Bachelor of Science in Biology Program
Courses Short Syllabus

College of Science

Department: Biology

BIO 1101 General 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 Biology

1. Course Description:

The course will cover the principles of eukaryotic/prokaryotic cell structure and function. This course will provide a conceptual and experimental background in biology sufficient to enable students to take courses that are more advanced in related fields.

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

1.0 Knowledge & Understanding	
1.1	List basic concepts and principles of general biology (**K1**)
1.2	Tell an understanding and appreciation of the vast diversity of living things, their special adaptations to their environment, and their evolutionary and ecological relationships (**K1, K2**).
2.0 Skills	
2.1	Summarize ideas as well as facts by requiring students to read material on ethical probes that have no easy answers (**S1**)
2.2	Prepare and rate hypotheses based on discovery-based activities by the mean of laboratories that emphasize observation and hands-on (**S1, S2**).
2.3	Analyze the results obtained from examination and investigations (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Show ability to communicate effectively with class mates and teaching staff (**V1, V2**).
3.2	Use laboratory instruments and computers (**V3**).
3.3	Analyze biological experiments and use various slides during laboratory classes (**V2, V3**).

3. Learning Resources

Main Textbook(s): Campbell Biology (Campbell Biology Series) 11th Edition.
Supplementary Materials: None.
Online Resources / Software: Learning Management System (Blackboard).

College of Science

Department: Chemistry

CHM 1101 General Chemistry

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

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

1. Course Description:

This introductory and general chemistry course covers fundamental observations, laws, and theories of chemistry at the basic level. Topics include atoms/molecules, stoichiometry, acids/bases, solutions, equilibrium, gases, solids, liquids, thermodynamics, the periodic table, and chemical bonding. The chemistry lab is taken in parallel with the course and covers the following basic experiments: density, mass-mass relationship, limiting reactant, acid-base titrations, solubility product, reactions in aqueous solution, Calorimetry and redox reactions.

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

1.0 Knowledge & Understanding	
1.1	To recognize the atomic theory and structure of the atom (**K1, K2**)
1.2	To describe different phenomena related to chemical reactions and its stoichiometry (**K1**).
1.3	To list gases laws and their physical properties (**K1, K2**).
1.4	To define the principles of safety, list of emergency responses and outline the routes of exposures to hazards, the minimization, and controlling and laboratory management (**K2**).
2.0 Skills	
2.1	To differentiate between protons, neutrons and electrons (**S1**)
2.2	To calculate and balance chemical equations (**S1**).
2.3	To interpret the ideal gases laws and illustrate chemical calculations (**S1, S3**).
2.4	To demonstrate ability to do oral communication and technical writing skills through writing and oral presentation of mini reports, operate electronic mail and Network in communicating with others (**S1, S2, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	To illustrate contribution in teamwork and raise Knowledge during various evaluations, initiatives, and Lab-reports to uphold scientific integrity (**V1, V2**).
3.2	To appraise teamwork, and adapt to the work environment culture as well as link theoretical study with practical reality (**V2**).

3. Learning Resources

Main Textbook(s): Chemistry, Raymond CHANG, Mc Graw Hill, 10thEducation, 2010, ISBN 9780073511092.

Supplementary Materials: Chemistry, Steven S. Zumdahl and Susan A. Zumdahl, Houghton Mifflin, 7thEdition, 2006, ISBN: 061852844X

Laboratory Manual for Principles of General Chemistry, J. A. Beran,, 7th Edition, John Wiley & Sons Inc., 2004.

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

http://highered.mcgrawhill.com/classware/ala.do?isbn=0073048518&alaid=ala_1136810&protected=true&showSelfStudyTree=true

http://www.chem1.com/acad/webtext/virtualtextbook.html

http://www.shodor.org/UNChem/index.html

College of Science

Department: Mathematics and Statistics

MAT 1101 Calculus (1)

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

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

1. Course Description:

This course provides a solid foundation for advanced studies and practical applications in mathematics. Indeed, it introduces essential mathematical concepts, starting with solving linear and quadratic equations, polynomials, and inequalities, along with functions and their domains, ranges, and operations. It covers trigonometric functions and sequences, followed by an exploration of limits and continuity, including limit theorems and asymptotes. The course focuses on differentiation, teaching how to compute derivatives and apply them to concepts like tangent lines and velocity. Finally, students learn to optimize functions, analyze monotonicity, and determine concavity.

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

1.0 Knowledge & Understanding	
1.1	Define key concepts related to linear equations, absolute value inequalities, and polynomial factoring (**K1**)
1.2	Describe the fundamental characteristics of functions, including domain, range, and composition (**K1, K2**).
1.3	Recall the definitions of limits and continuity, and the processes for computing derivatives (**K1**).
2.0 Skills	
2.1	Utilize appropriate integration techniques, including substitution and integration by parts, to effectively solve complex problems involving definite and improper integrals (**S1**)
2.2	Construct graphical representations of functions and curves described by parametric equations, accurately determining arc lengths and surface areas using calculus methods (**S2**).
2.3	Evaluate the convergence of infinite series by applying various convergence tests and effectively communicate the results through written explanations and presentations (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate ethical responsibility by collaborating effectively with peers, fostering a respectful and inclusive learning environment during group activities and projects (**V1**).
3.2	Cultivate self-directed learning by engaging in independent study and reflection, recognizing the importance of personal responsibility in mastering calculus concepts (**V2**).

3. Learning Resources

Main Textbook(s): Calculus, 4th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012. (Main Reference).

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.

Essential Calculus with Application; Richard A. Silverman, Dover Publications, 1989.

Schaum's Outline of Calculus, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.

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	1	0	2	5	None	None	1	English

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

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

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: Biology

BIO 1111 Animal Taxonomy

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1101	None	2	English

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

1. Course Description:

This course has titles which will introduce the basic concepts for all courses of biology in all next educational levels. So, this course shows definition, basic concept and importance of systematics and taxonomy concepts of different conventional and newer aspects in biosystematics, classification of animal kingdom-major and minor phyla and illustrates the evolutionary relationships between different organisms.

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

1.0 Knowledge & Understanding	
1.1	Define where each animal group fits evolutionarily in the animal kingdom (**K1**).
1.2	Outline how changes in animal structure (morphology) to perform his function (**K2**).
2.0 Skills	
2.1	Evaluate the general magnitude of animal evolution over time (**S1**)
2.2	Develop a historical perspective of animals (**S1**).
2.3	Explain how different animal structures and functions are complimentary relationships (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Show ability to communicate effectively with class mates and teaching staff (**S2**).
3.2	Use laboratory instruments and computers (**V3**).
3.3	Analyze biological experiments and use various slides during laboratory classes (**V1, V3**).

3. Learning Resources

Main Textbook(s):

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.
Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. & J.I., Spicer (2002) The Invertebrates: A New Synthesis. III Edition. Blackwell Science.
Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.

Supplementary Materials:

Campbell, N.A. and Reece, J. B. (2008) Biology 8th edition, Pearson Benjamin Cummings, San Francisco.
Griffiths, A.J.F et al (2008) Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. NY.
Raven, P.H et al (2006) Biology 7th edition Tata mcgrawhill Publications, New Delhi.

Online Resources / Software: Learning Management System (Blackboard).
http://www.occc.edu/biologylabs/documents/Zoology/General_Zoology.htm
http://www.smccd.net/accounts/bucher/zoo.html
http://fr.slideshare.net/bayenMD/introduction-to-general-zoology
http://www.occc.edu/biologylabs/documents/Zoology/General_Zoology.htm
http://www.smccd.net/accounts/bucher/zoo.html
http://fr.slideshare.net/bayenMD/introduction-to-general-zoology

College of Science

Department: Biology

BIO 1113 Cell Biology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1101	None	2	English

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

1. Course Description:

Cell Biology is an essential foundational course that explores the structural and functional organization of cells, which are the basic building blocks of life. This course is designed to introduce students to the fundamental principles of cellular biology, including the composition, behavior, and interactions of cells, as well as their significance in maintaining life processes.

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

1.0 Knowledge & Understanding	
1.1	Name the components of the cell and understanding the cell functions (**K1, K2**).
1.2	Describe the structure of cell membranes (**K1, K2**).
2.0 Skills	
2.1	Explain the intracellular mechanism of signaling pathways and describe how a cell communicate with other cells (**S1**)
2.2	Summarize the fundamentals of gene expression and describe how gene expression is regulated at the protein level (**S1, S2**).
2.3	Explain all the major organelles in eukaryotic cells and their respective major functions (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Show ability to communicate effectively with class mates and teaching staff (**V1**, **V2**).
3.2	Use laboratory instruments and computers (**V3**).
3.3	Analyze biological experiments and use various slides during laboratory classes (**V2, V3**).

3. Learning Resources

Main Textbook(s):

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. Freeman and Company, (2003). ISBN: 9780716743668.

Supplementary Materials:

http://legacy.saylor.org/bio301/Intro/

http://ocw.mit.edu/courses/biology/7-06-cell-biology-spring-2007/syllabus/

http://extension.berkeley.edu/search/publicCourseSearchDetails.do?method=load&courseId=41571

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

College of Science

Department: Biology

BIO 1121 Plant Taxonomy

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	2	0	10	BIO 1101	None	2	English

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

1. Course Description:

This course has titles which will introduce the basic species concepts. So, this course involves classification philosophies in wild and cultivated plants, how are plants named, study of apparent taxonomic units: total vegetative and total floral, characteristics of common plant families, monocot families and eudicots families.

