



Engineering School

Course Information			
Name: Environmental Engineering		Code: INC-349	
School: Engineering		Pensum: 2016	
Program: Civil Engineering		Credits: 4	
Module: Professional development (Module 14)		Hours, theory: 38	
Competencies for the module: - Participates in activities of learning and permanent updating to continue with their professional development, through training in work and academic contexts, thus being at the forefront of technological and social changes. - S/he is able to apply knowledge and tools of mathematics, science and engineering to tackle problems and design solutions of various kinds and contexts.		Hours, practicum: 12	
Course description: This course introduces students to the basic concepts of environmental engineering, giving them the opportunity to apply science and mathematics to the quantitative solution of problems associated with pollution prevention and control, environmental quality management and integral solid waste management. In addition, it presents and discusses the main environmental problems that are confronted worldwide and in the Dominican Republic, emphasizing the role of the engineering professional in the identification, evaluation and solution of these problems. Relevant regulations at the national level are presented and the importance of interdisciplinary work in solving environmental problems is highlighted. The main aspects of the environmental impact assessment system in the Dominican Republic are discussed, describing the main elements of the EIA process. The subject privileges the methodologies of active learning, making use of problems and case studies. Rubrics and objective tests will be used to evaluate and document the development of the competences associated with this course.		Pre-requisites: CBQ208 Chemistry II AND ING215 Fluid Mechanics	
		Co-requisites: N/A	
Type of course: ☐ Mandatory ☒ Elective	Mode: ☒ Classroom based ☐ Blended learning ☐ Online	[mark all that apply] ☐ Laboratory ☐ Internship or field practice ☐ Hospital rotation	Pensum component ☐ General studies ☐ Specialized studies ☒ Professional studies
Fecha de elaboración: Agosto, 2017 Fecha de última revisión: Octubre de 2017			

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Competencies to be developed	
Competencies	Elements
Generic Competencies CG1. Understands the impact of engineering solutions in a global, economic, environmental and social context. CG2. It is able to apply knowledge and tools of mathematics, science and engineering to tackle problems and design solutions of various kinds and in different contexts.	EG1. S/he interprets global and local environmental issues, relating them to the development and consumption patterns of our society. EG2. Applies knowledge of physics, chemistry and mathematics to solve problems related to air and water pollution, and waste management. EG3. S/he is able to approach problem solving autonomously and creatively. EG4. Works collaboratively with a group of students to solve problems and cases. EG5. S/he shows a critical, proactive and productive attitude in the presentation of his/her solutions.
Specific Competency CE1. Analyze and solve basic environmental engineering problems to prevent and control pollution.	EE1. Describes national and global environmental challenges, identifying the role of the engineer in their solution EE2. Describes appropriate strategies / technologies for water and wastewater treatment. EE3. Describes the impacts of air pollution and identifies control measures. EE4. Distinguishes the local, regional and global impacts of environmental pollution. EE5. Uses the main regulations used to protect environmental quality in the Dominican Republic. EE6. Quantifies contaminants in air and water, using direct measurement techniques, simple models and formulas. EE7. Formulates solutions for urban solid waste management.

1. Environmental problems: global and local context				
Content		Strategies		Resources
- Human beings and the environment, how we interact: sustainable development - Legal framework for environmental management in the DR: comparative analysis with other legislation, including the US - Local impacts of global problems		- Individual and shared reflection from videos and images. - Teacher presentation.		Videos Class notes. Reading: Climate Change 2014, Summary for Policy Makers https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf
Documentation of achievement				
Evidence	Instrument	# Associated elements	Value (points)	Week
Graded homework	Check list	EG1, EE1	10	2

2. Material balance and Chemistry				
Content		Strategies		Resources
• Measurement units • Material balance • Simple models • Stoichiometry • Chemical balance • Organic and inorganic chemistry		Presentation. Example problems worked in class.		Text: Introduction to Environmental Engineering and Science, 3rd Ed. G.M. Masters and W. Ela. Chapters 1 y 2
Documentation of achievement				
Evidence	Instrument	# Associated elements	Value (points)	Week
Online Reading quiz (10 to 20 multiple choice questions)	Questions	EG2	5	2-3
Graded homework	Check list	EG2	5	3

3. Water quality: pollution prevention and control				
Content		Strategies		Resources
- Water resources - Water Pollutants - Regulations - Risk - Water quality in rivers - Lakes and reservoirs - Underground water - Drinking water treatment - Waste water treatment		Presentation Reading Problem based learning		Class notes. Text: Introduction to Environmental Engineering and Science, 3rd Ed. G.M. Masters and W. Ela. Chapters 4, 5 y 6 Dominican regulations: www.ambiente.gob.do
Documentation of achievement				
Evidence	Instrument	# Associated elements	Value (points)	Week
Online Reading quiz (10 to 20 multiple choice questions)	Questions	EG2, EG3, EE6, EE2	5	3-5
Mini-workshops in class: students work in groups to solve selected problems related to national reality	Rubric	EG4, EG5, EE5, EE2	10	3-5
Mid-term	Exam	EG2, EE6, EE2	15	5

