COLLEGE OF ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 3 (FHEQ LEVEL 6)

CIVIL 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
WELCOME

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

CIVIL ENGINEERING PORTFOLIO DIRECTOR:
Professor E De Souza Neto (e.desouzaNeto@swansea.ac.uk)
Room A134, Engineering Central

YEAR 3 CO-ORDINATOR:
Professor MG Edwards (m.g.edwards@swansea.ac.uk)
Room A131, Engineering Central

ADMINISTRATIVE SUPPORT:
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.
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<td><strong>EG-321</strong></td>
<td><strong>EG-3064</strong></td>
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<tr>
<td>Geomechanics</td>
<td>Construction Management and Project Delivery</td>
</tr>
<tr>
<td>10 Credits</td>
<td>10 Credits</td>
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<td>Prof AJ Gil</td>
<td>Dr PA Xavier</td>
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| **EG-323**        | **EG-320**         |
| Finite Element Method | Structural Mechanics III |
| 10 Credits         | 10 Credits         |
| Dr W Harrison      | Prof Y Feng        |

| **EG-328**        | **EG-326**         |
| Superstructure Design | Engineering of Foundation |
| 10 Credits         | 10 Credits         |
| Dr BCL Lau         | Prof D Peric       |

| **EG-329**        | **EGA304**         |
| Hydrology and Unsteady Flow | Civil Engineering Design Practice II |
| 10 Credits         | 10 Credits         |
| Dr Y Xuan/Dr J Clancy | Miss X Yin/Dr J Clancy |

| **EGA331** | **EG-353** |
| Coastal processes and engineering | Research Project |
| 10 Credits         | 30 Credits |
| Prof HU Karunarathna/Prof DE Reeve | Mrs RM Kerton/Ms NM Chartier/Mr GD Hill/Dr CP Jobling/Prof MJ Mcnamee/Mr AB Montgomery |

**CORE**

| **Total 120 Credits** |
**EG-3064 Construction Management and Project Delivery**

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<tr>
<th>Credits: 10</th>
<th>Session: 2017/18 Semester 2 (Jan - Jun Taught)</th>
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**Module Aims:** Civil Engineering projects can be amongst the most complex projects you can find in any sphere of work. A good project manager has to constantly assess and balance cost, quality and time. When this applies to a live construction project, making sure a good understanding of how the project is functioning will mean the difference between profit and loss, and a safe or unsafe environment for the workforce.

This module introduces project management tools for scheduling, resourcing and logistical planning of site operations.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

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<tr>
<th>Format:</th>
<th>Lectures</th>
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<table>
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<tr>
<th>Lecturer(s):</th>
<th>Dr PA Xavier</th>
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<table>
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<td></td>
<td>Coursework 2 (10%)</td>
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<td>Coursework 3 (10%)</td>
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<td>Coursework 5 (10%)</td>
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<td>Coursework 6 (50%)</td>
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**Assessment Description:**

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<td>Coursework 4 (10%) - Business Case</td>
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<td>Coursework 5 (10%) - Value Engineering</td>
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<td>Coursework 6 (50%) - Scheduling Assessment Day</td>
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**Moderation approach to main assessment:** Universal second marking as check or audit

**Failure Redemption:** 100% Coursework supplementary

**Assessment Feedback:** Feedback given during workgroup sessions and lectures.

Group feedback given via blackboard.

Feedback on formative assessment tasks will inform summative assessment tasks.
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<td>- Funding Options</td>
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<td>- Delivery parameters</td>
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<td>- Accountability and responsibility</td>
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<td>- Procurement strategy</td>
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<td>- Value management</td>
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<td>- Quality management and control</td>
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<td>- Operational commissioning</td>
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<td>- Project audit</td>
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<td>- Project feedback</td>
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<td>- Close-out report</td>
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<td>Intended Learning Outcomes:</td>
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<tr>
<td>----------------------------</td>
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<tr>
<td>- Recall the eight stages of Project Management according to the CIOB Code of Practice,</td>
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<tr>
<td>- Recall the key roles and responsibilities in a construction project</td>
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<tr>
<td>- Evaluate appropriate procurement strategies for a given project</td>
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<tr>
<td>- Define the key processes, objectives, deliverables and resources associated with each stage of the management process, using examples from case study projects.</td>
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<td>- Evaluate risks to a project and suggest appropriate risk management</td>
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<tr>
<td>- Discuss PPP/PFI arrangements and evaluate their suitability for different types of project</td>
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<tr>
<td>- Develop a project plan and monitor critical path activities</td>
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<td>- Discuss dispute resolution options</td>
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| Additional Notes: | Available for visiting and exchange students |
### Module Aims:
This module aims to provide a fundamental understanding of the principles of structural instability and the principles of limit state analysis and elasto-plastic bending. Study of structural instability will include the potential energy approach and stability analysis of beam/columns, rigid bar/spring systems. Statical and kinematic solution approaches to plastic collapse problems will be analysed and applied in the solution of the plastic collapse of beams/frameworks.

