University of the West of England
BRISTOL

CORPORATE AND ACADEMIC SERVICES

MODULE SPECIFICATION

Part 1: Basic Data						
Module Title	Earth System Science					
Module Code	USSKAF-30-2		Level	2	Version	1
Owning Faculty	Health & Applied Sciences		Field	Biological, Biomedical and Applied Sciences		
Contributes towards	BSc Environmental Science					
UWE Credit Rating	30	ECTS Credit Rating	15	Module Type	standard	
Pre-requisites	USSJFB-30-1 The Earth		Co- requisites	none		
Excluded Combinations	none		Module Entry requirements			
Valid From	September 2014		Valid to			

CAP Approval Date	

Part 2: Learning and Teaching	
Learning Outcomes	On successful completion of this module students will be able to: • Discuss the physical, chemical and biological characteristics of all aspects of the Earth system including air, water, soils and sediments (Assessed in component A). • Explain the **biogeochemical** functioning of the Earth as a complete system (Assessed in component A and B1) • Understand the key processes linked with changing climate and global environmental change (Assessed in component A and B2). • Describe the movement of nutrients and energy through the natural environment (Assessed in component A). • Describe and compare the use of contemporary analytical techniques utilised in the study of the Earth System and Environmental Science (Assessed in component B2) • Gain practical experience in a range of analytical techniques (Assessed in component B2)
Syllabus Outline	Planet Earth is a complex, interconnected system. The overall behaviour of the

	Earth system is strongly shaped by the interactions among its various component systems including the atmosphere, cryosphere, hydrosphere, oceans, pedosphere and lithosphere. To build an effective understanding of the whole system requires an increase in knowledge of its component parts and the ways they interact. Specifically students will study: • The natural characteristics of the hydrosphere (water), the atmosphere (air) and the terrestrial biosphere (soil and sediments). Specifically: I. Hydrology, ocean circulation and Marine systems II. Atmospheric chemistry, meteorology, climate and global change III. The dynamic geosphere, soil processes and environmental issues • Understanding the dynamic planet - The Biogeochemical Cycling of elements through the Earth system. The influence of these cycles on the wider dynamics of the Earth system and how these processes are linked with climate regulation and global change. • Earth system change, including climate change interactions and feedbacks, palaeoclimate, potential future Earth system scenarios and future climate predictions. • Natural Hazards of all origins, including atmospheric, volcanic, seismic, hydrological and future hazards arising from global environmental changes. Experiential learning of the Earth system will be achieved through the practical study and hands-on analysis of components from all of the Earth's spheres. This will incorporate a comprehensive introduction to environmental analytical Instrumentation. Specifically students will learn: • Techniques for measuring the physical, chemical, and biological parameters of water, the atmosphere, soil and sediments. • Laboratory analysis of field samples using a range of environmental analytical techniques. • Analysis and interpretation of environmental data. • The limitations and sources of error associated with the analysis of environmental samples (natural and perturbed) and analytical measurement techniques.
Contact Hours	The contact hours (72) are distributed as follows: 12 interactive lectures @ 3 hours/lecture = 36 hours 12 Laboratory Workshops @ 3 hours/workshop = 36 hours = 72 hours
Teaching and Learning Methods	The module will be taught by a combination of interactive lectures and laboratory practical workshops. A major feature of this module is the focus on the experiential learning of transferable analytical (field-based and laboratory) skills and therefore field work and in particular

	laboratory work will formulate a large component of the module. Regular laboratory-based analytical practical classes will be used in parallel to lectures to link practice and theory. This module focuses on the further development of general practical laboratory skills initiated at level one (The Earth) with particular emphasis on applied analytical methodologies. Lectures (theory) and practicals (practice) will be integrated through the use of Blackboard and tutorials. Students are expected to self-study in their own time to help develop a deeper understanding of the subject. Full support will be given in this regard. **Scheduled learning** includes lectures, tutorials, and laboratory practical classes. **Independent learning** includes hours engaged with essential reading, assignment preparation and completion of laboratory workshop written reports.
Key Information Sets Information	Key Information Sets (KIS) are produced at programme level for all programmes that this module contributes to, which is a requirement set by HESA/HEFCE. KIS are comparable sets of standardised information about undergraduate courses allowing prospective students to compare and contrast between programmes they are **Key Information Set - Module data** *Number of credits for this module* 30 Hours to be allocated: 300 Scheduled learning and teaching study hours: 72 Independent study hours: 228 Placement study hours: Allocated Hours: 300 The table below indicates as a percentage the total assessment of the module which constitutes a - **Controlled:** Written Exam **Coursework**: Coursework Report; Practical Logbook and Report Total assessment of the module: Written examination 50% Coursework 50% 100%
Reading Strategy	All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways. The University Library's web pages provide access to subject relevant resources and services, and to the library catalogue. Many resources can be accessed remotely. Students will be presented with opportunities within the curriculum to develop their information retrieval and evaluation skills in order to identify such resources effectively. Any **essential reading** will be indicated clearly, along with the method for accessing it,

