



Universidad Juárez del Estado de Durango
Facultad de Ciencias Forestales



Learning Unit Programme
With an integral professional competences approach

I. LEARNING UNIT GENERAL DATA

1. learning Unit Name		2. Code			
Water pollution		8502			
3. Academic Unit					
FORESTRY SCIENCES FACULTY					
4. Academic programme			5. Level		
Environmental Management Engineering			Bachelor's degree		
6. Training Area					
Disciplinary					
7. Academy					
Academy of Environmental Engineering					
8. Modality					
Mandatory	X	Course	X	Attendance	X
Elective		Course-workshop		Non-attendance	
		Workshop		Mixed	
		Seminar			
		Laboratory, field practice, etc.	X		
		Professional Practice			
		Academic Stay			
9. Pre-requirements					
Physical Chemistry, Instrumental Analysis; Environmental Toxicology; Environmental Audit; Air Pollution, Environmental Legislation;					

Biotechnology; Statistical sampling; Microbiology; Thermodynamics 10				
10. Theory hours	Practice hours	Independent study hours	Total hours	Credits
4	1	0	5	5
11. Names of the teachers who participated in the development and/or modification of the programme				
Hugo Ramírez Aldaba				
12. Date of development		Date of modification	Date of approval	
10/08/2015		04/10/2017 Dr. Hugo Ramírez Aldaba	04/10/2017	

II. LEARNING UNIT SPECIFIC DATA	
13. Presentation	
<p>Water is a unique natural resource, over the years human activities have been altering its natural cycle, which leads to great and irreversible consequences. This learning unit is located in the fifth semester of the Environmental Management Engineering Education Program and comprises a total of 5 credits. In this learning unit it is intended that the student, know, analyse, understand and identify the various factors involved in a process of water pollution and recognize the importance of water as a unique resource, learn the physicochemical characteristics that make this liquid indispensable for life and be able to describe the different uses to which it is intended. The student will be able to classify and explain the different sources and types of contamination that may occur in water, and based on this knowledge can propose and apply techniques that allow you to analyse samples and determine the degree of contamination in it by comparison with the official standards that regulate its quality of the environment and are interested in it and its problems, causes and consequences of its deterioration and that it has the knowledge, aptitudes, attitudes, motivations and desires of to work individually and collectively in the search for solutions to current environmental problems and to prevent those that may appear in the future.</p>	
14	
14. Integral professional competences to develop in the student	
Generic competences	<ul style="list-style-type: none"> • Instrumental <ul style="list-style-type: none"> - Analysis and synthesis - Oral and written communication skills - Knowledge of a foreign language Decision making • Personal <ul style="list-style-type: none"> - Teamwork

	<ul style="list-style-type: none">- Systemic- Motivation for quality- Ability to apply theoretical knowledge in practice			
Professional competences	<ul style="list-style-type: none">• Disciplinary: Basic general knowledge of environmental engineering Ability to approach environmental problems in a multidisciplinary way• Professionals : Management of the natural environment			
General purpose of the course	Promotes interest and increased sensitivity in order to take them, successively and simultaneously, to be able to accept, observe, understand, love, protect and transform the environment, so they must defend, preserve and improve it as a better way of life quality and harmony with nature for the development of the human being in fullness. Which implies the development of new habits and promotion of values oriented to the prevention and solution of the problems derived from the environmental crisis			
15. Joint of axes				
Research, Ethics, Values, Environmental education, Languages and disciplinary fields of environmental sciences				
16. development of the course				
Module 1	water			
Intended learning	Learning contents	Learning product(s)	Strategies	Teaching resources and materials
Analyse, recognize and identify the type of water present on Earth and its importance in the different environmental processes	Generalities: Importance of water, water worldwide, in Mexico and its functions	<ul style="list-style-type: none">• Presentation in pptx• Summary of topics• Test	Research in a last 5 bibliographic sources of the topics of the module and presentation of each topic in team in pptx. <ul style="list-style-type: none">• Reading, analysis and synthesis of the topics.	Computer, internet, white-board, down for white-board, projector, multimedia presentations, referred bibliography.

