ZENV H3101: Environmental Monitoring

Module Title:	Environmental Monitoring
Language of Instruction:	English

Credits:	10

NFQ Level:	7

Module Delivered In	1 programme(s)

Teaching & Learning Strategies:	This module will be taught over 30 hours as a one hour theory classes plus 45 hours practical laboratory class Section B: will be taught over 30 hours as one hour theory classes and seven three hour practical classes Theory and practical module content will be synchronised and questions relating to the material will be discussed during the theory class and/or during practical sessions and at all times, the application of practical analysis will be emphasised using modern industrial examples and processes. To emphasise this, students will be taken to visit at least one industrial site during the module. Where practical, aspects related to current research projects within the EnviroCORE centre will be integrated in theory and practical classes. Students will be required to demostrate enquiry based learning and good communication skills by choosing a topic of interest and submitting a short report and presentation. This module has been designed so that learning outcomes, learning strategies and assessment are constructively aligned. The topics in the module will be related to each assessable learning outcome. A constructivist learning strategy will be used. These activities will develop important enquiry and research skills that will enhance knowledge acquisition, evaluation and communication While learning will be scaffolded, the participants will be expected contribute to their own and the learning of others via autonomous and peer learning activities. A combination of active learning strategies will be used. Lectures will be given to identify key topics, however on occasion learners will be expected prepare in advance so that class time can be used for discussion of case studies/scenarios, problem solving and critical thinking etc. Scaffolded reading the primary literature and other sources in this area will allow the complexity of situations and emerging issues to be explored. Practicals and workshops will allow practice in technical competencies, data interpretation and understanding the limitations of methodologies. The virtual learning environment Blackboard® will facilitate scaffold ,independent and group learning. It will act not only as a repository of a range of different resources but will allow easy communication of feedback and the sharing of new knowledge and ideas.

Module Aim:	The aim of this module is to impart a fundamental working knowledge of chemical, biological and microbiological monitoring techniques relevant to industrial and environmental samples. It will provide the student with the necessary practical and critical thinking skills to enable them to develop and implement scientifically valid monitoring programmes in industry.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Appreciate the importance of monitoring the environment for key physical, chemical and biological parameters.
LO2	Be capable of developing and implementing a scientifically valid environmental monitoring program applicable to industry. Be aware of the principles and quality aspects of sampling and their imitations etc, Include different types of monitoring strategies
LO3	Be aware of national and international regulations and legislation (e.g. EU Directives, BRC,FDA and EULEX).
LO4	Understand the key concepts of microbiology including: identification and classification; microbial growth and its control, disinfection/sterilisation and apply these concepts in a monitoring context.
LO5	Apply the above knowledge to develop suitable monitoring programs in the environment and a range of food and pharmaceutical industries.
LO6	Correctly critically interpret the results of monitoring programmes.
LO7	Be compentent in a range of the laboratory skills involved in monitoring, sampling ,detecting and quantifying and identifying of appropriate chemical and microbial contamination.
LO8	Demonstrate effective written and oral communication of the results from their experiments and related topics.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
Successful completion of year 2 or equivalent

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Module Content & Assessment

Indicative Content
LO 1 Environmental Awareness Impacts of modern society on the national and global environments. Threats to the environment and human health, sustainable development.
LO 1 Environmental Analysis Parameters used in monitoring soil, water and air quality. Environmental Pollutants. Sample collection, pretreatment and analysis. Biosensors, toxicity assays (cress test, Daphna-tox), Dioxins screening usind LUX biosensors. ELISA assays. Bioindicators. PCBS biosensors.
LO 2 Quality Control Quality control vs quality assurance. SOPs, analytical controls (blanks, field trip blanks, spikes/surrogotes, standards, CRM), documentation.
LO 3 Environmental Monitoring Investigative approach, observation, analysis, conclusions. Representative sampling, scientifically reliable data, legally defensible data, chain of custody. Case studies. Environmental legislation and regulations.
LO 4 Monitoring Programs Identifying program objectives, sampling and analysis plans (SAPs).
LO 4 Microbiology Range and significance of different groups of microorganisms found in sterile and non-sterile environments and industries eg water, food and pharmacuticals. Significance of biofilms in nature and in industry. Hazards posed by microrganisms. Principles of risk assessment. Contamination, pathogens and their products including endotoxin; objectionable organisms, indicator and specified organisms. Microbial metabolism and interactions with the environment and other organisms. Microbial growth and its control. Physical and chemical methods of disinfection and sterilisation. Validation of control methods, Bio indictors. Principles of sterile and non sterile processing and manufacture.
LO 5 Microbial Monitoring Mainternace and monitoring in controlled and other environments. Rationale for EM techniques for water, air, surfaces raw and finished materials. Interpretation of EM results; bioburden, limits out of specification results; trends, alert and action limits. Compendial and other methods. Rapid and molecular monitorring methods; biosensors,biioindicators, arrays Phenotypic and genotypic identification, current and rapid methods
LO 6 Interpretation of Monitoring n/a
LO 7 Practical component Students will practice cGood Laboratory and cGood Microbiological Practice and observe due regard to current occupational health and safety as apprporiate. Student will be exposed to a range of analytical techniques for analysing soil and water quality parameters. Including methods for identify and quantifying pesticides, phenolics, PAHs, PCBs and TPHs. Biodegradation studies using respirimetry (OXITOP) and analytical quantification using HPLC and GC methods. The use of ELISA and biosensor assays for detection dioxins, hormone/antibiotic residues, PCBs and dioxins. Microbiolobial detection, isolation and identification techniques in soil, water, air and on industrial surfaces. Including: Microbial growth,medial selective and differential Enumeration methods and their limitations Water analysis: Membrane filtration/Quantitray Materials analysis Surface microbiology: Swab tests/contact plates Air quality: Settle plates/ Volumetric air quality LAL testing Enrichments Gram stains Rapid ID and classification methods (Biolog/API) Use of Bergerys manual Analytical method development, compensation for interferences and reference materials will be incorporated. Where possible practicals may be carried out in the form of a mini project where different analytical techniques (chemical amd microbiological) can be linked and utilised. Case studies: Industrial site remediation, landfill and current reports.
LO 8 Communication Students will have opportunities through out the practical and theroetical parts of the module to develop and practice effective written and oral and other communication skills. Students will produce concise resports on the results from their experiments and write and present assigments based on their research into relevant topics from a range of credible sources. Academic conventions of format , citing and referencing will be used.

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	40.00%
End of Module Formal Examination	50.00%

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*
Examination	End term 1 exam	1,2,3,4,7,8	2.50	n/a
Case Studies	Students must design a scientifically reliable sampling and analysis plan (SAP) for an industry of their choice	2,3,4,5	2.50	n/a
Written Report	Assigment based on a microbial monitoring topic	2,4,5,6,8	2.50	n/a
Multiple Choice Questions	Formative assessment to reinforce knowlege and develop critical thinking	1,2,3,4,5,6,7	2.50	n/a

No Project

Practical				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Practical Report Book, Practical demonstration and short answer/MCQ exam	4,5,6,7,8	40.00	Sem 1 End

End of Module Formal Examination				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	3 hour written examination	1,2,3,4,5,6,8	50.00	End-of-Semester

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

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	30 Weeks per Stage	1.00
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Laboratory	30 Weeks per Stage	1.50
Estimated Learner Hours	30 Weeks per Stage	2.00
	Total Hours	165.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_SASES_B	Bachelor of Science (Honours) in Environmental Science	3	Mandatory