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 2014/2015 academic year begins on 22 September 2014

DATES OF 2014/15 TERMS

22 September 2014 – 12 December 2014
5 January 2015 – 27 March 2015
20 April 2015 – 12 June 2015

SEMESTER 1

22 September 2014 – 23 January 2015

SEMESTER 2

26 January 2015 – 12 June 2015

The 2015/2016 academic year begins on 21 September 2015
Dear Student

Welcome to Mechanical Engineering at Swansea University. We are delighted that you have chosen Swansea as the starting point for your future career. We will endeavour to play our part in ensuring that your student experience forms some of the best years of your life. We will be working closely with you over the next few years and encourage you to engage with us so that your study can be both enjoyable and rewarding. We are here for academic and personal guidance, if you have any problems or issues please contact either your Personal Tutor, the Year co-ordinator or the Administrative Officer in the first instance.

Enjoy your year and study hard, we look forward to working with you.

The Mechanical Engineering Team at Swansea University

Key Contact Information for Mechanical Engineering Students

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Contact</th>
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</thead>
<tbody>
<tr>
<td>Engineering Reception (Faraday Foyer)</td>
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<tr>
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<tr>
<td></td>
<td></td>
<td>Tel: 01792 606679</td>
</tr>
<tr>
<td>Year Co-ordinator</td>
<td>Professor TC Claypole</td>
<td><a href="mailto:t.c.claypole@swansea.ac.uk">t.c.claypole@swansea.ac.uk</a></td>
</tr>
<tr>
<td>Portfolio Director</td>
<td>Dr Ian Masters</td>
<td><a href="mailto:l.masters@swansea.ac.uk">l.masters@swansea.ac.uk</a></td>
</tr>
</tbody>
</table>

Please note that you will be assigned a Personal Tutor in Week 1.
# Compulsory Modules

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<th>Semester 1 Modules</th>
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<td><strong>EG-103</strong> Heat Transfer 10 Credits Mr CD Jones/Professor MF Webster</td>
<td><strong>EG-144</strong> Dynamic Systems 10 Credits Dr DR Daniels</td>
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<tr>
<td><strong>EG-211</strong> Fluid Flow 10 Credits Professor PR Williams CORE</td>
<td><strong>EG-260</strong> Dynamics 1 10 Credits Professor S Adhikari/Dr H Haddad Khodaparast CORE</td>
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<td><strong>EG-255</strong> Circuit Analysis 10 Credits Dr PM Holland</td>
<td><strong>EG-262</strong> Stress Analysis 1 10 Credits Professor SJ Hardy CORE</td>
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<tr>
<td><strong>EG-261</strong> Thermodynamics 2 10 Credits Dr RS Ransing CORE</td>
<td><strong>EG-268</strong> Experimental Studies 10 Credits Dr A Rees/Dr IW Griffiths/Dr H Haddad Khodaparast/Mr Z Jelic/...</td>
</tr>
<tr>
<td><strong>EG-264</strong> Computer Aided Engineering 10 Credits Dr C Wang/Dr MJ Clee</td>
<td><strong>EG-284</strong> Manufacturing Technology II 10 Credits Professor TC Claypole/Dr A Das</td>
</tr>
<tr>
<td><strong>EG-269</strong> Design of Machine Elements 10 Credits Professor SJ Hardy/Dr SS Chitsaz Charandabi</td>
<td><strong>EGA214</strong> Mechanical Engineering Design 2 10 Credits Dr MJ Clee</td>
</tr>
</tbody>
</table>

**Total 120 Credits**
**Module Aims:** The module is designed to provide a basic understanding of heat transfer in Chemical Engineering. Subjects will include: conduction, forced and natural convection and an introduction to radiation. Students will be given a basis for the more advanced study of the subject in other modules.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**
- Lectures 20 hours
- Example classes 5 hours
- Directed private study 75 hours

**Lecturer(s):** Mr CD Jones, Professor MF Webster

**Assessment:**
- Examination 1 (90%)
- Coursework 1 (10%)

**Assessment Description:** Exam 90%
- Four tutorials 10%

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

**Failure Redemption:** Supplementary exam.

**Assessment Feedback:** Students complete four tutorials, which are marked and returned to the students in the following week. Tutorial classes cover each assignment and model answers are issued.