### Pre-requisite Modules:
EG-225

### Co-requisite Modules:

### Incompatible Modules:

### Format:
- Lectures 2 hours per week
- Example classes 1 hour per week
- Office hours: 1 hour per week
- Directed private study and preparation for assessment: 6 hours per week

### Lecturer(s):
Prof Y Feng

### Assessment:
- Examination 1 (100%)

### Assessment Description:
Written 2-hour closed-book examination (100%) at the end of the semester

### Failure Redemption:
Exam re-sits according to university regulations. A supplementary examination will form 100% of the module mark.

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

### Failure Redemption:
Compliance with College of Engineering progression regulations for third year students. Any student failing to pass in the June examination period may be invited to sit a supplementary examination in August of the same year depending on Engineering progression regulations and at the discretion of the Civil Engineering Portfolio

### Assessment Feedback:
Students will receive feedback after submitting answers to Homework Questions issued through the course. Individual feedback and model answers will be provided within three weeks of submission. Examination feedback will be provided using the College of Engineering online feedback system, with general information provided on examination performance in each question and statistics on overall class performance

### Module Content:
- Introduction to stability theory.
- Total potential energy: Energy method for the calculation of equilibrium conditions and the stability of the equilibrium position
- Application to simple rigid bar-spring models and beam/columns.
- Introduction to limit state analysis. The theory of elasto-plastic bending.
- Demonstration of moment redistribution under progressive loading. The bounding theorems of limit analysis.
- Statical and kinematic solution approaches. Solution of continuous beams by the statical method.
- Introduction to mechanisms. Determination of independent and combined mechanisms.
- Use of the principle of virtual work to determine collapse loads.
- Problem solution for portal framed structures.
- Solution procedures for gable (pitched roof) frameworks.
Intended Learning Outcomes:
After completing this module you should be able to demonstrate a knowledge and understanding of:
- The principles of structural stability theory.
- The principles of limit state analysis of steel structures.
- Elasto-plastic theory of bending of sections
- The concepts of redistribution of moments in beams and framed structures.

Students will need to demonstrate ability to:
- Identify the various independent and combined mechanisms by which plastic structural collapse can occur.
- Distinguish between axial and bending load carrying actions in framed structures.
- Identify the appropriate methods of analysis for linear and stability analysis of pin-jointed frameworks.
- Position loads on structures in order to obtain worst load case conditions.
- Identify possible shapes leading to structural instability in simple beam/column structures
- Apply the theory of elasto-plastic bending to determine shape factors for various sections.
- Use the equilibrium method to determine the limit load of continuous beam structures.
- Use the kinematic approach to determine the limit load of framed (portal and gable) structures.
- Calculate the buckling load for simple beam/columns.

Rhodes, J, Virtual work and energy concepts / J. Rhodes, Chatto and Windus, 1975.

Additional Notes: Not available to visiting and exchange students.
This module particularly builds on the work done in the Level 2 Structural Mechanics 2 (a) and (b) modules. Students should revise the topics learnt in these modules. This module also assumes students are familiar with the basic mathematical concepts learnt in the levels one and two mathematics modules.
EG-321 Geomechanics

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

Module Aims: This module builds upon the "Basic Soil Mechanics" module taught in Level 2 Civil Engineering. It is designed to strengthen the knowledge on the behaviour of soils and to give basic understanding of some geotechnical structures (e.g. retaining walls). The theories of lateral earth pressure (Mohr-Coulomb and Rankine) will be explained in detail as well as their implications into the design of earth retaining structures and the stability of slopes. The students will have the opportunity to resolve realistic geotechnical problems by means of their own designed computer program (e.g. through the use of the computer software MatLab).

Pre-requisite Modules: EG-223; GEL200

Co-requisite Modules:

Incompatible Modules:

Format:
- Lectures: 2 hours per week
- Example classes: 1 hour per week
- Office hours: 1 hour per week Directed private study and preparation for assessment: 6 hours per week

Lecturer(s): Prof AJ Gil

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

Assessment Description: Examination 1: Open-book open examination (80%). Adhering to the University Examination Guidelines, students are permitted to bring the following to the examination: class notes and textbooks are permitted.

