Bachelor of Science in Environmental Sciences Program Courses Short Syllabus

College of Science

Department: Biology

EVS 1110 Fundamentals of Environmental Science

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	2	0	10	None	None	1	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

The fundamental Environmental Science course is designed to offer an integrated approach to the basic scientific study and basic analysis of the environment, backed-up with a good awareness of current environmental issues and concerns. The course aims to provide a stimulating learning environment to enable students to develop a range of academic and generic skills to help them find good quality employment on graduation and provide the basis for a lifetime of learning. The course embraces the integrated nature of environmental science, drawing on biology, chemistry, physics, and geology to allow students to interpret the pressures on our environment and point to ways in which we can act to manage these more successfully. Elements of the course can be chosen including energy resources and the science of zero carbon, hydrology, climate change and environmental conservation. There is the opportunity to specialize and numerous opportunities for fieldwork. In the final-year dissertation, students are able to choose their own area in which to conduct a substantial environmental investigation to produce a report.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Clarify the contributions of the natural sciences and the social sciences to the identification, understanding and resolution of environmental issues. (**K1**)
1.2	Describe the processes which shape the natural world at different spatial and temporal scales and how they influence, and are influenced by, human activities (**K2**).
1.3	Explain how knowledge of environmental issues forms the basis for informed concern about the Earth and its people (**K3**).
1.4	Outline the issues concerning the availability and sustainability of the Earth's resources, including the consequences for the environment of resource exploitation and waste disposal and the human responses to environmental problems such as environmental impact assessments, management and policy (**K3**).
1.5	Illustrate the interaction of human and Earth systems and the roles of organizations and other stakeholders in managing and regulating human impacts on the environment (**K4**).
2.0 Skills	
2.1	Evaluate the methods of acquiring, interpreting and analyzing information relating to the environment, with a critical understanding of the appropriate contexts for their use, and apply these methods to enable monitoring and management of natural and human-induced environmental changes (**S1**)
2.2	Analyze and interpret information and communicate any findings, both orally and in writing, in a coherent manner (**S2**).
2.3	Plan a research study, and perform the work using the proper research tools (**S3**).
2.4	Employ the appropriate independent research skills for the investigation of issues in environmental science, including experimental design, fieldwork, survey and monitoring, laboratory work, statistical testing and spatial representation of data (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to perform the assigned work independently and collaborate with interdisciplinary teams to achieve common goals (**V1**).
3.2	Share in discussion of scientific issues professionally, and present research data effectively through different modes and for varied audiences (**V2**).
3.3	Show accountability and share positively in scientific discussions and decision-making processes (**V3**).
3.4	Adhere to the moral and ethical issues relating to environmental sciences, including scientific examination of the implications of sustainability relating to natural resources and sustainable development (**V4**).

3. Learning Resources

Main Textbook(s): C.H. Walker, R.M. Sibly, S.P. Hopkin, D.B. Peakall (2006) PRINCIPLES OF ECOTOXICOLOGY, Fourth Edition.
Supplementary Materials: None.
Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1112 Basics of Biology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	2	0	10	None	None	1	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

Basic biology is a core discipline that seeks to provide students with a fundamental understanding of biological principles and concepts. This course covers a wide range of topics, including cellular structure and function, genetics, evolution, the diversity of life (including animal and plant taxonomy), evolutionary connections between species, and the physiological systems of organisms and their interaction with the environment. By engaging in lectures, laboratory exercises, and interactive activities, students will acquire a fundamental understanding of biology and its practical implications in both daily life and scientific research.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe basic structure and function of cells, including cell organelles and cellular processes (**K1**)
1.2	Discuss the fundamentals of evolution theory and evolutionary mechanisms as well as reproduction at the Cellular Level (**K2**).
1.3	Outline the principles of genetics, including inheritance, DNA structure (**K3**).
1.4	Clarify the classification and the diversity of life forms, from microorganisms to multicellular organisms (**K4**).
2.0 Skills	
2.1	Relate the concepts and theories of biology to explain the various biological phenomena (**S1**)
2.2	Employ the practical skills and lab tools to conduct experimental work (**S2**).
2.3	Evaluate, interpret, and analyze the research results using the appropriate analytical methods (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate the ability to work independently and cooperate in a team (**V1**).
3.2	Show the ability to assemble information from a variety of sources (textbooks, research papers and review articles), and use information technology to prepare, process and present information (**V2**).
3.3	Adhere to ethical regulations while working in the field of biology (**V4**).

3. Learning Resources

Main Textbook(s):

Campbell, N.A. and Reece, J. B. (2008) Biology 8th edition, Pearson

Hickman C. P. Jr. et al., Integrated Principles of Zoology. 16th ed. (2013). ISBN-13: 9780073524214.

Paul Waldau. Animal Studies: An Introduction 1st Edition (2013). ISBN-13: 9780199827039. Barnes,R.D. Invertebrate Zoology (1982) VI Edition. Holt Saunders International Edition.

Bruce Alberts et al., Essential Cell Biology, Third edition, London, UK. (2009). ISBN-13: 978-0815341291.

Lodish, et al. Molecular Cell Biology. 5th ed. New York, NY: W.H

Supplementary Materials: http://www.Britannica.com/science/biology.

Online Resources / Software: Learning Management System (Blackboard).

Access to scientific databases, educational videos, and interactive simulations.

College of Science

Department: Biology

EVS 1114 Terrestrial and Aquatic Ecology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	2	0	10	None	None	1	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides a conceptual framework for understanding the range of the world's terrestrial and aquatic ecosystems and provides practical field experience with major terrestrial and Aquatic ecosystems in the Kingdom of Saudi Arabia. Topics include: the structure and function of Terrestrial and Aquatic Ecology ecosystems, Appreciate the intrinsic and extrinsic values of ecosystems and biodiversity, the basics of nutrient cycling; food webs; biodiversity, concerns and consequences of associated human influence, energy usage and production including renewable resources, Comprehend the dimensions of the sustainability challenge.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Identify the main principles and processes involved in terrestrial and Aquatic ecosystems (**K1, K2**)
1.2	Explain the values and purposes of terrestrial and Aquatic ecosystems as part of global conservation strategies (**K3, K4**).
2.0 Skills	
2.1	Analyze the cultural, social, economic, and community implications in the protection and management of terrestrial and Aquatic ecosystems (**S1, S2**)
2.2	Apply ecosystem management concepts and approaches to protection and management of terrestrial and Aquatic ecosystems (**S3, S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Participate in work and communicate effectively in groups (**V1, V2**).
3.2	Adhere to assigned tasks with responsibility (**V3, V4**).

3. Learning Resources

Main Textbook(s):

Terrestrial Ecosystem Ecology: Principles and Applications, 2012, by Folke O. Andersson and Göran I. Ågren.
Fundamentals of Aquatic Ecology. 2009. K. H. Mann ،R. S. K. Barnes
Conservation Biology for all. 2010. edited by Sodhi, N. S, and P. R. Ehrlich. Oxford University Press.
Field and Laboratory Activities for Environmental Science. 2012. Eldon Enger ،Bradley F. Smith

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: College of Languages and Translation

ENG 1140 English (1)

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	None	None	1	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course, "English for Science", enhances English language proficiency while integrating fundamental scientific concepts. Through lectures and interactive tutorials, students will explore topics such as the composition of matter, energy, motion, and the universe. Activities include group discussions, hands-on experiments, and presentations, fostering critical thinking and effective communication of scientific ideas.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Develop a repertoire of essential words and phrases to describe several topics (**K1, K2, K3, K4**).
1.2	Demonstrate knowledge of simple grammatical structures (**K1, K2, K3, K4**).
1.3	Demonstrate understanding of phrases and expressions (**K1, K2, K3, K4**).
2.0 Skills	
2.1	Extract essential information from several resources (**S1, S2, S3, S4**).
2.2	Identify main ideas, details, and reasons in listening passages on multiple topics (**S1, S2, S3, S4**).
2.3	Locate specific information in simple written material on various topics (**S1, S2, S3, S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Participate in short conversations on topics (**V1, V2, V3, V4**).
3.2	Justify briefly reasons and explanations for opinions (**V1, V2, V3, V4**).
3.3	Contribute discussions or concerns in a respectful and in collaborative way (**V1, V2, V3, V4**).

3. Learning Resources

Main Textbook(s): Zimmerman, F. (2005). English for science. Pearson Malaysia Sdn. Bhd.
Supplementary Materials: None
Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Mathematics and Statistics

MAT 1109 Applied Calculus for Environmental Science

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	0	2	10	None	None	2	English

Program(s) offered for: Bachelor of Science in Biology

3. Course Description:

This course describes the most important ideas, results, and examples of basic precalculus, limit, differentiation, and integration. The course includes the essential fundamentals of these topics. The emphasis is on calculations and applications to environmental problems.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Recall basics of Precalculus (**K1**)
1.2	List basic tools of limits, differentiation, and Integration (**K1, K2**).
2.0 Skills	
2.1	Apply techniques of problem solving (**S1**).
2.2	Report mathematics clearly and precisely both orally and in writing (**S2, S3**).
2.3	Demonstrate the connection between differentiation and its applications in areas and volumes (**S3, S4**).
2.4	Draw graphs of functions handily and by using CAS and online solvers (**S1**).
3.0 Values, Autonomy & Responsibility	
3.1	Work individually (**V1**).
3.2	Develop personal values and attributes such as honesty, empathy and respect for others (**V2**).

3. Learning Resources

Main Textbook(s):

Calculus, Early Transcendental Functions, Robert Smith, Roland Minton, McGraw-Hill Science Engineering, 2007

Supplementary Materials:

Calculus; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994.

Calculus: Early Transcendentals, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Mathematics and Statistics

STA 1112 Statistical Analysis of Environmental Data 1

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	None	None	2	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

The course covers both descriptive statistics and hypothesis testing in the field of environmental science. The students acquire the skills to compute and analyze measurements of location and deviations, frequencies, and covariation. The course covers the use of sample data to estimate a population parameter. The course will focus on the application of univariate and multivariate statistical approaches, explaining statistical ideas without requiring intricate mathematical proofs.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	To state the various measures of central tendency and dispersion (**K1**).
1.2	To outline effective sampling strategies and data collection methods for environmental studies (**K1, K2**).
1.3	To define and reproduce the population and sample, sample size, parameter, and estimate (**K1**).
1.4	To memorize the use of computer programming to apply these concepts to environmental problems (**K1, K2**).
2.0 Skills	
2.1	To summarize data using tables and charts (**S1**).
2.2	To explain various statistical methods used in environmental statistics (**S2**, **S3**).
2.3	To perform descriptive and inferential statistical analyses (**S3, S4**).
2.4	To interpret the output obtained from a statistical software package (**S1**).
3.0 Values, Autonomy & Responsibility	
3.1	To show collaborative approaches in data analysis projects, valuing diverse perspectives and fostering an inclusive learning environment (**V1**).
3.2	To draw decisions based on data analysis and understand the broader environmental and social implications of their findings (**V2**).
3.3	Demonstrate a commitment to ethical standards in data collection, analysis, and reporting ensuring transparency and integrity in environmental research (**V4**).

3. Learning Resources

Main Textbook(s):

Elementary Statistics, 14th edition; Mario F. Triola, Pearson, 2022. (Main Reference).

Statistics for Environmental Science and Management, 2nd Edition, Bryan F. J. Manly, CRC Press, 2009.

Supplementary Materials:

Analyzing Environmental Data, Walter W. Piegorsch, A. John Bailer, John Wiley & Sons, Ltd., 2005.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Chemistry

CHM 1106 Basics of Chemistry

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	2	2	2	10	None	None	2	English

Program(s) offered for: Bachelor of Science in Environment Sciences

1. Course Description:

This course provides the students with the fundamental principles of chemistry, including the atomic and molecular structure of matter, and the changes it undergoes through chemical reactions. The course addresses important topics including quantum chemistry, chemical bonding, stoichiometry, kinetics, chemical equilibrium, thermochemistry and thermodynamics, molecular structure and function, electrochemistry, and the periodic chemical properties of the elements. State functions, energy, properties of solutions, states of matter, and properties of acids and bases are also among the course topics. The course emphasizes the classification of matter by its state and bonding behavior using the Periodic Table as a reference.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Discuss the fundamentals of the current theories in the subfields of chemistry including inorganic, organic, and physical chemistry (**K1**)
1.2	Describe the properties of different substances and their reactivity patterns, chemical bonds in molecules, and chemical equilibrium (**K2**).
1.3	Clarify the rates of chemical reactions and how energy transfers in these reactions (**K3**).
1.4	Explain the electronic and molecular structures of common substances using the proper models (**K2, K3**).
2.0 Skills	
2.1	Relate between the basic concepts of chemistry and the real-world applications to solve emerging problems (**S1**)
2.2	Investigate the qualitative and quantitative relationships between matter and energy involved in chemical or physical processes (**S2**).
2.3	Design and perform research experiments in chemistry by employing practical skills, methodologies, and convenient equipment (**S3**).
2.4	Interpret and evaluate the chemical data based on critical thinking, and analyze the data b applying the appropriate statistical methods (**S2, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to work independently and to collaborate effectively in a team (**V1**).
3.2	Demonstrate the ability to prepare organized and concise scientific data, and communicate information through written reports and oral presentations to varied audience (**V2**).
3.3	Adhere to the ethical rules while performing scientific activities in the field of chemistry (**V3**).

