COLLEGE OF ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 1 (FHEQ LEVEL 4)

ELECTRONIC AND ELECTRICAL ENGINEERING DEGREE PROGRAMMES

PART TWO OF TWO
(MODULE AND COURSE STRUCTURE)

2017/18
DISCLAIMER

The College has made all reasonable efforts to ensure that the information contained within this publication is accurate and up-to-date when published but can accept no responsibility for any errors or omissions.

The College reserves the right to revise, alter or discontinue degree programmes or modules and to amend regulations and procedures at any time, but every effort will be made to notify interested parties.

It should be noted that not every module listed in this handbook may be available every year, and changes may be made to the details of the modules.

You are advised to contact the College directly if you require further information.

The 2017/18 academic year begins on 25 September 2017

DATES OF 2017/18 TERMS

25 September 2017 – 15 December 2017
08 January 2018 – 23 March 2018
16 April 2018 – 15 June 2018

SEMESTER 1
25 September 2017 – 26 January 2018

SEMESTER 2
29 January 2018 – 15 June 2018
We would like to extend a very warm welcome to all students for the 2017/18 academic year and in particular, to those joining the College for the first time.

The University offers an enviable range of facilities and resources to enable you to pursue your chosen course of study whilst enjoying university life. In particular, the College of Engineering offers you an environment where you can develop and extend your knowledge, skills and abilities. The College has excellent facilities, offering extensive laboratory, workshop and IT equipment and support. The staff in the College, many of whom are world experts in their areas of interest, are involved in many exciting projects, often in collaboration with industry. The College has excellent links with industry, with many companies kindly contributing to the College’s activities through guest lectures and student projects. We have close links with professional engineering bodies and this ensures that our courses are in tune with current thinking and meet the requirements of graduate employers. All the staff are keen to provide a supportive environment for our students and we hope that you will take full advantage of your opportunities and time at Swansea.

We hope that you will enjoy the next academic session and wish you every success.

Professor Stephen GR Brown
Head of the College of Engineering

Professor Cris Arnold
Deputy Head of College and
Director of Learning and Teaching

Professor Johann Sienz
Deputy Head of College and
Director of Innovation and Engagement

Professor Dave Worsley
Deputy Head of College and
Director of Research

ELECTRONIC AND ELECTRICAL ENGINEERING PORTFOLIO DIRECTOR:
Dr Chris Jobling (c.p.jobling@swansea.ac.uk)
Room B206, Engineering East

YEAR 1 CO-ORDINATOR:
Dr Richard J Cobley (Richard.j.cobley@swansea.ac.uk)
Room A012, Engineering Central

IET Staff Student adviser
Dr Chris Jobling (c.p.jobling@swansea.ac.uk)
Room B206, Engineering East

ADMINISTRATIVE OFFICER:
Should you require administrative support please visit the Engineering Reception, open Monday – Friday 8:30am – 5:00pm and speak with a member of the Student Information Team who will be happy to help.
IMPORTANT INFORMATION

In line with IET accreditation requirements, the Electrical Engineering programme has specific rules in place for passing modules. Please be aware of these - they are noted in the module descriptors.

IMPORTANT – EG-151 and EG-152
Please be aware that at Year 1 there are two modules where a student is unable to redeem their failure by the Standard Failure Redemption if a student does not attend at least 80% attendance at Laboratory classes. These modules are EG-151 and EG-152. Failure to attend the required number of classes and activities related to these Laboratory sessions will mean that you fail the module; hence you will be required to repeat the module during the next academic year. No failed modules can ever be carried over to the next Level.
## Year 1 (FHEQ Level 4) 2017/18

### Electronic and Electrical Engineering

- BEng Electronic and Electrical Engineering [H602, H605]
- BEng Electronic and Electrical Engineering with a year abroad [H603]
- BEng Electronic and Electrical Engineering with a year in industry [H603]
- MEng Electronic and Electrical Engineering [H606]
- MEng Electronic and Electrical Engineering with a year abroad [H600]

**Coordinator:** Dr RJ Cobley

### Semester 1 Modules

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Module Title</th>
<th>Credits</th>
<th>Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG-143</td>
<td>Digital Design</td>
<td>10</td>
<td>Dr RJ Cobley</td>
</tr>
<tr>
<td>EG-151</td>
<td>Microcontrollers</td>
<td>10</td>
<td>Dr L Li/Dr T Davies</td>
</tr>
<tr>
<td>EG-155</td>
<td>Circuit Analysis</td>
<td>10</td>
<td>Dr PM Holland</td>
</tr>
<tr>
<td>EG-168</td>
<td>Engineering Professional Development</td>
<td>10</td>
<td>Dr PA Xavier/Dr AE Martinez Muniz/Prof MJ Mcnamee/Dr ZA Quiney/...</td>
</tr>
<tr>
<td>EG-189</td>
<td>Engineering Analysis 1</td>
<td>10</td>
<td>Dr PD Ledger/Dr DR Daniels/Dr I Sazonov</td>
</tr>
<tr>
<td>EGA108</td>
<td>Functional and Smart Materials</td>
<td>10</td>
<td>Dr AE Martinez Muniz</td>
</tr>
</tbody>
</table>