Assignment 1: Development of a MatLab computer program for the analysis of a realistic geotechnical structure (e.g. embedded wall) and preparation of a 10-page engineering report summarising the main results and drawing some technical conclusions regarding the structural performance of the structure (20%). This is a group project.

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

Failure Redemption: In compliance with College of Engineering progression regulations any student failing to pass in the June examination period may be invited to sit a supplementary examination in August of the same year (100% of the final mark), at the discretion of the Civil Engineering Portfolio in compliance with Swansea University regulations.

Assessment Feedback:
- Feedback will be given on all submitted coursework via direct written feedback information.
- Examination feedback will be provided using the College of Engineering online feedback system, with general information provided on examination performance in each question and statistics on overall class performance.

Module Content:
- Review of basic concepts of continuum mechanics: stress (normal and shear), Mohr-circle representation, strain (normal and shear), constitutive relationships (Hooke’s law), deviatoric and pressure stress components, isotropic state of stress. [3 hours]

- Shear strength of soils - Idealised stress-strain relationship. Mohr-Coulomb failure criterion in terms of stresses on a plane and in terms of principal stresses. Effect of drainage. Triaxial tests: CD, CU and UU tests. Influence of dilatancy on strength. Stress paths, peak and residual strengths of soils. [8 hours]


**Intended Learning Outcomes:** Upon completion of this module, students should be able to:

- Recognise, utilise and define the theoretical aspects underpinning the mechanical behaviour of soils, including shear strength of soils, Terzaghi’s principle, Mohr-Coulomb failure theory, cohesive and non-cohesive soil behaviour and lateral earth pressure theories (e.g. Mohr-Coulomb and Rankine).
- Differentiate the various soil’s states of stress, including stress paths, deviatoric stress and isotropic state of stress.
- Utilise effectively soil’s strength concepts, such as peak and residual strengths and dilatancy.
- Recognise, use and distinguish the two prototypical lateral earth pressure scenarios (i.e. active and passive cases).
- Assess the stability of slopes.
- Develop industry computer software from scratch.
- Utilise computer software to resolve realistic geotechnical problems, otherwise unsolvable by hand.
- Appreciate the importance of sustainability within the field of geomechanics.

**Reading List:**


**Additional Notes:**

- The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.
- Available to visiting and exchange students.
- Assessment of external students: 100% from end of semester open-book examination.
- Notes, worked examples and past papers for this module can be found on Blackboard.
## EG-323 Finite Element Method

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

**Module Aims:** This module provides a concise introduction to the elementary concepts and methods of finite element analysis, with applications to heat flow, solid mechanics, groundwater flow and other engineering problems. It also provides practice in using finite element software/codes.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**  
- Lectures 2 hours per week  
- Example classes 1 hour per week  
- Laboratory work 12 hours in total

**Lecturer(s):** Dr W Harrison

**Assessment:**  
- Examination 1 (80%)  
- Assignment 1 (10%)  
- Assignment 2 (10%)

**Assessment Description:**

(i) Assignment 1: Solve 1D problems using both hand calculations and computer codes (10%).  
(ii) Assignment 2: Solve multidimensional and transient problems using both hand calculations and computer codes (10%).  
(iii) Final examination: Closed book exam (80%).

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

**Failure Redemption:** Resit may be allowed in exceptional circumstances - subject to university regulations. Assessment - 100% examination.

**Assessment Feedback:** Assignments 1 and 2 are assessed via blackboard. Individual student feedback will be provided through blackboard. An overall feedback on the final examination will be posted online.

**Module Content:**


**Review [2] and Assessment.**

Attendance is a course requirement. Each student will need to complete two assignments that will require both hand calculation and computer simulations. Computer simulations will be using the existing finite element software, which includes small finite element programs.
<table>
<thead>
<tr>
<th>Intended Learning Outcomes:</th>
<th>Upon completion of this module, the student should be able to demonstrate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A knowledge and understanding of:</td>
<td>(i) Fundamentals of the finite element method as an approximation method for analysis of a variety of engineering problems. (ii) Differences between mathematical (conceptual) and computer models.</td>
</tr>
<tr>
<td>An ability to (thinking skills):</td>
<td>(i) Distinguish between strong and weak form of the engineering problem at hand. (ii) Understand levels of approximation inherent in computer modelling approaches to the solution of engineering problems.</td>
</tr>
<tr>
<td>An ability to (practical skills):</td>
<td>(i) Develop finite element formulation for analysis of a variety of engineering problems including: (a) elastostatics of 1-D bars and cables (b) heat conduction, potential flow, porous media flow, torsion (c) plane strain and plane stress problems. (d) transient problems. (ii) Use finite element method to solve engineering problems (a)-(d). (iii) Use a computer to model and analyse engineering problems (a)-(d).</td>
</tr>
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<table>
<thead>
<tr>
<th>Additional Notes:</th>
<th>Penalty for late submission of continuous assessment assignments: zero tolerance.</th>
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<tr>
<td>Available to visiting and exchange students.</td>
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### EG-326 Engineering of Foundation

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

**Module Aims:** This module focuses on basic principles and methodologies for analysis and design of engineering foundations. Mechanical concepts underlying the bearing capacity and serviceability are established from the continuum mechanics principles, and applied to the design of engineering foundations. Both shallow and deep foundations are considered, subject to different soil characteristics, loading conditions and construction techniques. Basic techniques of design for realistic foundations will be established by employing the Eurocode.

