

Module Title:	Physico Chemical Science
Language of Instruction:	English
Credits:	10
NFQ Level:	8
Module Delivered In	1 programme(s)
Teaching & Learning Strategies:	This module will be taught as a 3 hour theory class for thirty weeks and ten three hour practical sessions to be delivered over ten weeks. The module content will be delivered via lectures and practicals, guided reading, and written assignments on selected topics. To develop independent and active learning, emphasis will be on the analysis and critique of reading materials. Students may be required to access material by guided reading in advance of class and practicals. Course lecture notes, additional materials, announcements and other course-related information will be available on Blackboard, a virtual learning environment. Any course-related issue or questions that may arise will be discussed at lectures. Students can contact lecturer outside of class hours to discuss feedback on reports, assignments and assessments.
Module Aim:	The aim of this module is to impart knowledge regarding the principles of the physical and chemical nature of the dynamics of the natural environment and to equip the student with the skill set to monitor, analyse and manage the environment sensitively and sustainably with regard to safety best practice and current legislation. This module covers advanced theory of physicochemical principles in the global environment and practical applications in relation to the monitoring and protection of water quality and air quality.
Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Explain the overall interactive nature of the global environment.
LO2	Describe the environmental impacts of natural and anthropogenic pollutants.
LO3	Describe the chemistry and processes of modern waste treatment methods.
LO4	Describe modern analytical methods and technologies for environmental monitoring
LO5	Discuss the methodologies of emission monitoring.
LO6	Describe the applications and importance of remote sensing.
LO7	Discuss workplace pollutant monitoring including air quality and sound.
LO8	Understand and interpret official reports.
LO9	Perform analytical procedures and be able to collate data, interpret results and write environmental reports
LO10	Explain the environmental impacts of natural chemicals and anthropogenic pollutants.
Pre-requisite learning	
Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
Successful completion of year 3 or equivalent	

Module Content & Assessment

Indicative Content

Environmental pollutants

Review of organic and physical chemistry to include kinetics and gas laws; Polluting chemicals: pesticides, herbicides, chlorinated hydrocarbons, PAH, heavy metals: chemistry and toxicities; Processing waste chemicals: landfill, incineration, SCWO, recycling; Chemicals in the workplace: radon, NO_x, CO, ETS, asbestos; Outdoor pollutants, PM Index; Chemistry and reactivity of the hydroxyl radical (OH^{*})

Transport of pollutants

Transport mechanisms of chemical in the environment (LRTAP, Kow etc)

Environmental analytical methods

Environmental applications of chromatography (HPLC, IC), solvent extraction, chelation.

Fluid dynamics

Point, line and continuous sources of pollution.

Monitoring of air quality and emissions to air

Emissions monitoring: manual and continuous monitoring techniques for particulate and gaseous emissions from stacks and ducts; Ambient and outdoor air monitoring.

Remote sensing

Principles and applications of remote sensing. LIDAR and spectroscopic techniques.

Sound

Noise monitoring, noise nuisance criteria and standards

Biogeochemical cycles

Atmosphere-earth-hydrosphere as dynamic system. Sources, sinks, reservoirs. Nitrogen, Phosphorus, Carbon and Sulphur cycles.

Hydrosphere.

Properties of water; Hydrological cycle; Lake stratification and effects; Eutrophication; Acidification, neutralisation and buffering. Drinking water sources and treatment; Waste-water treatment.

Water quality monitoring

Monitoring requirements under Water Framework Directive, Catchment monitoring, Priority substances. Sampling and laboratory methods; Portable devices and test kits. In situ monitoring technologies.

Chemistry of the earth (biosphere)

Mineral composition, groundwater protection; Physical/chemical interactions in soils; Speciation, N and P nutrients.

Chemistry of the atmosphere

Structure and composition of the atmosphere; Photochemistry; Chapman and catalytic reactions, halogenated gases, ozone depletion. Greenhouse effect, greenhouse gases, climate change.

Practicals

Practicals are designed to reinforce and amplify the theoretical content of the course and will be based on relevant applications of techniques such as ion exchange and ion chromatography, HPLC, solvent extraction/chelation of metals, ashing / dissolution techniques, graphite furnace and flame AAS, various parameters by titrimetry and spectroscopy, determination of chemical oxygen demand, FTIR spectroscopy of trace gases, jar tests / flocculation and residuals monitoring, conductivity / mass-charge balance evaluation.

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	20.00%
End of Module Formal Examination	70.00%

Special Regulation

Students must achieve a minimum grade (35%) in both the practical/CA and final examination.

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Other	Two continuous assessment examinations of 1 hour duration	1,2,3,4,5,6,7,10	10.00	n/a

No Project

Practical

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Written reports/laboratory book and other appropriate assignments	3,4,8,9	20.00	n/a

End of Module Formal Examination				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Formal Exam	No Description	1,2,3,4,5,6,7,10	70.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	30 Weeks per Stage	3.00
Laboratory	30 Weeks per Stage	1.00
Estimated Learner Hours	30 Weeks per Stage	3.00
Total Hours		210.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_SASES_B	Bachelor of Science (Honours) in Environmental Science	4	Mandatory