### Semester 2 Modules

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Module Title</th>
<th>Credits</th>
<th>Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG-142</td>
<td>Instrumentation and Control</td>
<td>10</td>
<td>Dr RJ Cobley</td>
</tr>
<tr>
<td>EG-144</td>
<td>Dynamic Systems</td>
<td>10</td>
<td>Dr DR Daniels</td>
</tr>
<tr>
<td>EG-150</td>
<td>Signals and Systems</td>
<td>10</td>
<td>Dr P Loskot</td>
</tr>
<tr>
<td>EG-152</td>
<td>Analogue Design</td>
<td>10</td>
<td>Dr KS Teng/Dr T Davies</td>
</tr>
<tr>
<td>EG-190</td>
<td>Engineering Analysis 2</td>
<td>10</td>
<td>Prof P Rees/Mr A Egwebe/Dr PD Ledger</td>
</tr>
<tr>
<td>EGA107</td>
<td>Power Engineering</td>
<td>10</td>
<td>Dr G Todeschini</td>
</tr>
</tbody>
</table>

**Total 120 Credits**
**EG-142 Instrumentation and Control**

**Credits:** 10  
**Session:** 2017/18 Semester 2 (Jan - Jun Taught)

**Module Aims:** This module introduces the fundamentals of sensors, measurement, instrumentation and control in typical engineering applications.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**  
- Lectures: 20 hours  
- Example classes: 3 hours  
- Revision classes: 2 hours  
- Directed private study: 25 hours  
- Personal revision: 50 hours

**Lecturer(s):** Dr RJ Cobley

**Assessment:**  
- Examination 1 (80%)  
- Coursework 1 (20%)

**Assessment Description:**  
- Examination: Written final exam: 80%.
- Coursework: An individual assignment containing a mix of exam style calculation questions, and the design of a solution to a given instrumentation problem.

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** If a student is awarded a re-sit: Failure Redemption of this module will be by Examination only (100%).

**Assessment Feedback:**  
- Written final exam - standard university feedback sheet completed for exam  
- Assignment: individually marked and returned to the student electronically

**Module Content:** Sensors, clipper circuits, rectification, ripple factor, zener diodes, voltage dependent resistors, ac and dc bridges, component tolerances, non-ideal components, operational amplifier circuits, real properties of the op-amp and how that effects instrumentation systems, control, feedback, time and frequency representation of signals, PID controllers, sampling theory, quantisation error, analogue and digital conversion.

**Intended Learning Outcomes:** After completing this module you should be able to:
  - Choose the correct sensor for the required physical input, understand the choices, and be able to describe the sensor and its physical method of operation
  - Design circuits required to interface sensors in to electrical circuits
  - Analyse the performance of sensor circuits in terms of ideal vs non-ideal behaviour, the effect of unwanted impedances, error analysis and linearity
  - Design a range of operational amplifier circuits useful for instrumentation systems
  - Understand the purpose of Laplace transforms in control systems, to understand the difference between open and closed loop control systems, to understand transient response, and be able to select an appropriate type of control system.
  - Understand analogue and digital conversion and be able to perform simple calculations around analogue to digital conversion, including quantisation error and data rate.

**Reading List:**  
- Hyperphysics.  
**Additional Notes:**

- Swansea students should have taken EG-152 in order to take this module.
- **LIMITED AVAILABLITY** to visiting and exchange Students. Visiting and exchange students should have studied a basic electrical circuit course, which covers circuit analysis, current and voltage calculations, and resistor networks. A basic understanding of operational amplifier (op-amp) circuits is useful but not essential.
- The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.
## EG-143 Digital Design

**Credits:** 10  
**Session:** 2017/18 Semester 1 (Sep-Jan Taught)

**Module Aims:** To introduce the fundamentals of logic design methods and implement, test and compare these designs using simulators.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

### Format:
- Lectures: 10 hours
- Example classes: 2 hours
- Laboratory work: 20 hours
- Directed private study: 20 hours
- Personal revision: 48 hours

**Lecturer(s):** Dr RJ Cobley

**Assessment:**
- Examination (60%)
- Practical (15%)
- Coursework 1 (10%)
- Coursework 2 (15%)

**Assessment Description:**
- **Examination:** 3 out of 4 questions to be solved in 2 hours, each question carries 20 marks.
- **Practical:** Laboratory work: Students will take a laboratory introduction session to learn the health and safety and basic laboratory skills by constructing an analogue circuit. The work will be assessed by examining the circuit and the report.
- **Project:** This assignment is about the manipulation of Boolean algebra, expression minimisation by Boolean algebra and Karnaugh maps, and design and verification of digital circuits using the simulation tool MultiSim. It will be assessed by examination of the circuits in the lab and the final report submission.

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Second marking as sampling or moderation

**Failure Redemption:** If a student is awarded a re-sit - Failure Redemption of this module will be by Examination only (100%). The failure redemption is only available to students who record at least 80% attendance at laboratory classes during the teaching semester.