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

1.0 Knowledge & Understanding	
1.1	Recognize introduction addresses in taxonomy, its importance, its applications, the basic rules of classification (**K1**).
1.2	List scientific and taxonomic keys naming, recent trends in the science of taxonomy (**K1, K2**).
2.0 Skills	
2.1	Explain and identify the relationship between cause and consequence in the different mechanisms of taxonomy (**S1**)
2.2	Analyze data and information and view discussion of sound scientific debate (**S1, S2**).
2.3	Predict incidental problems which they face and provide appropriate solutions (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Appraise collaborative work skill (**V1**).
3.2	Illustrate linking between science and technology with society (**V1, V3**).
3.3	Demonstrate the operation and use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Janick J., 2003. Horticultural Reviews: Volume 28, John Wiley & Sons. ISBN: 978-0-471-21542-4.
Harris, J.G. and Harris M.W., 2001. Plant identification terminology: an illustrated glossary, 2nd edition. Spring Lake Pub., Spring Lake UT. ISBN-10: 0964022168.
Pandey S. N. et al., 2001. A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany Paperback. ISBN-10: 8121904048.
Sivarajan V.V., 1991. Introduction to the Principles of Plant Taxonomy Cambridge University Press, Second Edition. ISBN-13: 978-0521356794.

Supplementary Materials:

C. Jeffery (2007): An Introduction to Plant Taxonomy. Cambridge University Press, Second Edition.
Pandey (2004): Practical botany volume I and II by B.P.
Whitson, T.D. (2006): Weeds of the west, 9th edition. Diane Pub Co. ISBN-10: 0756711827.
Fahn A. (1990). Plant Anatomy.4th. Edit. Pergamon press, Oxford.

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

College of Science

Department: Physics

PHY 1101 General Physics (1)

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 Biology

1. Course Description:

This course covers topics like kinematics and the study of work and energy and. Students will gain with a deep understanding of these concepts and topics. A laboratory portion of this course will provide hands-on experience with these topics.

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

1.0 Knowledge & Understanding	
1.1	Describe the concepts and principles in introductory dynamics in one and two dimensions (**K1, K2**).
1.2	Outline physical phenomena using Newton's laws of motion (**K1, K2**).
1.3	Describe physical phenomena using energy and work concepts (**K1, K2**).
2.0 Skills	
2.1	Explain and summarize the basic knowledge gained from studying mechanics (**S1, S2**).
2.2	Explain and summarize the basic knowledge gained from studying mechanics (**S1, S2**).
2.3	Develop the students ability to solve and analyze problems in physics related the topics covered by the course (**S2, S3**).
2.4	Explain and use information from the output of experiment to draw conclusions (**S2, S3**).
2.5	Summarize conclusions and write reports (**S2, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently (**V1, V2, V3**).

3. Learning Resources

Main Textbook(s):

Serway R.A. and Jewett J.W., Physics for Scientists and Engineers with Modern Physics,9th Edition, Brooks/Cole, Belmont, CA, USA (2014).

Supplementary Materials:

Halliday D. and Resnick R., Physics, 9thEdition, John Wiley and sons (2011).

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	1	0	2	5	None	None	2	English

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

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

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

BIO 1231 Genetics

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1113	None	3	English

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

1. Course Description:

This course covers principles of prokaryotic and eukaryotic cell genetics. Emphasis is placed on the molecular basis of heredity, chromosome structure, patterns of Mendelian and non-Mendelian inheritance, evolution, and biotechnological applications. Upon completion, students should be able to recognize and describe genetic phenomena and demonstrate knowledge of important genetic principles.

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

1.0 Knowledge & Understanding	
1.1	Define the mechanisms by which genetic information is transmitted to new cells in the process of cell division and gamete formation (**K1**).
1.2	Describe the molecular mechanisms by which genetic information is transmitted (**K2**).
2.0 Skills	
2.1	Explain the major extensions and modifications of Mendel's principles of heredity (**S1**)
2.2	Differentiate particularities of bacterial and viral genetics (**S1**).
2.3	Justify how gene pool of a population shapes it and changes with time (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Use computer programs for analyzing and processing the experimental data (**V1**).
3.2	Use laboratory instruments and computers (**V3**).
3.3	Analyze biological experiments and use various slides during laboratory classes (**V2**, **V3**).

3. Learning Resources

Main Textbook(s):

Hartl, D L (2011): Essential Genetics, A Genomics Perspective. 5th edition. Sudbury, MA: Jones and Bartlett Publishers. ISBN: 978-0-7637-7364-9 / 0-7637-7364-6

Robert j.Brooker- Gentics ,(2008): analysis and principles , edition 3. ISBN 13:9780077229726.

Griffiths, Anthony J. F., Jeffrey H. Miller, David T. Suzuki, Richard C. Lewontin, and William M. Gelbart (2000): An Introduction to Genetic Analysis. 7th ed. New York: W. H. Freeman, ISBN: 9780716735205.

Supplementary Materials:

http://ocw.mit.edu/courses/biology/7-06-cell-biology-spring-2007/syllabus

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

http://ocw.mit.edu/courses/biology/7-03-genetics-fall-2004/index.htm

http://ocw.mit.edu/courses/biology/7-03-genetics-fall-2004/lecture-notes/

College of Science

Department: Biology

BIO 1237 Biochemistry

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1101 and CHM 1101	None	3	English

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

1. Course Description:

This course offers an overview of the chemical processes that drive biological systems. It also explores the basic principles of biochemistry and develops the student's appreciation and understanding of biological networks. In addition, it focuses on the understanding of biochemical processes in the context of chemical principles; and the importance of research design and application in the investigation of questions in biochemistry.

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

1.0 Knowledge & Understanding	
1.1	Describe the structure, biochemical properties, biological role, anabolism and catabolism of the cellular macromolecules, including carbohydrates, proteins, lipids, enzymes, vitamins, and nucleic acids (**K1**).
1.2	Outline the biochemical reactions and bioenergetics of the major macromolecules' metabolic pathways, their interrelationships, and how they are controlled (**K1**, **K2**).
2.0 Skills	
2.1	Analyze the different macromolecules in natural/synthetic samples using macromolecule-specific qualitative tests (**S1**)
2.2	Estimate the concentration of a macromolecule candidate in biological samples using quantitative assays (**S1, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Assemble and summarize information from a variety of sources (textbooks, research papers and review articles), and use information technology to prepare, process and present information (**V2**).
3.2	Compose and show ideas effectively both orally and in writing (**V1**, **V3**).
3.3	Perform independently and as a member of a team (**V3**).

3. Learning Resources

Main Textbook(s):

Kyle Kirkland, Anne Wanjie (2014). The Basics of Biochemistry (Core Concepts), Rosen Pub Group.

Supplementary Materials:

Michael A. Lieberman, Rick Ricer (2009). Lippincott's Illustrated Q&A Review of Biochemistry, 1st Edition, Lippincott Williams & Wilkins.

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

College of Science

Department: Biology

BIO 1241 General Microbiology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1101	None	3	English

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

1. Course Description:

This course covers principles of microbiology with emphasis on microorganisms and human disease. Topics include an overview of microbiology and identification and control of pathogens, disease transmission, host resistance, and immunity.

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

1.0 Knowledge & Understanding	
1.1	Name microorganisms and classify them (**K1**, **K2**).
1.2	Recall chemical principals and list microbial metabolism and growth (**K1**, **K2**).
2.0 Skills	
2.1	Analyze the properties of microorganisms in terms of cellular anatomy and physiology (**S1**)
2.2	Evaluate how physical and chemical methods can be used to control microbial growth (**S1, S2**).
2.3	Explain how the human body interacts with various microorganisms through symbiotic relationships and host defenses (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Illustrate the application of microbiology concepts to current issues in human health and infectious diseases (**V1**).
3.2	Use safety measures and operate laboratory instruments during laboratory sessions (**V3**).
3.3	Analyze microbiological experiments and use various slides and technics during laboratory classes (**V3**).

3. Learning Resources

Main Textbook(s):

Tortora, Funke, Case: Microbiology – An Introduction; Pearson (Benjamin Cummings 11e). 12 ed, (2015). ISBN-13: 978-0321929150.

Brock's Biology of Microorganisms. (2012). Madigan, M., J.M. Martinko, D.A. Stahl and D.P. Clark. 13th edition. [Benjamin Cummings, Boston, MA).

Microbiology Laboratory, New York City College of Technology. McGraw Hill Publishing.(2013). ISBN 13: 9781121951501.

Supplementary Materials:

http://ocw.mit.edu/courses/biology/7-06-cell-biology-spring-2007/syllabus

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

http://www.csus.edu/indiv/t/telleena/biol440/http://ocw.mit.edu/courses/biology/7-06-cell-biology-spring-2007/syllabus/

http://www.sci.sdsu.edu/bioadvise/syllabi/Bio350_S10.pdf

http://www.csus.edu/indiv/t/telleena/biol440/

http://www.washington.edu/students/crscat/microbio.html

College of Science

Department: Biology

BIO 1251 Ecology and Biodiversity

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1121	None	3	English

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

1. Course Description:

This course describes the nature and diversity of life, from microorganisms and fungi to plants and animals.