4. Air quality: pollution control				
Content		Strategies		Resources
- Criteria pollutants - Regulatory framework - Emissions and their sources - Dispersion models - Pollution reduction technologies		Presentation of the contents in class. Reading Project based learning.		Class notes. Text: Introduction to Environmental Engineering and Science, 3rd Ed. G.M. Masters and W. Ela. Chapter 7 Regulations: www.ambiente.gob.do
Documentation of achievement				
Evidence	Instrument	# Associated elements	Value (points)	Week
Students in teams will measure parameters of atmospheric pollution in the surroundings of INTEC. Results presented in the 8th week.	Rubric	EG4, EE6, EE3	15	6-8
Online Reading quiz (10 to 20 multiple choice questions)	Questions	EG2, EG3, EE6, EE3	5	6-8

5. Solid waste management				
Content		Strategies		Resources
• Municipal Solid Waste • Integrated waste management • Regulatory framework • Collection, transfer and transport operations • Landfills • Other forms of final disposal • Resource recovery • Zero waste		Presentation of the contents in class. Reading Project based learning.		Class notes. Text: Introduction to Environmental Engineering and Science, 3rd Ed. G.M. Masters and W. Ela. Chapter 9 Regulations: www.ambiente.gob.do
Documentation of achievement				
Evidence	Instrument	# Associated elements	Value (points)	Week
Online Reading quiz (10 to 20 multiple choice questions)	Questions	EG2, EE7	5	8-11
Students in teams will do a field work where they will visit a municipal landfill and will investigate about the waste management in the municipality, preparing a proposal for solutions. Presentation in the 11th.	Rubric	EG5, EG3, EE4, EE7	15	8-11

6. Field visit				
Content	Strategies		Resources	
Visit a selected community where they can find water treatment plants and wastewater, observe situations of urban environmental management, point sources of pollution and natural areas.	Direct observation. Guided visits. Conference		Descriptive material of the visit.	
Documentation of achievement				
Evidence	Instrument	# Associated elements	Value (points)	Week
Students in teams prepare a trip report (preferably as a video) to be presented and discussed in class	Rubric	EG5, EE1, EE4	10	7-10

* El puntaje y la fecha de las evidencias es un aproximado. Estas informaciones están sujetas a cambio según la disposición docente, teniendo en cuenta el calendario trimestral para el reporte de las calificaciones de medio término y final.

References
Textbook Masters, G & W. Ela (2013). Introduction to Environmental Engineering and Science. Pearson Education. 692 pp.

Other texts:

- Davis, M & D. Cornwell (2012). Introduction to Environmental Engineering. McGraw-Hill Series in Civil and Environmental Engineering, 5th Edition. 1040 pp.
- IPCC (2014). Climate Change 2014, Summary for Policy Makers
https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf
- Ley General sobre Medio Ambiente y Recursos Naturales. Ley no. 64-00. República Dominicana (2000). Recuperada de: <http://ambiente.gob.do/wp-content/uploads/2016/09/Ley-No-64-00.pdf>
- Norma Ambiental de Calidad de Aire. Ministerio de Medio Ambiente y Recursos Naturales. República Dominicana (2001). Recuperado de: <http://www.accionverde.com/pdf/normas/SGAN03-calidad-del-aire.pdf>
- Norma Ambiental para la Gestión de Residuos Sólidos no Peligrosos. Ministerio de Medio Ambiente y Recursos Naturales. República Dominicana (2001). Recuperado de: <http://www.cne.gob.do/wp-content/uploads/2016/08/Norma-Residuos-Solidos-no-Peligrosos.pdf>
- Norma Ambiental sobre Calidad de Aguas Subterráneas y Descargas al Subsuelo Ministerio de Medio Ambiente y Recursos Naturales. República Dominicana (2004). Recuperado de: <http://ambiente.gob.do/transparencia/download/18/reglamentos/412/reglamento-para-la-calidad-de-descargas-de-aguas-subterranas.pdf>
- Norma Ambiental sobre Calidad de Aguas Superficiales y Costeras. Ministerio de Medio Ambiente y Recursos Naturales. República Dominicana (2012). Recuperado de: <http://ambiente.gob.do/files/Norma-Ambiental-de-Calidad-de-Aguas-Superficiales-y-Zonas-Costeras.pdf>
- Norma Ambiental sobre Descargas a Aguas Superficiales, Alcantarillado y Aguas Costeras. Ministerio de Medio Ambiente y Recursos Naturales. República Dominicana (2012). Recuperado de: <http://ambiente.gob.do/files/Norma-Ambiental-sobre-Control-de-Descargas-a-Aguas-Superficiales-alcantarillado-sanitario-y-aguas-costeras.pdf>