A decision of Repeat module during the next academic session will be given to students who do not obtain the required 80% Laboratory attendance in EG-143.

**Assessment Feedback:** For the examination, students will receive feedback through an Examination Feedback Summary Sheet which provides both the statistics and analysis of each question. Project submission is electronic, and marked electronic copies will be returned individually to students.

**Module Content:** Combinatorial logic design:
- Number systems
- Logic operations
- Truth tables
- Boolean algebra
- Karnaugh maps
- De Morgan’s theorem
- Practical logic elements
- PLD implementation of logic
- PLCs and ladder diagrams
- Timing

Practical work:
- A simple construction exercise introduces the standard laboratory tools available
- A series of simulation exercises supports the taught material
Intended Learning Outcomes: After completing this module you should be able to:
• use decimal, binary and hexadecimal numbers, and convert between them
• apply the basic laws of Boolean algebra to manipulate and simplify logic expressions
• construct the simplest expression for a network output variable
• describe the properties of basic logic and apply them to the implementation of a simple logic network
• use integrated circuit elements to realise a logic network
• to identify potential timing hazards and alter designs to reduce or remove them
• create, test and evaluate logic circuits
• create, test and evaluate ladder logic diagrams
• produce a report comparable with that required of a professional engineering
• to compare and contrast different forms of implementing logic circuits (including discrete logic, silicon, FPGAs, PLDs and PLCs) and select the most appropriate based on cost and appropriateness to required design brief

Pappas, Nicholas L, Digital design / Nicholas L. Pappas, Createspace, 2014.ISBN: 9781499266764

Additional Notes:
• NOT AVAILABLE TO Visiting and Exchange Students due to Number Restriction
• The Level One Laboratory Introduction sessions (shown as Practical 15%) will be timetabled under EG-151 for convenience, but the credit will be awarded in this module.
• Penalty for late submission of continual assessment assignments: ZERO TOLERANCE

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.
### EG-144 Dynamic Systems

**Credits:** 10 Session: 2017/18 Semester 2 (Jan - Jun Taught)

**Module Aims:** The module introduces descriptions of signals in both time and frequency domains and provides a basis for modelling dynamic systems, including methods for linear systems and for obtaining their responses to stimuli.

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-189; EG-190

**Incompatible Modules:**

**Format:**
- Lectures 22 hours
- Example classes / Laboratory work 6 hours
- Directed private study 72 hours

**Lecturer(s):** Dr DR Daniels

**Assessment:** Examination 1 (100%)  
**Assessment Description:** Examination: Written - 2 hours answer 3 questions

**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** If a student is awarded a re-sit: Failure Redemption of this module will be by Examination only (100%).

**Assessment Feedback:** Formal feedback lecture. Also Feedback will be in a standard format on the College of Engineering intranet. Information provided includes average marks, maximum and minimum marks for the exam as a whole and for individual questions.

**Module Content:**
- Electrical systems: voltage, current, resistance, capacitance, inductance, transfer function models of electrical networks.
- Translational mechanical systems: force, displacement, velocity, mass, friction, equations of motion, transfer function models.
- Rotational mechanical systems: torque, angular displacement and velocity, moment of inertia, friction, equations of motion, transfer function models.
- Practical work: supported by EG-152

**Intended Learning Outcomes:** After completing this module you should be able to:
- Apply Laplace transforms to dynamic systems.
- Construct transfer function models of electrical and mechanical dynamic systems.
- Obtain the responses of dynamic systems to simple inputs.


**Additional Notes:**
- NOT AVAILABLE TO Visiting and Exchange students due to the high number of students already studying the module within the School.
- Penalty for late submission of work: ZERO TOLERANCE.
**Module Aims:** The module introduces mathematical description of signals in time domain. Basic properties of deterministic signals are defined. The concept of frequency and frequency domain is introduced using Fourier series of periodic continuous time signals. Finally, the concept of systems with ideal filters as an example is explained.

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-189; EG-190

**Incompatible Modules:**

**Format:**
- Lectures 22 hours
- Example classes 6 hours
- Directed private study 72 hours

**Lecturer(s):** Dr P Loskot

**Assessment:**
- Examination 1 (80%)
- Coursework 1 (20%)

**Assessment Description:** This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

Examination: Standard 2 hour exam: Answer 3 out 4 questions. Each question carries 25 marks.
Coursework: This is an individual piece of coursework to help students to self-assess their knowledge and prepare for the exam.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** If a student is awarded a re-sit: Failure Redemption of this module will be by Examination only (100%).

**Assessment Feedback:** Continuous feedback during lectures, by emails, and general feedback after the exam.

**Module Content:**
- Signals in time domain: analog and digital signals, periodic and aperiodic signals, even and odd symmetry signals.
- Waveforms: sines, cosines, exponentials, steps, rectangular and squares, impulses and ramps.
- Time domain operations on waveforms: time scaling, time reversal and time shift.
- Calculation of waveforms parameters: energy, power, mean value, R.M.S. value and crest factor.
- Periodic signals representation in frequency domain: trigonometric and complex exponential Fourier series.
- Introduction to systems: basic properties, description of ideal filters.