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

1.0 Knowledge & Understanding	
1.1	Define the processes that lead to biodiversity and the nature and characteristics of global biodiversity (**K1**).
1.2	Describe the molecular and structural unity of life (**K2**).
2.0 Skills	
2.1	Predict whether populations of interacting organisms persist over time or become extinct (**S1, S3**)
2.2	Explain how the diversity of living things is generated and perpetuated (**S1, S2**).
2.3	Explain how interactions with the physical environment and with other organisms are involved in ecological and evolutionary change of populations (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Use quantitative models and data to solve problems in evolution and ecology (**S2, V1**).
3.2	Use laboratory instruments and computers (**V3**).
3.3	Analyze biological experiments and use various slides during laboratory classes (**V3**).

3. Learning Resources

Main Textbook(s):

Smith, R. L. and Smith, T. M. Elements of Ecology 9 th edition Pearson Education(2014). ISBN13: 978-0321934185.
M.J., S. Jennings, M. Attrill, Marine Ecology: Progresses, Systems, and Impacts. 2nd. ed., Oxford Univ.Press, London (2011). ISBN-13: 978-0199227020.
Kalff, J. 2002. Limnology. Pearson Education, Prentice Hall. 2nd. ed., (2011) ISBN-13: 9780130337757.

Supplementary Materials:

http://podolskyr.people.cofc.edu//biol211/lectures.htm

Online Resources / Software: Learning Management System (Blackboard).
http://www.usc.edu.au/learn/courses-and-programs/courses/course-library/sci/sci102biodiversity-and-ecology
http://podolskyr.people.cofc.edu//biol211/

College of Science

Department: Mathematics and Statistics

STA 1217 Biostatistics

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

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

1. Course Description:

This course describes the most important ideas, practical results, and examples of Descriptive Statistics, Probabilities and Distributions, Estimation, Hypothesis Testing, Inferences, Correlation and Regression, and Multinomial Experiments. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned.

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

1.0 Knowledge & Understanding	
1.1	Identify several techniques of counting and calculus (series, integrals…) to calculate probabilities, mean, and variance. (**K1, K2**).
1.2	Describe different sampling experiments, sampling distribution, confidence interval, and hypothesis testing. (**K1, K2**).
2.0 Skills	
2.1	Use techniques of problem solving (**S3**)
2.2	Draw graphs of data using descriptive statistics (**S3**).
2.3	State, clearly and precisely, both orally and in writing, correlation and regression technique (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Generate initiatives independently (**V1, V2**).
3.2	Develop personal values and attributes such as honesty, empathy and respect for others (**V1, V2**).

3. Learning Resources

Main Textbook(s):

Biostatistics for Biological and Health Sciences, M.M. Triola & M.F. Triola, Pearson, 2006. ISBN-10: 0321194365 ISBN-13: 9780321194367

Supplementary Materials:

Biostatistical Analysis, 5th Edition, Jerrold H. Zar, PearsonEducation. Inc., 2010. ISBN-10: 0131008463, ISBN-13:9780131008465

The Analysis of Biological Data, M.C. Whitlock, D.Schluter, Roberts & Company Publishers, 2015. ISBN:9781936221486.

Intuitive Biostatistics, 3rd Edition, Oxford UniversityPress, Harvey J. Motulsky, 2013. ISBN13: 978-0199946648, ISBN10: 0199946647.

Basic Biostatistics: Statistics for Public Health Practice, 2ndEdition, B. Burt Gerstman, Jones & Barlett Learning, 2015. ISBN-13: 9781284036015.

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

College of Science

Department: Biology

BIO 1212 Immunology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1113	None	4	English

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

1. Course Description:

This course introduces the principles knowledge of the immune system at both the molecular and cellular levels. Specifically, it aims to familiarize students with the components of the human immune system and the mechanisms involved in recognizing and eliminating pathogens. The course also focuses on innate and adaptive immunity, signaling molecules and the complement system. Additionally, immunological disorders including the immune system's role in allergic reactions, autoimmune, as well as immunodeficiency also emphasized to enable the students to get acquainted. The lectures are complemented by laboratory that integrates widely used immunology tools.

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

1.0 Knowledge & Understanding	
1.1	Name the components of the immune system and their role in immunity (**K1**).
1.2	List the difference between innate and adaptive immunity. Cell vs humoral mediated immune response (**K1**, **K2**).
1.3	Recognize the types and structure of both antigens and antibodies (**K1**, **K2**).
1.4	Describe the immunological issue in the context of allergy, autoimmune, immunodeficiency diseases (**K1**, **K2**).
2.0 Skills	
2.1	Explain how T-cells aid in eliminating pathogens from the body (**S1**)
2.2	Summarize the role of B-cells and T-cells in the specific immune system (**S1, S2**).
2.3	Analyze the mechanisms that lead to the removal of pathogens, such as opsonization, complement activation, and other relevant processes (**S1, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate proper immunological laboratory involving microscopy and biochemical techniques (**V1**).
3.2	Illustrate the ability to communicate their ideas with the instructor at all times during and after the class (**V1, V2**).
3.3	Use safety measures and operate laboratory instruments during laboratory sessions (**V3**).

3. Learning Resources

Main Textbook(s):

Judith A Owen; Janis Kuby; Jenni Punt; Sharon A Stranford Pat Jones, Kuby Immunology 8th ed, (2018), ISBN-13: 978-1429219198.

The Immune System (TIS), 3rd edition, Peter Parham (2005), ISBN 978-0-8153-4146-8.

Supplementary Materials:

Murphy, K. M., and Weaver, C. (2016) Janeway's Immunobiology, 9th Edition, W. W. Norton & Company, ISBN 978-0815345053.

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

College of Science

Department: Biology

BIO 1218 Microtechniques

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	1	4	0	7.5	BIO 1101	None	4	English

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

1. Course Description:

This course deals with the microscopic study of different tissues and the tissue organization of organs in relation to their function using light and electron microscopy. Tissue preparation for microscopic study, histochemistry, stains and stain technology are also studied. Theoretical principle and investigative experimental activities are incorporated into this course.

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

1.0 Knowledge & Understanding	
1.1	Describe the structure of normal animal cell and its inclusions (**K1**).
1.2	Define the functions of all cellular components (**K1**).
2.0 Skills	
2.1	Summarize methods of preparation of whole mounts, smears, permanent section, and paraffin embedding and sectioning using microtomes (**S1**)
2.2	Differentiate between the different cellular organelles (**S1**).
2.3	Predict the abnormal ultrastructure of the organelles under different treatments (**S1**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate ability to communicate with people based on different biological techniques used in biology (**S2, V1**).
3.2	Use laboratory instruments and computers (**V3**).
3.3	Use biological experiments and use various slides during laboratory classes (**V3**).

3. Learning Resources

Main Textbook(s):

https://sites.google.com/a/koyauniversity.org/mit6115/description

Supplementary Materials:

http://ac.els-cdn.com/0026265X71900816/1-s2.0-0026265X71900816-main.pdf.

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

https://sites.google.com/a/koyauniversity.org/mit6115/home

http://microscopy.berkeley.edu/courses/microtech/

https://www.ee.washington.edu/research/microtech/Courses.htm

College of Science

Department: Biology

BIO 1232 Molecular Biology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1231	None	4	English

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

1. Course Description:

This course deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It offers a detailed analysis of the biological systems at the molecular level in prokaryotic and eukaryotic organisms. It focuses on the structure, function and metabolism of nucleic acids. Topics include nucleic acids structure and function, DNA structure and replication, RNA transcription and processing, as well as translation. It provides students with an appreciation of the experimental approaches used in molecular biology.

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

1.0 Knowledge & Understanding	
1.1	Describe the basic molecular structure and function of nucleic acids and proteins (**K1, K2**).
1.2	Outline the mechanisms of DNA replication, repair, transcription, gene regulation, RNA processing and translation in prokaryotes & eukaryotes (**K2**).
2.0 Skills	
2.1	Analyze and contrast flow of genetic information and regulation of gene expression in both prokaryotes and eukaryotes (**S1**)
2.2	Plan and use standard molecular biology techniques to isolate, purify and analyze nucleic acids and proteins (**S1, S3**).
2.3	Analyze and interpret molecular biology data using standard molecular tools (**S1**).
3.0 Values, Autonomy & Responsibility	
3.1	Assemble and summarize information from a variety of sources (textbooks, research papers and review articles), and use information technology to prepare, process and present information (**S2, V1**).
3.2	Compose and show ideas effectively both orally and in writing (**V2**).
3.3	Perform independently and as a member of a team (**V3**).

3. Learning Resources

Main Textbook(s):

Victor A. Bloomfield, Donald M. Crothers, Ignacio Tinoco, John E. Hearst, David E. Wemmer, Peter A. Killman, Douglas H. Turner (2000). Nucleic Acids: Structures, Properties, and Functions, 1st Edition, University Science Books.

James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick (2013). Molecular Biology of the Gene, 7th Edition, Pearson.

Supplementary Materials:

Robert F. Weaver. (2011) Molecular Biology, 5th Edition, McGraw-Hill Education.

Michael M. Cox, Jennifer Doudna, Michael O'Donnell. (2015) Molecular Biology: Principles and Practice, 2nd Edition, W. H. Freeman.