**Module Content:**
- Conduction: Fourier's law, one-dimensional conduction, composite materials, thick cylinders, insulation. [2]
- Convection: Derivation of equations for free and forced convection (dimensional analysis), non-circular conduits; internal flow and external flow over banks of tubes: heat transfer (average coefficients) and pressure drop. [2]
- Combined Heat Transfer: Overall coefficients, tube outside and inside areas. [2]
- Unsteady State Heat Transfer: Heating and cooling an agitated tank. [2]
- Insulation: economic and critical thickness for heat loss [1].
- Practical work: Relevant experiments at Level 2 - Unit Operations.
- Radiation: Mechanism, Stefan-Boltzmann law, emissivity, radiation into a large enclosure, heat transfer coefficient. Combined radiation and natural convection. [2]
- Unsteady State Heat Transfer: Heating and cooling an agitated tank. [2]
- Insulation: Economic and critical thickness for heat loss. [1]

**Intended Learning Outcomes:** After completing this module students should be able to demonstrate a knowledge and understanding of: the mechanisms of heat transfer in process engineering; an understanding of the principles of design of process equipment for heat transfer duty; the fundamental concepts and mechanisms of conductive, convective and radiative heat transfer; the fundamentals of the design of basic industrial heat exchangers, including, single pipe, double pipe, shell and tube heat exchangers; identifying the conductive, convective and radiative heat transfer characteristics of a variety of representative practical situations; using equations for total heat capacity and overall heat transfer to calculate the duty of heat transfer equipment, or vice versa; relating everyday practical situations involving heat transfer to the fundamental underlying mechanism and transferring experience to industrial situations; relating the fundamental concepts and mechanisms of heat transfer to everyday situations and experience; calculating steady state heat transfer rates for conductive heat transfer problems including, composite planar surfaces, thin and thick walled pipes, thermal conductivities for standard process engineering materials; using a range of correlations to calculate film heat transfer coefficients; making design/performance calculations for basic industrial heat transfer equipment, including concentric pipes, shell and tube heat exchangers; applying basic principles of heat transfer to the design of basic process equipment; using correlations for calculating htc's; making decisions based on limited or contradictory information; creatively synthesising design problems in heat transfer equipment; making sketches of industrial heat transfer equipment; selecting process equipment items from standard lists/catalogues.


**Additional Notes:** Available to visiting and exchange students.

Penalty for late submission of work: ZERO TOLERANCE.
**EG-144 Dynamic Systems**

**Credits:** 10  
**Session:** 2014/15 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: This module aims to extend the previous Fluid Mechanics (EG-160) module, to introduce the flow of fluids around particles, through porous media, pipes and devices (with special reference to the design and operation of differential head flowmeters) to provide a balance between theory and practical aspects of equipment used in chemical engineering, such as mixing impellers (with special reference to the Rushton-turbine type mixer) and packed beds (spherical particles). The module also addresses elements of non-Newtonian fluid flow in terms of the Power-Law Model and the Bingham-Plastic Model (for yield stress materials) and considers the flow of these materials in pipes.

Pre-requisite Modules: EG-160

Co-requisite Modules:

Incompatible Modules:

Format: Lectures 20 hours
Example classes / Tutorials 4 hours
Directed private study 76 hours

Lecturer(s): Professor PR Williams

Assessment: Examination 1 (90%)
Coursework 1 (10%)

Assessment Description: Coursework includes numerical problems directly related to taught material. Coursework covers the principal headings of course and will be set as individual work.

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: Marked coursework is handed back to students and discussed.

