

DEREE COLLEGE SYLLABUS FOR: ES 3241 ENVIRONMENTAL CHEMISTRY		3/0/3
(same as CH 3241) (Fall 2022)		UK LEVEL: 5 UK CREDITS:15
	CH 1002 Principles of Chemistry ES 1010 Environmental Science: Energy Resources and Pollution	
CATALOG DESCRIPTION:	A study of the chemistry of the atmosphere, water, and soil as well as the associated pollution problems. Chemical hazards in the environment such as heavy metals and synthetic organic compounds, risk assessment, and the chemistry and environmental implications of energy production are also discussed.	
RATIONALE:	The course explores the chemistry of environmental processes. It uses the fundamental principles of chemistry to help students develop an understanding of the sources, reactions, transport, effects and fates of chemical substances in natural and polluted environments. Knowledge of the chemistry of the environment (atmosphere, hydrosphere, lithosphere), of the health and environmental effects of hazardous chemicals and of the use of energy is essential for understanding and addressing contemporary environmental challenges such as pollution issues and global climate change. The course is addressed to Environmental Studies majors and to any other student who wishes to develop an understanding of the chemistry of the environment in which we live.	
LEARNING OUTCOMES:	As a result of taking this course, the student should be able to: <ol style="list-style-type: none"> 1. Demonstrate knowledge and understanding of the chemistry of the lithosphere and the hydrosphere, of associated pollution problems and of treatment processes. 2. Demonstrate knowledge and understanding of atmospheric chemistry and of associated environmental problems such as pollution, climate change and ozone depletion, relate them with the use of energy, and discuss management solutions. 3. Outline the process of risk assessment and explain the nature, chemical properties, fates, as well as the health and environmental effects of toxic chemicals including heavy metals and synthetic organic compounds. 4. Examine, analyze and evaluate an environmental chemistry topic of current interest and compose a project report. 5. Demonstrate ability to communicate data, information and research findings effectively in several forms (e.g. written, graphical and verbal), and defend them in a professional manner. 	
METHOD OF TEACHING AND LEARNING:	In congruence with the learning and teaching strategy of the college, the following tools are used:	

	<ul style="list-style-type: none"> • Class lectures, interactive learning (class discussions, group work), video presentations, and practical exercises/problems. • Exercises and primary source documents are assigned as homework and are reviewed in class. • Literature discussions and use of Scientific Journals of the field. • Office hours: students are encouraged to make full use of the office hours of their instructor, where they can ask questions, see their exam paper, and/or go over lecture material. • Use of a Blackboard site, where instructors post course information, lecture notes, assignments, announcements, as well as additional resources. • Use of Blackboard online interactive tools for teaching and learning. 								
ASSESSMENT:	<p>Summative:</p> <table border="1"> <tr> <td>Project (2,000 to 2,500 words)</td> <td>40%</td> </tr> <tr> <td>Final examination (2 hours)</td> <td>50%</td> </tr> <tr> <td>Portfolio of short assignments (critical thinking essay questions/exercises)</td> <td>10%</td> </tr> </table> <p>Formative:</p> <table border="1"> <tr> <td>Essay questions (as homework assignments)</td> <td>0</td> </tr> </table> <p>The student project tests Learning Outcomes 4 and 5. The final examination tests Learning Outcomes 1, 2 and 3. The portfolio of short assignments tests learning outcomes 1, 2 and 3.</p> <p>The formative assessments aim to prepare students for the examination.</p>	Project (2,000 to 2,500 words)	40%	Final examination (2 hours)	50%	Portfolio of short assignments (critical thinking essay questions/exercises)	10%	Essay questions (as homework assignments)	0
Project (2,000 to 2,500 words)	40%								
Final examination (2 hours)	50%								
Portfolio of short assignments (critical thinking essay questions/exercises)	10%								
Essay questions (as homework assignments)	0								
INDICATIVE READING:	<p>Required Readings:</p> <ul style="list-style-type: none"> • Baird, C. and Cann, M. 2012. <i>Environmental Chemistry</i>, 5th edition, W.H. Freeman and Co, New York <p>Recommended Readings:</p> <ul style="list-style-type: none"> • Hamung, S. E. 2012. <i>Chemistry and the Environment</i>, Cambridge University Press • Wright, J. 2003. <i>Environmental Chemistry</i>, Routledge 								
INDICATIVE MATERIAL: (e.g. audiovisual, digital material, etc.)	<p>REQUIRED MATERIAL: N/A</p> <p>RECOMMENDED MATERIAL: N/A</p>								
COMMUNICATION REQUIREMENTS:	Verbal skills using academic/professional English								
SOFTWARE REQUIREMENTS:	Word, PowerPoint, Excel								
WWW RESOURCES:	<ul style="list-style-type: none"> • Scientific American: http://www.scientificamerican.com/ • American Chemical Society http://www.acs.org/content/acs/en.html 								

	<ul style="list-style-type: none"> • International Union of Pure and Applied Chemistry https://iupac.org/ • National Institute for Occupational Safety and Health (NIOSH), Pocket Guide to Chemical Hazards http://www.cdc.gov/niosh/npg/npg.html • National Institute of Environmental Health Sciences: http://www.niehs.nih.gov/: • US Food and Drug Administration: http://www.fda.gov/ • US Environmental Protection Agency: http://www3.epa.gov/ • Occupational Safety and Health Administration: https://www.osha.gov/: • European Environment Agency: http://www.eea.europa.eu/
<p>INDICATIVE CONTENT:</p>	<p>CONTENT OUTLINE:</p> <ol style="list-style-type: none"> 1. Introduction to Environmental Chemistry 2. The Atmosphere <ul style="list-style-type: none"> • Ozone Layer and Ozone Depletion • Air Pollution • The Greenhouse Effect • Global Climate Change • Energy Use and Contribution to Atmospheric Changes 3. The Hydrosphere <ul style="list-style-type: none"> • Chemistry of Natural Waters • Water Pollution and Purification/Treatment 4. Toxic Chemicals <ul style="list-style-type: none"> • Toxicology and Risk Assessment • Heavy Metals • Organic Compounds: Pesticides • Organic Compounds: Dioxins, Furans, PCBs and Others 5. Environment and the Solid State <ul style="list-style-type: none"> • Chemistry of Soils and Sediments • Solid and Hazardous Waste: Chemical Composition and Management