# Subject Description Form

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| **Subject Code** | CSE29371 |
| **Subject Title** | Environmental Chemistry |
| **Credit Value** | 3 |
| **Level** | 2 |
| **Exclusions** | CSE370 Environmental Sciences I & CSE371 Environmental Sciences II |
| **Objectives** | The subject aims to provide the student with an understanding of chemical processes in air, water and soil in both natural and human perturbed environments on the earth. It will include a discussion of the links of these chemical processes to current environmental pollution and solutions. |
| **Intended Learning Outcomes** | Upon completion of the subject, the students will be able to:<br>a. understand the basic concepts of environmental chemistry in water, soil, and air;<br>b. understand the chemistry behind environmental issues, in both the natural or engineered systems;<br>c. integrate the chemical principles into environmental practices;<br>d. exercise the experimental works in the laboratory and incorporate the results into technical reports to describe the observed phenomenon and scientific findings;<br>e. to recognize the need for, and to engage in life-long learning; |
| **Subject Synopsis/ Indicative Syllabus** | **Keyword syllabus:**<br><br>1. Water Chemistry<br>Basic concepts of general chemistry, physical chemistry, equilibrium chemistry, reduction and oxidation; introduction to acid-base equilibrium, and charge/proton balances in aquatic systems;<br><br>2. Chemistry of Solid-Water Interaction<br>Basic concepts of soil-water interaction; some introduction on soil chemistry, e.g. adsorption isotherms, complex and precipitates;<br><br>3. Atmospheric Chemistry<br>Structure of the atmosphere, solar radiation, oxidative capacity, free radicals, oxidation of nitrogen oxides, sulphur compounds, and volatile organic compounds, acid-base reactions, composition and reactions of aerosol, basics of chemical kinetics; photochemical smog, acid rain, haze, and stratospheric ozone depletion.<br><br>4. Laboratory Works<br>Acid-base titration to define the dissociation coefficients of different acids; adsorption isotherms of pollutant to adsorbent; numerical simulations of photochemical mechanisms.<br><br>5. Seminar<br>Introduction to environmental issues and the state-of-the-art technologies to resolve the problems in air, water, and wastes. |

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<tr><td>Teaching/Learning Methodology</td><td>Fundamental knowledge will be covered in the lectures. Tutorials will provide opportunities for discussion of lecture materials and will also be conducted with problem-solving sessions to supplement understanding from lectures. Laboratory works will help students to appreciate the basic principles and familiarize themselves with basic water, soil, and air chemistry.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weight</td><td colspan="5">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1. Assignments</td><td>15</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>2. Laboratory reports</td><td>10</td><td>√</td><td>√</td><td></td><td>√</td><td></td></tr>
<tr><td>3. Seminar report</td><td>5</td><td>√</td><td></td><td>√</td><td></td><td>√</td></tr>
<tr><td>3. Tests</td><td>20</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>4. Final examination</td><td>50</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>Total</td><td>100</td><td></td><td></td><td></td><td></td><td></td></tr>
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Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall results.
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td></td><td>Average hours per week</td></tr>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures/ Tutorials/ Laboratory</td><td>3 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and Studying</td><td>4.2 Hrs.</td></tr>
<tr><td>▪ Completion of Assignments/Lab. Reports</td><td>1.8 Hrs.</td></tr>
<tr><td>Total Student Study Effort</td><td>9 Hrs.</td></tr>
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</td></tr>
<tr><td>Reading List and References</td><td>Colin Baird (2012), Environmental Chemistry, Fifth Edition, W.H. Freeman and Company;<br><br>Sawyer, C. N., McCarty, P. L., and Parkin, G. F. (2003) Chemistry for Environmental and Engineering and Science, Fifth Edition, McGraw Hill Co;<br><br>Benjamin, M. M. (2010) Water Chemistry, McGraw Hill Co;<br>Bleam W. F. (2012) Soil and Environmental Chemistry, Elsevier Inc.</td></tr>
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