Module Content: Module content: [lecture hours]
Basic Conservation Equations
Flow Measurement
Fluid Agitation and Mixing
Laminar Flow in Newtonian and non-Newtonian Fluids
Flow around submerged Bodies, including wings, drag, lift, etc
Porous Media
Similarity. Concept of dynamic similarity and its significance in practical fluid mechanics, Reynolds, Froude numbers, model testing.

Intended Learning Outcomes: A knowledge and understanding of:
Basic conservation equations, flow measurement, agitation and mixing, laminar flow in Newtonian and non-Newtonian fluids, flow around submerged bodies and similarity.

An ability to: identify flow types and from first principles derive solutions for a wide variety of fluid flow problems.

An ability to: apply conservation equations appropriately to analyse fluid flow behaviour. Use dimensional analysis and similarity concepts and apply them to engineering fluid flow problems. Solve problems in the areas of flow measurement and laminar flow for Newtonian and non-Newtonian fluids as well as for flows around submerged bodies and in porous media.

An ability to: study independently, use library resources and manage working time.


Additional Notes: PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION.

Available to visiting and exchange students.
EG-255 Circuit Analysis

Credits: 10 Session: 2014/15 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 22 hours
          Example classes 4 hours
          Directed private study 72 hours

Lecturer(s): Dr PM Holland

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

Assessment Description: The examination is worth 80% of the module. The examination will use a multiple choice format consisting of twenty questions.

The examination topics will be those presented directly in the lectures.

The assignment is worth 20%. It is a multiple choice format administered using Blackboard.

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. Level 2 supplementaries (re-sits) will be capped at 40%.

Assessment Feedback: For the assignment students will be able to reclaim their assignment that has been marked. They will also receive a model solution and a form that gives general feedback on the assignment.

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.

Intended Learning Outcomes: After completing this module you should be able to demonstrate a knowledge and understanding of circuit analysis.

This will improve both:

Knowledge:
• state the basic circuit laws, concepts and principles;
• describe the response of resistors, capacitors, inductors and op-amps to the application of a.c. and d.c. signals.

Practical skills:
• simplify a.c. and d.c. networks to obtain equivalent circuits;
• choose and apply the most efficient network method to analyse analogue circuits.
• design circuits to modify or manipulate voltages and currents and perform simple tasks.

**Additional Notes:**

- PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION
- AVAILABLE TO: visiting and exchange students.
EG-260 Dynamics 1

Credits: 10 Session: 2014/15 Semester 2 (Jan - Jun Taught)

Module Aims: Elements of vibrating systems; simple harmonic motion; use of complex exponential representation.
One-degree-of-freedom systems; natural frequency; effect of damping; harmonic excitation; rotating out-of-balance; vibration isolation and transmission. Undamped multi-degree-of-freedom systems; eigenvalues and eigenvectors; vibration absorbers. Experimental testing. Lagrange's equation and its physical interpretation.

Pre-requisite Modules: EG-166
Co-requisite Modules:

Incompatible Modules:

Format: Lectures 2 hours per week
Example classes 1 hour per week
Directed private study 40 hours
Preparation for assessment 30 hours

Lecturer(s): Professor S Adhikari, Dr H Haddad Khodaparast

Assessment: Examination 1 (85%)
Assignment 1 (8%)
Assignment 2 (8%)

Assessment Description: Assessment: 15% internal assessment (Two assessments) and 2 hour examination at the end of the Semester (85%). Resits in August will have 100% weighting.

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

Failure Redemption: An opportunity to redeem failures will be available within the rules of the University. A supplementary exam will form 100% of the module mark.

Assessment Feedback: Via model answers for the continuous assessments and overview of generic issues from written examinations. Feedback will be left on blackboard.


Lagrange's Equation: Derivation, physical interpretation, simple examples of its application.

Intended Learning Outcomes: A knowledge and understanding of: the importance of natural frequencies and resonance; the role of damping; the analysis of single and two degree of freedom systems.

An ability to: estimate resonances of simple systems;

to derive the equations of motions of systems using Lagrange's equation.

An ability to: apply the methods presented in the course to develop simple models of real structures;
analyse these models to calculate natural frequencies and evaluate the response to harmonic forces.