**Intended Learning Outcomes:** After completing this module you should be able to:
- understand the basic concepts in signal and system modelling which is often encountered in other modules
- understand mathematical abstraction such as being able to read, analyze and evaluate mathematical expressions
- define and recognize common waveforms such as impulse and step signals, exponential and rectangular signals
- calculate basic properties of deterministic signals in time domain
- calculate basic properties of periodic signals in frequency domain
- compute the complex-exponential and trigonometric Fourier series of periodic signals
- define properties of systems and specify parameters of ideal filters


**Additional Notes:**
- AVAILABLE TO Visiting and Exchange students.
- The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.
- Notes, worked examples and past papers for this module can be found on Blackboard.

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.
**EG-151 Microcontrollers**

**Credits:** 10  
**Session:** 2017/18 Semester 1 (Sep-Jan Taught)

**Module Aims:** This module introduces basic microcontroller structure and operation.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**
- Lectures 11 hours
- Examples classes 3 hours
- Laboratory work 22 hours
- Directed private study 64 hours

**Lecturer(s):** Dr L Li, Dr T Davies

**Assessment:**
- Examination 1 (60%)
- Laboratory work (20%)
- Class Test 1 - Coursework (20%)

**Assessment Description:**
- Examination: Three out of four questions to be solved in 2 hours, each question carries 25 marks.

- Laboratory work: Students will be given four laboratory based exercises to learn the use of the integrated development environment (IDE), skills in programming and problem solving. These exercises will involve simple assembly level programmes with CodeWarrior, followed by an introduction to embedded "C" programming. The exercises will be assessed during the laboratory sessions and are valued at 5 marks each (20 marks total).

- The remaining 20 marks will be obtained from an open-book test held during one laboratory session.

EG-151 is assessed by a combination of examination and laboratory assessment. You are required to achieve at least 30% in the examination component to pass the module. If a resit is awarded, the assessment will be 100% by examination.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** If a student is awarded a re-sit - Failure Redemption of this module will be by Examination only (100%). The failure redemption is only available to students who record at least 80% attendance at laboratory classes during the teaching semester. A decision of Repeat module during the next academic year will be given to students who do not obtain the required 80% Laboratory attendance in EG-151.

**Assessment Feedback:** For the examination, students will receive feedback through the College's Examination Feedback Summary Sheet which provides both the statistics and analysis of each question. For the exercises, feedback will be given to students in laboratory at the time of assessment. Results and feedback on the test will be provided to the class within two weeks of the test. Students can always make appointment with the lecturer to receive personal feedback.

**Module Content:**
- Microprocessor fundamentals:
  - Architecture; instruction execution; basic instructions; simple software design; software development tools.
  - Practical work:
    - A progressive series of exercises will be carried out, in support of the taught material.

**Intended Learning Outcomes:** After completing this module you should be able to:
- describe and analyse the operation of a microcontroller;
- explain what different instructions are used for and how they are executed;
- design a simple assembly-language program;
- apply a development environment to implement and commission a program.

**Reading List:**
Additional Notes:
• LABORATORY CLASSES ARE COMPULSORY. Students must have at least 80% attendance at laboratory classes in order to be allowed to be assessed for the module.
• Student with less than 80% attendance, unless with valid extenuating circumstances, may have to repeat the module in the next academic year (automatic fail).
• The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.
• Previous students have found the following on-line book useful: www.planetpdf.com/codescuts/pdfs/aoa.pdf.
## EG-152 Analogue Design

**Credits:** 10 Session: 2017/18 Semester 2 (Jan - Jun Taught)

**Module Aims:** The module covers aspects of Engineering Applications for Level 1 students and all aspects of the design process for analogue circuits. It includes preparation, performance and reporting on a structured series of experiments supporting the taught modules at this level and gives practice in using IT packages to assist with report writing.

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-142; EG-155; EG-168

**Incompatible Modules:**

**Format:**
- Laboratory work 44 hours
- Directed private study 56 hours

**Lecturer(s):** Dr KS Teng, Dr T Davies

**Assessment:**
- Report (30%)
  - Assignment 1 (10%)
  - Assignment 2 (60%)

**Assessment Description:** Students will be assessed on the following components:

i) Report: Formal Report (30%) - Individual assessment

ii) Assignment 1: Printed Circuit Board (10%) - Group assessment

iii) Assignment 2: Lab Diary (60%) - Group assessment

This module is assessed by three assignments. In order for ‘Assignment 2’ marks to count, you must achieve at least 30% in Assignment 2. If you achieve less than 30% in Assignment 2 then the module mark will be just the Assignment 2 mark. Re-assessment is by a single piece of coursework.