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

Web-based Molecular Biology Tools

College of Science

Department: Biology

BIO 1242 Bacteriology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1241	None	4	English

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

1. Course Description:

This course covers the fundamental principles related to bacteria mainly of bacterial organization importance and their interaction with host cells and molecular events during their replication.

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

1.0 Knowledge & Understanding	
1.1	List the general characteristics of bacteria and how to study them and to define the growth, metabolism and genetics of bacteria (**K1**).
1.2	State how specific bacterial pathogens, interact with their host to cause disease (**K1, K2**).
2.0 Skills	
2.1	Develop a knowledge base of principles of microbial taxonomy, structure, physiology and function (**S1**)
2.2	Prepare the laboratory to diagnose infections, including appropriate specimen collection and test ordering (**S2, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Illustrate the ability to communicate their ideas with the instructor at all times during and after the class (**S2, V1**).
3.2	Use laboratory instruments and computers (**V3**).
3.3	Demonstrate the different types of microorganisms (**S2, V1**).

3. Learning Resources

Main Textbook(s):

Salle A. J. (2007): Fundamental Principles of Bacteriology, Even press, ISBN10: 1406707376, ISBN-13: 978-1406707373.

Ted R. (2015): Johnson. Laboratory Experiments in Microbiology 11th ed., ISBN-13: 9780321994936.

Supplementary Materials:

https://legacy.saylor.org/bio407/Intro/

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

https://archive.org/details/fundamentalprinc029784mbp

College of Science

Department: Biology

BIO 1252 Environmental Impact Assessment

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1251	None	4	English

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

1. Course Description:

This course describes the principles, processes, and necessary techniques for environmental impact assessment.

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

1.0 Knowledge & Understanding	
1.1	Define principle of environmental impact assessment (**K1, K2**).
1.2	Recognize processes of environmental impact assessment (**K1, K2**).
2.0 Skills	
2.1	Contrast theoretical of each resource dimension to the environmental impact assessment (**S3**)
2.2	Develop analytical thinking (**S1**).
2.3	Interpret integrated knowledge to enhance skills on environmental impact assessment (**S2, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show ability to work in a team and solve the problem regarding the environmental issues (**S1**, **S2, V1**).
3.2	Illustrate the principle and result of assessment on environmental impact from assignment (**V1, V2**).
3.3	Use laboratory instruments and computers (**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.

Supplementary Materials:

http://www.kryeministri-ks.net/repository/docs/Final_EIA_Veterinary_Laboratory321.pdf
http://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/Appendix%20B.pdf

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

College of Science

Department: Biology

BIO 1314 Animal Physiology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1237	None	5	English

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

1. Course Description:

This course provides the students with the fundamentals of the body systems functions. The course focuses on the physiological concept of body organization starting from the level of atoms and molecules reaching to the full organization of an organism. The various physiological processes of the body are presented along with the coordination between the different organ systems. The processes of homeostasis and the relevant control mechanisms are also introduced.

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

1.0 Knowledge & Understanding	
1.1	Identify the organization levels of the organism (from atoms to full organism), and the structure/ function relationships of the various cells and tissues (**K1**).
1.2	Outline the functions and regulatory mechanisms of the major physiological systems including metabolism, circulatory, respiratory, digestive, urinary, reproductive, muscular, nervous, and endocrine systems (**K2**).
1.3	Explain how two or more organ systems are integrated to accomplish certain physiological functions (**K1, K2**).
1.4	Discuss the significance of homeostasis in maintaining the equilibrium of the internal environment of the body (**K2**).
2.0 Skills	
2.1	Relate the principles of chemistry and physics with physiology concepts to understand the underlying physiological mechanisms (**S1**)
2.2	Design a minor experiment and consequently conduct laboratory experimental work by employing the acquired practical skills and convenient tools (**S1, S2**).
2.3	Analyze and interpret the experimental results by using critical thinking skills, quantitative reasoning, and analytical statistical methods (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Perform the assigned work independently, and cooperate effectively with a work team (**V1**).
3.2	Communicate scientific data clearly through writing formats and oral presentations (**V2**).
3.3	Adhere to the ethical rules related to the activities in the field of physiology (**V3**).

3. Learning Resources

Main Textbook(s):

Moyes and P.M. Schulte. Principles of Animal Physiology 2nd Edit (2013). ISBN: 0-8053-5351-8.

Supplementary Materials:

Richard W. Hill, Gordon A. Wyse, Margaret Anderson, Animal Physiology, 3rd Edit, (2012), ISBN-10: 0878938982.

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

SCHMIDT-NIELSON, K. 1997. Animal Physiology. 5th Edition. Cambridge UP, Cambridge

College of Science

Department: Biology

BIO 1322 Plant Anatomy and Physiology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1251	None	5	English

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

1. Course Description:

The course introduces the students to the principles of plant anatomy and physiology. The topics include the structure of the various types of plant cells, tissues and organs. This course emphasizes the major vital physiological processes and their mechanistic pathways that take place in the diverse plant species. These vital processes encompass photosynthesis and responses to light and stresses, water relations and internal transport, primary and secondary growth, adaptations to different environmental factors, mineral nutrition, regulation of growth and development. In addition, the developmental stages of flowers, fruit, and seeds in relation to their structure and function, senescence and dormancy are emphasized. The life cycle of flowering plants is employed as a model for investigating the principal physiological processes incorporated in the survival, growth, and reproduction of plants. The designed Lab sessions provide the students with in-hand experience and practical skills on the main physiological processes such as photosynthesis, seed germination, and water potential using living plant specimens. The group and lab work and reports emphasize analysis, presentation, and interpretation of physiological data.

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

1.0 Knowledge & Understanding	
1.1	Outline the major anatomical structures and their functions in the higher plants at the level of cells, tissues, and organs (**K1**).
1.2	Recognize the macroscopic characters and the microscopic morphological features of plant tissues (**K2**).
1.3	Describe the various central physiological processes that are vital for growth and reproduction of plants (**K2**).
1.4	Explain the diverse structure-function inter-relationships that enable plants to perform the vital processes and adapt to different environments (**K1**, **K2**).
2.0 Skills	
2.1	Relate and utilize the acquired knowledge of plant anatomy and physiology in the various relevant fields (**S1**)
2.2	Design and conduct research work in the field of plant physiology using the proper tools and techniques (**S2**).
2.3	Analyze and interpret the experimental and field data using the appropriate statistical methods (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate the ability to work independently and cooperate with a team (**V1**).
3.2	Share in the specialized meetings and present the scientific data either orally or in written formats (**V2**).
3.3	Adhere to the ethics and regulations while performing a research work in the field of plant physiology (**V3**).

3. Learning Resources

Main Textbook(s): Taiz L, Zeiger E. Plant Physiology. 5th ed. Sunderland, MA: Sinauer Associates, Inc. Publishers; 2010. ISBN: 978-0-87893-866-7.

Raven PH, Evert RF, Eichhorn SE. Biology of Plants. 8th ed. New York: W.H. Freeman and Company; 2013. ISBN: 978-1-4292-1961-7.

Moore R, Clark WD, Vodopich DS. Botany. 3rd ed. New York: McGraw-Hill Education; 2010. ISBN: 978-0-07-122212-9.

Supplementary Materials: Beck CB. An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2nd ed. Cambridge: Cambridge University Press; 2010. ISBN: 978-0-521-51805-5.

Raven PH, Evert RF, Eichhorn SE. Biology of Plants. 8th ed. New York: W.H. Freeman and Company; 2013. ISBN: 978-1-4292-1961-7.

Mauseth JD. Plant Anatomy: An Applied Approach. Oxford: Blackwell Publishing; 2008. ISBN: 978-1-4051-2679-3.

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

College of Science

Department: Biology

BIO 1343 Parasitology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1111	None	5	English

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

1. Course Description:

This course provides the students with an understanding of the parasitic infections, their significance, and the susceptible hosts. It also covers the host-parasite relationships and emphasizes the biology of parasites, including their classification and morphological features. The coursework covers unicellular protozoal parasites and helminths, with a focus on medically important parasites. By studying the life cycle of parasites, students learn to identify the different developmental stages and modes of transmission. The course also provides an overview of the epidemiology of parasitic infections, including endemic and epidemic diseases, and preventive and control measures. Students will gain specialized knowledge in identifying appropriate clinical specimens and laboratory methods required for diagnosing parasitic infections.

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

1.0 Knowledge & Understanding	
1.1	Outline the major taxonomic groups of the medically important parasites and their characteristic morphologic features (**K1**).
1.2	Explain the various host-parasite relationships, and the parasitic infections responsible for clinical diseases in humans and animals (**K1, K2**).
1.3	Describe the life cycles of the main parasitic groups including protozoal and helminth parasites, and the related appropriate preventative and control measures (**K1, K2**).
1.4	Identify the common transmission modes of parasitic infections, and the proper clinical specimens necessary to establish a laboratory diagnosis (**K1, K2**).
2.0 Skills	
2.1	Employ the proper laboratory methods and techniques to diagnose and differentiate parasitic infections (**S1**)
2.2	Write a short proposal and conduct minor laboratory work to investigate the focused parasites using microscopy and other technical methods (**S2**).
2.3	Interpret the laboratory results using the acquired technical skills, and relate the findings to the corresponding clinical parasitic infections (**S1, S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Perform the assigned work independently in a safe environment and cooperate effectively with a team (**V1**).
3.2	Communicate issues of parasitology clearly, and present the scientific data through oral presentations and written formats (**V2**).
3.3	Adhere to the relevant ethics while working in the field of parasitology (**V2**, **V3**).

