

DEREE COLLEGE SYLLABUS FOR: : ES 3240 INTEGRATED METHODS IN ENVIRONMENTAL ANALYSIS I		3/0/3
(Spring 2016)		UK LEVEL: 5 UK CREDITS:15
PREREQUISITES:	ES 1000 Environmental Science: Ecosystems and Biodiversity, ES 1010 Environmental Science: Energy Resources and Pollution	
CATALOG DESCRIPTION:	The course aims to cover basic methods and techniques needed in environmental science. Selected natural science methods and their basic principles and techniques are presented, with emphasis on interdisciplinary inquiry. Hands-on experience, laboratory and field work on some of the presented methods and techniques are offered.	
RATIONALE:	Any systematic and effective environmental study and action requires the knowledge of scientific methodology. Environmental Studies is an interdisciplinary field, drawing from both natural and social sciences; therefore, its methodology should also be interdisciplinary, often using mixed-modes of inquiry. For technical aspects of environmental action, natural scientific methods, such as measurements of the concentration of chemicals and laboratory work, are required. Such methods will be discussed in this course. For behavioral and social aspects of environmental practices, social scientific, field-based empirical and text-based interpretive methods are needed; these are discussed in the course Integrated Methods in Environmental Analysis II. The course also discusses data analysis and presentation, as well as how research results are communicated, thus introducing students to the basics of scientific research.	
LEARNING OUTCOMES:	As a result of taking this course, the student should be able to: <ol style="list-style-type: none"> 1. Discuss and utilize selected natural scientific methods and techniques related to environmental studies such as sampling techniques, identification of organisms, chemical analysis of air, water and soil, ecological analysis, demographics and land use surveys. 2. Identify moral and ethical issues of scientific research and apply professional codes of conduct to their environmental research. 3. Demonstrate ability to collect, record, process, interpret and present data using appropriate methods and techniques. 4. Examine and analyse an environmental research topic based on natural science methodology. 	
METHOD OFTEACHING AND LEARNING:	In congruence with the teaching and learning 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 case studies discussed in class. • Laboratory and field work (includes practical work and lab reports) • Exercises and primary source documents are assigned as homework, the answers and critical response to which are reviewed in class • Student projects • 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/lab material. • Use of a Blackboard site, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources. 	

	<ul style="list-style-type: none"> Use of Blackboard online interactive tools for teaching and learning. 								
ASSESSMENT:	<p>Summative:</p> <table border="1"> <tr> <td>Project (1,500-1,800 words)</td><td>35%</td></tr> <tr> <td>Portfolio of lab reports</td><td>25%</td></tr> <tr> <td>Final examination (2-hour, comprehensive)</td><td>40%</td></tr> </table> <p>Formative:</p> <table border="1"> <tr> <td>Critical response to selected questions during the semester – including a sample test</td><td>0</td></tr> </table> <p>The selected questions aim to prepare students for the examination. The formative tests aim to prepare students for the final examination and for the lab reports and research project. The student project tests learning outcomes 2 and 4. The portfolio of lab reports tests learning outcomes 1 and 3. The final examination tests learning outcomes 1 and 2.</p>	Project (1,500-1,800 words)	35%	Portfolio of lab reports	25%	Final examination (2-hour, comprehensive)	40%	Critical response to selected questions during the semester – including a sample test	0
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INDICATIVE READING:	<p>REQUIRED READING:</p> <ul style="list-style-type: none"> Jones, A., Duck R., Reed, R. and Weyers, J. 2000. <i>Practical Skills in Environmental Science</i>, Prentice Hall <p>RECOMMENDED READING:</p> <ul style="list-style-type: none"> Watts, S. 1996. <i>Essential Environmental Science: Methods and Techniques</i>. first published by Routledge Weyers, J. Reed, R. Jones, A. 2012. <i>Practical Skills in Biology</i>. 5th Edition, Pearson Reed, R., Holmes, D., Weyers, J. and Jones, A. 2012. <i>Practical Skills in Biomolecular Sciences</i>. 4th edition, Pearson 								
INDICATIVE MATERIAL: (e.g. audiovisual, digital material, etc.)	<p>REQUIRED MATERIAL:N/A</p> <p>RECOMMENDED MATERIAL: On Line Protocols Videos ES methods.docx posted on blackboard</p>								
COMMUNICATION REQUIREMENTS:	In all presentations using proper English, written or spoken.								
SOFTWARE REQUIREMENTS:	Word, Powepoint, Excel								
WWW RESOURCES:	<p> www.epa.gov www.eea.europa.eu/ http://labtutorials.org/ http://www.jove.com/ http://www.dnalc.org/ http://www.protocol-online.org/ http://cshprotocols.cshlp.org/ http://www.currentprotocols.com/WileyCDA/ http://protocolsonline.com/category/essentials/ http://www.nature.com/protocolexchange/ </p> <p>Additional web resources specific for each method are posted on blackboard course material/presentations.</p>								

<p>INDICATIVE CONTENT:</p>	<ol style="list-style-type: none"> 1. Introduction: The Scientific Method and its Basic Steps 2. The investigative approach (Measurements, Observations, Diagrams, Experimental Design, Project Work) 3. Methods in Environmental Science <ol style="list-style-type: none"> 3.1. Methods for biological research <ul style="list-style-type: none"> • Sampling, manipulating and identifying sampled biological materials (e.g. naming and classifying organisms, using microscopes, preparing specimens for light and electron microscopy, culture systems and growth measurement, including homogenization and fractionation of cells and tissues) 3.2. Analytical techniques used in environmental research <ul style="list-style-type: none"> • Analytical techniques used in biological sciences (e.g. use of radioactive isotopes, basic spectroscopy, centrifugation, chromatography, electrophoresis, etc.) • Techniques used in the chemical analysis of environmental materials (e.g. gravimetry, volumetric analysis, optical methods, electroanalytical methods, chromatography etc.) 3.3. Ecological analysis and demographics <ul style="list-style-type: none"> • Sampling strategies • Population characteristics (e.g. density/cover, life tables) • Community parameters (e.g. species diversity) 3.4. Methods for research on Earth materials (soil, sediments, rocks and fossils) <ul style="list-style-type: none"> • Sampling soils, sediments, minerals, rocks and fossils, • Manipulating and identifying sampled materials • Analysis of soils and sediments • Extracting information from maps and photographs 3.5. Methods for research on aquatic environments <ul style="list-style-type: none"> • Sampling water and manipulating sampled materials • Analysis of aquatic environments 3.6. Methods for research on atmospheric quality <ul style="list-style-type: none"> • Sampling air and manipulating sampled materials • Measuring atmospheric variables and analysis 3.7. Environmental Impact Assessment 4. Analysis and Presentation of Data 5. Information Technology and Library Resources 6. Communication of the Research Results
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