3. Learning Resources

Main Textbook(s):

Analytical Chemistry, Gary D. Christian, Purnendu K. (Sandy) Dasgupta, Kevin A. Schug. 7th Edition. ISBN: 978-0-470-88757-8.

Supplementary Materials:

Fundamentals of analytical chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, 9th Edition. ISBN-13: 978-0-495-55828-6.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: College of Languages and Translation

ENG 1195 English (2)

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	ENG 1140	None	2	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course, "Scientific English: Writing and Communication," aims to enhance students' skills in writing effectively within scientific contexts. It covers the conventions of formal scientific English, emphasizing clarity, structure, and precision. Students will learn to summarize texts, write abstracts, and construct well-organized reports. Practical exercises will foster critical thinking and improve their ability to communicate complex ideas clearly. Additionally, the module provides resources for independent study and expands students' scientific vocabulary, preparing them for academic success and professional communication in the scientific field.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Demonstrate a comprehensive understanding of the conventions and structures of scientific writing (**K1, K2, K3, K4**).
1.2	Articulate the importance of clarity, precision, and accuracy in scientific communication (**K1, K2, K3, K4**).
1.3	Identify and explain key scientific vocabulary and terminology (**K1, K2, K3, K4**).
2.0 Skills	
2.1	Apply effective writing techniques to produce clear and enhanced scientific documents (**S1, S2, S3, S4**).
2.2	Analyze and critique scientific literature (**S1, S2, S3, S4**).
2.3	Utilize research tools to gather and synthesize information (**S1, S2, S3, S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Recognize ethical considerations in scientific writing (**V1, V2, V3, V4**).
3.2	Develop accountability for writing and research standards (**V1, V2, V3, V4**).
3.3	Work collaboratively in diverse teams (**V1, V2, V3, V4**).

3. Learning Resources

Main Textbook(s): Skern, T. (2011). Writing scientific english: A workbook. Facultas.wuv, UTB.
Supplementary Materials: None
Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1120 Plant Ecosystems

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	None	None	2	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

The earth can be divided up into different types of areas with shared characteristics. The simplest division is that into areas covered by water and areas covered by dry land. This division is based upon simple physical characteristics. There are many other ways of dividing up regions which are far more complex; based upon not just physical characteristics but also the living things that inhabit an area. Regions of the world can be differentiated according to environmental conditions, topography, different plants, animals, microbes, and all other organisms, and all their interrelationships, these are called ecosystems. Different ecosystems (ecological systems) can be distinguished: forest ecosystem, grassland ecosystem, desert ecosystem, tundra ecosystem (polar and high mountains), aquatic ecosystem (freshwater ecosystem, marine ecosystem). Each of these ecosystems will be developed according to their different types, characteristics, components, and functions. The plant palette varies with the ecosystem because this requires the adaptation of various plant species to the specific conditions of each ecosystem. The physiology of the plant varies in this case and we will explain, for each ecosystem, the physiological behavior of plants allowing them their adaptation to the specificities of the environment.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Demonstrate a broad and coherent understanding of ecosystems and their different types (**K1, K3**)
1.2	Outline the diversity and distribution of plants in several ecosystems, including land, water, desert, grassland, and forest (**K2, K3**).
1.3	Describe a broad and coherent theoretical and practical Knowledge through implementing appropriate methodologies for studying plant ecosystems (**K2, K3**).
1.4	Explain the role of ecological systems in shaping the evolution of plant life histories (**K2, K4**).
2.0 Skills	
2.1	Evaluate the different factors affecting the plant in the environment (**S1, S2**).
2.2	Relate plant distribution, growth and natural selection to soil, geography, weather and climate (**S1, S2**).
2.3	Analyze the factors leading to environmental degradation, their reasons and their impact on the environment (**S2, S3, S4**).
2.4	Interpret the concepts, types, development, and functions of various plant ecosystems (**S3, S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate independence and cooperate effectively with the research team (**V1**).
3.2	Share in the discussion of scientific issues in the field of plant ecosystems (**V2, V3, V4**).
3.3	Show the ability to present plant environment-related information through different modes to various audiences (**V2, V3**).

3. Learning Resources

Main Textbook(s): Grime G.P., 2001. Plant strategies, vegetation processes, and ecosystems properties, Publisher: Wiley, Second edition, 417 pages, ISBN: 9780470850404, 047085040X.

Smith T. M., Shugart H. H., Woodward F. I., 1997. Plant functional types. Their relevance to ecosystem properties and global change, 388 pages, ISBN: 9780521566438.

Chapin III F.S., Matson P.A., Vitousek P.M., 2011. Principles of terrestrial ecosystem ecology, Springer New York, Second edition, 529 pages, ISBN: 9781441995049, 1441995048.

Schulze E.D., Beck E., Buchmann N., Clemens S., Müller- Hohenstein K., Scherer-Lorenzen M., 2019. Plant ecology, second edition, Springer, 928 pages, ISBN 978-3-662-56231-4.

Mahalingam R., 2014. Plant ecosystem, Agrotech Press, ISBN-10 : 9383101741.

Lack A., 2022. Plant ecology and conservation, Publisher: Garland Science, 328 pages, ISBN: 1000597881, 9781000597882.

Maarel E. van der, Franklin J., 2012. Vegetation ecology, Publisher: Wiley Blackwell, 576 pages, ISBN: 9781118452486, 1118452488.

Supplementary Materials: Larcher W., 2003. Physiological plant ecology, 4th edition, Springer, 513 pages, ISBN: 9783540435167, 3540435166.

Kurzius A., 2019. Plants and ecosystems, Publisher: Scholastic Incorporated, 48 pages, ISBN: 9780531234648, 0531234649.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Mathematics and Statistics

STA 1213 Statistical Analysis of Environmental Data 2

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	MAT 1109 STA 1112	None	3	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

The course covers the statistical tests for parametric, non-parametric and binomial data, linear and non-linear regression approaches, Goodness-of-Fit and contingency tables, one-way ANOVA, two-way ANOVA. Furthermore, students will acquire practical skills in utilizing statistical software tools by engaging in weekly discussions. Students are required to develop proficiency in coding activities, data manipulation, and effectively communicating their quantitative analyses.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	To state hypothesis tests in some common models (including Normal models), correctly using the terms null hypothesis, alternative hypothesis, test statistic, rejection region, significance level, power, and p-value (**K1, K2**).
1.2	Describe how correlation is used to identify relationships between variables (**K1, K2**).
1.3	Describe how regression analysis is used to predict outcomes (**K1, K2**).
1.4	To state the assumptions for one- way ANOVA, two-way ANOVA the analysis of variance and nonparametric statistics (**K1, K2**).
2.0 Skills	
2.1	To appraise the results of test hypothesis, linear regression, multiple linear regression analyses using statistical software package (**S1**).
2.2	To explain the results of ANOVAs using statistical software for the case of between-subjects, repeated measures, and, when applicable, mixed designs, and conduct appropriate follow-up and simple effects analysis (**S3**, **S4**).
2.3	To differentiate between research questions that requires the implementation of statistical analyses (**S2, S3**).
2.4	To interpret the results of statistical analysis using a statistical software package (**S1**).
3.0 Values, Autonomy & Responsibility	
3.1	To show collaborative approaches in data analysis projects, valuing diverse perspectives and fostering an inclusive learning environment (**V1**).
3.2	To draw decisions based on data analysis and understand their findings' broader environmental and social implications (**V2**).
3.3	Demonstrate a commitment to ethical standards in data collection, analysis, and reporting, ensuring transparency and integrity in environmental research (**V4**).

3. Learning Resources

Main Textbook(s):

Elementary Statistics, 14th edition; Mario F. Triola, Pearson, 2022. (Main Reference).

Statistics for Environmental Science and Management, 2nd Edition, Bryan F. J. Manly, CRC Press, 2009. (Main Reference).

Supplementary Materials:

Analyzing Environmental Data, Walter W. Piegorsch, A. John Bailer, John Wiley & Sons, Ltd., 2005.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1230 Biodiversity

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	3	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course deals with biodiversity; and the definition of species; Measuring biodiversity (Units of biodiversity, Levels of biodiversity, Biodiversity indices) Importance of biodiversity in Saudi Arabia (values of biodiversity); Threats to biodiversity; Impacts of biodiversity loss; Extinction; Biodiversity hotspots; Conservation of biodiversity (protected areas in KSA and Arab countries).

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the basic concept of biodiversity (**K1**)
1.2	Recognize the importance of biodiversity (**K2**).
2.0 Skills	
2.1	Use computers and internet to explain the threats that biodiversity confronts (**S1**)
2.2	Analyze scientific biodiversity management strategies (**S2**).
2.3	Evaluate of biodiversity in Saudi Arabia (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate the ability to work independently and cooperate with a team (**V1**).
3.2	Participate in discussion of scientific issues and present data through oral presentation or written format (**V2**).
3.3	Adhere to the relevant ethical regulations (**V3**).

3. Learning Resources

Main Textbook(s):

Science for Environment Policy (2015). Ecosystem Services and the Environment. In-depth Report 11 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol.

European Commission (2013). Mapping and Assessment of Ecosystems and their Services. An analytical framework for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020. Technical Report – Discussion paper.

European Commission (2014). Mapping and Assessment of Ecosystems and their Services. Indicators for ecosystem assessments under Action 5 of the EU Biodiversity strategy to 2020. Technical Report - Discussion paper.

Supplementary Materials:

Maczulak, A. (2010). Biodiversity: Conserving Endangered Species. ISBN-10: 0-8160-7197-7.

Van Dyke, F. (2008). Conservation Biology: Foundations, Concepts, Applications. 2nd Edition. Springer. ISBN: 978-1-4020-6890-4.

Magurran, A. E. (2004). Measuring Biological Diversity. Blackwell Publishing. ISBN-13: 978-0-632-05633-0

Mora et al. (2011). How Many Species Are There on Earth and in the Ocean? PLoS Biology, 9, e1001127.

Online Resources / Software: Learning Management System (Blackboard).

http://www.cbd.int/ http://www.iucn.org/ http://www.iucnredlist.org/

http://www.conservation.org/where/priority_areas/hotspots/Pages/ hotspots_main.aspx

http://www.edgeofexistence.org/index.php

College of Science

Department: Chemistry

CHM 1205 Environmental Analytical Chemistry

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	2	0	10	CHM 1106	None	3	English

Program(s) offered for: Bachelor of Science in Environment Sciences

1. Course Description:

This course introduces the students to the basic principles of environmental chemistry. The course focuses on the chemistry of air, water, and soil with specific emphasis on the effects of human-made chemical products and by-products on the environmental processes. The interconnections between different sectors of the environment (soil, water, atmosphere) and the effect of human activities on the natural chemical processes are emphasized. During this course the chemistry of the air, water and soil is studied with an emphasis on the environmental fate of anthropogenic chemicals released into the environment. The course encompasses the knowledge derived from atmospheric chemistry, hydrosphere chemistry, water chemistry, biosphere chemistry, toxic organic compounds and metals, and soil chemistry. Connections with green chemistry are also highlighted.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Identify the relative importance of various reactions, physical processes and transport mechanisms affecting different chemicals in the environment (**K1**).
1.2	Clarify the relationships between the chemical exposures and challenges relatedto human activities, and their effects on the various segments of the environment (**K2**).
1.3	Outline the chemistry of elements and compounds in the atmosphere, water, and soil, and describe the principles of solid-, liquid-, and gaseous- state environmental chemistry (**K3**).
1.4	Explain how to use chemistry knowledge to find the most proper management methods to ensure sustainable earth resources (**K2, K3**).
2.0 Skills	
2.1	Apply the concepts and synthesize the hypotheses from multiple disciplines in environmental chemistry (**S1**)
2.2	Employ the technical skills to quantify the effects of hazardous chemicals in the environment (**S2**).
2.3	Design the plans necessary to study the dose-response relationships of the various chemical compounds and assess their impacts on the environment (**S2**).
2.4	Interpret and analyze the environmental research data using the appropriate statistical methods (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate the ability to work independently and cooperate in a team (**V1**).
3.2	Share in the specialized meetings and present the scientific data professionally through oral presentations and written forms (**V1**).
3.3	Adhere to the relevant ethical rules while performing a research work in chemistry (**V3**).

3. Learning Resources

Main Textbook(s):

Analytical Chemistry, Gary D. Christian, Purnendu K. (Sandy) Dasgupta, Kevin A. Schug. 7th Edition. ISBN: 978-0-470-88757-8.

