CL 975 Environmental Chemistry

Module Registrar: Helen Keenan
Taught To (Course):
- MSc Hydrogeology
- MSc Environmental Engineering
- MSc Environmental Science
- MSc Environmental Forensics

Other Lecturers Involved: Robert Kalin, Charles Knapp
Credit Weighting: 10
Semester: 2

Assumed Prerequisites:
BSc or BEng in one of the following disciplines: earth, biological or physical sciences, environmental or chemical engineering, environmental management.

Compulsory/optional/elective class
Academic Level: 5

Module 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>0</td>
<td>16</td>
<td>0</td>
<td>25</td>
<td>39</td>
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Educational Aim

This module aims to introduce chemistry in a manner that is of practical importance in environmental science.

Chemistry has a special role in the environment. Wide variety of chemical processes has provided us an unprecedented standard of living, but a cost of pollution and environmental degradation. Individuals need to have some knowledge of chemistry if they are to make a contribution to environmental improvement.

Aim of the module is to teach scientists the discipline of chemistry (or, provide a review to trained chemists). The class is written at a level such that, with a little extra study for those without prior knowledge of basic chemistry, an individual can understand the basic principles of environmental chemistry.

Further, the module will familiarise with basic concepts of chemical analysis relevant to the environment, establish outline knowledge of a range of common analytical techniques and provide practical experience in analytical chemistry.

Learning Outcomes

On completion of the module the student should be:

- LO1: be conversant of chemistry such that they can communicate about chemical systems, including nomenclature and proper terminology
- LO2: understand chemical cycles and their role in the environment
- LO3: understand chemical reactions, and their effects and impacts in the environment
- LO4: gain practical skill in chemical analysis

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

Syllabus

Lecture:
1. Fundamentals of basic chemistry
2. Fundamentals of aquatic chemistry
3. Oxidation and reduction reactions
4. Phase interactions
5. Geosphere and geochemistry
6. Soil chemistry
7. Organic chemistry
8. Nature and sources of hazardous wastes
9. Toxicology

Laboratory related:
1. Health & safety
2. Sampling and analysis
3. QC/QA
4. Analytical methods (theory)
5. Laboratory experiments (soil analysis)
6. Pollutant transport and fate modelling

Assessment of Learning Outcomes
Criteria

For each of the Module 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** be conversant of chemistry such that they can communicate about chemical systems, including nomenclature and proper terminology

C1 ability to recognise chemical formula, structure and nomenclature

C2 demonstrated ability of effectively disseminating this knowledge in written form

C3 participation in classroom discussions

**LO2** understand chemical cycles and their role in the environment

C1 demonstrated ability to describe nutrient cycles

C2 ability to evaluate potential impact and influences on the process

**LO3** understand chemical reactions, and their effects and impacts in the environment

C1 evidence of a capability to undertake analytical results and evaluate environmental outcomes

C2 evidence that the student has obtained a sound understanding of chemical stoichiometry

**LO4** gain practical skill in chemical analysis

C1 demonstrated ability to take knowledge and lessons acquired into carrying out methodologies and generating sound analytical results

C2 demonstrate the ability carry out experiments in a safe, effective manner

C3 demonstrate the ability to disseminate knowledge in written form and discussion

For each of the Module 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.]

The standards set for each criterion per Module 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 module.

1. Assignments are routine and evenly distributed throughout the class.
2. Assistance (via teach/laboratory assistance and lecturer) will be available to student to provide timely feedback.
3. Students will have ample opportunities (via multiple projects) to incorporate feedback and improve their performance.
4. Students work on a regular basis on small summative tasks that carry minimal marks but each with regular feedback. The continual assessments will provide a clear understanding of what is required and have had practice in the task.
5. Group (laboratory) projects to create natural peer dialogue.
6. Students will be asked to maintain a laboratory journal in relation to their learning.
7. Departmental policy: carry out mid-term class assessments and provide feedback to students.
8. Establishment of MSc cohorts tend to foster the development of learning groups. They student interact closely with each other, and tend to be high supportive.
9. Encourage self-motivation and mutual respect in group projects; procedures support individual and group accountability in the lab.

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

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Duration</td>
<td>Weighting</td>
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<tr>
<td>LO 1-3</td>
<td>1</td>
<td>2</td>
<td>50%</td>
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Coursework / Submissions deadlines:
cw1 (10%) week 3; cw2 (10%) week 6; cw3 (10%) week 9; cw4 week 12 (20%)

Resit Assessment Procedures:
Resit will comprise entirely (100%) of exam.

PLEASE NOTE:
Students need to gain a summative mark of 40% / 50% (please delete as appropriate) to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of exam / coursework / viva (please delete as appropriate).

Recommended Reading

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

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<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Room No</th>
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<tr>
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Session: TBC

Approved:

Course Director Signature:

Date of Last Modifications:

(Updated November 2010)
**MODULE TIMETABLE**

<table>
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<th>CL xxx</th>
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<tbody>
<tr>
<td>Module Title:</td>
<td>Environmental Chemistry</td>
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**Brief Description of Assessment:**
(tentatively) exam 50% and continual assessment / coursework (3 assignments 50%)

Coursework 1: problem set covering the principles of chemistry, stoichiometry and equilibrium reactions (20%)
Coursework 2: calculations related to contaminant fate (10%)
Coursework 3: solving redox and metabolic half reactions (10%)
Coursework 4: calculations and interpretations of analytical work (10%)

**Assessment Timing:-**

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

<table>
<thead>
<tr>
<th>Semester One</th>
<th>WK1</th>
<th>WK2</th>
<th>WK3</th>
<th>WK4</th>
<th>WK5</th>
<th>WK6</th>
<th>WK7</th>
<th>WK8</th>
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<th>WK11</th>
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Please, provide tentative schedule

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<th>Semester Two</th>
<th>WK1</th>
<th>WK2</th>
<th>WK3</th>
<th>WK4</th>
<th>WK5</th>
<th>WK6</th>
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<th>WK10</th>
<th>WK11</th>
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CW1 due
cW2
due
Cw3
due
Lab1
Lab2
Lab3
Lab4
cW4
due