

## Course Outcomes Matrix

Course Title: General Biology

Prefix: BIOL

Course Number: 1015

Course Description (from the catalog): 1015. General Biology, (3-4) Credit 5 semester hours. Basis of life, cell theory, cell structure, energy transformation, reproduction, and genetic variability. Origins of Diversity of Organisms.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
1. Conduct of laboratory investigations using safe, environmentally appropriate, and ethical practices.	T	R	I
2. The use of the scientific method during laboratory investigations. You are expected to: a. Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting instruments and technology. b. Collect data, organize it, analyze it, evaluate, make inferences, and predict trends. c. Communicate valid conclusions.	T	R	I
3. Use critical thinking and scientific problem solving to make informed decisions. a. Analyze, review, and critique scientific explanations, including hypotheses and theories using scientific evidence and information b. Draw inferences based on data.	T	R	I
4. Describe the characteristics of living things that distinguish them from non-living things.	T	R	I
5. Describe the hierarchy of biological organization.	T	R	I
6. Contrast the six kingdoms of living things and know examples of each.	T	R	I
7. Summarize the role and examples of producers, consumers, and decomposers.	T	R	I
8. Understand the chemical basis of life.	T	R	I

<p>9. Demonstrate an understanding of the four types of organic molecules.</p> <p>a. Distinguish between organic molecules and inorganic compounds.</p> <p>b. Describe the properties of carbon that make it the central atoms of organic compounds.</p> <p>c. Distinguish between the three types of isomers.</p> <p>d. Identify the major functional groups that present in certain organic molecules.</p> <p>e. Learn the function and draw the structures of the carbohydrates, lipids proteins, and nuclei acids to include the building block molecules: monosaccharides, glycerol, fatty acids, amino acids, phosphates, and nucleotides.</p> <p>f. Understand biological function of each type of organic molecules organic molecules studied.</p> <p>g. Draw the structures of amino acids, explain how they are grouped according to their radical group, and explain the levels of protein structure.</p> <p>h. Draw the chemical structures of ribonucleotides and deoxyribonucleotides to include the purines, pyrimidines, pentoses, and phosphate groups.</p> <p>i. Draw the structure of DNA and RNA.</p>	T	R	I
<p>10. Explain why the cell is the basic unit of life and describe the cell theory.</p> <p>a. Compare and contrast the characteristics of prokaryotic and eukaryotic cell.</p> <p>c. Explain why the relationship between surface area and volume of a cell determines its efficiency and entrance into cell division.</p> <p>d. Describe the structure and function of the various bacterial cell structures.</p> <p>e. Describe the structure and function of eukaryotic cell structures and organelles.</p> <p>f. Explain the methods used to study cells.</p> <p>g. Trace the path of proteins synthesized in the rough endoplasmic reticulum as they are processed, modified and transported to specific destinations.</p> <p>h. Compare the functions of mitochondria and chloroplasts.</p> <p>i. Explain the structure and function of</p>	T	R	I

<p>microtubules, intermediate filaments, and actin filaments and their importance to cells and animal tissues.</p> <p>j. Describe how flagella, cilia, pseudopods, actin conduct cellular, and animal movement.</p>			
<p>11. Understand the phospholipids bilayer structure and function of biological membranes.</p> <p>a. Explain the importance of cellular membranes and their functions.</p> <p>b. Explain how the various classes of membrane proteins associate with phospholipids bilayer and discuss the role of each class of proteins.</p> <p>c. Describe the passage of materials through the membranes by diffusion, osmosis, facilitated diffusion, active transport, endocytosis, and exocytosis.</p> <p>d. Understand how cells communicate by cell signaling.</p> <p>e. Demonstrate how cell form tissues and how the various cell junctions connect cells.</p>	T	R	I
<p>12. Know the laws of thermodynamics that apply to energy transformations in living systems.</p> <p>a. Know how ATP and GTP are the energy currency of cells.</p> <p>b. Understand how organic catalyst such as enzymes and ribozymes speed up specific chemical reactions in cells.</p> <p>c. Know how the various enzymes function and how they are regulated.</p>	T	R	I
<p>13. Know the four stages of aerobic respiration.</p> <p>a. Know the enzyme catalyzed reaction steps in stage I of glycolysis and stage II of glycolysis.</p> <p>b. Draw the substrates and products of each step of glycolysis.</p> <p>c. Draw the enzyme, substrate and products of the conversion of pyruvate to acetyl CoA.</p> <p>d. Draw the enzymes, substrates, and products of each step of the citric acid cycle.</p> <p>e. Conceptualize the energy conversions of each step of the electron transport chains and the coupled oxidative phosphorylation.</p>	T	R	I
<p>14. Understand photosynthesis.</p> <p>a. Know how covalent bonds of water are disrupted during the light dependent reaction and</p>	T	R	I

