials	
Fieldwork	
Project Supervision	
Guided Independent Study	30
Demonstration	
Supervised time in studio/workshop	
Work Based Learning	
Placement	
Year Abroad	
Total Module Hours	100

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
011	Lab Exercises and Report 1	50				
012	Lab Exercises and Report 2 (Final)	50				

Intended Learning Outcomes

Discipline specific knowledge: by the end of the module students will have the ability to:
1. Independently plan and conduct experimental work, analyse data collected (using statistical and theoretical methods) and discuss experimental results in the context of background theory relating to associated modules in materials, properties and processing, thermodynamics and fluid mechanics, mechanics of structures, electrical engineering, communications, electromagnetism and control (appropriate to degree programme and modules studied).
2. Perform quantitative error analyses based on errors in measurements and from other sources, and use these to evaluate the significance of experimental findings.
3. Demonstrate an ability to write concise, professional, technical reports of the standard expected in industry.
Transferable skills:
1. Written communication (via lab notebooks and formal reports)
2. Problem solving (by planning and conducting experiments).
3. Information handling (through the collection and analysis of experimental data).

Teaching and Learning Methods

Laboratory practical classes, computer practical classes

Assessment Methods

Lab reports and notebooks

Pre-Requisites

EG1003 - Experimentation 1

Co-Requisites

EG2102, EG2102, EG2103, EG2201, EG2202, EG2301

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG2101 Materials 1: Properties and Processing

Academic Year: 2018/9
Module Level: Year 2
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: Rob Thornton
Mark Scheme: UG Module Mark Scheme

No.	Assessment Description	Weight %	Qual Mark	Exam Hours	Ass't Group	Alt Reass't
012	Computer examination	30		2		
016	Examination (Final)	70		2.5		
017	Re-sit examination	100		2.5		Y

Intended Learning Outcomes

Discipline specific knowledge:
By the end of the first part of this module (Materials Properties), successful students will have the ability to:
(1) Define the basis of common mechanical properties of materials: Young's modulus, yield strength, tensile strength and fracture toughness; and be able to describe the microstructural factors that influence them in polycrystalline materials.
(2) Derive appropriate performance metrics to enable the selection of materials for different engineering applications on the basis of their objective (i.e. lightweight or minimal cost) and likely failure modes (i.e. stiffness, strength or toughness).
(3) Qualitatively describe the microstructural mechanisms of mechanical strengthening in polycrystalline materials, in terms of the influence they have on atomic movement and dislocation movement: intrinsic lattice resistance (bonding and crystal structure), grain size refinement, solid solution strengthening, precipitation hardening and strain hardening.
(4) Qualitatively describe key failure mechanisms of engineering materials in terms of their microstructural initiation and progress and therefore be able to qualitatively describe the characteristics of materials that inhibit or promote these mechanisms: brittle (fast) and ductile fracture, low-cycle and high-cycle fatigue, oxidation and corrosion.
(5) Be able to apply stress intensity methods to the solution of basic fracture problems and common fatigue laws (Paris Law, Miner's Rule) to predict the fatigue life of engineering materials.

By the end of the second part of this module (Materials Processing), successful students will have the ability to:
(1) Describe the fundamental interactions between microstructure and processing in the determination of the mechanical properties of engineering materials (polycrystalline metals and ceramics, polymers and composites)
(2) Describe the major classes of engineering materials (metals, ceramics, polymers, elastomers, glasses and hybrids) in terms of their structure, characteristic properties and typical applications in engineering, and the ways in which they are processed to produce engineering components.
(3) Quantitatively describe the process of phase change in terms of phase diagrams, thermodynamics and kinetics.
(4) Analyse the influence of carbon content and heat treatment on the properties of plain carbon steels, the development of microstructure in heat treatable light alloys, and the major processing routes for polymers and composites.

Transferable skills:
(1) Problem solving (by the application of theory and calculation to the selection of materials and processes).

Teaching and Learning Methods

Lectures, screencasts, online quizzes, examples sheets, surgery hours

Assessment Methods

Blackboard exam (30%), written exam (70%)

Pre-Requisites

EG1101 Mechanical Engineering.