3. Learning Resources

Main Textbook(s):

Ruth Leventhal and Russell F. Cheadle (2011) Medical Parasitology. A self-instructional text (6th edition) X. F.A. Davis Co., Philadelphia ISBN: 080362543.

Roberts & Janvy. Foundations of Parasitology, 8th edition, (2008). ISBN-13: 978-0073028279.2015.

Practical guide to diagnostic parasitology (2nd edition) American Society for Microbiology, Washington DC, USA.ISBN: 1555814573.

Supplementary Materials:

Atlas of Human Parasitology (5th edition) ISBN: 0891891676 American Society for Clinical Pathology, Chicago, U.S.A. Lynne S. Garcia (2006).

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

http://whqlibdoc.who.int/publications/9241544104_(part2).pdf

College of Science

Department: Biology

BIO 1353 Entomology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1111	None	5	English

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

1. Course Description:

This course is designed to acquaint students with our dependence on and interaction with insects in today's world. Biology of insects, including evolution and diversity, anatomy and physiology, behavior, ecology, insects as medical and agricultural pests, and insects as beneficial organisms. Laboratory sessions are devoted primarily to the identification of major families of insects, study exterior shape typical insect, anatomy of typical insects to get to know various internal organs, various appendages of body and its modifications and histological examination of the parts of the gastrointestinal tract.

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

1.0 Knowledge & Understanding	
1.1	Define the insect world and their position in the animal kingdom (**K1**).
1.2	Outline the reasons for the spread of insects, general characteristics and morphology of insects (**K1, K2**).
2.0 Skills	
2.1	Reconstruct information about the functions of the organs and arrange them logically and sequentially (**S2**)
2.2	Compare organs of the body and the interpretation of its mechanisms (**S1**).
2.3	Explain and identify the relationship between cause and consequence in the different mechanisms (**S1**).
3.0 Values, Autonomy & Responsibility	
3.1	Appraise the collaborative work and to accept criticism from others (**V1**).
3.2	Illustrate non-verbal understanding and effective cooperation and discussion (**V1, V2**).
3.3	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Rtiplehorn, C. A .and Johnson, N.F. (2005). Borror and DeLong's Introduction to the study of insects.7th Edition. Thomson Brooks / Cole, US.

Chapman. R.F. (1982). The Insects: Structure and function. Cambridge, Massachusettes, Harvard University. Press.

Supplementary Materials:

Howard E. Evans Insect Biology: A Textbook of Entomology ISBN-13: 978-0201119817 ISBN-10: 0201119811.

P. J. Gullan The Insects: An Outline of Entomology 3rd Edition ISBN-13: 978-1405111133 ISBN-10: 1405111135, 2010.

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

http://www.ent.iastate.edu/LIST

http://www.chenowith.k12.or.us/TECH/subject/science/bugs.html

College of Science

Department: Chemistry

CHM 1307 Analytical Analysis

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	3	0	10	CHM 1101	None	5	English

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

1. Course Description:

This course introduces the theory, principles, and practices of quantitative analytical chemistry. The course covers the fundamentals of analytical chemistry: concentration units, statistical data analysis, acids-bases equilibria, introduction to titration and types of titrations.

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

1.0 Knowledge & Understanding	
1.1	Recognize the main principles of analytical chemistry (**K1**)
1.2	State formula related to statistics and the effect of different errors on the analytical results (**K2**).
1.3	List some of the analytical chemistry methods and types of concentration expressions (**K1, K2**).
2.0 Skills	
2.1	Differentiate between the types of statistical errors and predict results obtained from chemical analysis statistically (**S1, S3**)
2.2	Design accurate chemical analysis through accurate preparation of standards and reagents (**S1, S3**).
2.3	Prepare the experimental set-up, Operate different laboratory instruments during laboratory classes and evaluate statistical data to justify analytical measurements. To demonstrate ability to use mail and Network to communicating with others (**K2**, **S2, S3**).
2.4	Appraise oral communication skills by presenting seminars before his class mates and teaching staff, to write reports about real pollution cases in his community and operate electronic mail and Network skills in communicating with others (**S2, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Appraise self-confidence attitudes through single and team work practical sessions, presentations, and discussions. Avoid over consumption of materials and chemicals and keep the lab instruments and equipment clean and safe (**V1, V2,V3**).

3. Learning Resources

Main Textbook(s):

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

Supplementary Materials:

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

Daniel C. Harris. Quantitative Chemical Analysis, 8thedition,2010, W. H. Freeman & Co., New York, ISBN:9781429218153.

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

http://highered.mcgrawhill.com/classware/ala.do?isbn=0073048518&alaid=ala_1136810&protected=true&showSelfStudyTree=true

http://www.chem1.com/acad/webtext/virtualtextbook.html

http://www.shodor.org/UNChem/index.html

College of Science

Department: Biology

BIO 1324 Plant Pathology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1322	None	6	English

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

1. Course Description:

This course provides an introduction to the basic principles of plant pathogens, their interactions with the host plants, and the impact of plant diseases on agricultural activities and ecosystems. The course topics enable the students to explore the causative agents of plant diseases, including the biotic pathogens (fungi, bacteria, viruses, nematodes, and other microorganisms) and abiotic factors (drought, salinity, temperature extremes, and nutrient deficiencies). The course emphasizes identification, diagnosis, and management of the significant plant diseases through diverse integrated approaches, including cultural, chemical, and biological control methods.

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

1.0 Knowledge & Understanding	
1.1	Define the discipline of plant pathology and elucidate its importance to work in the field of agriculture and in ecosystems-related professions (**K1**).
1.2	Classify plant pathogens (fungi, bacteria, viruses, nematodes) and describe their life cycles (**K2**).
1.3	Explain the physiological and biochemical mechanisms integrated in the plant-pathogen interactions (**K2**).
2.0 Skills	
2.1	Diagnose plant diseases caused by biotic and abiotic factors using the proper laboratory techniques (**S1**)
2.2	Apply the integrated pest management (IPM) strategies to control plant diseases (**S2**).
2.3	Analyze and interpret experimental and field data and draw conclusions related to disease management (**S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate responsibility and the ability to be integrated in teamwork and collaborate in laboratory and field activities (**V1**).
3.2	Participate in specialized meetings and communicate the scientific findings effectively through oral presentation and written formats (**V2**).
3.3	Adhere to ethical rules and regulations while performing research work relevant to the field of plant pathology (**V3**).

3. Learning Resources

Main Textbook(s):

Taiz, L., and E. Zeiger. Plant Physiology. 5th ed. Sinauer Associates, Inc. Publishers, Sunderland, MA (2010). ISBN: 978-0-87893-866-7 (casebound). Available at bookstore or online. William G. Introduction to plant physiology. 4 ed., university of weseren.(2008). ISBN 978-0470-24766-2.

Agrios GN. Plant Pathology. 5th ed. Burlington, MA: Academic Press; 2005. ISBN: 978-0-12-044565-3.

Supplementary Materials:

Schumann GL, D'Arcy CJ. Essential Plant Pathology. 2nd ed. St. Paul, MN: American Phytopathological Society (APS Press); 2010. ISBN: 978-0-89054-381-8.

Lucas JA. Plant Pathology and Plant Pathogens. 4th ed. Hoboken, NJ: Wiley-Blackwell; 2020. ISBN: 978-1-119-51199-9.

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

American Phytopathological Society (APS) Education Center

Website: https://www.apsnet.org/edcenter/

Coursera: Plant Pathology Courses

Website: https://www.coursera.org/

College of Science

Department: Biology

BIO 1333 Genetic Engineering & Biotechnology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
4	3	2	0	10	BIO 1231 BIO 1232	None	6	English

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

1. Course Description:

This course provides the basic necessary knowledge of genetic engineering and biotechnology principles, techniques, and applications. The course topics covers recombinant DNA technology, cloning strategies, gene expression systems, genome editing. The course content also emphasizes the biotechnological applications in the fields of medicine, agriculture, and industry. The offered practical sessions reinforce the theoretical concepts by the mean of hands-on experience in the aforementioned techniques.

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

1.0 Knowledge & Understanding	
1.1	Explain the fundamental principles of genetic engineering and biotechnology, including recombinant DNA technology, cloning, and gene expression systems (**K1, K2**).
1.2	Describe the genome editing techniques such as CRISPR-Cas9 and their applications in medicine, agriculture, and industry (**K1, K2**).
1.3	Identify the key industrial biotechnological processes, including enzyme production and fermentation technology (**K2**).
2.0 Skills	
2.1	Perform the basic molecular biology techniques, including DNA extraction, PCR, and bacterial transformation (**S1**)
2.2	Design and optimize the cloning strategies using appropriate vectors and host systems (**S2**).
2.3	Employ the critical thinking and skills to Troubleshoot and solve the technical problems encountered during conducting lab work related to genetic engineering and biotechnology (**S2, S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Show independency to accomplish the assigned tasks and cooperate effectively in multidisciplinary teams (**V1**).
3.2	Share in the discussion of genetic engineering and biotechnology issues and communicate scientific data professionally as oral presentation and written format (**V2**).
3.3	Demonstrate ethical responsibility in genetic engineering practices, including the biosafety and regulatory compliance (**V3**).