Supplementary Materials:

Fundamentals of analytical chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, 9th Edition. ISBN-13: 978-0-495-55828-6

Environmental Chemistry, S. A. Manahan, (7th Ed.), Boca Raton: CRC Press LLC, 2000, ISBN: 978-1-4398-3276-9.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1232 Conservation Biology and Bio-extinction

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110, EVS 1112, EVS 1114	None	3	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course explores the evolution of key elements in conservation-focused. studies involving biodiversity patterns, extinction trends, genetics for conservation, and population conservation efforts in communities, landscapes, and the sustainability of ecosystems. Nowadays, humans have triggered an unparalleled reshuffling of the earth's biota. We purposely and accidentally continue to spread a growing number of species across environmental barriers that were once thought impossible to overcome. Successful introductions typically have negative impacts on ecosystem function, biodiversity, and ecosystem services, with invasion being considered a significant current natural disaster. The course 'Conservation Biology and Bioextinction' will focus on non-native alien species, examining what causes them to rapidly increase in population and have harmful effects on the ecosystem in their new habitat, leading to the extinction of other susceptible species. It will establish direct links between basic principles in ecology and evolutionary biology, issues relevant to extinction and invasion ecology, and the unique characteristics of individual invasive species. Therefore, the primary objective is to highlight species extinction's ecological significance and explore related sociological, economic, and associated topics.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the procedures for examining the preservation of species, biodiversity, and the prevention of extinction (**K1**)
1.2	Discuss the rules, guidelines, and agreements that address the conservation biology issues (**K2**).
1.3	Explain the importance of conservation genetics theory in promoting biological conservation efforts (**K3**).
2.0 Skills	
2.1	Apply quantitative techniques for conducting population viability analyses (**S1**)
2.2	Use quantitative methods to analyze population viability and biodiversity (**S2**).
2.3	Evaluate strategies that can be defended in order to conserve a species or a system that is of concern (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Share in the discussion of the literature articles in the field of conservation biology and use using scientific evidence deduced from raw data to support their position to an audience of peers (**V1**).
3.2	Show the ability to communicate endemic and invasive taxa- related information to various audiences in an accurate, compelling, and logically supported manner, via writing and talks (**V2**).
3.3	Adhere to the relevant ethical rules (**V3**).

3. Learning Resources

Main Textbook(s): Biodiversity: An Introduction by Gaston and Spicer, 2nd ed. (2004).

The Challenges of Biodiversity Science by Loreau (2010).

Kull, C. A. (2018). Critical Invasion Science: Weeds, Pests, and Aliens. In R. Lave, C. Biermann, & S. N. Lane (Eds.), The Palgrave Handbook of Critical Physical Geography (pp. 249–272). Springer International Publishing.

Bellard, C., Cassey, P., & Blackburn, T. M. (2016). Alien species as a driver of recent extinctions. Biology Letters, 12(2), 20150623.

Pimm, S. L., Jenkins, C. N., Abell, R., Brooks, T. M., Gittleman, J. L., Joppa, L. N., Raven, P. H., Roberts, C. M., & Sexton, J. O. (2014). The biodiversity of species and their rates of extinction, distribution, and protection. Science, 344(6187), 1246752.

Gurevitch, J., & Padilla, D. K. (2004). Are invasive species a major cause of extinctions?. Trends in ecology & evolution, 19(9), 470- 474.

Smith, K. F., Sax, D. F., & Lafferty, K. D. (2006). Evidence for the role of infectious disease in species extinction and endangerment. Conservation biology, 20(5), 1349-1357.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

USDA National Invasive Species Information Center: http://www.invasivespeciesinfo.gov/

Florida: https://www.invasivespeciesinfo.gov/us/florida

US Forest Service Invasive Species Program: http://www.fs.fed.us/invasivespecies/

US Geological Service Non-Indigenous Aquatic Species: http://nas.er.usgs.gov/

International Union for the Conservation of Nature (IUCN) Invasive Species Specialist Group: http://www.issg.org/

Florida Natural Areas Inventory– Invasive Species: https://www.fnai.org/invasivespecies.cfm

Center for Aquatic and Invasive Plants, University of Florida: https://plants.ifas.ufl.edu/

Florida Exotic Pest Plant Council: https://www.fleppc.org/

Florida Invasive Plant species mobile field guide: http://www.plantatlas.usf.edu/flip/

College of Science

Department: Biology

EVS 1240 Environmental Biotechnology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110, EVS 1112, EVS 1114	None	4	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This postgraduate course provides the candidates with a comprehensive understanding of the theoretical foundations, practical skills, and applications of Environmental Biotechnology. Welcome to the environmental Biotechnology course, where cutting-edge science meets the world of biotechnology. This course is designed to provide a comprehensive exploration of the principles and applications of biotechnology in Environmental sciences, aiming to equip students with the knowledge and skills needed to address the challenges and opportunities in the rapidly evolving field. From understanding the fundamentals of molecular biology and genetics to exploring advanced genetic engineering techniques, we delve into the intricate mechanisms that govern plant and microbial life. The course will cover the ethical, legal, and social dimensions of environmental biotechnology, ensuring a well-rounded perspective. As we navigate the landscape of genetic modification, plant breeding, and microbial biotechnology, we also examine the crucial role of biotechnology in enhancing crop yield, nutritional content, and overall food security. Through a blend of theoretical knowledge and hands-on laboratory experiences, students will gain practical insights into the world of Environmental biotechnology and its transformative impact on sustainable farming practices. Get ready to embark on a journey that merges scientific innovation with the imperative of feeding a growing global population.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the fundamental principles and concepts of environmental biotechnology (**K1**)
1.2	Explain the roles of microorganisms in environmental processes and their applications in biotechnology (**K2**).
1.3	Outline the mechanisms and techniques used in bioremediation, waste treatment, and pollution control (**K3**).
2.0 Skills	
2.1	Analyze and interpret data from environmental biotechnology experiments and studies (**S1**)
2.2	Evaluate critically the potential benefits, limitations, and risks associated with environmental biotechnology applications (**S2**).
2.3	Formulate strategies for sustainable environmental management using biotechnological approaches (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show independence and responsibility and cooperate effectively in a team to carry out research work (**V1**).
3.2	Share in the discussion of scientific issues and present research results via oral presentations and in written format (**V2**).

3. Learning Resources

Main Textbook(s):

Rittmann, B.E. and McCarty, P.L. (2020) Environmental Biotechnology: Principles and Applications. 2nd edn. New York: McGraw-Hill Education.
Singh, J.S., Singh, D.P. and Pandey, V.C. (2017) Environmental Biotechnology: Theory and Applications. Boca Raton: CRC Press.
Desai, C., Pathak, H. and Madamwar, D. (2010) 'Advances in molecular and "-omics" technologies to gauge microbial communities and bioremediation at xenobiotic/anthropogen contaminated sites', Bioresource Technology, 101(6), pp. 1558- 1569.

Supplementary Materials:

Martínez-Toledo, A., Rodríguez-Vázquez, R. and Garzón-Zúñiga, M.A. (2017) 'Environmental Biotechnology', in Singh, R.L. and Singh, P.K. (eds.) Introduction to Environmental Biotechnology. Singapore: Springer, pp. 1-22.
Singh, J.S. and Singh, D.P. (2012) 'Decontamination of environmental pollutants using naturally occurring and genetically engineered microorganisms', in Singh, S.N. (ed.) Environmental Biotechnology. New Delhi: APH Publishing Corporation, pp. 93- 116.

Online Resources / Software: Learning Management System (Blackboard).

National Center for Biotechnology Information (NCBI)
International Service for the Acquisition of Agri- biotech Applications (ISAAA)
The World of Genetically Modified Organisms (GMOs) – BIO
FAO Biotechnology Forum
Genetic Literacy Project
AgBioForum
BioTech Primer
United States Department of Agriculture (USDA) Biotechnology Resources

College of Science

Department: Biology

EVS 1242 Environmental Microbiology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110, EVS 1112, EVS 1114	None	4	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course will introduce students to the field of environmental microbiology, which is the study of microbes in natural environments such as soil, water and air. Environmental Microbiology introduces students to the fascinating world of microorganisms, highlighting their evolution, importance, and functionality in the most varied environments. In this course, students learn of the vital role of microbes in marine and terrestrial ecosystems by exploring the dynamic interactions that take place between microbial communities, the surroundings, and higher organisms. Students will learn about microbial abundance and diversity in common habitats and in peculiar niches under extreme environmental conditions. During the course, we will explore the importance of microorganisms in soil formation and quality, in food production and plant health, in nutrient cycling and biodegradation of varied substrates and pollutants, in medicine and industry, in space exploration, and in bioremediation of contaminated soils. In this course, students will also learn how microorganisms can communicate with each other using signaling molecules, and how their genetic potential can be used for the advance of biotechnological processes. Furthermore, students will learn how to perform scientific experiments for monitoring, quantification, and qualification of microorganisms associated with plants, soil, and water, and how to use DNA sequences for identifying species and their function. This course will provide students with the ability to demonstrate their knowledge of prokaryotic biodiversity and function, and to apply this understanding to solve problems and find solutions related to current environmental issues that threaten planetary and human health (i.e.: antibiotic resistance, pollution, greenhouse gas emission, and global warming).

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	State the fundamental concepts and methodology of environmental microbiology (**K1**)
1.2	Outline the diversity and distribution of microbes in several different environments, including water, sediments, soil and air (**K2**).
1.3	Tell how plants, soil, and human microbiomes are interconnected and how they can influence each other (**K3**).
1.4	Recognize the importance of microbial communities to the functioning of diverse ecosystems (**K3**).
1.5	Describe microbial metabolism, genetics, growth and function in an environmental context (**K4**).
2.0 Skills	
2.1	Summarize methods commonly used in environmental microbiology and explain their limitations (**S1**)
2.2	Demonstrate how microbial diversity is assessed in diverse ecosystems (**S2**).
2.3	Compare and evaluate microbial communities by employing a variety of laboratory techniques, including isolation, enumeration, basic genome analysis and functional assays (**S3**).
2.4	Predict changes in microbial community structure according changes in biotic and abiotic factors (**S3**).
2.5	Use knowledge in environmental microbiology and ecosystems management to find out solutions for environmental issues (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Analyze and criticize primary literature articles in the field of environmental microbiology, extract essential information, interpretfigures, and summarize key points, to improve critical thinking and evaluation skills (**V1**).
3.2	Communicate environmental microbiology- related information to various audiences in an accurate, compelling, and logically supported manner, via writing, talks and posters (**V2**).
3.3	Discuss specific problems using scientific evidence to support their position to an audience of peers (**V3**).

3. Learning Resources

Main Textbook(s):

Jean-Claude Bertrand, Pierre Caumette, Philippe Lebaron, Robert Matheron, Philippe Normand, Télesphore Sime-Ngando. (2015) Environmental Microbiology: Fundamentals and Applications, 1st Edition, Springer Nature

Ralph Mitchell, Ji-Dong Gu. (2010) Environmental Microbiology, 2nd edition, Wiley

Raina M. Maier, Ian L. Pepper and Charles P. Gerba. (2009) Environmental Microbiology, 2nd edition, Elsevier

Supplementary Materials: Marylynn V. Yates, Cindy H. Nakatsu, Robert V. Miller, Suresh D. Pillai. (2016) Manual of Environmental Microbiology, 4th Edition, Wiley

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1244 Fresh and Marine Water Algae

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1112 EVS 1114	None	4	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

The course is designed to study marine and freshwater algae genera, their phenotypic characteristics, reproduction. The systematic position of each division, the relationship between the algae and other organisms, the distribution of algae in different environments (snow, lake, river, pond freshwater, semi-saline water, the sea, the ocean). Benthic algae and plankton and chemical, natural and biological factors that influence their distribution and proliferation. Harmful algal species as well as the economically important species in industrial, medical, and agricultural fields. Practical Section: include the following topics: Isolation, purification, identification and preservation of ubiquitous algal genera in Saudi environment (i.e. terrestrial , fresh and marine species).

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	State the fundamental concepts and methodology of Phycology (**K1**)
1.2	State the types of algal division and the scope and its function within the environment (**K2**).
1.3	Define the diversity, characteristics, economic importance, and classification of main groups of algae (**K3**).
2.0 Skills	
2.1	Compare different structures, characteristics, and the life cycle of algae (**S1**)
2.2	Perform different experiments to examine and identify different types of algae safely and effectively (**S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Show ability to work in a team to conduct a specific project and solve problems (**V1**).
3.2	Demonstrate ability to monitor and examine different kinds of algal species, their growth and interaction with the environment (**V2**).

3. Learning Resources

Main Textbook(s):

"Algal Biology: A Comprhrnsive Guide". Linda E. Graham, Lee W. Wilcox, and Aaron J. Hehman. 2023.
"Algal Ecology: Freshwater Benthic Ecosystems". Brian A. Whitton, Michael F. Buchheim, John D. Wehr. 2022.
"Microalgal Biotechnology: Potential and Production" Eduardo Jacob-Lopes, Leila Queiroz Zepka, and Maria Isabel Queiroz. 2021.
"Phycology: Fourth Edition". Robert Edward Lee. 2020.
"Algae-Based Biopharmaceuticals". Hesham Ali El-Enshasy and Se-Kwon. 2020.

