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**	
Biotechnology				3377	
3. Academic Unit					
FORESTRY SCIENCES FACULTY					
4. Academic programme				**5. Level**	
Environmental Management Engineering				Bachelor's degree	
6. Training Area					
Discipline					
7. Academy					
Environmental management					
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					
Have studied and passed: Chemistry, Biochemistry and Environmental Biology					

10. Theory hours	Practice hours	Independent study hours	Total hours	Credits
2	3	0	5	5

11. Names of the teachers who participated in the development and/or modification of the programme		
Developed by: Miriam Mirelle Morones Esquivel		
12. Date of development	**Date of modification**	**Date of approval**
20/1/2015	04/08/2016	04/10/2017

II. LEARNING UNIT SPECIFIC DATA

13. Presentation

In general terms, biotechnology can be defined as the use of living organisms or compounds obtained from living organisms to obtain products of value to man. Modern biotechnology is composed of a variety of techniques derived from research in cellular and molecular biology, which can be used in any industry that uses microorganisms or plant or animal cells. It is the commercial application of living organisms or their products, which involves the deliberate manipulation of their DNA molecules. Therefore, we can say that biotechnology ranges from traditional biotechnology, well known and established, and therefore used, such as food fermentation, to modern biotechnology, based on the use of new recombinant DNA techniques (engineering genetics), monoclonal antibodies and new methods of cell and tissue culture. Environmental biotechnology refers to the application of modern biological processes for the protection and restoration of environmental quality. The main objective of the learning unit is for students to acquire current knowledge that allows them to analyse and have a critical vision of the scope of biotechnology and its application in the environmental area. That the student analyse environmental problems and their possible resolution through biotechnological techniques.

The learning unit focuses mainly on the bioremediation of water, soil and air and the role it plays today. In addition, a review is made of the calculation of the kinetic parameters applied to the design of bioreactors and an analysis of intermittent biotechnological processes and continuous.

Didactic intention

The teacher provides the means and facilitates the learning strategies for the students to build their own knowledge through collaborative learning, the solution of problems and the development of projects that stimulate the creativity and the concretion of the theoretical aspects in the solution of problems. of the discipline and develop the skills of higher order thinking, induction, deduction, analysis and synthesis.

14. Integral professional competences to develop in the student

Generic competences	• Ability to manage information

	• Capability for analysis and synthesis • Teamwork Decision making
Professional competences	• Management of the natural environment • Restoration of the natural environment • Planning and management of waste disposal and control • Clean technologies and renewable energies
General purpose of the course	The student acquires current knowledge that allows him to analyse and have a critical vision of the scope of biotechnology and its application in the environmental area
15. Joint of axes	
16. development of the course	

Module 1	Introduction to biotechnology			
Intended learning	**Learning contents**	**Learning product(s)**	**Strategies**	**Teaching resources and materials**
Time: 40 hours **Evaluation instrument:** **Rubrics** **Checklist** **Test Objective examination** **Weighing: 40%**	1. Definition of biotechnology and historical evolution of biotechnology 2.Multidisciplinary nature of biotechnology and applications 3. Fundamentals of modern biotechnology • Cell	Rubric evaluation of Debate about GMOs.	• Collaborative learning • Problem-based learning • Development of concept map	Teaching materials: Videos Bond paper, markers, paper sheets. Computer Board Projector Internet Markers for board software Textbooks Scientific articles

	informational molecules • Genetic engineering • Bioethics 4. Genetically modified organisms			
Module 2	Introduction to Environmental Biotechnology and Biotechnology applied to soil and air pollution			
Intended learning	**Learning contents**	**Learning product(s)**	**Strategies**	**Teaching resources and materials**
Know the behaviour of the solutions in nature and apply the concepts to the solution and management of different systems and processes of the environment. Time: 30 hours Evaluation instrument: Rubrics Checklist Test Video	1. Biotechnology and Biodiversity 2. Bioproduction • Biogas • Biopolymers • Bio-detergents 3. Group of technologies applied to soil contamination • Bio-piles • Composting • Phytoremediation 4. Development of bioprocesses for the treatment of polluted air	The student knows the impact of biotechnology on biodiversity. Learn about the main processes of bioproduction of biogas, biopolymers and biodetergents. The student makes a homemade compost	•Collaborative learning • Project-based learning • Development of essays	Teaching materials: Videos Bond paper, markers, letter size sheets. Computer Projector Internet
Module 3	Environmental biotechnology applied to water pollution			