An ability to: use a personal computer; study independently and use library resources; manage working time.

Reading List:
Additional Notes: PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

Available to visiting and exchange students.

Additional notes:

Office hours will be posted on the Blackboard.

Submission of the assignments will be via blackboard ONLY. Email submissions will NOT be accepted.

All notes and other teaching materials will be delivered via blackboard ONLY.
**EG-261 Thermodynamics 2**

**Credits:** 10  
**Session:** 2014/15  
**Semester 1 (Sep-Jan Taught)**

**Module Aims:** This module aims to generate ability to solve the problems and explain physical phenomena on the topic of Thermodynamics. The module will cover Gas-Vapour Mixtures and Air Conditioning, Refrigeration and Heat Pump, Combustion of fuels, Performance of Internal Combustion Engines, Gas Turbine Engines and Jet Propulsion (Regeneration, reheating, intercooling).

**Pre-requisite Modules:** EG-161  
**Co-requisite Modules:** EG-268

**Incompatible Modules:**

**Format:**  
Lectures 15 hours  
Example classes 15 hours  
Directed private study 40 hours  
Preparation for assessment 30 hours

**Lecturer(s):** Dr RS Ransing

**Assessment:**  
Examination 1 (100%)  

**Assessment Description:** Assessment: 2 hour examination at the end of the Semester (100%)  

Resits in August will have 100% weighting.

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

**Failure Redemption:** An opportunity to redeem failures will be available within the rules of the University.

**Assessment Feedback:** Via feedback solutions and overview of generic issues from written examinations.

**Module Content:**  
Gas-Vapour Mixtures and Air Conditioning: Specific and relative humidity of air, use of psychometric chart, heating/cooling and humidification/dehumidification of air, air conditioning  
Refrigeration and Heat Pump Cycles  
Gas Power Cycles: Brayton Cycle, Gas Turbine Engines and Jet Propulsion (Regeneration, reheating, intercooling)  
Gas Power Cycles: Otto and Diesel cycles, Mean Effective Pressure and Thermal Efficiency, Performance of IC Engines.  
Combustion: Combustion of fuels.

**Intended Learning Outcomes:** A knowledge and understanding of: the first law of thermodynamics applied to power generation cycles involving open and close systems, flow and non-flow processes, steady and unsteady processes, and, with air as a working fluid. Concepts of entropy and enthalpy applied to refrigeration and heat pump cycles. Combustion of fuels. Gas-vapour mixtures and air conditioning.

An ability to: identify methods used for the thermodynamic analysis of air and vapour power generation cycles and in air conditioning. Distinguish between ideal and real power generation cycles. Identify appropriate methods to account for the effects of 'regeneration' and 'reheating' in gas turbine engines.

An ability to: apply first and second law of thermodynamics to calculate the thermal efficiency of reciprocating engines and gas turbine engines. Analyse combustion process of hydrocarbon fuels.


**Additional Notes:** Failure to sit an examination will result in a mark of 0% being recorded.

This is a core module for several degree schemes.

Assessment: 100% weighting for examination with number of opportunities for formative assessments.

Available to visiting and exchange students. It will also be beneficial for students to observe Heat Engine and Jet Engine experiments undertaken during the EG-268 module.
**EG-262 Stress Analysis 1**

**Credits:** 10 Session: 2014/15 Semester 2 (Jan - Jun Taught)

**Module Aims:** This module continues on from EG-120 and includes: section properties; unsymmetrical bending; stresses in thick cylinders; rotating discs; theories of failure; stress concentration effects; fatigue and linear elastic fracture mechanics.

**Pre-requisite Modules:** EG-120

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**
- Lectures 20 hours
- Example classes 10 hours
- Directed private study 70 hours

**Lecturer(s):** Professor SJ Hardy

**Assessment:**
- Examination 1 (85%)
- Assignment 1 (15%)

**Assessment Description:** Closed-book examination

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

**Failure Redemption:** A supplementary written examination will be set which will form 100% of the mark.

**Assessment Feedback:** Students receive their marked coursework with feedback within three weeks of the submission deadline and in time for exam revision. A general pro-forma is completed, covering errors/issues that were identified during the marking process, and produced as formal examination feedback.