Supplementary Materials: Relevant Scientific journals

Online Resources / Software: Learning Management System (Blackboard).
http://algae.sourceforge.net/algae.html
http://algae.sourceforge.net/
http://www.algaebase.org/
http://en.wikipedia.org/wiki/Algae
http://www.kingdomplantae.net/

College of Science

Department: Biology

EVS 1246 Principles of Ecotoxicology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110, EVS 1112, EVS 1114	None	4	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

Ecotoxicology is an interdisciplinary field that draws from knowledge and techniques in the fields of ecology and toxicology to study the effects of toxic chemical or biological agents on biological organisms at the population, community or ecosystem level. Human activities significantly influence the natural environment, the BSc Environmental Resource Management will provide students with an in-depth understanding of what the implications of such activities on the environment are and what mitigation measures are needed to reduce such influences. Like any long-term strategy, understanding and safeguarding the environment requires a holistic perspective; since safeguarding one aspect today might have ripple effects on other factors eventually. The program is characterized by several modules that will allow students to develop technical solutions needed to solve, attenuate or control environmental issues. Specialized modules include Renewable Energy and Green Technologies, which aims to evaluate the technical, economic, and political aspects of renewable energy, as well as evaluate the successes and failures of implementing alternative energies at the local, national, and regional levels. Ecotoxicology aims to assess the effects of different classes of pollutants on individual organisms and species in food webs, enabling students to predict the negative implications on entire populations, ecosystems and on animals and human food resources.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Discuss the background in natural resource management, environmental quality, and analysis (**K1**)
1.2	Outline the computational tools for spatial analysis, together with data management, statistics and modelling which have become essential tools in the environmental field (**K2**).
1.3	Identify the research methods that help practitioners innovation (**K2**).
1.4	Clarify the theoretical background that governs environmental, energy and sustainability issues (**K3**).
1.5	Explain how interactions between organisms and their environments drive the dynamics at different biological levels and how human activities can influence interactions (**K4**).
2.0 Skills	
2.1	Relate the basic principles of toxicology to the applicable lab methods (**S1**)
2.2	Interpret the mechanisms underlying the uptake, metabolism, elimination and effects in humans and animals (**S1**).
2.3	Evaluate the toxicological impacts at the species, population, community and ecosystem levels (**S2**).
2.4	Apply the ecotoxicological tests in different environmental scenarios (**S3**).
2.5	Perform research work based on the general principles of environmental risk assessment of chemicals (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to perform the assigned work independently and collaborate with interdisciplinary teams to achieve common goals (**V1**).
3.2	Share in discussion of scientific issues professionally, and present research data effectively through different modes and for varied audiences (**V2**).
3.3	Demonstrate accountability and share positively in scientific discussions and decision- making processes (**V3**).

3. Learning Resources

Main Textbook(s):

Principles of Ecotoxicology, Third Edition by C. H. Walker, S. P. Hopkin, R. M. Sibly, D. B. Peakall, CRC Press Taylor & Francis Group, Boca Raton, FL, 2006, 33487–2742, ISBN 10:084933635X. Fourth Edition.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1248 Arab Gulf and Red Sea Ecosystems

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	4	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course covers the basics of marine ecology and its systems and physical and chemical properties focusing on the Ecologies of the Arabian Gulf and Red Sea, and identifying their Marine biology and wealth, as well as the challenges they face and the impact of pollution on them, and Comprehend the dimensions of the sustainability challenge for the Arabian Gulf and Red Sea Locally and globally.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the Ecology of the Arabian Gulf and Red Sea (**K1, K2**)
1.2	Discuss The environmental, cultural, and economic importance of the Arabian Gulf and Red Sea (**K2**).
1.3	Clarify the dimensions of the sustainability challenge (**K3, K4**)
2.0 Skills	
2.1	Analyze the marine ecosystems in the Arabian Gulf and Red Sea, and their importance and the chemical and physical properties of them (**S2,S4**).
2.2	Evaluate how human activity impacts on the eco-systems of Arabian Gulf and Red Sea (**S1,S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Participate in work and communicate effectively in groups (**V1, V2**).
3.2	Adhere to assigned tasks with responsibility (**V3, V4**).

3. Learning Resources

Main Textbook(s):

Conservation Biology for all. 2010. edited by Sodhi, N. S, and P. R. Ehrlich. Oxford University Press.

Vaughan, Grace O., Noura Al-Mansoori, and John A. Burt. "The arabian gulf." World seas: An environmental evaluation. Academic Press, 2019. 1-23.

Price, A. R. G., Mohiuddin Munawar, and Nuzrat Yar Khan. The Gulf ecosystem health and sustainability. Michigan State University Press, 2002.

Tesfamichael, Dawit. Assessment of the Red Sea ecosystem with emphasis on fisheries. Diss. University of British Columbia, 2012

Supplementary Materials:

Short, Frederick T. World atlas of seagrasses. Univ of California Press, 2003.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1292 Exit-Point Field Training

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
6	-			15	-	None	4	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

Field Training

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Recall knowledge of the context of the professional career before graduation (**K1, K2**).
1.2	Explain professional interests in related fields of Biology (**K1, K2**).
2.0 Skills	
2.1	Apply what has been learned in classroom to real-world situations (**S1, S3**).
2.2	Create critical thinking and innovative problem- solving skills with confidence and rigor (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Develop discipline, with the capacity to undertake lifelong learning, self and social responsibility (**V1, V2**).
3.2	Make ethic principles of the profession in practice. (**V4**).

3. Learning Resources

Mode of delivery: In-person/onsite (Hands-on activities).

Main Textbook(s): None.

Supplementary Materials: None.

Online Resources / Software: None.

College of Science

Department: Biology

EVS 1350 Green Infrastructure Technologies

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110 EVS 1112 EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course introduces the students to the concepts of green infrastructure and the implementation of renewable technologies. It also provides an overview of how green infrastructure systems work, the benefits they can provide, and how they can be employed effectively. The course outlines a comprehensive overview of the current and growing green infrastructure theory, design, and practice, and the associated challenges and opportunities.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the idea of Green Infrastructure Technologies and its benefits (K1)
1.2	Explain various Elements of Green infrastructure systems interdependence (K2).
1.3	Outline the types, elements, roles, functions and green infrastructure technologies and associated design applications (K3)
2.0 Skills	
2.1	Analyze and Investigate green infrastructure technologies that address site, environmental, function and management considerations (S1).
2.2	Design a green infrastructure installation that performs multiple functions, including the provision of relevant ecosystem services (S2).
2.3	Use computers and internet to analyze the green- infrastructure interdependence (S3).
3.0 Values, Autonomy & Responsibility	
3.1	Show independence in performing the assigned work and cooperate effectively with the members of the research teams (V1).
3.2	Share in the discussions of scientific issues and communicate the data effectively via verbal and non- verbal presentations (both oral and written formats) (V2).
3.3	Adhere to the relevant ethics while performing a field or research work (V3).

3. Learning Resources

Main Textbook(s):

Textbook: Benedict, Mark and McMahon, Edward T. (2006). Green Infrastructure: Linking Landscapes and Communities. Washington: Island Press.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1352 Sustainable Fisheries and Aquaculture

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110, EVS 1112, EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

Wild-captured fisheries and aquaculture are the biggest protein sources globally, providing more than 3 billion individuals essential nutrition. This protein is sourced from fish, elasmobranchs, crustaceans, molluscs, and algae harvested by commercial, recreational, and Indigenous fisheries and cultivated through aquaculture practices. This course examines the key aspects that impact the spread and number of specific species, crucial for comprehending their use in fishing practices. These factors consist of an evaluation of the life cycle phases, demographic composition, habitat preferences, and feeding interactions of the specified species. This data, in addition to farming techniques, is vital for the success of aquaculture operations. Students will examine methods utilized in fisheries science and analyze human activities' effects on managing wild-harvest fisheries. The discussion will focus on emerging trends such as transitioning from wild-harvest extraction to aquaculture production and more comprehensive ecosystem management. The program includes interactive learning sessions, labs for both wet and computer work, field trips, and workshops. The field study and off-University workshop will occur during the mid-trimester break. After the course, students will have the essential skills needed to get ready for careers in coastal- focused research and industry.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the main features of the biology of fisheries and aquaculture (**K1**)
1.2	State modern methods to gather, compile, and analyze ecological and biological data (**K2**).
1.3	Explain how fishing and aquaculture are practiced (**K3**).
1.4	Describe the management strategies applied to aquaculture and fisheries. (**K4**).
2.0 Skills	
2.1	Summarize methods commonly used in critically evaluating the life cycles of fish, crustaceans, molluscs, and algae and explain their limitations (**S1**).
2.2	Formulate arguments concerning the effects of aquaculture and fishing (**S2**).
2.3	Use focused exercises, online discussions, and digital presentations to communicate scientific information to the audience effectively (**S3**).
2.4	Employ knowledge in ecosystem management to find solutions for environmental issues related to fisheries practices and aquaculture (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate the ability to work independently and cooperate in teamwork (**V1**).
3.2	Show the ability to communicate fisheries-related information to various audiences in an accurate, compelling, and logically supported manner, via writing and talks (**V2**).
3.3	Share in the discussion of literature articles in the field of aquaculture, and argue specific problems using scientific evidence (**V3**).

3. Learning Resources

Main Textbook(s): Ahmed, M. & Lorica, M.H. 2002. Improving developing country food security through aquaculture developmentlessons from Asia. Food Policy, 27(2): 125–141.

Allen, R. 2010. International management of tuna fisheries: arrangements, challenges and a way forward. FAO Fisheries and Aquaculture Technical Paper. No. 536. Rome, FAO. 45 p

Naylor, R.L., Goldburg, R.J., Primavera, J.H., Kautsky, N., Beveridge, M.C., Clay, J., Folke, C., Lubchenco, J., Mooney, H. & Troell, M. 2000. Effect of aquaculture on world fish supplies. Nature, 405(6790): 1017– 1024.

Boyd, C.E., Tucker, C., McNevin, A., Bostock, K. & Clay, J. 2007. Indicators of resource use efficiency and environmental performance in fish and crustacean aquaculture. Reviews in Fisheries Science, 15: 327–360. Branch, T.A. 2008.

Not all fisheries will be collapsed in 2048. Marine Policy, 32(1): 38–39.

Dunham, R.A., Majumdar, K., Hallerman, E., Bartley, D., Mair, G., Hulata, G., Liu, Z., Pongthana, N., Bakos, J., Penman, D., Gupta, M., Rothlisberg, P. & Hoerstgen-Schwark, G. 2001. Review of the status of aquaculture genetics. In R.P. Subasinghe, P. Bueno,

M.J. Phillips, C. Hough, S.E. McGladdery & J.R. Arthur, eds. Aquaculture in the Third Millennium, pp. 137–166. Technical

Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20–25 February 2000. Rome, FAO, and Bangkok, NACA.

Supplementary Materials: Serrano, P.M. 2005. Responsible use of antibiotics in aquaculture. FAO Fisheries Technical Paper. No. 465. Rome, FAO. 97p. Sharma, C. & Rajagopalan, R. 2013. Marine protected areas: securing tenure rights of fishing communities. Land Tenure Journal, 1.

Muir, J. 1999. Aquaculture and poverty: full baskets or empty promises? Perspectives from DFID Aquaculture Research Programme. Paper presented at the Fifth Fisheries Development

Donor Consultation, 22–24 February. Rome, FAO.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1354 Environmental Impact Assessment

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110, EVS 1112, EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides an introduction to Environmental Impact Assessment (EIA) as a critical tool for evaluating the potential environmental consequences of proposed projects, policies, or plans. Students will learn the principles, methodologies, and regulatory frameworks associated with EIA, as well as practical skills for conducting environmental assessments. Case studies and real-world examples will be used to illustrate the application of EIA in various contexts. Understand principles, processes, and necessary tools and techniques for environmental impact assessment, mitigation and monitoring. Evaluate the impacts of the project's activities on natural resources, ecological systems and community.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the principle of environmental impact assessment (**K1**)
1.2	Recognize processes of environmental impact assessment (**K2**).
1.3	Explain the key concepts, methods, and techniques used in the assessment of environmental impacts (**K3**).
2.0 Skills	
2.1	Relate the theory of each resource dimension to the environmental impact assessment (**S1**)
2.2	Plan a research study in the field of environmental impact assessment (**S2**).
2.3	Apply integrated knowledge to enhance skills on environmental impact assessment (**S3**).
2.4	Analyze case studies and real-world examples to assess the effectiveness and challenges of EIA implementation (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Show ability to work in a team to solve problem regarding environmental issues (**V1**).
3.2	Share in specialized activities and present results of environmental impact assessment (**V2**).
3.3	Demonstrate accountability in carrying out the assigned work (**V3**).

3. Learning Resources

Main Textbook(s):

Eccleston HC. Environmental Impact Statements. Canada: John Wiley & Sons, Inc.; (2000). ISBN13: 978-0471358688.

Lee N, George C, editors. Environmental Assessment in Developing and Transitional Countries - Principles, Methods & Practice. (2000). ISBN-13: 978-0471985570.

Wathern P. Environmental Impact Assessment: Theory and Practice. Routledge; 2013.

Glasson J, Therivel R, Chadwick A. Introduction to Environmental Impact Assessment. Routledge; 2012.

Eccleston CH. Environmental Impact Assessment: A Guide to Best Professional Practices. John Wiley & Sons; 2005.

Canter L. Principles of Environmental Impact Assessment. CRC Press; 1996.

Supplementary Materials:

http://www.kryeministri-ks.net/repository/docs/Final_EIA_Veterinary_Laboratory321.pdf.

http://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/Appen dix%20B.pdf.