**Pre-requisite Modules:**
- EG-223; EG-321

**Incompatible Modules:**
- EG-223; EG-321

**Format:** Lectures 2 hours per week. Example Classes 1 hour per week. Directed private study 3 hours per week.

**Lecturer(s):** Prof D Peric

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

**Assessment Description:** Examination 1 - Standard 2 hour university examination worth 100% final mark. This is a closed book examination.

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

**Failure Redemption:** Exam re-sits according to university regulations. A supplementary examination will form 100% of the module mark.

**Assessment Feedback:** Examination 1 - Standard university exam feedback form.

**Module Content:**
- Review of soil mechanics: effective stress principle; drained and undrained conditions; overburden pressure [2]
- Bearing capacity of shallow foundations: Failure types in the soil: General shear, punch and local failure. Methods for the evaluation of the bearing capacity for general shear failure type: Upper and Lower Bound methods. [9]
- Bearing capacity equations: Hansen equation. Influence of depth, footing geometry, water table; bearing capacity of footings on sands and on layered soils. [6]

**Intended Learning Outcomes:** At the conclusion of the module, students should be able to:
- Identify basic principles underlying bearing capacity and settlement of shallow foundations.
- Identify basic principles underlying bearing capacity and settlement of deep (piled) foundations.
- Identify possible failure mechanisms and assess causes of excessive settlements of foundations.
- Design shallow (strip/pad) foundation so that it has an adequate margin of safety against collapse.
- Design deep (pile) foundation so that it has an adequate margin of safety against collapse.
- Distinguish between ultimate (general or local shear failure) and allowable bearing capacity.
- Predict the likely settlement of a simple shallow foundation during the working life of the structure being supported.
- Distinguish between immediate and long-term settlement.

**Reading List:**

**Additional Notes:** This module particularly builds on the work of Level 2 module EG-223 (Soil Mechanics) and EG-321 (Geomechanics). Therefore it may not be suitable for visiting and exchange students, unless student has prior knowledge of geomechanics equivalent to modules EG-223 and EG-321.

Failure to sit an examination or submit work by the specified date will result in a mark of 0% being recorded.
Module Aims: This module aims to develop design techniques, understanding of structural behaviour for steel and concrete structural building frames from low rise to tall building applications, forms of bridges and the concept of Life Cycle Assessment (LCA).

Pre-requisite Modules: EG-222; EG-224; EG-225

Co-requisite Modules: EG-M62

Incompatible Modules:

Format: Lectures 2 hours per week. Example classes 1 hour per week. Directed private study 3 hours per week. One hour office hour per week will be given to students through pre-booked appointment.

Lecturer(s): Dr BCL Lau

Assessment:
- Examination 1 (80%)
- Assignment 1 (10%)
- Class Test 1 - Held under exam conditions (10%)

Assessment Description: Assessment: 20% project work in 1 No. group assignment and 1 No of class test. Remaining 80% of the module marks are obtained by means of a 2-hour end of teaching block Closed Book examination. This module operates on a zero tolerance policy for late submission/plagiarism/collusion/commissioning of coursework i.e. zero marks awarded.

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

Failure Redemption: In line with College of Engineering progression regulations, if students who will study MEng or MSc and fail to pass EG-328 in the first sit examination (January) may be permitted to sit a supplementary examination in August of the same year, at the discretion of the Civil Engineering Portfolio Director.

Assessment Feedback: Individual oral or written feedback will be given on coursework, prior to the January examination. Examination feedback will be provided via the College of Engineering online feedback system, reflecting on the class performance as a whole to individual exam questions.