**Moderation approach to main assessment:** Second marking as sampling or moderation

**Failure Redemption:** If a student is awarded a re-sit at least one piece of coursework will be set. The failure redemption is only available to students who have at least 80% attendance at laboratory classes during the teaching semester. A decision of Repeat module during the next academic year will be given to students who do not obtain the required 80% Laboratory attendance.

**Assessment Feedback:** Students will receive feedback through the College's Feedback Summary Sheet, which provides both the statistics and analysis of each question.

**Module Content:**

With the aid of the commercial simulation package, Multisim, the practical laboratory work in this module develops topics such as:

- practical op-amp circuits;
- real circuit components;
- circuit response in the time and frequency domain;
- transient behaviour ;
- filters and oscillator circuits.
- The sequence of practical laboratories will lead to design, construction and testing of a waveform generator.

Practical work includes:

- the preparation, performance and reporting on a structured series of experiments supporting the taught modules at this level;
- practice in using IT packages to assist with report writing and presentations;
- the use of Electronic Workbench for circuit design and analysis;
- the construction of a function generator (ECG circuit for medical engineering students) which is then tested against a specification.

**Intended Learning Outcomes:**

After completing this module you should be able to:-

- Demonstrate the basic practical skills associated with circuit layout and construction.
- Use meters and instruments required for electrical measurements.
- Analyse the practical response of resistors, capacitors, inductors and op-amps to the application of ac and dc signals.
- Apply Multisim software in the design and analysis of circuits.
- Design and build circuits to modify or manipulate voltages and currents.

**Reading List:**
**Additional Notes:**

NOT AVAILABLE TO Visiting and Exchange Students due to number restriction.

LABORATORY CLASSES ARE COMPULSORY. Students must have at least 80% attendance at laboratory classes in order to be allowed to be assessed for the module.

Students with less than 80% attendance, unless with valid extenuating circumstances, will have to repeat the module in the next academic year (automatic fail).

The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

This module is assessed by three assignments. In order for ‘Assignment 2’ marks to count, you must achieve at least 30% in Assignment 2. If you achieve less than 30% in Assignment 2 then the module mark will be just the Assignment 2 mark. Re-assessment is by a single piece of coursework.
EG-155 Circuit Analysis

Credits: 10  Session: 2017/18 Semester 1 (Sep-Jan Taught)

Module Aims: Provides an introduction to analog electrical circuits analysis and design.

Pre-requisite Modules:
Co-requisite Modules:
Incompatible Modules:

Format: Lectures 20 hours
         E-Lectures 10 hours
         Directed private study 70 hours

Lecturer(s): Dr PM Holland

Assessment: Examination 1 (80%)
             Assignment 1 (20%)

Assessment Description: The assignment is worth 20%. It is a computer marked assignment using blackboard. Students will answer a variety of questions ranging from multiple choice, fill in the BLANK to full calculations and numerical value entry. The component values are randomised to encourage individual understanding.

The examination is worth 80% of the module. It is multiple choice consisting of twenty five questions. Questions 1-5 are worth 1 mark, questions 6-10 are worth 2 marks, questions 11-15 are worth 3 marks, questions 16-20 are worth 4 marks and questions 21-25 are worth 5 marks. Negative marking will be applied to questions 21-25. The examination topics will be those presented directly in the lectures.

EG-155 is a core module. This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the final module mark will be just the exam mark.

Any resit awarded will be by 100% supplementary exam in August. If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to complete the coursework.

Moderation approach to main assessment: Universal second marking as check or audit

Failure Redemption: If a student is awarded a re-sit, Failure Redemption of this module will be by Examination worth 100% of the module.

Assessment Feedback: For the assignment students will be able to see their computer marked assignment with feedback that has been written by the module owner for both correct and incorrect answer. They will also receive a generic feedback form at the end of the semester.

For the examination the students will receive a generic form that tells the student what the common mistakes were. It also lists the mean mark and the number of 1st class, 2:1 class, 2:2 class, 3rd class and fails achieved by the group.

Individually a student can make an appointment with the lecturer to receive specific individual feedback on the assignment or examination if this is wanted.

Module Content:
• Introduction to circuit characteristics and analysis: resistance, voltage, current, power, a.c. d.c. capacitance, inductance, series and parallel configurations, Ohm's law, Kirchoff's laws, superposition theorem and nodal analysis.

• Ideal operational amplifier circuits including inverting, non-inverting, comparator, differentiator and the integrator.

• Analysis of simple LCR networks energised by AC sources. This will include analysis in the time domain and using complex numbers and phasors in the frequency domain.

• Simplification techniques suitable for both DC and AC analysis such as Thevenin and Source Transformations.

• Low pass, high pass, band pass and band stop filters.

• Practical work supported by EG-152 for EEE students.
**Intended Learning Outcomes:** To understand and mathematically describe the physical concepts and parameters associated with voltage, current, resistance, capacitance, inductance, energy and power.

Simplify and analyse electrical circuits using a range of techniques including resistor reduction, delta-y, Kirchhoff's Laws, Thevenin's theorem, source transformations, superposition and nodal analysis.

Be able to identify and analyse a range of operational amplifier circuits.