Environmental Protection Agency (EPA). Environmental Impact Assessment. Retrieved from https://www.epa.gov/environmental-assessments

International Association for Impact Assessment (IAIA). Introduction to Environmental Impact Assessment. Retrieved from https://www.iaia.org/what-is-impact-assessment

United Nations Environment Programme (UNEP). (n.d.). Environmental Impact Assessment Training Resource Manual. Retrieved from https://wedocs.unep.org/handle/20.500.11822/25491

World Bank Group. (n.d.). Environmental Impact Assessment: A Guide to Best Professional Practices. Retrieved from https://www.worldbank.org/en/topic/environmentalassessment

Online Resources / Software: Learning Management System (Blackboard).

https://environment.ec.europa.eu/law-and-governance/environmental-assessments/environmental-impact-assessment-en_

College of Science

Department: Biology

EVS 1356 Epigenetics

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1112	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course is designed to introduce students into the rigorous foundation in epigenetics. It will emphasize various epigenetics process, how the epigenetic status of the genome forms and maintains, role of epigenetic processes in gene regulation, its involvement in disease development, and recent advances in assessing epigenetic changes of the genome. Based on the review of the seminal works in epigenetics field, this course will familiarize the student with current technology and driving principles of the field of epigenetics. The budding field of Ecological Epigenetics seeks to extend our knowledge of epigenetic mechanisms and processes to natural populations, and recent conceptual and technical advances have made progress toward this goal more feasible.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Explain how epigenetic inheritance from genetic inheritance and various methods to assess gene specific and genome wide epigenetic changes (**K1**)
1.2	Outline the structure and organization of chromatin and how it plays a role in epigenetic regulation (**K2**).
2.0 Skills	
2.1	Analyze the role of DNA methylation in epigenetic gene regulation (**S1**)
2.2	Relate between epigenetic changes and various disorders (**S2**).
2.3	Interpret epigenetic data (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate independence and ability to cooperate with a team (**V1**).
3.2	Share in scientific activities and present data effectively (**V2**).

3. Learning Resources

Main Textbook(s):

Benjamin A Pierce (2020) Genetics: a conceptual approach. 7th edition W.H. Freeman. ISBN-13-978-1319216801.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1358 Environmental Pollution and Biodegradation

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110, EVS 1112, EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides an overview of issues related to the degradation and pollution of terrestrial ecosystems, with a focus on soil and water. Students will learn about soil and plant sciences, microbiology, water management, and environmental conservation strategies. The course will also cover practical aspects of remediation, including the use of phyto-technologies. These methods involve using plants and microorganisms to remove contaminants and restore ecosystem health. They are cost-effective, non-invasive, and can complement traditional engineering-based approaches. The course will also discuss the advantages and limitations of these green technologies, including their ecosystem services, regulatory requirements, and public acceptance.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the impact of soil and water pollution on ecosystems and humans (**K1**)
1.2	Outline the concepts of bioavailability and bioaccumulation (**K2**).
1.3	Explain the concepts of degradation, transformation, and recycling of organic and inorganic elements (i.e., pesticides, heavy metals) (**K3**).
1.4	Discuss ecosystem services, regulatory requirements, and public acceptance of green technologies (**K3**).
1.5	Identify the economic and social benefits/limitations of biological remediation methods, pollutants, sources, vision to reduce their negative effects. (**K4**).
2.0 Skills	
2.1	Relate the multi-scale phenomena from plant cells to terrestrial ecosystems (**S1**)
2.2	Design a histogram to illustrate the national pollutant concentration distribution and their hazards (**S2**).
2.3	Distinguish the common sources and hazards of pollutants such as radiation, chemicals and heavy metals, emissions of gases, insecticides, industrial agricultural and human wastes (**S3**).
2.4	Apply the methods to measure or detect pollutants, economic and health hazards, write the recommended methods to improve air and water sources, and prevent hazards to human health, livestock production and economic loss (**S3**).
2.5	Analyze case studies and acquire an understanding of the complexity of what constitutes pollution remediation (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to perform the assigned work independently and collaborate with interdisciplinary teams to achieve common goals (**V1**).
3.2	Share in scientific discussions professionally, and present research data effectively through different modes and for varied audiences (**V2**).
3.3	Demonstrate accountability and share positively in scientific discussions and decision-making processes (**V3**).

3. Learning Resources

Main Textbook(s):

UN News Global perspective Human stories (2021) IPCC report: 'Code red' for human driven global heating, warns UN hief. https://news.un.org/en/story/2021/08/1097362 (Accessed 9/08/2021).

Masindi V, Muedi KL (2018) Environmental contamination by heavy metals. Heavy metals, eds R. Chamy, F. Rosenkranz (Rijeka: InTech Open) 10(1):115–132

Stadler Bernhard M and de Vries Johannes G (2021) Chemical upcycling of polymers. Phil. Trans. R. Soc. A. 379:20200341.

Xia Q, Chen C, Yao Y, Li J, He S, Zhou Y, Li T, Pan X, Yao Y, Hu L (2021) A strong, biodegradable and recyclable lignocellulosic bioplastic. Nat Sustain 4(7):627–635.

Zhong Y, Godwin P, Jin Y, Xiao H (2020) Biodegradable polymers and green-based antimicrobial packaging materials: A mini-review. Adv Ind Eng Polym Res 3(1):27–35.

Anczak K, Dąbrowska GB, Raszkowska-Kaczor A, Kaczor D, Hrynkiewicz K, Richert A l (2020) Biodegradation of the plastics PLA and PET in cultivated soil with the participation of microorganisms and plants. Int Biodeterior Biodegrad 155: 105087.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1359 Fauna and Flora in Local Environment

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110 EVS 1112 EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course offers a comprehensive examination of the varied plant and animal life present in the Kingdom of Saudi Arabia. Students will explore the distinct ecosystems, adaptations, and conservation issues related to the desert environment of Saudi Arabia. Participants will get a thorough comprehension of the kingdom's abundant biodiversity and the factors that impact its conservation through a blend of lectures, field trips, and research projects. An introduction to the various species of plants and animals, both marine and terrestrial, and their distribution throughout the Kingdom of Saudi Arabia. The course will focus on the study of climate, geomorphology, and their impact on plant and animal life. It will familiarize students with the diverse range of academic fields related to wild plants and animals, including endemic and endangered species. Examination of biological classification systems and examination of both physical characteristics and reproductive characteristics linked with local plants and animals.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the taxonomy, ecology, and natural history of native fauna and flora in Saudi Arabia (**K1, K2**)
1.2	Outline the principles of evolution, and conservation biology and how they are used to manage fauna and flora, and solve environmental problems (**K2, K3**).
1.3	Clarify the impacts of land use and environmental management decisions on ecosystems and society (**K2**).
2.0 Skills	
2.1	Demonstrate an emerging ability to identify and record observations of fauna and flora in the field (**S2, S3**)
2.2	Relate the structure and physiology of native plants and animals to their survival in Saudi Arabian environments (**S2, S4**).
2.3	Recognize the inherent and practical value of the diversity of the Saudi Arabian fauna and flora (**S2, S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate the ability to perform the assigned work independently and collaborate with interdisciplinary teams to achieve common goals (**V1**).
3.2	Share in specialized events and present research data effectively through different modes and for varied audiences (**V2**).
3.3	Show accountability and share positively in scientific discussions and decision-making processes (**V3**).

3. Learning Resources

Main Textbook(s):

Megahid A.M., 1989. Flora of Saudi Arabia, King Saud University, Riyadh.

Mandaville J.P., 1990. Flora of Eastern Saudi Arabia, John Wiley & Sons Ltd., London, 560p, ISBN: 9780203038208, DOI:https://doi.org/10.4324/9780203038208.

Supplementary Materials:

AbuZinada A.H., 2001. First Saudi Arabian National Report on the Convention on Biological Diversity. Robinson E.R., Iyad A.N., Al Wetaid Y.I. (eds), 131p.

Wittmer W., Büttiker W., Krupp F., Mahnert V., 1988. Fauna of Saudi Arabia, volume 9, Pro Entomologia c/o Natural History Museum (eds), ISBN: 3723400086, 9783723400081.

Online Resources / Software: Learning Management System (Blackboard).

https://simonderbyshire.home.blog/2019/05/31/flora- and-fauna-of-saudi-arabia/

https://www.plantdiversityofsaudiarabia.info/Biodiversity- Saudi-Arabia/Flora/Flora.htm

https://animalia.bio/saudi-arabia-animals

College of Science

Department: Biology

EVS 1360 Environmental Biomonitoring and Remediation

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110 EVS 1112 EVS 1114	None	6	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course covers environmental monitoring principles (physical, chemical, and biological), as well as bio-indicators and their usefulness in environmental biological monitoring for water, soil, and air quantitatively, genetically and biochemically. One of the steps following the bio-evaluation of the environmental quality is Bioremediation which is the process of using living organisms to remove or neutralize environmental contaminants like pesticides, PCBs, and drugs. A focus on Genetically Modified Organisms (GMO) impacting the environment is also evoked to assess the impact on unintended organisms; GMO crops; and using plants to clean up mercury and other pollutants that are organic in nature.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Identify the different types of pollutants: classic and emerging and define the bioremediation and phytoremediation (K1)
1.2	Explain the toxicity of contaminants (K2).
1.3	Discuss the outcomes of surveys using bio-indicators and biomarkers (K3).
2.0 Skills	
2.1	Differentiate between the Ex-situ bioremediation and In-situ bioremediation (S1)
2.2	Evaluate the roles of organisms in bioremediation (S2).
2.3	Analyze the collected information about bioremediation strategies (S3).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate independence and cooperate effectively in a team (V1).
3.2	Show the ability to communicate information about Environmental Biomonitoring and Bioremediation to various audiences in an accurate, compelling, and logically supported manner, via writing and talks. (V2).
3.3	Share in the discussion of literature articles in the field of Environmental Biomonitoring and Bioremediation, extract essential information, interpret figures, and summarize key points, to improve critical thinking and evaluation skills (V3).

3. Learning Resources

Main Textbook(s):

Singh A., Kuhad R.C. and Ward O.P. (2009). Advances in Applied Bioremediation. Springer-Verlag Berlin Heidelberg, Germany.

Singh A., and Ward O.P.(2004). Applied Bioremediation and Phytoremediation. Springer Verlag Berlin .Heidelberg, Germany.

Atlas R.A. and Philp J. (2005).Applied Microbial Solutions for Real-World Environmental Cleanup. ASM, Washington, D.C., USA.

Supplementary Materials:

Campbell, J. B. (1996) Introduction to Remote Sensing (2nd Ed), London: Taylor and Francis.

R. Harris, 1987. "Satellite Remote Sensing, An Introduction", Routledge & Kegan Paul.

Jensen, J. R. (2000) Remote Sensing of the Environment: An Earth Resource Perspective, 2000, Prentice Hall, New Jersey.

Jensen, J. R. (2005, 3rd ed.) Introductory Digital Image Processing, Prentice Hall, New Jersey.

Mather, P. M. (1999) Computer Processing of Remotely-sensed Images, 2nd Edition. John Wiley and Sons, Chichester. W.G. Rees, 1996. "Physical Principles of Remote Sensing", Cambridge Univ.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1362 Protected Areas

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	6	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides students with the essential knowledge related to the areas dedicated to nature conservation, also known as "protected areas." Protected areas cover more than 15% of global land mass and serve as a critical conservation tool for protecting nature and biodiversity. Effective conservation and management of this significant protected land is central to achieving global conservation and sustainable development goals. The knowledge, practical skills, and field training required by contemporary protected area conservation professionals are provided. The course contents explain why these areas are so important to the health of the environment in our fast-developing world. The students are introduced to the key concepts needed to understand protected area management and policy at the national and international levels. History, philosophy, laws, policies, and international conventions of the global protected area system are among the course key topics related to protected area management. The management planning, governance, management practice, ecological imperatives of protected areas and their sustainability are also covered to address complex conservation problems within protected areas. Terrestrial, freshwater and marine protected areas are addressed.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Explain comprehensively the techniques and principles underpinning the design of effective and representative protected area networks (**K1**)
1.2	Outline the principles and main processes of the government and management challenges of conservation (**K2**).
1.3	Describe the planning process for establishing protected areas (**K3**).
1.4	Relate between protected areas and their impacts on community and biodiversity and clarify how the effectiveness of a protected area is assessed (**K4**).
2.0 Skills	
2.1	Apply integrated conservation and development concepts and approaches to the management of protected areas (**S1**)
2.2	Evaluate the concepts and purposes of protected areas as part of global conservation strategies (**S2**).
2.3	Synthesize theories relevant to protected areas and wider conservation fields and apply data collection and analysis techniques to define problems and solutions (**S3**).
2.4	Analyze the contemporary relationship between protected areas and adjacent lands and communities. (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate independence and cooperate effectively with research team (**V1**).
3.2	Share in specialized discussions and present scientific data via written format and oral presentations (**V2**).
3.3	Adhere to ethical rules while performing activities in the field of protected areas (**V4**).