3. Learning Resources

Main Textbook(s):

Nicholl, D. S. T. (2023). An Introduction to Genetic Engineering (4th ed.). Cambridge University Press.

Glick, B. R., Pasternak, J. J., & Patten, C. L. (2017). Molecular Biotechnology: Principles and Applications of Recombinant DNA (5th ed.). ASM Press. ISBN: 978-1-55581-968-2.

Supplementary Materials:

Brown, T. A. (2020). Gene Cloning and DNA Analysis: An Introduction (8th ed.). Wiley-Blackwell. ISBN: 978-1-119-64957-4.

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

College of Science

Department: Biology

BIO 1345 Virology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1241	None	6	English

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

1. Course Description:

Viruses have been shown to infect all forms of life, and this course provides the fundamental background for studying the way in which viruses interact with their hosts. Surprisingly, these interactions may be beneficial as well as deleterious. The course will cover both sides of this dynamic interplay including virus disease in humans, animals and plants as well as molecular aspects of the nature of viruses, their evolution, replication, applications in genetic engineering and gene therapy, detection and control by both vaccines and antiviral strategies. The course will familiarize students with practical skills relevant to the isolation, purification and characterization of animal and plant viruses. These include tissue culture techniques and virus growth, as well as molecular aspects of the detection and study of viral genes and expressed proteins, and the application of virus vectors in cell biology and biotechnology.

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

1.0 Knowledge & Understanding	
1.1	Define the Introduction, structure and methods of multiplication of viruses (**K1, K2**).
1.2	Outline the virus classification, transmission and spread of viruses in host (**K1, K2**).
2.0 Skills	
2.1	Reconstruct information about the functions of the organs and arrange them logically and sequentially (**S2**)
2.2	Explain and identify the relationship between cause and consequence in the different mechanisms (**S1**).
2.3	Analyze data and information and view discussion of sound scientific debate (**S2**).
3.0 Values, Autonomy & Responsibility	
3.1	Write reports and preparation of presentations and the preparation of graphics and models by using technology (**V1, V2**).
3.2	Use of computers and means of modern technology (**V2, V3**).
3.3	Appraise the collaborative work skills (**V1**).

3. Learning Resources

Main Textbook(s):

Flint et al. Principles of virology .3rd eds.2008, ISBN: 13: 9781555814434

Supplementary Materials:

Alan J. Cann Principles of Molecular Virology, 6th Edition (2015). ISBN-13: 978-0128019467.

John Carter, Virology: Principles and applications, (2014) ,2nd ed. ISBN: 13: 97811999142.

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

College of Science

Department: Biology

BIO 1415 Embryology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1314	None	7	English

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

1. Course Description:

This course is designed to provide students with a foundation in human embryonic and fetal development from fertilization to birth. This course focuses on the morphological changes that take place during development. Underlying molecular mechanisms and relevant congenital anomalies may be briefly considered.

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

1.0 Knowledge & Understanding	
1.1	Describe human development and organogenesis (**K1**).
1.2	Define stem cell biology and regeneration, and how major congenital birth abnormalities arise (**K1, K2**).
2.0 Skills	
2.1	Apply basic practical laboratory skills and work with embryo (**S1**, **S2**)
2.2	Summarize regeneration models, annotate embryonic structures (**S1**, **S2**)
2.3	Explain developmental and regenerative stages (**S1**, **S2**)
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate critical thinking and problem-solving skills in diverse contexts (**S2, V1**).
3.2	Show ability to communicate effectively with class mates and teaching staff (**V3**).
3.3	Appraise team work and management of resources and time (**V2, V3**).

3. Learning Resources

Main Textbook(s):

Scott. F. Gilbert Developmental Biology, 10th ed, (2013). ISBN-13: 978-0878939787.

Bruce M. Carlson MD PhD .Human Embryology and Developmental Biology: With Student Consult Online Access, 5e 5th Edition,(2013). ISBN-13: 978-1455727940

Pankaj Talwar Manual of Assisted Reproductive Technologies and Clinical Embryology (2012). ISBN-13: 978-9350255063.

Laboratory Manual: Schoenwolf, G. C. 1995. Laboratory Studies of Vertebrate and Invertebrate Embryos. 7th ed. Prentice Hall. ISBN 0-02-407602-3.

Supplementary Materials:

Essentials of Domestic Animal Embryology by Poul Hyttel et al. (Dec 6, 2009) Published: SEP-2009 ISBN 10: 0-7020-2899-1, ISBN 13: 978-0-7020-2899-1.

Atlas of Descriptive Embryology (Book Review), a Descriptive Embryology Atlas by Gary Schoenwolf and Willis Mathews.2008.

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

College of Science

Department: Biology

BIO 1434 Bioinformatics

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	0	2	5	STA 1217	None	7	English

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

1. Course Description:

Bioinformatics is an interdisciplinary field that develops methods and software tools for understanding biological data. As an interdisciplinary field of science, bioinformatics combines computer science, statistics, mathematics, and engineering to analyze and interpret biological data. The course is designed to introduce the most important and basic concepts, methods, and tools used in Bioinformatics. Topics include (but not limited to) bioinformatics databases, sequence and structure alignment, protein structure prediction, protein folding, protein-protein interaction. Emphasis will be put on the understanding and utilization of these concepts and algorithms. The objective is to help the students to reach rapidly the frontier of bioinformatics and be able to use the bioinformatics tools to solve the problems on their own research.

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

1.0 Knowledge & Understanding	
1.1	Recognize the study of biological sequences data (**K1**).
1.2	Describe the analysis of Similar DNA sequences (**K1, K2**).
2.0 Skills	
2.1	Analyze the biological sequences data (**S1**)
2.2	Analyze and compare methods and topics related to microorganisms (**S1**, **S2**)
2.3	Analyze and compare methods and topics related to bioinformatics for plants and animals (**S1**, **S2**)
3.0 Values, Autonomy & Responsibility	
3.1	Appraise collaborative work skills (**V1, V2**).
3.2	Appraise understanding the views of the other aspects of the temporal, spatial and personality (**V1, V2**).
3.3	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Marketa Zvelebil Jeremy Baum Understanding Bioinformatics, Publisher: Garland Science; 1 edition (August 29, 2007), ISBN-10: 0815340249.

Teresa Attwood, David Parry-Smith Hal Introduction to Bioinformatics Paperback, 240 pages; March 8, 1999, 1st edition; Prentice. ISBN: 0582327881.

Supplementary Materials:

Pavel pevezer, Bioinformatics for biologists.1th ed. 2011.ISBN: 13: 978-1107648876.

Cynthia Gibas and Per Jambeck. Developing Bioinformatics Computer Skills, (2001).

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

NCBI, EMBL, UCSC

College of Science

Department: Biology

BIO 1454 Microbial Pollution

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
3	2	2	0	7.5	BIO 1242 and BIO 1345	None	7	English

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

1. Course Description:

This course is introduces microbial processes of environmental and geochemical significance and provide detailed information on the most up to date methods used to study the diversity and activity of micro-organisms in their natural habitats. A survey of modern micro-organisms and their activities of environmental and geochemical importance is an important foundation for the module as is the way that metabolic processes catalyzed by microorganisms are related to major elemental cycles, biogeochemical processes and contamination.

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

1.0 Knowledge & Understanding	
1.1	Describe the contamination with microorganisms in the environment (water, air, soil) (**K2**).
1.2	Recognize treatment for contaminated soil, water, or air (**K1**).
2.0 Skills	
2.1	Analyze the information about the general pathogenic microbial features (**S1**)
2.2	Design and conduct microbial contamination experiments (**S1**)
2.3	Evaluate the results of the experiments through the development of standards and criteria for evaluation (**S1**)
3.0 Values, Autonomy & Responsibility	
3.1	Appraise team work skills and participation in scientific groups (**S2, V1**).
3.2	Write reports, preparation of presentations, graphics, and models (**V2**).
3.3	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Ross E .Mckinney, Environmental Pollution Control Microbiology. A Fifty-Year Perspective, (2004). ISBN 9780824754938.

Tulasi Satyanarayana, Micro-orgaanisms in Environmental management: Microbes and Environment (2012) ISBN-13: 978-9400722286.

Supplementary Materials: None.

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

College of Science

Department: Biology

BIO 1455 Animal Behavior

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1252	None	7	English

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

1. Course Description:

This course focuses on the study of the mechanistic and evolutionary causes of animal behavior, including communication, foraging and anti-predator behavior, spatial behavior, mating behavior, parental care, and social behaviors.

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

1.0 Knowledge & Understanding	
1.1	Describe concepts of animal behavior (**K1**).
1.2	List the mechanisms involved in the production of a behavioral sequence by an animal (**K1, K2**).
2.0 Skills	
2.1	Explain patterns of behavior of animals (**S1**)
2.2	Summarize the relationship between the cause and the effect of an animal behavior (**S1, S2**)
2.3	Analyze animals' behavior (**S3**)
3.0 Values, Autonomy & Responsibility	
3.1	Appraise working within the group to reach the desired result (**V1**).
3.2	Write reports and preparation of presentations, graphics, and models (**V1**, **V2**).
3.3	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Shawn E.Nordell and Thomas J. Valone(2013) : AnimalBehavior; Concepts, Methods, Applications,1e.OxfordUniversity Press.