Determine the transient response of capacitors and inductors.

Determine the behaviour of LCR circuits energised by AC sources in time domain and frequency domain forms.

Be able to analyse simple filters and appreciate the concepts of resonance and bandwidth.

**Reading List:**

**Additional Notes:**
- AVAILABLE TO to visiting and exchange students.
- PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to do the coursework.
# EG-168 Engineering Professional Development

**Credits:** 10  
**Session:** 2017/18 Semester 1 (Sep-Jan Taught)

**Module Aims:** To develop fundamental engineering communication skills using standard ICT tools. These skills will be taught and developed in the context of the Swansea Tidal Lagoon.

This module also introduces ethics in engineering and continuing professional development.

**Pre-requisite Modules:**  
**Co-requisite Modules:**  
**Incompatible Modules:**

**Format:**  
- Lectures: 11 hours  
- PC Lab sessions: 14 hours  
- Seminar: 5 hours  
- Assessment and private study 70 hours

**Lecturer(s):** Dr PA Xavier, Dr AE Martinez Muniz, Prof MJ Mcnamee, Dr ZA Quiney, Dr AC Tappenden

**Assessment:**  
Coursework 1 (0%)  
Coursework 2 (5%)  
Coursework 3 (5%)  
Coursework 4 (0%)  
Coursework 5 (20%)  
Coursework 6 (50%)  
Coursework 7 (10%)  
Coursework 8 (10%)

**Assessment Description:**  
Coursework 1: Academic Integrity (pass/fail)  
Coursework 2: Matlab Blackboard Test A (5%)  
Coursework 3: Matlab Blackboard Test B (5%)  
Coursework 4: Tidal Lagoon Technical Report (pass/fail)  
Coursework 5: Group Presentation on Ethics (20%)  
Coursework 6: Technical Report on Tidal Lagoon Analysis & Group Performance Analysis (50%)  
Coursework 7: Portfolio (10%)  
Coursework 8: Sustainability and Risk Assessment test (10%)

**Moderation approach to main assessment:** Second marking as sampling or moderation

**Failure Redemption:** Supplementary coursework will be available for students which will form 100% of the module mark.

**Assessment Feedback:** All assignments (submitted electronically via blackboard) will receive electronic feedback using the turnitin feedback system. Tutors will provide feedback on presentations during tutorial sessions. Tutorial sessions will also be used for general feedback and guidance related to EG-168.

**Module Content:**  
Management principles: team dynamics, project planning.

Career planning and professional development: CVs, personal development planning.


Roles and responsibilities of professionals in science and engineering: health and safety, risk assessment, sustainability, environmental issues.

Introduction to computing: basics of programming, introduction to MATLAB, input and output of data, operations, functions, plotting, simple programming and debugging.

Ethics in Engineering Case Studies
**Intended Learning Outcomes:**

Have an appreciation of the wider multidisciplinary engineering context and its underlying principles.

Appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement.

Apply appropriate quantitative science and engineering tools to the analysis of problems.

Possess practical engineering skills acquired through, for example, work carried out in laboratories and workshops; in industry through supervised work experience; in individual and group project work; in design work; and in the development and use of computer software in design, analysis and control. Evidence of group working and of participation in a major project is expected.

Knowledge of management techniques which may be used to achieve engineering objectives within that context.

Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.

Evaluate ethical implications of engineering design and practice

**Reading List:**

- Oakley, Barbara A, A mind for numbers : how to excel at math and science (even if you flunked algebra) / Barbara Oakley, 2014.ISBN: 9780399165245

**Additional Notes:**

PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION; SUBMISSION ON EACH ASSIGNMENT MANDATORY.
**EG-189 Engineering Analysis 1**

**Credits: 10 Session: 2017/18 Semester 1 (Sep-Jan Taught)**

**Module Aims:** This module (in combination with engineering analysis 2) provides the essential grounding in mathematical analysis techniques for engineering students. This module ensures that all students have a suitable level of analytical skills for subsequent engineering modules.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

| Format          | Lectures 30 hours  
|                 | Directed private study 70 hours |

**Lecturer(s):** Dr PD Ledger, Dr DR Daniels, Dr I Sazonov

**Assessment:**

| Examination 1 (65%)       | Coursework 1 (5%)         |
| Coursework 2 (10%)        | Coursework 3 (10%)        |
| Coursework 4 (10%)        |                            |

**Assessment Description:** Examination:
A closed book 2 hour examination will take place in January (worth 65% of the final mark).

Coursework:
4 electronic online tests with randomised coefficients will be set during the semester. There will be an opportunity to practice similar exercises before attempting each test. These tests make up the coursework element of the course (worth 35% of the final mark). Each test is an individual piece of coursework.

Specific rules for passing this module:
This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to do the coursework.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** A supplementary examination will form 100% of the module mark.

**Assessment Feedback:** A feedback form for the examination will be available electronically.

Feedback will be provided electronically for each of the assessed tests.