3. Learning Resources

Main Textbook(s):

IUCN's Protected Area Governance and Management. (2014) (World Commission on Protected Areas).
Protected Areas Management (2017). Weston Allen (Editor). Larsen and Keller Education.
ISBN 978-1635492385
Managing Protected AreasA Global Guide.(2006).
Michael Lockwood, Graeme L., andAshish Kothari (Editors). Routledge. ISBN 9781844073030

Supplementary Materials:

https://www.protectedplanet.net/en
https://www.oursafetynet.org/2021/01/14/why-linking-protected-areas-is-crucial-for-wildlife-movement/
https://portals.iucn.org/library/sites/library/files/documents/PAG-021.pdf

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1364 Ecology of Palm Tree

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110 EVS 1112 EVS 1114	None	6	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course involves most of the important information about the Ecology of palm trees and an examination of palm tree etymology, and types of dates. It introduces taxonomy, morphology, reproductive biology, anatomical, and physiological characteristics of the palm tree. In addition, It Covers the environmental, cultural, and economic importance of this tree and the Nutritional value and health benefits of fruits. It also covers environmental and geographical information, species diversity and distribution, problems and challenges facing palm trees, ways to protect them and sustainable development.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the Ecology of palm trees (**K1, K2**)
1.2	Discuss The environmental, cultural, and economic importance of the palm tree, Nutritional value and health benefits of fruits (**K2**).
1.3	Clarify the dimensions of the sustainability challenge (**K3, K4**).
2.0 Skills	
2.1	Analyze how the palm tree is affected by environmental conditions, its interaction with biotic and abiotic factors, and ways of adapting with the environment (**S2, S4**)
2.2	Evaluate how human activity impacts on the Ecology of palm trees (**S1, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Participate in work and communicate effectively in groups (**V1, V2**).
3.2	Adhere assigned tasks with responsibility (**V3, V4**).

3. Learning Resources

Main Textbook(s):

Geographical ecology of the palms (Arecaceae): determinants of diversity and distributions across spatial scales.2011. Annals of Botany 108: 1391– 1416. By Wolf L. Eiserhardt et.

Conservation Biology for all. 2010. edited by Sodhi, N. S, and P. R. Ehrlich. Oxford University Press.

Field and Laboratory Activities for Environmental Science. 2012. Eldon Enger ،Bradley F. Smith

Jain, Shri Mohan, Al-Khayri, Jameel M., Johnson, Dennis V. Date Palm Biotechnology, 2011, XVIII, 743p. 161 illus.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

http://www.fao.org/docrep/006/y4360e/y4360e00.htm

http://www.britannica.com/EBchecked/topic/152224/date-palm

http://www.redpalmweevil.com/introDatepalm.htm

http://www.experiencefestival.com/date_palm_-_production

http://www.un.org/News/Press/docs/2004/sag276.doc.htm

http://www.pubhort.org/datepalm/datepalm1/datepalm1_28.pdf

http://www.postharvest.ucdavis.edu/files/71533.pdf

College of Science

Department: Biology

EVS 1366 Integrated Coastal Ecosystems

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	6	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides an examination of the key elements and complex processes (physical, biogeochemical and biological) that shape and influence estuarine and coastal ecology. The course will explore the highly dynamic nature of estuaries and coasts through the study of a wide variety of coastal systems, including coastal lagoons, coastal embayment and river estuaries. Students will examine the effects of catchment development on nutrient and sediment loads and the consequences for biological production and biodiversity. The course will also address issues of ecosystem functioning, appropriate ecosystem monitoring programs and the use of key indicators as a measure of ecosystem health. All lectures are recorded and the practical component is completed within three weeks of the semester. This course has a compulsory field trip component. Details and costs will be advised in the course outline and on the course Blackboard site prior to the start of the semester.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the different coastal habitats and the geomorphological and hydrological processes that shape these environments (**K1**)
1.2	Describe the important ecological processes that operate in estuaries and the coastal zone (**K2**).
1.3	Describe the ecological dynamics, including nutrient cycling, foodwebs, and biological interactions in estuarine and coastal environments (**K3**).
1.4	Identify coastal habitats and the physical processes that contribute to their formation (**K4**).
2.0 Skills	
2.1	Employ skills of field observation and data collection techniques to measure and interpret physical and ecological parameters (**S1**)
2.2	Analyze the important ecological processes that operate in estuaries and the coastal Zone (**S2**).
2.3	Apply analytical tools and models to study and predict ecological processes (**S3**).
2.4	Synthesize information about assessments of ecosystem health and management processes (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Share in the discussions on coastal ecosystems and present data effectively (**V1**).
3.2	Show independence and collaborate with a team (**V2**).
3.3	Adhere to ethical practices relevant to sustainable development in coastal environments (**V3**).

3. Learning Resources

Main Textbook(s):

"Introduction to Coastal Processes and Geomorphology" by Robin Davidson-Arnott.
"Estuarine Ecology" by John W. Day, Jr. et al.
"Coastal Management: Global Challenges and Innovations" edited by Nobuo Mimura and Ian S. F. Jones.

Supplementary Materials:

Journal of Coastal Research
Coastal Management Journal
Marine Ecology Progress Series

Online Resources / Software: Learning Management System (Blackboard).
NOAA Office for Coastal Management (coast.noaa.gov).
The Nature Conservancy's Coastal Resilience Network (coastalresilience.org).
MarineBio Conservation Society (marinebio.org).

College of Science

Department: Biology

EVS 1368 Atmospheric Environments

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	6	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course is an introduction to the physical processes occurring in the Earth's atmosphere and interpretation of weather maps and satellite images, cloud types and formation, atmospheric structure, thermodynamic processes, rain formation, solar and terrestrial radiation, energy balance at the surface, cumulus and cumulonimbus convection, and air pollution.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe atmospheric composition and structure, including the layers of the atmosphere from the surface to 100 km, and be able to describe the basic processes occurring in the atmospheric boundary layer and recognize cloud types and their formation mechanisms (K1)
1.2	Explain the structure, physics and dynamics of thunderstorms, tornadoes and hail formation (K2).
1.3	Outline the basic physics of atmospheric processes, such as radiation at the surface, water in the atmosphere and its phase changes, and air masses and weather fronts (K3).
2.0 Skills	
2.1	Synthesize and interpret meteorological data, including satellite imagery, and summarize professionally within an assignment (S1)
2.2	Use and evaluate numerical and graphical meteorological data, e.g., interpret weather maps in terms of local weather; plot and interpret vertical temperature and moisture soundings; observe, code and plot weather elements in standard format (S2).
2.3	Analyze large weather and climate related datasets using appropriate computing tools and methodologies (S3).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate the ability to perform the assigned work independently and collaborate with interdisciplinary teams to achieve common goals (V1).
3.2	Share in specialized events and present research data effectively through different modes and for varied audiences (V2).
3.3	Show accountability and share positively in scientific discussions and decision- making processes (V3).

3. Learning Resources

Main Textbook(s):

Atmospheric Science: An Introductory Survey (2nd Ed), J.M. Wallace and P.V. Hobbs
Weather: A Concise Introduction
Introducing Meteorology: A Guide to Weather, J. Shonk

Supplementary Materials:

Undergraduate Course: Meteorology: Atmosphere and Environment- University of Edinburgh
BSc Meteorology and Climate- University of Reading

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1470 Breeding Ecology of Camels

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110 EVS 1112 EVS 1114	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides an in-depth exploration of the breeding ecology of camels, focusing on the biological, ecological, and behavioral aspects that influence camel reproduction and population dynamics. Participants will gain a comprehensive understanding of the reproductive physiology of camels, mating systems, breeding strategies, and the environmental factors affecting their reproductive success.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the biological characteristics and adaptations of camels that influence their breeding ecology (**K1**)
1.2	Discuss the reproductive physiology of camels, including the estrous cycle, mating behavior, and gestation period (**K2**).
1.3	State the strategies of camels in their native habitats and the factors that influence successful breeding in captivity (**K2**).
1.4	Clarify how environmental factors such as climate, food availability, and habitat quality impact camel breeding patterns and reproductive success (**K3**).
1.5	Explain the role of breeding ecology in camel conservation efforts, including captive breeding programs, habitat conservation, and genetic diversity preservation (**K4**).
2.0 Skills	
2.1	Perform research through hands- on fieldwork, data collection, and analysis related to camel breeding ecology (**S1**)
2.2	Analyze data on various aspects of camel breeding ecology using the various statistical methods (**S2**).
2.3	Apply the information theory, maximum likelihood estimation, and generalized linear modelling in studying wildlife populations (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Share in discussions on how and why species are monitored and/or captured for wildlife population management (**V1**).
3.2	Participate in specialized meetings and present data through different modes (**V2**).
3.3	Show independency in carrying out research studies in the field of wildlife conservation and management (**V3**).

3. Learning Resources

Main Textbook(s):

"The Camel: Its Evolution, Ecology, Behaviour, and Relationship to Humans" by Shirley C. Strum and Linda M. Fedigan
Camel Breeding and Genetics" edited by Faisal M. Almathen, Hanotte O., and K. E. Fitzhugh

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

International Camel Consortium for Genetic Improvement

Camel Research Centre (CRC)

College of Science

Department: Biology

EVS 1472 Waste Management and Recycling

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This module aims to provide the students with an introduction to waste management and recycling and an overview of its environmental impacts. The objective of the course is to show how the waste management and recycling process can help the environment for cleanliness how waste materials can be converted to produce industrial products and how it can be a useful product for the country and human beings.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Explain the importance of the environmental impact of waste management and recycling (**K1**)
1.2	Outline the various models of Waste management and recycling (**K2**).
1.3	Discuss the basic concepts and tools used for the waste management and recycling to solve the environmental pollution problems (**K3**).
2.0 Skills	
2.1	Relate the process of recycling and conversion of waste to industrial products and understanding of valuable methods of waste management and recycling (**S1**)
2.2	Evaluate the various environmental policies used in environmental waste management and recycling (**S2**).
2.3	Analyze the environmentally eco- friendly services and useful industrial products from waste management and recycling materials (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show independence and responsibility and cooperate effectively in a team to carry out research work (**V1**).
3.2	Share in the discussion of the scientific issues and present research results via oral presentations an in written format (**V2**).
3.3	Adhere to the relevant ethical rules (**V3**).

3. Learning Resources

Main Textbook(s):

Ioannis S. Arvanitoyannis, Waste Management for the Food Industries. Elsevier Inc. 2008.

Agamuto S. Solid waste Management and Practices, University Malaya Press, Kuala Lumpur. 2009.

Supplementary Materials:

Sadhan Kumar Ghosh, Recent Trends in Waste Water Treatment and Water Resource Management. Springer Nature Singapore Pte Ltd. 2020. Paul T. Williams, Waste Treatment and Disposal. John Wiley & Sons Ltd, The Atrium, 3 Southern Gate, Chichester, West Sussex PO19 8SQ, England 2005

Hossain ABMS and M. Aleissa. Bioconversion and Bioprocess of waste. Lambert Academic Publishing Co. 2014.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1474 Environmental Law and Policy

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides a survey of the basic legal principles, regimes, and issues related to environmental protection and natural resource management. It introduces students to the fundamentals of environmental law and policy, including how the legal system works and relevant principles of common law. After building this foundation, the course focuses primarily on the National Environmental Policy Act, the Clean Water Act, the Endangered Species Act, and the Clean Air Act. Some national and international issues will also be addressed. By the end of the course, you will have grounding in basic legal principles, along with the core principles of environmental law and regulation and how they are changing over time.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe the structure of the international legal system in the context of international environmental protection (**K1**)
1.2	Outline the sources, principles, institutions and processes of international environmental law (**K2**).
2.0 Skills	
2.1	Analyze the implementation and effectiveness of international environmental agreements in the context of Saudi Arabia, the GCC and the Middle East (**S1**)
2.2	Perform legal research using primary and secondary legal sources (**S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Share in specialized meetings and present data effectively through different modes (**V2**).
3.2	Adhere to ethical standards and values behind the international environmental laws (**V4**).

3. Learning Resources

Main Textbook(s):

Salzman, J., & Thompson, B. H., Jr. (2019). Environmental Law and Policy (5th ed.). Foundation Press. (E-Book option available) ISBN: 978- 1683287902

Sands, P. and J. Peel, Principles of International Environmental Law (Cambridge: Cambridge University Press, 4th ed., 2018). ISBN: 9781108431125

https://www.cambridge.org/highereducation/books/principles-ofinternational-environmentallaw/B32CA39427B24F1947BDC5F884CCADC0#ov

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

EcoLex: Gateway to Environmental Law www.ecolex.org American Society for International Law: Guide to International Law http://www.asil.org/resource/treaty1.htm International Court of Justice https://www.icj-cij.org/en

College of Science

Department: Biology

EVS 1476 Renewable Energy Systems

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112 EVS 1114	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course offers an introductory exploration into renewable energy systems, focusing primarily on solar, water, and wind energy technologies. Its goal is to provide students with a fundamental understanding of the potential and practical applications of solar, wind, hydroelectric, biomass, and geothermal energy. The course will cover the design, operation, and integration of renewable energy systems into existing energy infrastructure, as well as the environmental, economic, and social implications of renewable energy arrangement. Students will explore the advantages, limitations, and potential of various energy sources including wind, solar, small-scale hydro, ground-source heat pumps, combined heat and power, biofuels, fuel cells, and other emerging technologies. Through the course, students will gain insight into the strategies and cost-benefit analyses used by energy analysts to fulfill energy demand through clean energy production. Additionally, students will undertake a study and develop a proposal for their own renewable energy project.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Identify energy production systems and sustainable energy conversion processes (K1)
1.2	Discuss solar radiation and characteristics of photovoltaic systems (K2).
1.3	State wind power and technologies for energy conversion (K3).
2.0 Skills	
2.1	Show proficiency in utilizing critical thinking and problem-solving skills to assess business energy usage, and determine appropriate applications of renewable energy solutions (S1)
2.2	Analyze and comprehend the challenges associated with the integration of renewable energy systems, and effectively evaluate potential obstacles to implementation (S2).
2.3	Evaluate the benefits, drawbacks, and potential of various clean energy sources tailored to the needs of buildings and businesses, and demonstrating a comprehensive understanding of their suitability and efficacy (S3).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate understanding and awareness of the regulatory frameworks governing renewable energy projects, including compliance requirements and permitting processes (V1).
3.2	Show accountability in presenting a comprehensive proposal for a clean energy project, integrating knowledge of technical, financial, regulatory, and policy aspects to offer a feasible and compelling plan (V2).
3.3	Share actively in specialized activities (V3).