Co-Requisites

EG2101 Materials 1: Properties and Processing

Excluded Combinations

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Guided Independent Study: Indicative Activities

Module Specification

EG2102 Thermodynamics & Fluid Dynamics

Academic Year: 2018/9
Module Level: Year 2
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: Audrius Bagdanavicius
Mark Scheme: UG Module Mark Scheme

No.	Assessment Description	Weight %	Qual Mark	Exam Hours	Ass't Group	Alt Reass't
012	Examination	50		2		
014	Examination (Final)	50		2		
015	Resit Examination	100		2.5		Y

Intended Learning Outcomes

At the end of this module students should be able to demonstrate that they have an appreciation of the implications of the second law of thermodynamics (including the concepts of reversibility and the Carnot cycle), be able to explain the concepts of entropy change and entropy generation, and calculate the effects of entropy change on practical systems.
They should be able to demonstrate that they are familiar with the various types of heat engines and refrigerators available for use in practical applications (including transportation and power generation) and to analyse a range of idealised gas and vapour power cycles, and vapour compression refrigeration cycles.
At the end of this module students should be able to demonstrate that they have gained a basic appreciation of the affects of fluid motion on solid boundaries in internal and external flows. Emphasis will be placed on the boundary layer and the generation of lift and drag on aerofoils and other solid bodies.

Teaching and Learning Methods

Lectures, example sheets, surgery hours. Relevant experiments will be included in EG2003 Exerimentation 2.
Current assessment pattern subject to academic review

Assessment Methods

Thermodynamics part of the module will be assessed by written exam (50%) at the end of semester one.
Fluid dynamics part will be assess by written exam (50%) at the end of semester two

Pre-Requisites

EG1101 - Mechanical Engineering

Co-Requisites

Excluded Combinations

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Guided Independent Study: Indicative Activities

Module Specification

EG2103 Mechanics of Structures

Academic Year: 2018/9
Module Level: Year 2
Scheme: UG
Department: Engineering
Credits: 20

Student Workload (hours)

Lectures	48
Seminars	
Practical Classes & Workshops	
Tutorials	
Fieldwork	
Project Supervision	
Guided Independent Study	152
Demonstration	
Supervised time in studio/workshop	
Work Based Learning	
Placement	
Year Abroad	
Total Module Hours	200

Period: Academic Year
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
011	Computer examination	30		2		
013	Examination (Final)	70		2.5		
014	Re-sit examination	100		2.5		Y

Intended Learning Outcomes

At the end of this module, typical students should be able to demonstrate awareness of the fundamental concepts used in the analysis, modelling and design of static and dynamic mechanical systems, and to apply these to realistic engineering problems. Using the methods introduced in this course, students should be able to make sensible deductions about the behaviour of a wide range of simple mechanical systems, in terms of their motion, the forces and moments acting on them, and the way they are distributed within a solid body.
Students should be able to apply the relevant theory and fundamental mathematical tools for the analysis of dynamic systems, including vector and matrix algebra, Newtonian mechanics, Kinematics and Kinetics of particles, systems of particles and simple mechanisms.They should also model single-degree of freedom systems, interpret correctly the phenomenon of resonance and define the natural frequency and damping ratio associated with such systems

Students should also be able to determine stresses, strains and deflections in simple structural components such as beams, columns and pipes subject to loadings such as tension, torsion, compression and internal pressure, and determine their useful strength using simple failure criteria including yield, brittle fracture and buckling.

Teaching and Learning Methods

Lectures, examples sheets, seminar/assignment/tutorial system, surgery hours. Relevant experiments will be available in EG2003.

Assessment Methods

Assessment will be by a mid-year computer-aided assignment (30%) and end of year examinations (70%).

Pre-Requisites

EG1101 Mechanical Engineering.