**Module Content:** Module content:
Number systems: numbers, algebra and geometry.
Functions: inverse and composite functions, polynomial functions, rational functions, circular functions, exponential, logarithmic and hyperbolic functions, continuous and discontinuous functions.
Introduction to complex numbers: The number j, real and imaginary components, Cartesian form, complex conjugate and polar form.
Differentiation: basic ideas and definition, elementary functions, rules of differentiation, parametric and implicit differentiation, higher derivatives, optimum values.
Integration: basic ideas and definition, definite and indefinite integrals, techniques of integration, integrals of partial fractions, integration by parts, integration by substitution.
Linear Algebra: simultaneous equations, Gauss elimination, matrices, rules of matrix algebra, rank and linear dependence, calculation of determinates and eigenvalue problems.

**Intended Learning Outcomes:** On successful completion of this unit students will be expected, at threshold level, to:

Demonstrate knowledge of the fundamentals of mathematics, which underpin their engineering degree. (Evaluated in the MyMathLab continuous assessments and the examination).

Demonstrate a comprehension of the fundamentals of mathematics, which underpin their engineering degree, through the use of the following specific techniques: manipulate algebraic expressions, differentiation (including optimisation of functionals), integration, matrices and Gauss elimination (Evaluated in the examination).
Reading List: James, Glyn, Modern engineering mathematics, 2015.ISBN: 1292080736

Additional Notes: AVAILABLE TO visiting and exchange students.

The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to do the coursework.
EG-190 Engineering Analysis 2

Credits: 10 Session: 2017/18 Semester 2 (Jan - Jun Taught)

Module Aims: Module Aims: this module (in combination with Engineering Analysis 1) provides further grounding in mathematical analysis techniques for Engineering students. The module extends the understanding into more complex analytical methods, focusing on complex numbers, multi-variable functions, series and sequences and differential equations.

Pre-requisite Modules:

Co-requisite Modules: EG-189

Incompatible Modules:

Format: Lectures 20 hours
Tutoring classes 10 hours
Directed private study 70 hours

Lecturer(s): Prof P Rees, Mr A Egwebe, Dr PD Ledger

Assessment: Examination 1 (65%)
Coursework 1 (5%)
Coursework 2 (10%)
Coursework 3 (10%)
Coursework 4 (10%)

Assessment Description: Examination:
A closed book 2 hour examination will take place in May/June (worth 65% of the final mark).

Coursework:
4 electronic online tests with randomised coefficients will be set during the semester. There will be an opportunity to practice similar exercises before attempting each test using homework exercises. These tests make up the coursework element of the course (worth 35% of the final mark). Each test is an individual piece of coursework.

Specific rules for passing this module:
This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to do the coursework.

Moderation approach to main assessment: Universal second marking as check or audit

Failure Redemption: A supplementary examination will form 100% of the module mark.

Assessment Feedback: A feedback form for the examination will be available electronically.

Feedback will be provided electronically for each of the assessed tests.

Module Content: Vectors: Physical meaning, components in Cartesian, cylindrical and spherical coordinates, magnitude, scalar product, cross product, equations of lines and planes.

Further complex numbers: manipulation of complex numbers, Cartesian, polar and exponential forms, Euler's formula, relationship between trigonometric and hyperbolic functions, De Moivre's theorem.

Ordinary differential equations: classification of differential equations, solutions to first order ODE's including separable, linear and more specialised types. Solution to second order ODE's with constant coefficients.

Functions of more than one variable: visualisation, partial differentiation, integration of lines, surfaces and volumes. Sequences and Series: review of arithmetic and geometric sequences and series, limit of a sequence, infinite series and tests of convergence, binomial series, power series of common functions.

Intended Learning Outcomes: On successful completion of this unit students will be expected, at threshold level, to be able to:

Demonstrate knowledge of the mathematics, which underpin their engineering degree. (Evaluated in the MyMathLab continuous assessments and the examination).

Demonstrate a comprehension of the mathematics, which underpin their engineering degree, through the use of the following specific techniques: work with complex numbers, manipulate vectors (in Cartesian, cylindrical and spherical coordinates), perform partial differentiation, integrate lines, surfaces and volumes, solve first and second order differential equations and expand real functions into series (Evaluated in the examination).
**Reading List:**

**Additional Notes:**
- AVAILABLE TO visiting and exchange students.

The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to do the coursework.
**EGA107 Power Engineering**

**Credits: 10 Session: 2017/18 Semester 2 (Jan - Jun Taught)**

**Module Aims:** To provide an introduction to the fundamental topics in electrical power systems and magnetic circuits

**Pre-requisite Modules:** EG-155

**Co-requisite Modules:** EG-189; EG-190

**Incompatible Modules:**

<table>
<thead>
<tr>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture 20 Hours</td>
</tr>
<tr>
<td>Example 8 Hours</td>
</tr>
<tr>
<td>Private Study 72 Hours</td>
</tr>
</tbody>
</table>

**Lecturer(s):** Dr G Todeschini

**Assessment:**

- Examination 1 (90%)
- Assignment 1 (10%)

**Assessment Description:** 10% Blackboard Quiz

90% exam

**NOTE:**
This module is assessed by a combination of an examination (90%) and a Blackboard Quiz (10%). In order for the quiz marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** If a student is awarded a re-sit (supplementary): Failure Redemption of this module will be by 100% Examination.