	e.g. students may be expected to purchase a set text, be given or sold a print study pack or be referred to texts that are available electronically, etc. This guidance will be available either in the module handbook, via the module information on Blackboard or through any other vehicle deemed appropriate by the module/programme leaders. If **further reading** is expected, this will be indicated clearly. If specific texts are listed, a clear indication will be given regarding how to access them and, if appropriate, students will be given guidance on how to identify relevant sources for themselves, e.g. through use of bibliographical databases. A detailed reading list will be made available through relevant channels, e.g. module handbooks, Blackboard, etc.
Indicative Reading List	**Books** The most recent edition of: Archer, D. *Global Warming; Understanding the Forecast*. Oxford: Blackwell Publishing, Chapman, D*Water quality assessments: A guide to the use of biota, sediments and water in environmental monitoring*. UNESCO/WHO/UNEP. Dean, J.R. *Methods for Environmental Trace Analysis*. Chichester: John Wiley & Sons, Ltd. Girard, J.E. *Principles of Environmental Chemistry*. Sudbury, MA: Jones and Bartlett Radojevic, M. and Bashkin, V.N. *Practical Environmental Analysis.* Cambridge: The Royal Society of Chemistry. Wright, J. *Environmental Chemistry*. London: Routledge. **Journals –** available via the e-journals A-Z link on the library website Atmospheric Environment – Institutional access. Available to all students via from Science Direct. Biogeosciences – Open Access. European Geosciences Union Earth System Dynamics - Open Access. European Geosciences Union Natural Hazards -. **Online Resources** Intergovernmental Panel on Climate Change, IPCC (http://www.ipcc.ch/) Environment Agency (http://www.environment-agency.gov.uk/) European Commission on Climate Change (http://ec.europa.eu/environment/climat/home_en.htm) Hadley Centre for Climate Prediction and Research

	(www.metoffice.gov.uk/research/hadleycentre/)

Part 3: Assessment	
Assessment Strategy	The Assessment Strategy has been designed to support and enhance the development of both subject-based and generic key skills, whilst ensuring that the modules Learning Outcomes are attained. The focus is on assessments that link directly to employability skills as described below. **Component A.** This will be assessed via a written examination. The written examination will be used to assess the student's key knowledge and understanding of the core science in all aspect of Earth system science including biogeochemistry, Earth system change and natural hazards. In addition to this, students will be assessed on their understanding of contemporary environmental analytical techniques and how environmental analysis can be used to study the wider Earth system. **Component B** ***Coursework 1*** **Coursework Report** The report will be based on the analysis of a scientific publication which demonstrates the interconnected nature of the Earth system. In addition to focussing on the Earth system the report will prioritise analysis of Earth system processes and assess the student's understanding of contemporary environmental analytical techniques. An understanding of how to survey, analyse and critique the scientific literature is also key skill that students need to develop prior to writing their final year project report. This assessment addresses both these key skills. **Coursework 2** **Practical Log Book and Report** This coursework contains two parts. i. Submission of practical logbook completed throughout the year during laboratory workshops. ii. A detailed scientific report synthesising the results from multiple interconnected laboratory sessions. This work will be presented as a formal report to be prepared and written in the style of brief scientific project to prepare students for writing up and submitting a scientific project report in their final year. They will learn how to synthesise a range of analytical data to answer specific scientific questions and meet the aims of the work.

Identify final assessment component and element		
% weighting between components A and B (Standard modules only)	**A:** **50%**	**B**: **50%**
First Sit		
Component A (controlled conditions) **Description of each element**	**Element weighting**	

1. Written Examination (3 hours)	100%
Component B **Description of each element**	**Element weighting**
1. Coursework Report	40%
2. Contemporaneous Practical Log Book and Report	60%

Resit (further attendance at taught classes is not required)	
Component A (controlled conditions) **Description of each element**	**Element weighting**
1. Written Examination (3 hours)	100%
Component B **Description of each element**	**Element weighting**
1. Coursework Report	40%
2. Data Analysis Case Study and Practical Report	60%
If a student is permitted an **EXCEPTIONAL RETAKE** of the module the assessment will be that indicated by the Module Description at the time that retake commences.	