Module Content: [No of hours]

- Steel Design to BS EN 1993
- Revision of section classification, design of fully restrained beams, and beams subjected to lateral torsional buckling [3]
- Plastic design and analysis of portal frame [3]
- Design of columns with combined axial and bending [2]
- Framing of single storey and tall buildings, braced and unbraced buildings [3]
- Concrete Design to BS EN 1992
- Reinforced concrete frame buildings with shear walls and lift cores [2]
- Reinforced concrete liquid retaining structures, its applications, performance criteria, crack width calculations due to flexure, early thermal and shrinkage effects. [3]
- Prestressed Concrete Theory and Design [3]

Forms of Bridges [3]

Reinforced concrete retaining walls - types of wall, pressure acting on wall, principal modes of failure and their design approach to BS EN 1997. [4]

Life Cycle Assessment as one of the tools to develop sustainable projects [3]

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

A knowledge and understanding of:
Basic design considerations for design of steelwork, reinforced concrete structures, an understanding of lateral torsional buckling of beams and importance of restraint in steel structures, failure modes of retaining walls, performance criteria of liquid retaining structures, forms of bridges and the concept of live cycle assessment for civil engineers.
Institution of Structural Engineers (Great Britain), issuing body, Manual for the geotechnical design of structures to Eurocode 7, The Institution of Structural Engineers, 2013.ISBN: 1906335230

Additional Notes: This module particularly builds on the work of Level 2 modules EG-222 and EG-224. Therefore it may not be suitable for visiting and exchange students, unless student has previous knowledge of structural analysis and design equivalent to modules EG-222 and EG-224. Similarly, students entering directly to Level 3 Civil Engineering should familiarise themselves with the content of those Level 2 modules as soon as possible.

The student of best performance of this module (including attendance) will receive the "Atkins Superstructure Design Prize".
# EG-329 Hydrology and Unsteady Flow

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

**Module Aims:** This module comprises two components: Hydrology (80%) and Water Engineering Design (20%)

Hydrology: 1. Introduction of important concepts in hydrology, such as hydrological cycle, rainfall runoff process, hydrological design; 2. Ensuring students to be able to solve common hydrological problems following the general practice guideline in engineering hydrology; 3. Encouraging critical thinking on issues related to development issues, with special emphasis on water supply problems under the climate change impacts.


**Pre-requisite Modules:** EG-190; EG-201

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**  
Lectures 2 hours per week  
Blended Learning + Office Contact 1 hour per week  
Directed private study 3 hours per week

**Lecturer(s):** Dr Y Xuan, Dr J Clancy

**Assessment:**  
Examination 1 (75%)  
Coursework 1 (15%)  
Coursework 2 (10%)

**Assessment Description:** Coursework 1: An individual written coursework contributing 15% to the final mark. Coursework 2: Design work to be completed in pairs, covering drainage scheme design for storm water run-off, contributing 10% to the final mark. A closed-book examination after the teaching block with 75% contribution to the final mark.

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

**Failure Redemption:** Exam resits according to university regulation. A supplementary examination will form 100% of the module mark.

**Assessment Feedback:** Coursework 1 - Feedback will be given on an individual basis via Blackboard. Coursework 2 - Feedback will be given on an individual basis via Blackboard. Examination 1 - Standard university exam feedback form.

**Module Content:**  
Hydrological cycle and water budget [1]; Precipitation analysis and design storms [2]; Evaporation and transpiration [2]; Infiltration and effective rainfall [1]; Flood estimation [1]; Catchment analysis [4]; Rainfall runoff modelling and Unit Hydrograph [2]; River routing and reservoir routing [2]; Hydrological modelling [1]; SuDs and Drainage Design [4]

**Intended Learning Outcomes:** Upon completion of the module, students should be able to:  
1. Demonstrate a knowledge and proven understanding of: Hydrological cycle and key hydrological processes such as precipitation, evapo-transpiration, infiltration, runoff; rainfall-runoff relationship; water budget and water supply using reservoirs; design storm and flood estimation; flood routing; risk analysis; hydrological modelling; climate change and sustainability issues and the impact on water resources.  
2. Apply key engineering methods to solve water problems relating to civil engineering: (1) Water use budgeting ;(2) Catchment analysis; (3) Design storms and estimating flood; (4) Water demand analysis and estimate suitable reservoir size; (5) Using Unit Hydrograph to predict runoff process; (6) Flood routing in open channel flow and reservoir routing; (7) Use computer-based hydrological models;(8) Risk analysis for extreme hydrological events; (9) climate change impacts. (8) Urban drainage design and SuDs
**Reading List:**

**Additional Notes:** Available to visiting and exchange students.
**EG-353 Research Project**

**Credits:** 30 Session: 2017/18 Semester 1 and 2 (Sep-Jun Taught)

**Module Aims:** The module involves the application of scientific and engineering principles to the solution of a practical problem associated with engineering systems and processes [EA2].

The student will gain experience in working independently on a substantial, individually assigned task, using accepted planning procedures. It will require and develop self-organisation and the critical evaluation of options and results, as well as developing technical knowledge in the chosen topic.