Drickamer, Lee C., Stephen H. Vessey, and Elizabeth Jakob. 2002. Animal Behavior: Mechanisms, Ecology, and Evolution. Fifth edition. McGraw-Hill Publishers. ISBN 9780070121997.

Supplementary Materials:

Brown R, Payne A, Graham KK and Starks PT. 2012. Preycapture and caste-specific payloadcapacities in the European paper wasp Polistes dominulus.Insectes Sociaux. 59: 519-525.

Chadwick V. Tillberg, Michael D. Breed, and Sarah J. Hinners (2007) : Field and Laboratory Exercises in Animal Behavior1st edition ,ISBN-13:978-0123725820

Bonnie J. Ploger and Ken Yasukawa (2003):Exploring animal Behavior in laboratory and Field, An Hypothesis-testing Approach to the Development, Causation, Function, and Evolution of Animal behavior 1st edition,ISBN-13978-0125583305.

Chrastil ER, Getz WM, Euler HA and Starks PT. 2006.Paternity Uncertainty Overrides Sex Chromosome Selection for Preferential Grandparenting.Evolution & Human Behavior. 27:206-223.

Dawkins R. (1982) Replicators and vehicles. pp. 45-64 in Current problems in sociobiology, (Kings College Sociobiology Group, ed.) Cambridge Univ. Press.

Online Resources / Software: Learning Management System (Blackboard).
http://www.cbu.edu/~aross/animbeh/Animal_Behavior.htm

College of Science

Department: Biology

BIO 1497 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 Biology

1. Course Description:

Field Training

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

1.0 Knowledge & Understanding	
1.1	Recall the knowledge pertaining to the professional career context before graduation. (K1).
1.2	Explain the theories relevant to biology and recognize the comprehensive knowledge that enhances competitiveness in the labor market (K1).
1.3	Outline the fundamental processes and best practices drawn from modern biology (K2).
2.0 Skills	
2.1	Employ critical thinking and innovative problem-solving skills and construct with other professionals (S1)
2.2	Analyze the data raised from field studies to support the related research work (S2)
2.3	Apply the acquired theoretical knowledge and skills to real-life situations (S3)
3.0 Values, Autonomy & Responsibility	
3.1	Participate in addressing social issues and adhere to relevant ethical guidelines to demonstrate awareness of societal responsibility (V1).
3.2	Demonstrate the ability to engage in lifelong learning and collaborate with peers to make evidence-based decisions (V2).
3.3	Show independence and take responsibility while performing assigned tasks, and collaborate effectively within a team (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

BIO 1499 Research Project

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. Upon specifying the research Project. BIO 1218 STA 1217	None	8	English

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

1. Course Description:

The capstone Research Project in Biology is the culminating course for students in the Bachelor of Science in Biology program. This course provides an opportunity to apply biological methods to tackle real-world problems. Students will select a relevant research topic, conduct a literature review, and develop biological models. They will work closely with faculty advisors to refine their research methodologies and address ethical considerations in data collection and in final written reports. The course concludes with a comprehensive written report and an oral presentation, showcasing students' ability to effectively communicate their findings. This capstone experience prepares students for advanced academic pursuits and equips them with essential skills for careers in biology and related fields.

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

1.0 Knowledge & Understanding	
1.1	Describe the basic concepts and up-to-date technical knowledge of the scientific research in Biology (**K1**).
1.2	List the essential processes and procedures for the investigation in Biology (**K1**).
2.0 Skills	
2.1	Summarize and analyze existing academic literature serving the Biology arguments (**S1**)
2.2	Prepare a research project proposal (**S1**)
2.3	Analyze research project results (**K1**, **S1**)
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to deal with various sources of knowledge (**S3**, **V1**).
3.2	Demonstrate good research project management skills (**S2, S3**, **V2**).
3.3	Demonstrate critical thinking and problem-solving skills in diverse contexts (**S2**, **V1**).

3. Learning Resources

Main Textbook(s): These are detected depending on the nature of the specialty of the research project.
Supplementary Materials: These are detected depending on the nature of the specialty of the research project.
Online Resources / Software: These are detected depending on the nature of the specialty of the research project.

College of Science

Department: Biology

BIO 1417 Hematology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1314	None	6	English

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

1. Course Description:

This course covers the diagnosis and management of blood cell disorders, anatomy and physiology of hematopoiesis, routine specialized hematology tests, analysis, classification, and monitoring of blood cell abnormalities.

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

1.0 Knowledge & Understanding	
1.1	Describe the general components of blood and their functions (**K1**).
1.2	List all diseases related to blood components abnormalities (**K2**).
2.0 Skills	
2.1	Explain the types and mechanisms of anemia (**S1**)
2.2	Summarize the blood coagulation process (**S1**, **S3**)
2.3	Analyze the relationship between blood components and hematological disorders (**S1**, **S3**)
3.0 Values, Autonomy & Responsibility	
3.1	Perform hematological tests (**S2, V1, V2**).
3.2	Use tools, kits, and instruments in diagnosing hematological disorders (**V1, V2**).
3.3	Appraise team work skills (**V3**).

3. Learning Resources

Main Textbook(s):

Essential Haematology' Hoffbrand A.V. Moss P.A.H. & Pettit J.E. 5th Edition, 2007, Blackwell. Publishing
Principles of Laboratory Instruments' Schoef L.E. & Williams R.H. 1993 Mosby - ISBN 08016749-1.

Supplementary Materials:

Dacie and Lewis Practical Haematology' SM Lewis, BJ Bain, I Bates10th Edition, 2012, Churchill Livingstone Elsevier. ISBN 9780702034077
Kandice Kottke-Marchant. Laboratory Hematology Practice 1st Ed (2012).ISBN-13: 978-1405162180

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

College of Science

Department: Biology

BIO 1419 Experimental Embryology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1314	None	6	English

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

1. Course Description:

This course deals with the comparative study in reproduction, gametogenesis, fertilization, cleavage and morphogenesis; development of organ systems in animals.

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

1.0 Knowledge & Understanding	
1.1	Describe experimental embryology and organogenesis (**K1**).
1.2	Recognize stem cell biology and regeneration, and how major congenital birth abnormalities arise (**K2**).
2.0 Skills	
2.1	Explain developmental and regenerative stages (**S1**)
2.2	Summarize regeneration models, annotate embryonic structures (**K2**, **S1**)
3.0 Values, Autonomy & Responsibility	
3.1	Appraise team work and management of resources and time (**S2, V1**).
3.2	Demonstrate critical thinking and problem-solving skills in diverse contexts (**V2**).
3.3	Show ability to communicate effectively with class mates and teaching staff (**V3**).

3. Learning Resources

Main Textbook(s):

Scott. F. Gilbert Developmental Biology, 10th ed, (2013). ISBN-13: 978-0878939787.

Bruce M. Carlson MD PhD .Human Embryology and Developmental Biology: With Student Consult Online Access, 5e 5th Edition,(2013). ISBN-13: 978-1455727940

Pankaj Talwar Manual of Assisted Reproductive Technologies and Clinical Embryology (2012). ISBN-13: 978-9350255063.

Laboratory Manual: Schoenwolf, G. C. 1995. Laboratory Studies of Vertebrate and Invertebrate Embryos. 7th ed. Prentice Hall. ISBN 0-02-407602-3.

Supplementary Materials:

Essentials of Domestic Animal Embryology by Poul Hyttel et al. (Dec 6, 2009) Published: SEP-2009 ISBN 10: 0-7020-2899-1, ISBN 13: 978-0-7020-2899-1.

Atlas of Descriptive Embryology (Book Review), a Descriptive Embryology Atlas by Gary Schoenwolf and Willis Mathews.2008.

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

College of Science

Department: Biology

BIO 1457 Biological control

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1353	None	6	English

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

1. Course Description:

This course covers the ecological principles and applied practices of modern biological control of insects, weeds and plant pathogens; including the history, scope, strengths and weaknesses, scientific basis of biological control, the biology of entomophagous insects, insect pathogens, microbial control, biological control methods, population ecology as it relates to biological control, biological control in integrated pest management, techniques and protocols in implementation of control programs and related topics.

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

1.0 Knowledge & Understanding	
1.1	Outline procedures for biological control of fungal and bacterial pathogens on aerial surfaces (**K1, K2**).
1.2	Describe biological control of soil-borne pathogens (**K1, K2**).
2.0 Skills	
2.1	Compare between biological control by microorganisms and by insects (**S1**, **S3**).
2.2	Analyze how tests with organic extracts are used in biological control (**S1**, **S3**).
2.3	Explain parasites, parasitoids, and predators of insects relevant to biological control (**S1**, **S3**).
3.0 Values, Autonomy & Responsibility	
3.1	Appraise working within the group to reach the desired result (**S2, V1**).
3.2	Write reports and preparation of presentations, graphics, and models (**V2**).
3.3	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Hajek A.E. (2004). Natural Enemies. Cambridge University Press.
Flint M.L. and Driestadt S.H. (1998). Natural Enemies Handbook: The illustrated guide to biological pest control. University of California Division of Agriculture and Natural Resources.
Van Driesche R.G. and Bellows T.S Jr. (1996). Biological Control. Chapman and Hall, New York, New York.
Van den Bosch R., Messenger P. S. and Gutierrez A. P. (1982).An Introduction to Biological Control. Plenum, N.Y.
Bellows T.S. and T.W. Fisher. (1999). Handbook of Biological Control. Academic Press. San Diego.
Debach P. and Rosen Y.D. (1991). Biological control by natural enemies. 2nd. Ed. Cambridge. Univ. Press, Cambridge, N.Y.