			<ul style="list-style-type: none"> • Search, analysis and discussion of a dissemination article of • water contamination 	
Module 2	Water's cycle			
Intended learning	Learning contents	Learning product(s)	Strategies	Teaching resources and materials
Knows the components of the water hydrological cycle, as well as its interaction in the atmosphere, inland waters and its evolution	<p>Concepts and generalities</p> <p>The cycle hydrological</p> <p>The water in the atmosphere</p> <p>The waters continental and its hydrogeochemical evolution of water</p>	<ul style="list-style-type: none"> • Presentation of pptx themes • Development of a conceptual map of the water cycle • Analysis and presentation • pptx articles • Teamwork on the hydro-geochemistry of water 	<ul style="list-style-type: none"> • Presentation by the teacher in the introduction to the topic • Presentation of the topics in a team of four members. • Search, analysis and discussion of a scientific article on Water Pollution. 	Computer, internet, white-board, down for white-board, projector, multimedia presentations, referred bibliography.
Module 3	Ecological Science			
Intended learning	Learning contents	Learning product(s)	Strategies	Teaching resources and materials

Know the different uses of water as well as the different organisms that regulate water quality and established regulations	<p>Uses of water, agriculture, industrial, irrigation, aquatic life protection, recreation and other uses. Rules Mexican Officials Indexes and parameters of the quality of ater</p> <p>Physicochemical and microbiological analysis of water (practice)</p>	<p>Presentation of topics.</p> <ul style="list-style-type: none"> • Research work on pollution indicators and • Water quality and its respective presentation. • Preparation of scientific article regarding a • Case of water pollution in the State. • Knowledge of the main NOMs that apply to the control of the •water quality. <p>Visit to the water treatment plant</p> <ul style="list-style-type: none"> • residuals • Municipality of Durango. 	<p>Search, analysis and interpretation of</p> <ul style="list-style-type: none"> • Mexican Standards. • Individual presentation of a Standard. • A search for information on the Pollution and Water Quality Indicators will be carried out and presented in PowerPoint. • A visit will be made to the treatment plant of • Waters of the municipality to compare sources of contamination and their treatment. • The student prepares a scientific article simulating a case of water pollution. • A sample of water will be analysed for microbiological studies and some 	<p>Computer, internet, paintbrush, down White-board, projector, multimedia presentations, referred bibliography.</p>
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Module 4	Sources and types of water pollution			
Intended learning	Learning contents	Learning product(s)	Strategies	Teaching resources and materials
Knows and manages to identify the sources and types of water pollution	<p>Definitions of water pollution</p> <p>Pollution sources</p> <p>Types of water pollutants</p>	<p>Presentation of pptx themes</p> <p>Development of a conceptual map of water pollutants, characteristics, types and hazards</p> <p>Analysis and presentation pptx articles</p> <p>Team work on articles that expand their knowledge of the sources of water pollution in Durango.</p> <p>Presentation of Water Contaminants in Durango through scientific article</p>	<p>Presentation of the teacher in the introduction to the topic</p> <p>Presentation of the topics in a team of four members.</p> <p>Search, analysis and discussion of a scientific article contamination of Water</p> <p>Guided discussion in the discussion of the scientific articles found concerning water pollution in Durango</p>	<p>Computer, internet, paintbrush, down White-board, projector, multimedia presentations, referred bibliography.</p>
Module 5	Water pollution assessment			
Intended learning	Learning contents	Intended learning	Learning contents	Intended learning
Water sampling, indices and parameters of water	Sampling Analytical techniques	<p>Presentation of pptx Themes.</p> <p>Analysis and presentation of pptx articles</p>	<p>The teacher in the introduction to the topic</p> <p>Presentation of the</p>	<p>Computer, internet, paintbrush, down White-board, projector,</p>

quality	Associated official Mexican standards Indexes and parameters of water quality.	Work team on official Mexican Standards and their application in the state of Durango.	topics in a team of Four members. Analysis of water sampling methodology, as well as its physicochemical characterization.	multimedia presentations, referred bibliography.
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17. Performance assessment:

Performance evidence(s)	Performance criteria	Application scopes	percentage
<ul style="list-style-type: none"> •Presentations using PowerPoint where include topics and main ideas of the topic to be explained, •Summary of articles, web notes, newspapers, Questionnaires •Team presentations of specific topics •Reports of guided visits 	<p>Punctuality</p> <p>Quality (Presentation): Cover, objective of the work, numbering of the page, individual conclusion, bibliography</p> <ul style="list-style-type: none"> • Congruence (content sequence) • Relevance (information regarding the topics requested) • Orthography 	Social sector, - business, - governmental: local, regional, nationa	<p>Formative evaluation 40</p> <p>evaluation 30%</p> <p>Self-evaluation 10%</p> <p>Co-evaluation 10%</p> <p>Heteroevaluation 10%</p>

18. Evaluation criteria: Define clear criteria and parameters, precise and concrete evaluation, not forgetting the formative intention that must accompany the assessment processes. So, it must also express its value in percentage form

Criterion	Value
Formative Evaluation	40% Exercises, presentations, practice reports are considered.
Summative evaluation	Summative 30% The exam grade is considered

Self-evaluation	10% The student observes their performance, compares it with what is established in a work plan (which is based on criteria or benchmarks) and assesses it to determine what objectives it met and with what degree of success
Co-evaluation	10% Students observe the performance of their peers and value it under the same criteria, without losing sight of the fact that respect, tolerance and honesty are a fundamental part of human interaction.
Heteroevaluation	10% Evaluation assigned by the teacher according to the attitude and behaviour of the student during class activities.
Criteria summation	100%
19. accreditation	
The accreditation of the learning unit is aligned with the provisions of the regulations of the Forestry Sciences Faculty. It is necessary to approve with a minimum of 6.0. The student who has obtained a minimum final average of 8.5 (eight point five) and 80% attendance, will be exempt from presenting an ordinary exam.	
20. Information sources	
Basic	1. Artiola J.F., Brusseau M.L. and Pepper I.L. (2004). Environmental Monitoring and Characterization. Academic Press, San Diego, Ca.). 2. Agarwal S.K. Water Pollution. (2009). Ed. S.B. Nangia. New Delhi. 3. Lanza E.J., Hernández P.S. y Carbajal P.J.L. (2000). Organismos indicadores de la calidad del agua y de la contaminación (Bioindicadores). Ed. Plaza y Valdés S.A. de C.V. México. 4. Manahan S.E. (2007). Introducción a la Química Ambiental. Ed. REVERTÉ, México. 5. Pepper I. L. Gerba C.P. and Brusseau M.L. (1996). Pollution Science. Academic Press, San Diego, Ca. 6. Pepper I.L., Gerba C.P., Brusseau M.L. (2006). Environmental and pollution science. Elsevier Inc. USA. 7. Juuti P.S., Katko T. S. and Vourinen H.S. (2007). Environmental History of Water. Ed. IWA Publishing. U.K. 1ª ed. U.K. 8. Prieto B.C. J. (2004). El agua: sus formas, efectos, abastecimientos, usos, daños, control y conservación. Ed. ECOE. 2ª ed. Bogotá, Colombia. 9. Ramos O.R., Sepúlveda M.R. y Villalobos M.F. (2003). El agua en el medio ambiente: Muestreo y análisis. Ed. Plaza y Valdés. Mé
Complementary	MEDELLIN M. P. (1998). The Precautionary Principle. Published in Pulso, Diario de San Luis Potosí, Ideas section August 20, 1998. San Luis Potosí, Mexico. URL: http://ambiental.uaslp.mx/docs/PMM-AP981112.pdf . MEDELLIN M. P. (1998). The 4 Environmental Principles of Barry Compose. Published in Pulso, Diario de San Luis Potosí, Ideas section, page 4a of Thursday, November 12, 1998. San Luis Potosí, Mexico. URL: http://ambiental.uaslp.mx/docs/PMM-

	AP981112.pdf. ODUM, E.; GARY, W. (2006) Fundamentals of Ecology. Thompson Publishers. S.A. of C.V. SECRETARY OF THE ENVIRONMENT AND NATURAL RESOURCES (2007). And the environment?. Problems in Mexico and the World.
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21. Profile for the teacher who imparts this learning unit

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| <ul style="list-style-type: none">• University Degree with Master's or Doctorate in Chemistry, Biochemistry, Environmental Engineering or related area.• Professional university experience as a professor in the area.• Teaching experience with the management of the chair with large groups.• Laboratory experience • Good interpersonal and communication relationships.• Ability to work in a team. • Ability to work under pressure |
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