3. Learning Resources

Main Textbook(s):

Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala. Fundamentals and Applications of Renewable Energy. McGraw Hill; 2nd edition (July 21, 2023). ISBN-13 : 978-1265079659

John Twidell and Tony Weir. Renewable Energy Resources. 2015, Routledge is an imprint of the Taylor & Francis Group, an informa business

Supplementary Materials:

Felix A Farret and M. Godoy Simoes. Integration of Renewable Sources of Energy, 2nd Edition, , Wiley, 2018, ISBN: 978-1-11- 913737-5

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1478 Remote Sensing Applications

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	EVS 1110 EVS 1112 EVS 1114	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course will focus on acquiring images of the Earth's surface from spacecraft, aircraft and drones to aid in the monitoring and management of the natural and built environments. Extensive computer-based analysis techniques are used to extract information from the recorded images in support of applications ranging over many earth and information science disciplines. This course covers the fundamental nature of remote sensing and the platforms and sensor types used. It also provides an in-depth treatment of the computational algorithms employed in image understanding, ranging from the earliest historically important techniques to more recent approaches based on deep learning. The course material is extensively illustrated by examples and commentary on how the technology is applied in practice.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe and discuss a set of methods to analyze, interpret and assess remotely sensed imagery (**K1**)
1.2	Define and explain the key concepts and terminologies used in remote sensing (**K2**).
1.3	Explain how the electromagnetic spectrum interacts with the terrestrial environment (**K3**).
1.4	List key platforms and sensors and their characteristics (**K3**).
1.5	Identify and explain common processing pathways used in remote sensing and describe and quantify error sources within remote sensing analyses (**K4**).
2.0 Skills	
2.1	Plan, manage and complete a remote sensing-based study and acquire remote sensing data and assess the suitability for analysis (**S1**)
2.2	Interpret remote sensing and GIS products and understand their metadata, and results of image analysis (**S2**).
2.3	Apply the appropriate methods/algorithm s and apply such methods/algorithm s to analyze optical, radar, and topographic data (**S3**).
2.4	Synthesize and process the data using model builder and scripting (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Share in the discussion of the literature on remote sensing and GIS and present data effectively (**V1**).
3.2	Show the ability to perform work independently and cooperate with a team (**V2**).
3.3	Demonstrate accountability and adhere to the relevant ethical rules (**V3**).

3. Learning Resources

Main Textbook(s):

Nicolas R. Dalezios (2021). Remote Sensing Applications in Environmental and Earth System Sciences, 1st Edition, CRC Press, USA. https://doi.org/10.1201/9781315166667

James B. Campbell, Randolph H. Wynne, and Valerie A. Thomas (2022). Introduction to Remote Sensing Sixth Edition, Guilford press, USA

Supplementary Materials:

Netzband, M. A1 - Stefanov, W.L. A1 - Redman, C. (2007. Applied RemoteSensing for Urban Planning, Governance and Sustainability, Springer Berlin Heidelberg,
https://books.google.com.sa/books?id=0fTse9UL6_IC

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1493 Major Field Training

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
6	-			15	The student must have completed a minimum number of 126 credit hours	None	8	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

Field Training

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Recall knowledge of the context of the professional career before graduation (**K1, K2**).
1.2	Explain professional interests in related fields of Biology (**K1, K2**).
1.3	Identify a range of opportunities for learning, development and monitoring throughout the duration of the training (**K3, K4**).
2.0 Skills	
2.1	Apply what has been learned in classroom to real-world situations (**S1, S3**).
2.2	Create critical thinking and innovative problem- solving skills with confidence and rigor (**S1**, **S2**).
2.3	Communicate oral and written information in a manner that reflects professional social work skills (**S2**, **S3**).
2.4	Monitor the various pressures that he/she may face in the labor market (**S2**, **S3**).
2.5	Construct with other professionals (**S3**, **S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Develop discipline, with the capacity to undertake lifelong learning, self and social responsibility (**V1, V2**).
3.2	Make ethic principles of the profession in practice. (**V4**).
3.3	Generate integrity and honesty (**V1**, **V3**).

3. Learning Resources

Mode of delivery: In-person/onsite (Hands-on activities).

Main Textbook(s): None.

Supplementary Materials: None.

Online Resources / Software: None.

College of Science

Department: Biology

EVS 1499 Graduation Research

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	-			10	The student must have completed a minimum number of 126 credit hours	None	8	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This graduate course provides students with the opportunity to conduct independent research projects with the guidance of academic supervisors. A research project for students is an extended essay that presents a research question for analysis and evaluation. Conduction of the research work is the subsequent step to project planning and submission of research proposals. Assigned research projects enable students to explore areas of interest across various biology disciplines, under the supervision of academic staff members. Through the independent conduction of planned projects, students are encouraged to develop and employ a range of research skills such as a collection of data from diverse sources and systematic reviewing of the relevant literature. Proper keeping of records, interpretation and analysis of research results, safe practices under laboratory and field conditions, and presentation of scientific issues are among the targeted skills. Given these skills, the students have the chance to develop a deeper understanding of research topics that are targeted in their projects. Through this course, the students are equipped with the experience of research and project management as well as the professional skills that are crucial to performing future research work. Successful completion of this course represents the cornerstone to qualify the enrolled students for graduation.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the sequence of preliminary steps, including topic approval, project planning and proposal submission, that precede the launch of a research project (**K1**).
1.2	Explain how to balance the sections of description and analysis in scholarly writing and how to implement them in the final research report (**K2**).
1.3	Describe how to prepare a checklist for the research project by listing the research resources and identifying the data sources, along with other requirements (**K3, K4**).
2.0 Skills	
2.1	Relate the intended original research to the proposal objectives and current trends to execute experimental or field research work (**S1**).
2.2	Employ the theoretical knowledge and practical experience to apply the research methodologies for generating reliable data (**S2**).
2.3	Apply critical thinking and professional skills to test research hypotheses and address the research questions (**S3**).
2.4	Formulate the final research report, by including the applied methods, results, and analysis, in a way that reflects in- depth knowledge and practical skills (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate a strong sense of independence and, an attitude of accountability and responsibility while carrying out the research project (**V1**).
3.2	Participate in discussions relevant to the research project, communicate scientific issues, and present research results orally and in written formats to varied audiences (**V2**, **V3**).
3.3	Adhere to the relevant ethical rules and demonstrate the ability to comply with safety procedures appropriate to the research project (**V4**).

3. Learning Resources

Main Textbook(s):

Thomas G. (2022). How to Do Your Research Project: A Guide for Students. 3rd Ed. SAGE Publications Ltd. ISBN 10: 1529757711

Berry R. (2004). The Research Project. How to Write It, 5th Ed. ISBN 9780415334457

Ewart J, Ames K. (2020). Managing Your Academic Research Project. Springer Singapore. ISBN: 978-981-15-9194-5

Supplementary Materials:

https://www.gla.ac.uk/coursecatalogue/course/?code=BIOL513P

https://ocasys.rug.nl/current/catalog/course/WBCH901-15

Online Resources / Software: None.

College of Science

Department: Biology

EVS 1010 Sustaining Natural Resources

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course will highlight the proficient administration of natural resources as an essential element in addressing the difficulties associated with resource depletion and global environmental change. The primary objective of the Sustaining Natural Resources specialization is to equip students with comprehensive expertise in strategies for efficiently managing natural resources within the broader framework of sustainability concerns and environmental governance. This specialization is well-suited for individuals aspiring to pursue careers as environmental scientists and natural resource managers, as it equips them with the necessary skills and knowledge to effectively address the sustainability challenges and capitalize on the opportunities presented by the current century. The curriculum will facilitate the acquisition of knowledge and skills about the natural and social sciences that are pertinent to the administration of natural resources (NR). These acquired skills can subsequently be applied to various contexts, such as environmental conservation and sustainable resource management. The specialization focuses on hands-on and practical learning in real-world settings.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the fundamental concepts of sustaining natural resource (**K1**)
1.2	Discuss resource management issues and strategies in Saudi Arabia and international contexts (**K2**).
1.3	Explain the main topics on natural resource management issues and their wider environmental context (**K3**).
1.4	Explain how wealth generated from natural resource development can be used to further sustainability (**K3**).
1.5	Identify efforts to sustainably manage extractive industry investments and Understand the complex and interwoven aspects of natural resource governance (**K4**).
2.0 Skills	
2.1	Analyze the generated data from natural resource development (**S1**)
2.2	Interpret the natural resource data and theory at a range of scales, and apply knowledge and skills in management and policy contexts (**S2**).
2.3	Test the sustainable options available for oil, gas, and mineral development (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to perform assigned work independently and cooperate with a team (**V1**).
3.2	Share effectively in scientific discussions and present data through different modes (**V2**).
3.3	Demonstrate responsibility and follow ethical rules while performing work in the field of environmental science (**V3**).

3. Learning Resources

Main Textbook(s):

Kathy Wilson Peacock (2008) Natural Resources and Sustainable Development forwarded by Jermy Ceral. Kethy Wilson peacock, USA.

Hannah.Ferguson (2024) Earthscan Studies in Natural Resource Management, Taylor & Francis Group, USA.

Supplementary Materials:

Paul Hawken (2017) The Most Comprehensive Plan Ever Proposed to Reverse Global Warming. New York Times bestseller.USA

Online Resources / Software: Learning Management System (Blackboard).

20 Best Sustainable Development Books of All Time - BookAuthority

College of Science

Department: Biology

EVS 1012 Reclamation of Arid and Impacted Lands

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course explores the principles and practices involved in the reclamation and restoration of arid and environmentally impacted lands. Students will examine the ecological foundations necessary to understand the degradation processes and the challenges specific to arid environments. The course covers a range of topics including soil chemistry, erosion control, hydrology, native vegetation restoration, and the use of innovative technologies in land reclamation. Through a combination of lectures, case studies, and fieldwork, students will learn about the strategies for mitigating the effects of mining, industrial activities, and unsustainable land use practices that lead to land degradation. The course will also address the policy and planning aspects of land reclamation projects, emphasizing sustainable practices and community involvement.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the ecological characteristics, biodiversity, and environmental processes that define arid regions (**K1**)
1.2	Identify the causes and consequences of land degradation (**K2**).
1.3	List the reclamation techniques and their applications (**K3**).
1.4	Explain the principles of sustainable land management (**K4**).
2.0 Skills	
2.1	Evaluate and analyze the causes and impacts of land degradation in arid regions using scientific methods (**S1**)
2.2	Interpret data from physical, chemical, and biological assessments to develop effective reclamation strategies (**S2**).
2.3	Use of modern tools and technologies for soil analysis, hydrological assessment, and vegetation mapping (**S3**).
2.4	Plan and execute reclamation projects, from initial assessment through to monitoring and maintenance phases (**S3**).
2.5	Design innovative solutions to complex problems of land degradation, considering ecological sustainability and economic feasibility (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate independence and collaborate with a team (**V1**).
3.2	Share in specialized meetings and present data through oral presentations and written formats (**V2**).
3.3	Demonstrate accountability and adhere to ethical regulations while performing a research work (**V3**).

3. Learning Resources

Main Textbook(s):

Restoration Ecology: The New Frontier" by Jelte van Andel and James Aronson.
Principles of Soil Conservation and Management" by Humberto Blanco-Canqui and Rattan Lal
Arid Land Hydrogeology: In Search of a Solution to a Threatened Resource" by A. S. Alsharhan.

Supplementary Materials:

Journal of Environmental Management
Restoration Ecology

Online Resources / Software: Learning Management System (Blackboard).
USDA NRCS Web Soil Survey
The Reclamation Library (ReclamationLibrary.com)

College of Science

Department: Biology

EVS 1014 Foundations of Sustainable Development

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1114	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course provides the candidates with the concepts of sustainable development and the processes involved in conducting sustainable development. It provides students with the knowledge and skills necessary to evaluate the environmental, social, and economic impacts of development projects and to recommend sustainable practices. This interdisciplinary course offers a comprehensive exploration of sustainable development principles. It aims to equip students with an understanding of how sustainable development can be achieved in the context of various development projects and how these projects can be planned and executed with minimal environmental impact. The course delves into the concept of sustainable development, examining its historical context, theoretical underpinnings, and its practical application in various sectors. Students will explore the interplay between environmental, economic, and social pillars of sustainability, and understand how these pillars are integrated in the planning and execution of development projects. The course will also cover the legal and policy frameworks that govern sustainable development, both internationally and nationally. Throughout the course, emphasis will be placed on critical thinking, ethical considerations, and the development of practical skills necessary for conducting and evaluating environmental sustainability. Students will engage with current debates and challenges in the field, preparing them for careers in environmental planning, policy-making, consultancy, and research in both the public and private sectors.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Outline the concepts of sustainable development, and methodologies used in environmental impact assessment (**K1**)
1.2	Discuss global challenges and sustainable development goals (SDGs) (**K2**).
1.3	Explain strategies for integrating sustainability into policy-making, planning, and decision-making processes at local, national, and international levels (**K3**).
2.0 Skills	
2.1	Analyze the interconnectedness of environmental, social, and economic systems within the context of sustainable development (**S1**)
2.2	Evaluate the role of various stakeholders (government, business, civil society, etc.) in promoting or hindering sustainable development practices (**S2**).
2.3	Evaluate the equity dimensions of sustainable development efforts (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show independence and responsibility and cooperate effectively in a team to carry out research work in sustainability and resilience in project planning (**V1**).
3.2	Share in the discussion of the scientific issues and present research results via oral presentations and in written format (**V2**).

