CLASS DESCRIPTION FORM

CL507    Ground Improvement and Reinforcement

Class Registrar: Dr M Kenny
Taught To (Course): MEng Civil Engineering

Other Lecturers Involved: None
Credit Weighting: 10
Semester: 2

Assumed Prerequisites: None
Compulsory/optional/elective class: Optional
Academic Level: 5

Class Format and Delivery (hours):

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Project</th>
<th>Assignments</th>
<th>Private Study</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>56</td>
<td>100</td>
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Educational Aim

This class aims to provide comprehensive understanding of the principles, techniques and methods of analysis for ground improvement and soil reinforcement, piles and other special foundations, and the application of these techniques for design in various ground conditions, including the use of computer-aided design.

Learning Outcomes

On completion of the class the student is expected to be able to

LO1  Identify the most appropriate techniques and apply design methods for ground improvement in different soil conditions.

LO2  Design reinforced earth walls and slopes.

LO3  Identify the most appropriate foundation solutions for various ground conditions and situations.

LO4  Design single piles and pile groups in different ground conditions.

(UK SPEC suggests no more than 4 learning outcomes per class. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the course specifications.)

Syllabus

The class will teach the following:

Ground Improvement
Techniques for ground improvement (mass replacement, preloading, vertical drains, deep mixing, dynamic compaction, deep vibro techniques, jet grouting, compaction grouting).
Design methods for ground improvement.

Soil Reinforcement
Principles of soil reinforcement.
Types of reinforcement, properties and behaviour.
Design of reinforced slopes and soil nailing.
Design of reinforced earth retaining walls using the tie-back wedge method.
Use of design software.

Pile and Special Foundations
Types of deep foundations, ultimate load capacity of pile foundations.
Design of pile foundations and pile groups.
Behaviour of driven piles and pile driving.
Assessment of Learning Outcomes

Criteria
For each of the Class Learning Outcomes the following criteria will be used to make judgements on student learning:

[Note: Criteria break the LO down into ‘teachable’ elements but do not become syllabus orientated i.e. no mention of CAD package names, components etc.]

LO1
C1  Able to assess the suitability of the various GI methods for a particular design situation.
C2  Able to optimise the design of sand drain systems using analytical methods.
C3  Able to design stone column systems.

LO2
C1  Understand the properties and behaviour of the various types of soil reinforcement.
C2  Able to design reinforced earth retaining walls.
C3  Appreciate the influence of reinforcement type on the behaviour of reinforced earth retaining walls.
C4  Understand the behaviour of soil nailed slopes and the fundamental design principles.

LO3
C1  Able to assess the suitability of piles and different pile types for a particular building design situation.
C2  Appreciate the construction problems which could arise from piling in different soil profiles.
C3  Able to design pile foundations and optimise the pile dimensions and spacing.
C4  Understand and apply the principles of Eurocode 7 to pile design.

The standards set for each criterion per Class Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

12 Principles of Assessment and Feedback
(on Learning & Teaching web pages: www.strath.ac.uk/learnteach/teaching/staff/assessfeedback/12principles/)

Please state briefly how these are incorporated in this class.

Feedback will be provided to students individually and as a group through the tutorial sessions, which will include worked examples.
The coursework will require out of class learning and library study
Coursework feedback will be provided in relation to the specific marking criteria set out in the coursework.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
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<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Duration</td>
<td>Weighting</td>
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<tr>
<td>LO1, LO2, LO3</td>
<td>1</td>
<td>2 Hours</td>
<td>80%</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

Coursework / Submissions deadlines:
Friday, week 4, semester 2.

Resit Assessment Procedures:
Examination (100%)

PLEASE NOTE:
Students need to gain a summative mark of 50% to pass the class. Students who fail the class at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of an exam.

Recommended Reading
Additional Student Feedback
(Please specify details of when additional feedback will be provided)

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Session:

Approved:

Course Director Signature:

Date of Last Modifications: September 2013
### Class Code:
CL507

### Class Title:
Ground Improvement and Reinforcement

### Brief Description of Assessment:
Coursework in the form a short report.

### Assessment Timing:-

Indicate on the table below the Start/Submission dates for each Assignment/Project and the timing of each Exam/Class Test(s).

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<th>WK2</th>
<th>WK3</th>
<th>WK4</th>
<th>WK5</th>
<th>WK6</th>
<th>WK7</th>
<th>WK8</th>
<th>WK9</th>
<th>WK10</th>
<th>WK11</th>
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<th>Exam Period</th>
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C/W issued

Submission