Co-Requisites

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG2201 Electrical Engineering

Academic Year:	2018/9
Module Level:	Year 2
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:	Stephen Dodd
Mark Scheme:	UG Module Mark Scheme

No.	Assessment Description	Weight %	Qual Mark	Exam Hours	Ass't Group	Alt Reass't
001	Computer examination	30		2		
002	Examination (Final)	70		2.5		
003	Resit examination	100		2.5		Y

Intended Learning Outcomes

At the end of this module, typical students should be able to demonstrate an awareness of the key facts, mathematical principles, concepts and theories relating to the field of Electrical Engineering. In particular the students will be able to:
(1) Solve engineering problems involving single and three-phase ac circuits, calculation of active, reactive and apparent power in ac circuits, power factor correction, resonance in electrical circuits and the design of wound electro-magnetic components.
(2) Apply engineering principles of magnetic circuits and limitations of magnetic materials to the analysis, design and prediction of performance of wound electrical equipment including power inductors and transformers,
(3) Apply engineering principles to the design of DC power supplies.
(4) Apply the principle of electro-mechanical energy conversion to different DC and three-phase AC electrical machines (synchronous and induction) for prediction of machine characteristics and steady state performance.
(5) Be aware of design considerations and industrial applications of AC electrical machines.
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Teaching and Learning Methods

Lectures, examples sheets, seminar/assignment/tutorial system, surgery hours. Relevant experiments will be available in EG2003.

Assessment Methods

Assessment will be by Blackbord test in week 12 (30%) and end of year examination (70%).

Pre-Requisites

EG1201 - Electrical and Electronic Engineering.

Co-Requisites

EG2203 - Electromagnetism and Electronics.

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG2202 Communications 1

Academic Year: 2018/9
Module Level: Year 2
Scheme: UG
Department: Engineering
Credits: 20

Student Workload (hours)

Lectures	48
Seminars	
Practical Classes & Workshops	
Tutorials	
Fieldwork	
Project Supervision	
Guided Independent Study	152
Demonstration	
Supervised time in studio/workshop	
Work Based Learning	
Placement	
Year Abroad	
Total Module Hours	200

Period: Academic Year
Occurence: E
Coordinator: Alan Stocker
Mark Scheme: UG Module Mark Scheme

No.	Assessment Description	Weight %	Qual Mark	Exam Hours	Ass't Group	Alt Reass't
001	Examination (blackboard) 1	50		2.5		
002	Examination (blackboard) 2	50		2.5		
003	Resit Examination	100		3		Y

Intended Learning Outcomes

At the end of this module, typical students should be able to answer questions on the basic theory governing electromagnetic field and wave effects in electrical applications, and on the main modulation and coding techniques employed in communications systems. They should be able to: (1) recognise and apply the basic concepts behind communication systems (Information source, sender, channel, receiver, output etc.); (2) recognise and apply the basic concepts behind Analogue modulation and digital modulation and be able to discuss the relative advantages of analogue and digital communication systems; (3) manipulate the mathematical detail of amplitude, frequency, phase and pulse amplitude modulations; (4) recognise and apply the concept of fixed and variable-length coding, including error checking and correction through simple (odd/even) parity checks, block parity and Hamming codes, Huffman coding and Shannon's theorem; (5) recognise and apply the concept of digitisation for the transmission of analogue waveforms by digital means; (6) derive useful results from Maxwell's equations, such as the planar wave equation, polarisation skin depth and power flow and loss; (7) solve questions about transmission lines, including propagation of pulses on transmission lines, transmission and reflection coefficient, impedance matching, space-time diagrams, calculation of velocity and impedance from L and C; (8) solve questions on guided waves including the effect of the dimensions of a rectangular waveguides, cut off, phase and group velocities, and dispersion.

Teaching and Learning Methods

Lectures, ConcepTests, peer-peer learning, examples sheets and Blackboard quizzes, surgery hours, directed reading. Relevant experiments will be available in EG2003.

Assessment Methods

Two computer based examinations. Resit is by single written exam and replaces original examination marks.

Pre-Requisites

EG1201 Electrical and Electronic Engineering.

Co-Requisites

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG2203 Electromagnetism and Electronics

Academic Year: 2018/9
Module Level: Year 2
Scheme: UG
Department: Engineering
Credits: 20

Student Workload (hours)

Lectures	48
Seminars	
Practical Classes & Workshops	
Tutorials	
Fieldwork	
Project Supervision	
Guided Independent Study	152
Demonstration	
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	Blackboard test (week 12)	30		2		
002	Examination (final)	70		2.5		
003	Resit examination	100		2.5		Y

Intended Learning Outcomes

Electromagnetism and Semiconductor Materials:
At the end of this module, typical students should be able to discuss the basic principles of electromagnetism and apply them to solve simple engineering problems. These include the calculation of the capacitance of simple geometry systems, the definition and calculation of inductance, and the design of simple electromagnetic circuits. They should also be able to define the relationship between magnetic fields and electrical currents and carry out simple calculations of electrical and magnetic forces. They should be able to describe a semiconductor and show how its conductivity can be controlled by doping.