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Incompatible Modules:**

**Format:**
- Formal Lectures 16 hours;
- Directed private study (incl. meetings with supervisors 284 hours

**Lecturer(s):** Mrs RM Kerton, Ms NM Chartier, Mr GD Hill, Dr CP Jobling, Prof MJ Mcnamee, Mr AB Montgomery

**Assessment:**
- Assignment 1 (5%)
- Assignment 2 (0%)
- Assignment 3 (0%)
- Assignment 4 (5%)
- Assignment 5 (5%)
- Report (50%)
- Project (35%)

**Assessment Description:** The 'Engineer as a Practitioner and Scientist':

- Oral examination: Presentation (10%) and defence (20%)
- Assessment of the conduct of the project evidenced by the log book (5%)

- Report (50%)
  - Preliminary feedback stage: First draft of research paper (10 pages) for formal review and feedback (formative)
  - Final version of research paper (15%) is primarily an assessment of the quality of the presentation of the work by means of the camera-ready research paper. Note: SPLD Assessment Guidelines apply to all items in this category.
  - Quality and contribution of project (35%) is an overall assessment of the quality of the outcomes of the research as evidenced by achievement of original or revised targets and the parts of the research paper (results, discussion and conclusions) that require critical and objective evaluation of the work and its contribution.

The 'Engineer as a Professional':

- Coursework 1 (15%)
  - Project Plan (5%)
  - Risk Assessment (pass/fail)
  - Ethics Assessment (pass/fail)
  - Progress Report (5%)
  - Employability related assessments (total 5%)

**NB:** Project Plan, Risk assessment, Ethical impact statement, progress report and Employability items will be assessed during the course of the project. All other components will be assessed in April/May.

**Full assessment criteria will be on Blackboard accessible though "My Grades".**

**Items labelled 'pass/fail' are not awarded a grade but MUST be passed to in order to pass the module.**

**Moderation approach to main assessment:** Universal double-blind marking

**Failure Redemption:** There is no failure redemption for this module. Failure in this module would normally result in an exit qualification due to insufficient credits having been attained.
Assessment Feedback:
Most feedback will be delivered via meetings with supervisors.

There will be a formal opportunity to submit a first draft of the project 10-page paper for preliminary review to
i) provide feedback to the student and
ii) provide the student with an opportunity to make modifications to the paper before final submission.

A formal feedback procedure for the research project will be developed by the College of Engineering and is likely to
take the form of a summary of the student's performance as measured against the formal assessment criteria with comments from the supervisor and second marker. For efficiency, it is likely that this will be delivered orally at the end of the formal viva.

Module Content:
- The nature of the research project varies from one student to another. The allotted project may involve survey of literature, theoretical or experimental studies and computational studies. Students will be offered the opportunity to define the topic of their own research project. The academic staff of the College of Engineering will produce a list of project descriptors and students will be given a chance to select a project over the summer before the start of the academic year.

- Each student will be allocated an individual project and a supervisor. It is recommended that students meet their supervisors at least once a fortnight to discuss progress. Each student must keep a logbook and this should be signed by the supervisor at these meetings. It is the responsibility of the student to ensure that the logbook is signed.

- Briefings on risk assessment, project management, research techniques, record keeping, report preparation and presentation skills will be given. Precise assessment criteria, deadlines, submission formats and instructions will be disseminated via the Blackboard web site.

- A risk and ethical assessment for the project will be carried out in consultation with the supervisor.

- You will prepare a project plan with stated aims, an initial introduction to your research paper with key references, and project targets. The project plan must be submitted by the published deadline. A progress report summarising your progress against the plan, and including an extended introduction, list of references and final paper outline, is submitted at the start of the second semester.

- A final report in the form of a Journal article (10 pages maximum) will be submitted for review before the end of the spring term and final, "camera ready copy", taking account of reviewer's comments, must be submitted shortly after the Easter vacation.

- Each student will attend an individual 30 minute viva voce examination at the end of the project period with 2 members of academic staff. A suitable presentation (10 minutes) should be prepared. At this time, the logbook will also be inspected by the examiners.

- A full personal CV or LinkedIn profile must be completed with a reflective report on how the dissertation has enhanced the student's employability will be prepared and assessed.
**Intended Learning Outcomes:** On successful completion of this module, students should, at a threshold level, be able to operate in each of these three modes:

**Engineer as Practitioner**
- define a project specifying the aims, objectives and realistic targets;
- construct a project schedule and work to that schedule;
- synthesize the various activities associated with the project;
- evaluate available options, including budgetary, sustainability and ethical considerations where relevant, and choose appropriate solutions;
- propose the development of a technical subject in some depth, largely on your own initiative and carry this out,
- prepare a journal article summarising your work and submitting it for review.