**Module Content:** Module content:

- Stress and strain - Stress equilibrium, strain compatibility, stress-strain relationships.
- Section Properties - Second moment of area; product moment of area; principal axes; unsymmetrical bending.
- Thin cylinder formulae.
- Thick Cylinders - Derivation of Lame equations; built-up cylinders and shrink/interference fits.
- Rotating Discs - Derivation of basic equations; effect of 'fit' and external loads; blade design.
- Failure Theories - Failure mechanisms; ductile and brittle failure; Tresca theory, von Mises theory; other relevant theories.
- Stress Concentration Effects - Causes and effects; examples of stress concentration factors and design data; effect of surface finish, residual stresses etc.; design to minimise stress concentration effects; case histories.
- Fatigue - Nature of fatigue; low and high cycle fatigue; presentation of fatigue data; fatigue strength; notch sensitivity; variable loading and cumulative damage; design for infinite life and acceptable finite life.
- Linear Elastic Fracture Mechanics - Modes; stress function approach; crack tip plasticity approaches (Irvin and Dugdale); fracture toughness; LEFM applied to fatigue; environmental effects.

**Intended Learning Outcomes:** A knowledge and understanding of: the significance and theory of unsymmetrical bending. Thick cylinder and rotating disc theory. Theories of ductile and brittle material failure. Stress concentration features and their effects on design. Fatigue and fracture theories.

An ability to: identify the sources and types of stress and stress concentration in components and structures under various loading regimes and choose suitable methods of analysis based on the loading and boundary conditions.

An ability to: apply the equations of unsymmetrical bending, thick cylinders and rotating discs to practical problems. Design simple components and structures to avoid failure by yielding, fatigue and/or fracture, including the effects of stress concentration features.

**Additional Notes:** 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.

Available to visiting and exchange students.

Office hours, prior to examinations, will be posted up on the notice board outside Room 121, Digital Technium (Prof. S. J. Hardy)
## EG-264 Computer Aided Engineering

**Credits:** 10 Session: 2014/15 Semester 1 (Sep-Jan Taught)

### Module Aims:
This module deals with the significance of computers in numerical analysis. Integration by MALAB and Finite Element Analysis (FEA) - (a) Review of MATLAB programming techniques; (b) Introduction of FEA and the techniques to implement FEA by using Solidworks including stress analysis of one-dimensional beam structures and two dimensional structures, etc.

Module Aims: competence in SOLIDWORKS to implement FEA method and MATLAB to solve mathematical problems

### Pre-requisite Modules:
EG-163

### Co-requisite Modules:

### Incompatible Modules:

### Format:
- Lectures 11 hours
- Example classes / Laboratory work 33 hours
- Directed private study 54 hours

### Lecturer(s):
Dr C Wang, Dr MJ Clee

### Assessment:
- Other (Coursework) (100%)

### Assessment Description:
Assignments for two sections of the module are marked after each session

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

### Failure Redemption:
A supplementary written examination will be set which will form 100% of the mark.

### Assessment Feedback:
Students will receive feedback on their assignment in lectures, office hours and on the blackboard

### Module Content:
**FEA Method:**
- (a) Introduction of FEA method; (b) Fundamental techniques to implement FEA by using SOLIDWORKS software; and (c) Implementation of FEA method for stress analysis of different mechanical structures, e.g., beams and plates subject to different loadings.

**MATLAB**
- (a) Review of MATLAB programming techniques; (b) Introduction of numerical analysis basics, including solution of nonlinear algebraic equations and numerical integration etc.

### Intended Learning Outcomes:
After completing this module students should be able to:

- Demonstrate an ability to implement FEA by using Solidworks and utilize the MATLAB to implement numerical methods in solving mathematical problems.