Analogue and Digital Circuits:
Typical students should be able to:
(1) discuss the basic principles of diodes, bipolar transistors, mosfets and their use in transistor amplifiers and other analogue circuits;
(2) apply these principles to the design and analysis of transistor amplifiers of various classes; (3) understand the differences between combinational and sequential digital circuits;
(4) undertake designs of both synchronous and asynchronous digital circuits.

Teaching and Learning Methods

Lectures, examples sheets, seminar/assignment/tutorial system, surgery hours. Relevant experiments will be available in EG2003.
Current assessment pattern subject to academic review

Assessment Methods

Assessment will be by mid-year assessment (30%) and end of year examination (70%).

Pre-Requisites

EG1201 - Electrical and Electronic Engineering.

Co-Requisites

Excluded Combinations

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Guided Independent Study: Indicative Activities

Module Specification

EG2301 Classical Control

Academic Year: 2018/9
Module Level: Year 2
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 (final)	100		2		
002	Resit examination	100		2		Y

Intended Learning Outcomes

At the end of this module, typical students should be able to analyse the dynamical properties of simple Engineering system or process described by single-input single-output continuous-time transfer functions. They should be able to discuss the performance of feedback control loops, to deigns simple feedback loops and to analyse their properties in terms of stability, and robustness in the face of modelling uncertainties. They should be able to demonstrate knowledge of the simplifications used to obtain a control solution and identify possible limitations in the solution proposed. The laboratory component of this module contributes to the continuing development of skills in conducting experiments, working in groups, and evaluating and reporting results.
Syllabus: introduction to the feedback control problem, transfer functions definition and properties, root locus methods, control analysis and design in the frequency domain
.

Teaching and Learning Methods

Lectures, examples sheets, seminar/assignment/tutorial system, surgery hours.
Relevant experiments will be available in EG2003

Assessment Methods

End of year examination (100%)

Pre-Requisites

Co-Requisites

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG3005 Third Year Project

Academic Year: 2018/9
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: Andrew Norman
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

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Guided Independent Study: Indicative Activities

Module Specification

EG3007 Management

Academic Year: 2018/9
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: Martin Rhodes
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

UNIVERSITY OF LEICESTER

Module Specification

EG3101 Materials 2: Failure Mechanisms and Tribology

Academic Year: 2018/9
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).

Teaching and Learning Methods

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

Assessment Methods

Written examination (100%)

EG3101 Materials 2: Failure Mechanisms and Tribology

Pre-Requisites

EG2101 Materials 1.

Co-Requisites

Excluded Combinations

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Guided Independent Study: Indicative Activities

Module Specification

EG3102 Thermodynamics and Fluid Dynamics 2

Academic Year: 2018/9
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		2		
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

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG3103 Mechanics of Structures 2

Academic Year: 2018/9
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

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG3201 Electrical Power

Academic Year: 2018/9
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

Co-Requisites

EG2202 - Communications.

Excluded Combinations

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG3202 Communications 2

Academic Year: 2018/9
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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Guided Independent Study: Indicative Activities

Module Specification

EG3204 Programmable Electronics

Academic Year: 2018/9
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

Module Specification

EG3311 State Variable Control

Academic Year: 2018/9
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: Matteo Rubagotti
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

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Guided Independent Study: Indicative Activities

UNIVERSITY OF LEICESTER

Module Specification

EG3321 Digital Control

Academic Year: 2018/9
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

Module Specification

EG3322 Signal Processing I

Academic Year:	2018/9	**Student Workload (hours)**	
Module Level:	Year 3	Lectures	22
Scheme:	UG	Seminars	
Department:	Engineering	Practical Classes & Workshops	6
Credits:	10	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