**Engineer as Scientist**
- write a technical report in the form of a short (10 page) journal article.
- compose an oral presentation (plus PowerPoint) on the progress of your project and the results obtained and defend it against critical appraisal;

**Engineer as Professional**
- perform a risk and ethical assessment for your project, create a project plan and report on progress;
- keep a log-book to record developments and progress;
- prepare for employment by writing a full personal CV and reflecting on the benefits of the project in enhancing your employability.

**Reading List:**


Mike Ashby, How to Write a Paper, Engineering Department, University of Cambridge, 2005.

Alisdair Montgomery (Academic Liaison Librarian), Giles Lloyd-Brown (Subject Librarian), Naomi Prady (Subject Librarian), Philippa Price (Subject Librarian), Library Support for Engineers.

Avoiding Plagiarism (Cardiff University).


How to write a Paper in Scientific Journal Style and Format.


**Additional Notes:** Only available to students following an Engineering Degree Programme.

There are a number of compulsory submissions (a project plan; a risk assessment; an ethics assessment; evidence of preparation for employability; a progress report; an 10-page research paper and log book). In addition, attendance at a viva examination at which the project results will be presented and the research paper defended is a compulsory part of the assessment. The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of coursework and continuous assessment.
## EGA304 Civil Engineering Design Practice II

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

**Module Aims:** This module aims to develop skills in civil and structural engineering design through project-based learning. The coursework assignments are based on a real-life project from industry, which includes concept design and design elements such as superstructures, geotechnical, foundation and drainage. This aims to help students to apply their prior knowledge of different aspects of engineering design and develop design concepts which meet client/project brief, whilst paying due consideration to the necessary design parameters, health and safety and sustainability. This will also help students to further develop their design skills obtained from relevant modules in design practice.

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-326; EG-328; EG-329

**Incompatible Modules:**

**Format:**  
- Lectures (demonstrations) 1 hour per week  
- Design classes 2 hours per week  
- Directed private study 6 hours per week

**Lecturer(s):** Miss X Yin, Dr J Clancy

**Assessment:**

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<tr>
<th>Assessment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Coursework 1</td>
<td>40%</td>
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<tr>
<td>Coursework 2</td>
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<td>Coursework 3</td>
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<td>Coursework 4</td>
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<td>Class Test 1 - Practical Assessment Not Exam Cond</td>
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**Assessment Description:** This coursework is conducted and assessed in groups.

- Coursework 1 (40%) – Scheme conceptual design, scheme concept (30%), sustainability (10%)
- Coursework 2 (15%) – Element design 1
- Coursework 3 (15%) – Element design 2
- Coursework 4 (15%) – Element design 3
- Class assessment (15%) – Element design 4

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

**Failure Redemption:** As the module is assessed solely through group coursework submitted, the redemption of an individual student failure would be based on terms set out by the Module Co-ordinator and the Civil Engineering Portfolio Director, as deemed necessary on a case by case basis.

**Assessment Feedback:** Student groups will receive detailed oral feedback throughout the project during weekly scheduled design classes. If deemed necessary, additional group tutorials will be provided and some groups may also be invited to a formal group interview at the end of each stage of the project, so that a fair distribution of marks may be awarded within the group.
**Module Content:** A comprehensive group design project which includes the following design elements:

Conceptual/Scheme design – conceptual design based on a real-life project provided by industrial partners. Develop viable conceptual design options and give recommendations based on engineering knowledge and judgement. Design options must pay due consideration to health & safety and sustainability and justification given to ethical design.

Superstructure design – using the knowledge and skills developed from a number of design modules, this part of the course and assessment focuses on structural design. Familiarisation with commercial software for the analysis and design of concrete and steelworks to Eurocode, analytical results must be verified by hand calculations.

Geotechnical design – using on the knowledge and skills developed from EG-321 Geomechanics and EG3-28 Superstructure Design, this part of the course and assessment focuses on geotechnical design and the design of retaining structures. Conceptualisation of the given scenario into design parameters, analysis of realistic geotechnical structures and carry out the geotechnical and structural design to Eurocode.

Foundation design – using on the knowledge and skills developed from EG-326 Engineering of Foundations, this part of the course and assessment focuses on the foundation design required for the superstructure. Conceptual design to give outline sizing of different foundation options, recommendation of suitable solution and design development to provide a foundation solution.

Drainage design – using on the knowledge and skills developed from EG-329 Hydrology and Unsteady Flow, this part of the course and assessment focuses on drainage design. Scheme design for storm water run-off for the whole site, individual drainage element design including considerations for SuDs.