### Reading List:

### Additional Notes:
PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

AVAILABLE TO VISITING AND EXCHANGE STUDENTS.

THIS MODULE IS NORMALLY ONLY ASSESSED IN SEMESTER 1.

FAILURE TO ATTEND ACTIVITIES THAT ARE A MODULE REQUIREMENT WILL NORMALLY MEAN THAT YOU FAIL THE MODULE

LATE SUBMISSIONS OF MATLAB WORK WILL BE HANDLED ACCORDING TO UNIVERSITY EXAMINATION PROCEDURES BUT WILL NOT NORMALLY CONTRIBUTE TO THE TOTAL MARK FOR THE MODULE

Penalty for late submission of continual assessment assignments:
for FEA and MATLAB assignments: normally ZERO marks will be awarded.
For the Matlab part, attendance to all PC lab sessions is compulsory.
Office hours will be posted on the notice board outside the rooms of the lecturers.
EG-268 Experimental Studies

Credits: 10 Session: 2014/15 Semester 2 (Jan - Jun Taught)

Module Aims: The course introduces the students to experimental studies in a wide range of subjects.

Each experiment is self contained and the student will present the findings in written form through a lab report which will have a set of experiment specific questions to answer.

This written report also forms the basis for the assessment.

All students work in groups and carry out five experiments which vary according to discipline, however the assignments are all individually submitted.

The students keep a log-book of the experimental observations and results, which is used for reference for the technical report from each experiment written-up in the week after the experiment, and a final formal report is submitted on one of the experiments at the end of term.

Pre-requisite Modules: EG-163

Co-requisite Modules:

Incompatible Modules:

Format: Lectures 5 hours it in total, throughout the module.
Practical classes 4 hours per week
Directed private study 4 hours per week

Lecturer(s): Dr A Rees, Dr IW Griffiths, Dr H Haddad Khodaparast, Mr Z Jelic, Dr NPN Lavery, Dr B Sandnes, Dr R Van Loon

Assessment: Coursework 1 (15%)
Coursework 2 (15%)
Coursework 3 (15%)
Coursework 4 (15%)
Coursework 5 (15%)
Coursework 6 (25%)

Assessment Description: 1. Lab-reports are for each experiment (C1 to C5) are handed a week after the experiment each worth 15%
2. Each student gives a formal report of one set experiment for their discipline worth 25%
3. All assignments are submitted electronically on Blackboard using templates

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

Failure Redemption: A supplementary piece of coursework will be set which will form 100% of the mark. Written work may be resubmitted in the supplementary period but it is not possible to repeat experiments.

Assessment Feedback: 1. Lab reports are returned with feedback via Blackboard within one week from submission.
2. Feedback is also provided for formal reports.

Module Content: Revision of lab report and formal report writing, and statistical data / error analysis [3].

Measurement techniques for physical parameters: position, velocity, acceleration, temperature, pressure, strain, flow.

Laboratory classes are:
- Mechanical/Product Design (fluids, stress, heat engine, vibration and jet engine)
- Aerospace (stress, jet engine, vibration, flight simulator and aeroplane based flight lab, wind tunnel)
- Medical (stress, fluids, vibration, respiratory physiology, biomechanics, ultrasound)

Intended Learning Outcomes: A knowledge and understanding of: a wide range of experimental techniques.

An ability to: understand and follow experimental procedures.

An ability to: consider health and safety issues when working in labs.

An ability to: maintain accurate informal notes.

An ability to: report findings in written form.
<table>
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<tr>
<th>Reading List:</th>
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<tr>
<td><strong>Additional Notes:</strong> The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.</td>
</tr>
<tr>
<td>All assignments are submitted electronically and the University rules on Plagiarism apply.</td>
</tr>
<tr>
<td>Additional notes:</td>
</tr>
<tr>
<td>Final mark is based on two components:</td>
</tr>
<tr>
<td>5 Technical Reports for each of 5 experiments</td>
</tr>
<tr>
<td>1 Formal report of one experiment</td>
</tr>
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</table>
### EG-269 Design of Machine Elements

**Credits:** 10
**Session:** 2014/15 Semester 1 (Sep-Jan Taught)

**Module Aims:** The module introduces the students to the design and analysis of a number of common machine elements including drives and couplings, gears, bearings and power screws. Balancing of rotating machinery is also covered.