**Assessment Feedback:** Formal feedback lecture following the first assignment

Feedback provided during office hour

Standard feedback through College of Engineering intranet. Information provided includes average marks, maximum and minimum marks for the exam as a whole and for individual questions.
Module Content: Section 1 – Introduction to Module

Module administration

Brief History of Electrical Engineering

International System of Units

Section 2 – Fundamentals of Electric Circuits

Definitions

Kirchhoff’s current and voltage laws

Electric power and sign convention

Practical voltage sources

Section 3 – Solution of electric circuits

Node voltage method

Mesh currents method

Principle of superposition

One port network

Section 4 – AC Circuit Analysis

Energy storage elements

Analysis of circuits containing dynamic elements

Phasor analysis of ac circuits

Section 5 – AC Power

Power definitions in AC circuits

Power factor

Three phase power

Section 6 – Principles of electromechanics

Electricity and magnetism

Magnetic circuits
**Intended Learning Outcomes:** Upon completion of the module, students should be able to:

- solve RLC circuits in steady-state
- analyse first-order circuits supplied by dc sources
- solve ac circuits in steady-state (both single-phase and three-phase)
- calculate active and reactive power in single-phase and three-phase circuits
- calculate power factor in a circuit and learn methods to improve power factor value
- apply basics electromagnetic laws to the analysis of magnetic circuits

**Reading List:**

**Additional Notes:**
- Available to Visiting and Exchange students provided that they passed EG-155
- Penalty for late submission: ZERO tolerance
- This module is assessed by a combination of an examination (90%) and a Blackboard Quiz (10%). In order for the quiz marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.
### EGA108 Functional and Smart Materials

**Credits:** 10  
**Session:** 2017/18 Semester 1 (Sep-Jan Taught)

**Module Aims:** This module covers the underlying scientific principles behind the physical properties of functional and smart materials. It provides the basis for electrical conductivity, semiconductivity, superconductivity as well as optical, magnetic and thermal properties. The ways in which these properties can be utilised in a wide range of devices is explored.

Module Aims: to introduce the scientific principles behind the physical properties of functional and smart materials and to explore the manufacture of functional devices.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**
- Lectures 20 hours
- Tutorials / Example classes 5 hours
- Directed private study 40 hours
- Preparation for Assessment 30 hours

**Lecturer(s):** Dr AE Martinez Muniz

**Assessment:**
- Examination 1 (80%)
- Assignment 1 (20%)

**Assessment Description:** The module is assessed with a 2-hour exam worth 80%. There is one Blackboard assessment worth 20%.

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** If a student is awarded a re-sit (supplementary) Failure Redemption of this module will be by 100% exam.

**Assessment Feedback:** Standard examination feedback form available for all students after the examination. Feedback sheets are completed for each assignment. General feedback for the class test will be uploaded to Blackboard.

**Module Content:**

Introductory lecture. Setting the scene for the module. [1]

A review of the atomic theory of the elements and interatomic bonding. [2]

The theory of electrical conduction is then introduced, initially from a 'classical' point of view (Drude model) and then progressing (via the necessary concepts) to the modern band theory of semiconduction. The relationship to thermal properties is explored. [5]

Junctions between different types of semiconductor (p-n junctions) and devices. [2]

Manufacturing of semiconductor devices [2]

Photovoltaic materials [1]

Optical properties of materials. [3]

Display technologies [1]

Magnetic properties of materials [2]

Memory storage materials and devices [1]

**Intended Learning Outcomes:**

Students will attain an understanding of the basic principles of atomic and solid state theory. A key focus of the course is how the material structure (e.g. behaviour of atoms, ions and in particular electrons) controls the macroscopic properties of insulating, semiconducting and metallic solids. The optical, magnetic and thermal behaviour of materials and how these relate to structure, will also be described. Material manufacturing and example of applications will be presented.

Students will learn how to predict the physical behaviour of materials from knowledge of their atomic and microscopic structure. Some numerical analysis of the physical principles is involved.
<table>
<thead>
<tr>
<th>Reading List</th>
<th>Authors/Editors</th>
<th>Title</th>
<th>Publisher</th>
<th>Year</th>
<th>ISBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulay, Pradeep P</td>
<td>Pradeep Fulay</td>
<td>Electronic, magnetic, and optical materials</td>
<td>Taylor &amp; Francis</td>
<td>2010</td>
<td>9780849395642</td>
</tr>
<tr>
<td>Jiles, David</td>
<td>David Jiles</td>
<td>Introduction to the electronic properties of materials</td>
<td>Nelson Thornes</td>
<td>2001</td>
<td>9780748760428</td>
</tr>
</tbody>
</table>

| Additional Notes | | AVAILABLE FOR Visiting and Exchange Students |

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.