Relevant sketches, calculations with correct references to Eurocode and AutoCAD drawings to communicate the final design are required for each coursework submission.

**Intended Learning Outcomes:** Develop knowledge and understanding of:

- Design considerations for design of steelwork (portal frame design), reinforced concrete (retaining structure design), foundations and drainage systems.
- Project/client brief and how it translates to design parameters.
- Development of design concepts for different type of projects.
- How health & safety, sustainability and ethics should be taken into consideration in the design concepts of different types of projects.

Develop ability to:

- Visualise, through hand sketching and physical modelling of the structural form to identify problems, and to disassemble a structure for element design.
- Make planning and design decisions by utilising knowledge of steel, reinforced concrete, geotechnics and fluids for design calculations by hand or commercial software.
- Verify analytical results with hand calculations.
- Have the awareness or 'feel' for expected sizes; critical scrutiny of calculations.
- Use working knowledge of Eurocode Standards to check or 'size' elements for final designs.
- Communication of design decisions by production of formal drawings using AUTOCAD.

Continue to develop skills in:

- Working as a member of a team including division of work, checking of group-members' work and working to deadlines.
- Time management of both individual and group work. Delivering to project deadlines.
- Communication of design ideas and basis of design calculations using hand sketches.
Reading List:

Additional Notes:
Not available to visiting and exchange students, unless the student has completed the Level 3 Semester 1 Civil Engineering modules EG-326, EG-328 and EG-325 or equivalent.

Penalty for late project submissions - zero tolerance.

Practical work: Practical design classes and lecture hours to help with understanding of design work (linked to modules EG-326, EG-328, EG-325) and project work. Students to familiarise themselves with the requirements of British and Eurocode Standards and with software in design.

Project work:

One integrated design project, in groups, with design elements including concept, superstructure, geotechnical, foundation and drainage design.

Class assessment:

A group class assessment to test student's ability to use basic engineering principles to develop solutions to problems and analyse their effectiveness.

The project work submissions will be phased for marking to ensure satisfactory progress by each member of the group.

The class assessment will be be intermixed with lecture hours. Groups may be interviewed after each stage submission.

Notes from relevant design guides / Eurocodes / details on case studies of good practice may be made available to students by the lecturer involved via Blackboard / during lectures.

Where possible learning will be reinforced by guest lectures from practicing civil engineers and site visits. Students are also recommended to attend relevant ICE and IStructE evening lectures.
EGA331 Coastal processes and engineering

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

Module Aims: This module introduces the fundamentals of wave and tidal mechanics including linear wave theory, wave transformation, nearshore processes, theory of tides and coastal water level variations which are essential to coastal engineering. The concepts introduced here provides an overview of the main physical processes that shape the coastal environment and forms the basis of learning more complex coastal zone management, coastal zone processes modelling and coastal designs in Level M.

Pre-requisite Modules:

Co-requisite Modules:

Incompatible Modules:

Format:
- Lectures 2 hours/week
- Example classes 1 hour/week
- Directed private study 4 hours per week

Lecturer(s): Prof HU Karunarathna, Prof DE Reeve

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

Assessment Description: Coursework 1 - online submission (20%)
Closed Book Examination (80%). 2 hours.

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: Feedback on coursework via comments in class
Feedback on exam via normal procedure; in subsequent years via overview of generic issues arising from previous examinations

Module Content:
Introduction: historical context, the coastal environment, context of design, hard and soft engineering options for coastal defence and their effects on the coastal environment

Linear wave theory: airy wave equations, water particle motions, approximations for 'deep' and 'shallow' water, energy content and power in a wave, group velocity, brief introduction to nonlinear theories.

Wave transformation: refraction, shoaling, reflection, diffraction

Coastal Processes: wave breaking, wave-induced currents, set-up and set-down

Theory of tides: equilibrium tidal theory, classification of tides, tidal analysis, tidal prediction, dynamic theory of tides

Water level variations: tides, surge, sea level rise, tsunamis

Intended Learning Outcomes: Upon completion of this module students should be able to:

- Apply linear wave theory to determine essential wave parameters required for coastal management situations
- Understand the limitations of linear wave theory and their consequences
- Use linear wave theory to perform wave transformation to determine nearshore waves
- Determine location of wave breaking, wave set-up/set-down and nearshore currents using principles of nearshore processes
- Use equilibrium theory of tides
- Apply equilibrium tidal theory to formulate tidal prediction problems, apply tidal classification methods, determine tide levels and to estimate total water level
- Distinguish surges and tsunamis

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. Late assignments will not be marked.