Supplementary Materials:

Roy Van Driesche and Thomas S. Bellows Jr.1996. Biological control.
Vincent et al. (2007). Biological Control: A Global Perspective.CAB International.
G. Gurr, S. S. Wratten (eds.) (2000). Biological Control: Measures of Success. Kluwer Academic Publishers. **Online Resources / Software:** Learning Management System (Blackboard).
www.biocontrol.entmology.cornell

College of Science

Department: Biology

BIO 1458 Ecological Physiology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1252	None	6	English

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

1. Course Description:

This course is an exploration of environmental effects on fundamental physiological processes in plants and animals. Abiotic factors such as temperature and water availability interact with biotic forces such as predation, herbivory, and competition to constrain the ability of organisms to survive, grow, and reproduce. Physiological solutions that allow success in one environment may preclude it in another. This course seeks to build up from physiological principles to understand characteristics of populations, communities, and ecosystems.

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

1.0 Knowledge & Understanding	
1.1	Define the major approaches to physiological ecology (**K1**).
1.2	Describe the relevance of physiology to ecology (**K1**, **K2**).
2.0 Skills	
2.1	Describe the basic physiological ecology issues (**K1, S1**, **V1**)
2.2	Explain how individual-level physiology affects and is affected by ecological phenomena across the diversity of life (**S1**)
2.3	Compare how, in the context of evolution, organisms exhibit similarities and differences in their basic physiology (**S1**, **S3**)
3.0 Values, Autonomy & Responsibility	
3.1	Appraise working within the group to reach the desired result (**S2, S3**).
3.2	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Lambers H, Chapin III FS, Pons TL. (2008). Plant Physiological Ecology. Springer-Verlag. ISBN-13: 978-0387783406.
Hill, Wyse, and Anderson, (2012). Animal Physiology, 3rd edition (Sinauer).

Supplementary Materials:

William H. Karasov and Carlos Martinez del Rio. (2007). Physiological Ecology: How Animals Process Energy, Nutrients and Toxins.

Online Resources / Software: Learning Management System (Blackboard).
www.dartmouth.edu/~bio31

College of Science

Department: Biology

BIO 1459 Flora & Fauna of Saudi Arabia

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1251	None	7	English

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

1. Course Description:

This is an introductory course to general kinds of animals' species (marine and terrestrial), their distribution within the Saudi Kingdom. The course will address the climate, geomorphology and their effect on animal life. It will expose students to the multi-disciplinary nature of wild animals, endemic and endangered species. Consideration of biological taxonomic systems and consideration of both vegetative features and reproductive features associated with local flora and fauna.

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

1.0 Knowledge & Understanding	
1.1	List the rare species of plants and animals (**K1**).
1.2	Recognize the types of rare plants and animals that are resident, migratory, exotic and endangered extinction (**K2**).
2.0 Skills	
2.1	Explain how to collect marine fauna, invertebrate species, of Saudi Arabia (**S1**)
2.2	Create the application of conservation of all types of flora and fauna (**S1**, **S3**)
2.3	Differentiate between resident and immigrant birds (**S1**)
3.0 Values, Autonomy & Responsibility	
3.1	Appraise working within the group to reach the desired result (**S1, S2, V1**).
3.2	Write reports and preparation of presentations, graphics, and models (**V2**).
3.3	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

A.M. Megahid, (1989). Flora of Saudi Arabia, King Saud University, Riyadh.
J.P. Mandaville, (1990). Flora of Eastern of S.A., John Wiley & Sons Ltd. England.

Supplementary Materials:

Krupp, F. and Mahnert, V. (eds.) 1987-2004, Fauna of Saudi Arabia, Vols. (9-22), NCWCD, Riyadh, Saudi Arabia.
Buttiker, W. and Krupp, F. (eds.) 1979-1987, Fauna of Saudi Arabia, Vols. (1-8), NCWCD, Jeddah, Saudi Arabia.

Online Resources / Software: Learning Management System (Blackboard).
http://www.splendidarabia.com/kingdom/flowers-of-saudi-arabia/
http://www.saudinf.com/main/a6.htm

College of Science

Department: Biology

BIO 1461 Endocrinology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1314	None	7	English

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

1. Course Description:

This course provides an overview of endocrinology from both an anatomical and physiological view. It discusses synthesis, distribution and regulation of the entire human endocrine system. In addition, contextual examples of these functions through human endocrine disorders are also explored.

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

1.0 Knowledge & Understanding	
1.1	List the basic components of the endocrine system, including hormones and receptors (**K1**).
1.2	Describe how the organization and regulation of the endocrine system determines its function (**K1**, **K2**).
2.0 Skills	
2.1	Compare the physiological endocrine system to the pathological endocrine responses (**K2**, **S1, V1**)
2.2	Develop specific knowledge of select endocrine disorders that illustrate divergent organization or function of the endocrine system (**S1**)
2.3	Integrate knowledge of hormone molecular and cellular mechanisms to current pharmaceutical and biomedical interventions (**S1**)
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate group leadership skills (**S2, S3, V1**).
3.2	Use of computers and means of modern technology (**V3**).

3. Learning Resources

Main Textbook(s):

Basic Medical Endocrinology; Fourth Edition, By H. Maurice Goodman, Elsevier/Academic Press. 2009; ISBN: 978-0-12-373975-9.

Endocrine Physiology, by Griffin, Oxford University Press (2004) "Hormones" by A.W. Norman and G. Litwack, Academic Press 2ndEdition

Supplementary Materials:

Guyton and Hall. Textbook of Medical Physiology, 12thedition. Elsevier, Inc. ISBN-13: 978-0-7216-0240-0. ISBN-10:0-7216-0240-1.

Endocrinology (6th edition) by Mac E. Hadley, Prentice-Hall, New Jersey (2007).

Comparative Vertebrate Endocrinology, by Bentley, Cambrige Univ. Press. Cambridge, (2000).

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

College of Science

Department: Biology

BIO 1471 Applied Biology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	BIO 1333	None	7	English

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

1. Course Description:

This course offers students a dynamic gateway into the world of practical biological applications. This course equips learners with hands-on skills, fostering a deeper comprehension of real-world biological processes. From biotechnology to environmental management, students engage with versatile topics that amplify their career opportunities.

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

1.0 Knowledge & Understanding	
1.1	Understand the research skills utilized in applied biology (**K1, K2**).
1.2	Describe the scientific processes involved in applied biology research (**K1, K2**).
1.3	Outline essential biological concepts and the results of biological studies (**K1, K2**).
2.0 Skills	
2.1	Analyze the scientific literature on a chosen methodology (**S1, S2**)
2.2	Conduct biological studies using appropriate laboratory tools and techniques (**S1**, **S3**)
2.3	Communicate in the context of the applied biology discipline (**S2, S3**)
3.0 Values, Autonomy & Responsibility	
3.1	Show the ability to generate plans for self-development (**V1, V3**).
3.2	Assemble discipline-based knowledge and skills to investigate problems and drive decision making (**V2**).
3.3	Demonstrate competencies in standard laboratory methodologies (**V2**, **V3**).

3. Learning Resources

Main Textbook(s):

Th. J. Abatzopoulos (ed.), J. A. Beardmore (ed.), J. S. Clegg (ed.), P. Sorgeloos (ed.). Artemia: Basic and Applied Biology. Publisher: Springer, Year: 2002. ISBN: 978-90-481-6073-0,978-94-017-0791-6

Supplementary Materials:

Waite, Lee; Waite, Gabi Nindl. Applied cell and molecular biology for engineers. Publisher: McGraw-Hill, Year: 2007. ISBN: 9780071509527

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

College of Science

Department: Biology

BIO 1473 Scientific Methodology

Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
2	1	2	0	5	STA 1217	None	7	English

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

1. Course Description:

The course provides the student with a basic understanding of the scientific methodology and enables the student to develop research, analyze collected data of various forms and ask critical questions recording data collection and analysis process. It also discusses the techniques and tools to be employed in completing a research project. In addition, it enables the students to prepare report writing and framing research proposals. The students learn to define good problem statements and learns how data can be used to support decisions and strategic choices.

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

1.0 Knowledge & Understanding	
1.1	Name basic concepts, aims, and problems of the scientific research (**K1, K2**).
1.2	Describe different steps of a scientific research (**K1, K2**).
1.3	Recognize scientific methods and different points of view concerning them (**K1, K2**).
2.0 Skills	
2.1	Plan and carry out a simple research (**S1, S2**)
2.2	Summarize techniques of data collection and data analysis (**S1**, **S3**)
2.3	Analyze and interpret different kinds of research data (**S2, S3**)
3.0 Values, Autonomy & Responsibility	
3.1	Demonstrate competence to search for academic publications using central databases (**V1, V3**).
3.2	Report scientific research results (**V2**).
3.3	Show a clear ethical attitude in relation to how scientific methodology is used (**V2**, **V3**).

3. Learning Resources

Main Textbook(s):

Leedy, P D, and Ormrod, J E: "Practical Research, -Planning and design", 11 th ed. Pearson Educational Int.

Supplementary Materials: None.

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