**Pre-requisite Modules:** EG-165; EG-165

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**
- Lectures 20 hours
- Example classes 10 hours
- Directed private study 70 hours

**Lecturer(s):** Professor SJ Hardy, Dr SS Chitsaz Charandabi

**Assessment:**
- Examination 1 (85%)
- Assignment 1 (15%)

**Assessment Description:** Closed book examination.

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

**Failure Redemption:** A supplementary written examination will be set which will form 100% of the mark.

**Assessment Feedback:** Students receive their marked coursework with feedback within three weeks of the submission deadline and in time for exam revision. A general pro-forma is completed, covering errors/issues that were identified during the marking process, and produced as formal examination feedback.

**Module Content:**

- Drives and couplings - clutches, brakes, belts and couplings
- Balancing - rotating and reciprocating systems
- Gear design - gears, the analysis of gearboxes, including epicyclics
- Bearings - types of bearings, bearing design, bearing selection
- Screws and threads - power screws

**Intended Learning Outcomes:** A knowledge and understanding of: the design and selection process for typical machinery components.

- An ability to: identify the important machine components under various loading regimes and choose suitable methods of analysis based on the loading and boundary conditions.
- An ability to: apply the knowledge to practical machine design problems.


**Additional Notes:** 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.

Additional notes: Office hours, prior to examinations, will be posted up on the notice board outside Room 162 (Prof. S. J. Hardy)
Module Aims: The course builds on information presented in Manufacturing Technology I (EG-182) by describing advanced processes for special machining and surface modification and by examining available joining techniques for assembly of components. The advantages and limitations of specific processes are outlined and procedure for optimum design and manufacture provided. The importance of quality assurance in manufacturing is discussed and selected methods of condition assessment are described.

Module Aims: to provide awareness and understanding of advanced manufacturing methods used for engineering materials and components.

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

Format:
- Lectures 24 hours
- Tutorials / Example classes 12 hours
- Directed private study 36 hours
- Preparation for assessment 28 hours

Lecturer(s): Professor TC Claypole, Dr A Das

Assessment:
- Examination 1 (100%)

Assessment Description: Examination contributes 100%

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

Failure Redemption: Through Supplementary Examination in August

Assessment Feedback: Through College of Engineering feedback procedure

Module Content: Module content: [lecture hours]

Special machining processes such as chemical milling, electro-chemical, and electric discharge, are described. Benefits of these techniques are outlined with reference to selected industrial applications, including micro manufacture [4]
The role of surface modification in improving component performance is described. Traditional and modern techniques for surface coating, with organic and inorganic materials and metal coating eg by electroplating, ion plating, vapour, plasma or metal plating are detailed. This includes the principles of additive manufacturing techniques such as printing[5]
The use of SPC (Statistical Process Control) fo quality assurance.
Factors affecting the selection of an appropriate method of joining are described. Details of processes for mechanical fastening, soldering, brazing, adhesive bonding and welding are given with examples provided of joints manufactured in metals alloys, polymers and ceramics. [4]
Potential defects in components are outlined and the need for quality assurance is discussed. Factors affecting the degree and type of inspection to ensure necessary quality are presented and non-destructive testing methodsare described. [4]
The importance of microstructure on the mechanical properties and its control during large scale manufacturing is discussed with suitable examples. Basic introduction to process modelling is provided with a discussion on consideration for microstructural features. [4]

Intended Learning Outcomes: After completing this module you should be able to:
Understand the principles, advantages and limitations of the main non-traditional machining processes.
Discuss coating technology, joining techniques and their advantages and limitations.
Understand the principles of quality control using SPC
Describe inspection techniques including non-destructive testing.
Predict the effects of machining, coating and joining techniques on the materials structure and properties.
Select appropriate machining, coating and joining techniques.
Relate the effects of large scale processes on the microscopic structure of materials.
Compare information from several sources to select optimum processing.