Intended learning	Learning contents	Learning product(s)	Strategies	Teaching resources and materials
Appropriating the concepts surrounding the colligative properties and the surface phenomena and applying them in the solution of problems related to the environment. Time: 10 hours Evaluation instrument: Rubrics Checklist	1. Bioremediation of wastewater -Important organizations That intervene in treatment systems biological - Kinetics of the reactions of heterotrophic organisms 2. Biological processes of suspension culture - Aerobic and anaerobic processes - Types of reactors 3. Solid support processes - Trickling filters - Rotary biological contactors	The student can apply the different concepts of the unit, and explain some natural phenomena	• Collaborative learning • Project-based learning	Teaching materials: Videos Bond paper, markers, letter size sheets. Computer Projector Internet

17. Performance assessment:

Performance evidence(s)	Performance criteria	Application scopes	percentage
Draft essays Participation Preparation of videos Oral presentations	Knowledge: expressed in terms of the disciplinary and critical training area based on the scientific method. Skills and skills: based on actions that allow adapting to different scenarios and apply the acquired knowledge in a practical way. Attitudes and values: expressed in terms of behaviors and as a reflection of the values that the person possesses. Responsibility,	• In the recognition and application to natural systems and processes. • Taking relevant information from biotechnological processes • In the collection of information to develop a research project.	Formative evaluation: 20% - Delivery of work in time 10 -assistance 10 Summative

	honesty, respect and tolerance are among the values that we will be able to evaluate Relevance, Congruence of the preliminary draft Have the requested structure Quality in the written and oral presentation		evaluation: 50% -Test 20 -Portfolio 15 -Projects 15 Self-assessment: 10% Co-evaluation: 10% Heteroevaluation: 10%

18. Evaluation criteria:

Criterion	Value
Formative Evaluation	20% Responsibility, commitment, tolerance, ethics, values
Summative evaluation	80% The elaboration and presentation of the products
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 in the partial examinations a minimum average of 8.5 and had 80% attendance will be exempt from the ordinary exam; however, to raise your average you can submit it if you wish.

20. Information sources

Basic	• Reinhard Renneberg. (2008). BIOTECHNOLOGY FOR BEGINNERS. BARCELONA: REVERTÉ • Bolivar Zapata. (2007). FOUNDATIONS AND SUCCESSFUL CASES OF MODERN BIOTECHNOLOGY • Francisco Castillo Rodríguez, M. D. (2005). ENVIRONMENTAL BIOTECHNOLOGY. 4 MADRID: TEBAR S.L.
Complementary	• Protocolo de Cartagena sobre Seguridad de la Biotecnología del Convenio sobre la Diversidad Biológica Secretaría del Convenio sobre la Diversidad Biológica. Montreal, 2000

• Iáñez Pareja, Enrique. (2005) Introducción a la biotecnología Instituto de Biotecnología. Universidad de Granada, España.
• Xu, Feng (2005). «Applications of oxidoreductases: Recent progress» Industrial Biotechnology. Vol. 1. n.º 1. pp. 38-50. doi:10.1089/ind.2005.1.38. Consultado el 15/11/07.
• Frazzetto, Giovanni (2003). «White biotechnology» EMBO reports. Vol. 4. n.º 9. pp. 835-837. Consultado el 15/11/07.
• La biotecnología verde» Biotech Magazine. n.º 4. Consultado el 15/11/07.
• Diaz E (editor). (2008). Microbial Biodegradation: Genomics and Molecular Biology, 1st ed. edición, Caister Academic Press. ISBN 978-1-904455-17-2.
• E. S. Lipinsky (1978). «Fuels from biomass: Integration with food and materials systems» 'Science'. Vol. 199. n.º 4329. ISSN 0036-8075.
• Iáñez Pareja, Enrique. (2005) Biotecnología, Etica y Sociedad. Instituto de Biotecnología. Universidad de Granada, España. (Publicado el 2005-02-15)
• Persley, Gabrielle J. y Siedow, James N. (1999) Aplicaciones de la Biotecnología a los Cultivos: Beneficios y Riesgos Programa de Conservación de Recursos Genéticos, Universidad de California en Davis, Estados Unidos. Publicado en Agbioworld el 1999-12-12.
• Declaración Universal sobre Bioética y Derechos Humanos Conferencia General de la Unesco. (October de 2005).

21. Profile for the teacher who imparts this learning unit

Bachelor's, master's or doctoral degree in the area of biotechnology
Professional experience in the area of environmental engineering
Professional experience as a teacher in the area.
Teaching experience with the management of large groups of students. Ability to develop and promote teaching strategies
Ability to develop and promote learning environments in the natural sciences.
Responsibility and organizational capability
Ability to work in a team, to work under pressure and oriented to results.
Management of computer packages