# Subject Description Form

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| **Subject Code** | ABCT3276 |
| **Subject Title** | APPLIED CHEMISTRY - ENVIRONMENTAL CHEMISTRY |
| **Credit Value** | 3 |
| **Level** | 3 |
| ~~**Pre-requisite**~~<br>**Co-requisite** | General Chemistry II |
| **Objectives** | The subject aims to provide the student with an understanding of the earth's natural chemical processes in air, water and soil with special attention to the chemical aspects of environmental disturbances that humans have provoked in the natural environment. It will also include a discussion of current environmental problems, their associated health effects and their solutions. Examples will be chosen and discussed within the context of environmental problems arising from local and international urban and industrial development wherever appropriate. |
| **Intended Learning Outcomes** | Upon completion of the subject, students will be able to:<br><br>a. identify and describe the major environmental issues in our region, country, and on a global scale;<br>b. understand and explain the chemistry of the major environmental threats to our air, water and soil;<br>c. differentiate between natural cycles of chemicals and those exacerbated by human activities.<br>d. critically analyze and describe the sources, causes, extent of key environmental problems and their solutions as well as remedial options;<br>e. explain the analytical methods of the important water quality parameters;<br>f. be aware of the scientific developments and trends on society and their environmental impacts. |
| **Subject Synopsis/ Indicative Syllabus** | **Atmosphere**<br>Atmospheric structure, atmospheric chemistry. Sources and effects of particulates, oxides of sulphur, CO and $CO_2$, oxides of nitrogen and air-borne lead. Freons and the depletion of stratospheric ozone. Photochemical smog. Greenhouse effect and global warming.<br><br>**Hydrosphere**<br>Chemistry of natural waters. Water quality, supply and demand of drinking water, management. Water pollution, sources of industrial and agricultural water pollution, organic and inorganic pollutants. Water quality analysis. $CO_2$ equilibrium, carbonate systems, acid rain. Water and Wastewater Treatment. |

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<tr><td></td><td>Lithosphere<br>Nature of soil, soil chemistry, and wastes and pollutants in soil.<br><br>Biogeochemical Cycles<br>The Carbon and Oxygen cycles</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Interactive lectures will provide students with fundamental principle and concepts of environmental chemistry as well as guidance on further reading. Tutorials are designed to provide the forum for group discussion and problem-based learning on the subject materials. Problems and case studies will be provided to cultivate the skill of students to identify and tackle environmental problems. During tutorial sessions, students are trained to think critically, write, discuss, analyze, synthesize, evaluate, apply concepts and knowledge learned in class to solve environmental chemistry problems and work together.</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">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr>
<tr><td>1. Group Presentation</td><td>20</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tests</td><td>20</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Final examination</td><td>60</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
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<br>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:<br><br>Presentations are used to train and assess the presentation and critical thinking skills. Examination and tests will cover material from lectures, most of the intended subject learning outcomes will be assessed.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>30 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>9 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading, studying, preparing for class etc.</td><td>60 Hrs.</td></tr>
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| | ▪ Presentation preparation | 10 Hrs. |
| | Total student study effort | 109 Hrs. |
| **Reading List and References** | **<u>Essential Textbook</u>**<br><br>1. Manahan, S. E. *Environmental Chemistry*, 9th ed. Boca Raton, FL: CRC Press, 2010.<br><br>**<u>References</u>**<br><br>2. Weiner, E. R. *Applications of Environmental Aquatic Chemistry*: *A Practical Guide*, 2nd ed. Boca Raton, FL: CRC Press, 2008.<br><br>3. Sawyer, C. N., McCarty, P. L., Parkin, G. F. *Chemistry for Environmental Engineering and Science,* 5th ed. McGraw Hill, 2003.<br><br>4. Wright, R. T. *Environmental Science: Toward a Sustainable Future*, 10th ed. Upper Saddle River, NJ: Pearson/Prentice Hall, 2008.<br><br>5. Ibanez, J. G., Hernandez-Esparza, M., Doria-Serrano, C., Fregoso-Infante, Singh, M. M. *Environmental Chemistry: Fundamentals*, New York, NY: Springer, 2007.<br><br>6. Environmental Protection Department. *Environment Hong Kong* (Current Editions), Hong Kong Government Publication. | |