Additional Notes: PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION
**EG214 Mechanical Engineering Design 2**

**Credits:** 10  
**Session:** 2014/15  
**Semester 2 (Jan - Jun Taught)**

**Module Aims:** Within this module students will be expected to complete a series of exercises that will form the basis of a 'major' design. The scope of the module will involve the students to work in groups where they will consider, as a team, conceptual designs, embodiment using innovative approaches to design processes and standards etc leading to final design documentations and manufacturing techniques.

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-163; EG-165; EG-264

**Incompatible Modules:**

**Format:**  
- Lectures 10 hours  
- Laboratory work 30 hours  
- Directed private study 60 hours

**Lecturer(s):** Dr MJ Clee

**Assessment:** Group Work - Project (100%)

**Assessment Description:** Research Study  
- Analysis Tests  
- Concept designs  
- Final Design Report

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

**Failure Redemption:** A failure would be redeemed by doing a design exercise and submitting a formal report during the normal August Supplementary period. This would form 100% of the mark.

**Assessment Feedback:** Lectures will provide feedback on presentations during lecture and laboratory sessions. Tutorial sessions may also be used for general feedback and guidance.

**Module Content:** Module content:  
- Application of core engineering subjects (thermo, fluids, stress and dynamics) to a practical design project related to their discipline.  
- Computer aided design  
- Advanced design practice
**Intended Learning Outcomes:** A 'greater' knowledge and understanding of multi-disciplinary aspects of the design process leading to a total design solution. 
An ability to apply theoretical subjects to a real engineering problems. 
Experience of project planning and teamwork, deadlines and organisation of meetings.

Intended Learning Outcomes: After completing this module you should have: 
A knowledge and understanding of the multidisciplinary nature of design and understand the implications of many design decisions. Understand the main stages of embodiment, concept and detail design and be able to contribute to each of these.

An understanding of the link between design and manufacture of a product prototype model.

An ability to apply analysis tools in the design and manufacture of a product. This will include engineering sciences as well as manufacturing and commercial considerations.

KU2 Have an appreciation of the wider multidisciplinary engineering context and its underlying principles, particularly when applied to design.

KU3 Appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement.

D1 Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues.

D4 Use creativity to establish innovative solutions.

D5 Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal

D6 Manage the design process and evaluate outcomes.

P1 Knowledge of characteristics of particular equipment, processes or products

P2 Workshop and laboratory skills

P6 Understanding of appropriate codes of practice and industry standards

P8 Ability to work with technical uncertainty

PS1 Possess practical engineering skills acquired through, work carried out in laboratories and workshops; in individual and group project work; in design work; and in the use of computer software in design, analysis and control

S2 Knowledge of management techniques which may be used to achieve engineering objectives within that context

S3 Understanding of the requirement for engineering activities to promote sustainable development

S4 Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.

S5 Understanding of the need for a high level of professional and ethical conduct in engineering

**Reading List:**

**Additional Notes:** PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION
**ACADEMIC YEAR PLAN: SESSION 2014/15**

### Michaelmas Term 22 September 2014 to 12 December 2014

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<td>Enrolment Week and Arrivals Weekend</td>
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<tr>
<td>1</td>
<td>Welcome Week &amp; Induction</td>
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<tr>
<td>2</td>
<td>Semester 1: Teaching and Learning</td>
<td>Christmas Recess Revision</td>
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<td>Marking &amp; Feedback</td>
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### Summer Term 20 April 2015 to 12 June 2015

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**Additional Dates:**

**Session 2015/16:**
- **Michaelmas Term:** 21 Sept 2015 - 11 Dec 2015
- **Lent Term:** 04 Jan 2016 - 18 Mar 2016
- **Summer Term:** 11 April 2016 - 10 June 2016