3. Learning Resources

Main Textbook(s):

Robertson, M. (2021). Sustainability Principles and Practice (3rd ed.). Routledge.

Le Blanc, D. (2017). The Sustainable Development Goals: An Ambitious Agenda for the World. New York: Springer.

Stern, N. (2007). The Economics of Climate Change: The Stern Review. Cambridge: Cambridge University Press.

Raworth, K. (2017). Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist. London: Random House Business.

Ukaga, O., & Richardson, R. I. (Eds.). (2014). Sustainable Development: Principles, Frameworks, and Case Studies. New York: Routledge.

Supplementary Materials: IISD's EIA Online Learning Platform

UNEP's Massive Open Online Courses

United Nations Sustainable Development Goals (SDGs) website

World Bank Sustainable Development

Intergovernmental Panel on Climate Change (IPCC)

Global Footprint Network

International Institute for Sustainable Development (IISD)

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1016 Conservation of Wildlife

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1114 EVS 1232	None	5	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course will provide students with an understanding of the science and theory of managing wildlife and habitats beginning with the fundamental needs of wildlife. The following topics will be examined: Use of natural and anthropogenic habitats by wildlife including grasslands, agricultural lands, urban environments, wetlands, and forests, direct and indirect management of wildlife including habitat management and the use of hunting and trapping to manage wildlife, exotic species and their impact on native species, the economics of wildlife and consumptive and non-consumptive uses of wildlife, and current threats to the conservation of wildlife and habitats

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Recognize the scientific, technical, and regulatory bases of wildlife management and conservation (K1)
1.2	Describe various issues concerning wildlife conservation (K2).
1.3	Outline the ongoing management protocols used in natural wildlife and their values in wildlife conservation (K3).
2.0 Skills	
2.1	Apply appropriate solutions for problems related to the depletion of wildlife (S1)
2.2	Inspect the management of selected wildlife populations through relevant case studies (S2).
2.3	Evaluate the application of information theory, maximum likelihood estimation, and generalized linear modelling in studying wildlife populations (S3).
3.0 Values, Autonomy & Responsibility	
3.1	Show independence in carrying out assignments and demonstrate cooperation with the work team (V1).
3.2	Participate in scientific meetings and present data effectively (V2).
3.3	Adhere to ethical rules while working in the field of conservation of wild life (V3).

3. Learning Resources

Main Textbook(s):

Wildlife Management and Conservation: Contemporary Principles and Practices, 2013, by Paul R. Krausman et al.
Wildlife Ecology and Conservation: Principles, Techniques, and Applications, 3rd Edition.
Conservation Biology for all. 2010. edited by Sodhi, N. S, and P. R. Ehrlich. Oxford University Press.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1018 Animal Behavior and Environment

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1112	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

The course is designed to study how the animals are related to each other as well as to their environment. The activities of animals performed during their lifetime including locomotion, feeding, breeding, capture of prey, avoidance of predators, and social behavior are also focused. The course emphasizes that animals send signals, respond to signals or stimuli, carry out maintenance behavior, make choices, and interact with one another.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Explain the fundamental concepts and methodology of animal behavior and environment (**K1**)
1.2	Outline the types of animal behavior and the scope and its function within the environment (**K2**).
1.3	Discuss the Communication between animals from different communities, and the chemical communication through Pheromones, and how to communicate with each other within their original environment (**K3**).
2.0 Skills	
2.1	Evaluate animal behavior within its Environments (**S1**)
2.2	Analyze behavioral data by using the appropriate statistical analytical methods (**S2**).
2.3	Perform research work by employing the proper methods and techniques. (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to work in a team to conduct a specific project and solve problems (**V1**).
3.2	Demonstrate independence to study different kinds of animal behavior and its interaction with the surrounding environment (**V2**).
3.3	Participate in scientific meetings and communicate specialized data via different modes (**V3**).

3. Learning Resources

Main Textbook(s):

Nicholas B. Davies. 2012. An Introduction to Behavioural Ecology. Wiley-Blackwell.

Shawn Nordell 2013. Animal Behavior: Concepts, Methods, and Applications. Oxford University Press.

Supplementary Materials:

Michael D. Breed. 2015. Animal Behavior. Academic Press

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1020 Evolutionary and Ecological Genetics

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1112	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

The course encompasses several aspects of evolutionary and ecological genetics focusing on case studies and data analysis. The course emphasizes the link between molecular and phenotypic analyses in the study of evolutionary processes in natural populations. A special focus is also made on linking evolutionary and ecological processes.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Discuss genetic mechanisms underlying evolutionary processes (**K1**)
1.2	Outline general principles in population genetics and quantitative genetics (**K2**).
1.3	Identify the basic theories of phenotypic selection and adaptive evolution (**K3**).
1.4	Explain how ecological and evolutionary processes interact and affect short- and long-term population viability (**K4**).
2.0 Skills	
2.1	Use genetic data to estimate population genetic parameters and determine relatedness and individual fitness (**S1**)
2.2	Estimate strength and direction of phenotypic selection and predict rate of evolution - Analyze relatedness and molecular genetic data to determine the genetic basis for ecologically important phenotypic traits (**S2**).
2.3	Evaluate critically, interpret and judge results from studies at the intersection of evolution, genetics and ecology (**S3**).
2.4	Plan studies in evolutionary and ecological genetics (**S4**).
3.0 Values, Autonomy & Responsibility	
3.1	Evaluate the importance of genetic and ecological processes for evolution in natural populations (**V1**).
3.2	Judge and reflect on primary literature in evolutionary and ecological genetics (**V2**).
3.3	Show the ability to present results from quantitative studies through different modes (**V3**).
3.4	Demonstrate the ability to work independently and cooperate with team (**V4**).

3. Learning Resources

Main Textbook(s):

Benjamin A Pierce (2020) Genetics: a conceptual approach. 7th edition W.H. Freeman. ISBN-13-978-1319216801.

Supplementary Materials: None.

Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Biology

EVS 1022 Industrial Waste and Carbon Emissions

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1368	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course deals with the basic concepts of industrial waste and its waste generated during industrial processes, manufacturing, or production activities. It includes solid waste, hazardous materials, and wastewater, and an integrated approach to reducing carbon emissions in industrial clusters, including systemic efficiency, circularity, direct electrification, renewable heat, and hydrogen solutions.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Describe methods to estimate greenhouse gas emissions from different waste handling practices, including solid waste disposal sites, domestic wastewater, industrial wastewater, and waste incineration) (K1)
1.2	Define and apply current remediation processes and technologies for waste management and inform communities and stakeholders about the best practices in waste management (K2).
1.3	Explain an integrated approach to reducing carbon emissions in industrial clusters, including systemic efficiency, circularity, direct electrification, renewable heat, and hydrogen solutions (K3).
2.0 Skills	
2.1	Compare, interpret and predict the different biological methods and their applications in various biological industries (S1)
2.2	Interpret and Valorization of Industrial Wastes , Focus on minimizing waste generation, promoting reuse, recycling materials, and exploring waste valorization processes and technologies (S2).
2.3	Demonstrate the ability to select the criteria of treatment technologies and site remediation (S3, S4).
3.0 Values, Autonomy & Responsibility	
3.1	Share in scientific discussions and prepare the scientific reports related to apply waste management (V1).
3.2	Demonstrate the ability to organize and collect data and present it through different modes to a varied audience (V2).

3. Learning Resources

Main Textbook(s):

Industrial Waste Treatment Handbook" by Woodard & Curran Inc. "Carbon Emissions in the Industrial Sector" by J. Smith & R. Green.

Reducing Carbon Emissions in Manufacturing: Case Studies from Automotive Industry" by B. Lee & C. Chen.

Supplementary Materials:

WWW.United Nations Environment Programme (UNEP)

Online Resources / Software: Learning Management System (Blackboard).

https://link. Intergovernmental Panel on Climate Change (IPCC)

College of Science

Department: Biology

EVS 1024 Global Climate Change

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110 EVS 1368	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course will describe the science of global warming and its forecast for humans' impact on Earth. Climate change is one of the most profound environmental and social issues affecting communities, nations and individuals. This course is an introduction to this global challenge, including its scientific underpinnings, history, potential impacts on natural systems and human societies around the world, and two societal responses: adaptation and greenhouse gas mitigation. Opportunities to develop sustainable resilient communities, as well as Saudi Arabia's climate change policy responses, will be highlighted.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Discuss comprehensively and understand of key elements of the climate system, and how these elements are being altered by the human emission of greenhouse gases (K1)
1.2	Explain the impacts of climate change on both human and natural systems (K2).
1.3	Clarify the difference between climate change adaptation and mitigation, and understand a portfolio of actions that communities can take to respond to climate change (K3).
1.4	Outline the key issues at play in international climate change negotiations, as well as recent KSA policy proposals (K4).
2.0 Skills	
2.1	Relate between the different practices and be aware of the challenges in detecting unusual global warming signals amidst natural climate variability (S1)
2.2	Evaluate the appropriate theory and methods to sustainability (S2).
2.3	Analyze the knowledge, information, and research skills to solve problems related to climate change (S3).
2.4	Perform the relationship between water, climate change, and the adaptation of living organisms, nutrition, cultivation, adaptation strategies, risks, and potential threat (S4).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate critical and creative thinking skills (V1).
3.2	Participate between the three approaches to achieve sustainability (V2).
3.3	Adhere to the relevant ethical rules on specific problems using scientific evidence to support their position to an audience of peers (V3).

3. Learning Resources

Main Textbook(s):

Burch, Sarah and Sara Harris. 2014. Understanding Climate Change: Science, Policy and Practice. Toronto: University of Toronto Press.

Adger, W. N., J. Paavola, S. Huq, and M. J. Mace (eds.). 2006. Fairness in Adaptation to Climate Change. Cambridge, MA: MIT Press.

Adger, W. N., S. Agrawala, M. M. Q. Mirza, C. Conde, K. L. O'Brien, J. Pulhin, R. Pulwarty, B. Smit, and K. Takahashi. 2007. Assessment of adaptation practices, options, constraints, and capacity. In Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. M. L. Parry, O. F. Canziani, J. P. Palutikof, C. E. Hanson, and P. J. Van Der Linden (eds.). Cambridge: Cambridge University Press.

Supplementary Materials:

Adams, P. N., and D. L. Inman. 2009. Climate Change and Potential Hotspots of Coastal Erosion Along the Southern California Coast— Final Report. CEC-500-2009-022-F, Sacramento, California Energy Commission.

Online Resources / Software: Learning Management System (Blackboard).

https://nap.nationalacademies.org/read/12782/chapter/22

College of Science

Department: Biology

EVS 1026 Environmental Economics

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	2	0	0	5	EVS 1110	None	7	English

Program(s) offered for: Bachelor of Science in Environmental Sciences

1. Course Description:

This course aims to provide you with an introduction to and an overview of environmental economics. The objective of the course is to show how economic analysis can help identify the causes of environmental degradation and the policy measures to deal with environmental problems.

2. Course Learning Outcomes (CLOs) and Alignment with PLOs

1.0 Knowledge & Understanding	
1.1	Clarify the emergence of environmental concerns in economics (**K1**).
1.2	Explain various models of economy-environment interdependence (**K2**).
1.3	Outline the basic economic concepts and tools used in the analysis of environmental problems (**K3**).
2.0 Skills	
2.1	Relate between the various concepts of value, the economic rationale for the monetary valuation of the environment and the valuation methods (**S1**)
2.2	Perform the cost-benefit analysis, and show a clear understanding of the problems in using cost-benefit analysis for environmental management (**S2**).
2.3	Use computers and the internet to analyze the economy-environment interdependence (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show independence and responsibility and cooperate effectively in a team to carry out research work (**V1**).
3.2	Share in the discussion of scientific issues and present research results via oral presentations and in written format (**V2**).

3. Learning Resources

Main Textbook(s):

Tietenberg & Lewis, 2009. Environmental and Natural Resource Economics. 9th edition.

Supplementary Materials:

Goulder & Parry, 2008. Instrument Choice in Environmental Policy. Review of Environmental Economics and Policy, 2(2): 152-174.
Shortle, J. 2013. Economics and Environmental Markets: Lessons from Water-Quality Trading. Agricultural and Resource Economics Review, 42(1): 57-74

Online Resources / Software: Learning Management System (Blackboard).