<p>the three products are produced.</p> <p>b. Know how ATP is formed by chemi-osmosis.</p> <p>c. Demonstrate by drawing the enzyme catalyzed steps of the Calvin Cycle to include the substrates and products.</p> <p>d. Draw the substrates and products of each step of the synthesis of alpha glucose from two glyceraldehydes 3-phosphate (G3P) molecules.</p>			
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Course Learning Outcomes	Competencies (T, R, I)		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
<p>15. Understand cell communication and regulation of the cell cycle.</p> <p>a. Understand the structure and functions of cellular receptors.</p> <p>b. Describe signal transduction and the cellular response.</p> <p>c. Explain how the cell cycle is regulated.</p>	T	R	I
<p>16. Understand chromosomes, mitosis, and meiosis.</p> <p>a. Explain chromosomes in terms of genes, loci, heterochromatin, euchromatin, species number of chromosomes, sister chromatids, centromeres, and kinetochores.</p> <p>b. Describe the principle events of the stages of the eukaryotic cell cycle and how it is controlled.</p> <p>c. Diagram the process of mitosis.</p> <p>d. Draw the process of both stages of meiosis.</p> <p>e. Distinguish between asexual reproduction and sexual reproduction.</p> <p>f. Distinguish between haploid cells and diploid cells.</p> <p>g. Define homologous chromosomes.</p>	T	R	I
<p>17. Understand how the structure of DNA forms the genetic codes for genes.</p> <p>a. Summarize the evidence observed in the 1950's demonstrating that DNA is the genetic material.</p> <p>b. Draw how the for types of deoxyribo-nucleotide subunits are bonded together to form the structure of DNA. State the base pairing rule for DNA.</p> <p>c. Draw how the ribo-nucleotide subunits are bonded together to form RNA.</p> <p>d. Understand DNA transformation of bacteria, and bacteriophage DNA transduction of bacteria.</p> <p>e. Summarize the evidence that demonstrated semi-conservative replication of DNA.</p> <p>f. Explain the steps of DNA replication.</p> <p>g. Know each enzyme involved in DNA replication and its function.</p> <p>h. Compare the organization of DNA in prokaryotic and eukaryotic cells.</p>	T	R	I

<p>18. Demonstrate by drawings an understanding of gene expression (transcription).</p> <p>a. Summarize the early evidence that most genes code for proteins.</p> <p>b. Outline the flow genetic information (central dogma) from DNA to Protein.</p> <p>c. Know the various types of RNA polymerases and how they catalyze the synthesis of RNA.</p> <p>d. Know the substrates and products of transcription.</p>	T	R	I
<p>19. Demonstrate an understanding of the substrates, products, enzymes and ribozymes involved in the steps of translation.</p> <p>a. Identify the features of tRNA that function in decoding the genetic information during translation.</p> <p>b. Explain how ribosomes function in protein synthesis.</p> <p>c. Diagram the processes of initiation, chain elongation, and chain termination in protein synthesis.</p> <p>d. Compare mRNA synthesis, modifications, and ribosome recognition sites in prokaryotes and eukaryotes.</p>	T	R	I
<p>20. Demonstrate a knowledge of gene regulation.</p> <p>a. Explain the organization of bacterial genes into operons. Explain the function of each gene. Explain why some operons are inducible and others are repressible.</p> <p>b. Explain the role of repressors in the regulation of gene expression.</p> <p>c. Differentiate between positive and negative control of operon gene expression.</p> <p>d. Draw the components of a eukaryotic gene and the DNA sequences that are involved in the regulation of transcription of that gene.</p> <p>e. Provide examples of DNA binding proteins and describe how they bind to DNA..</p> <p>f. Explain how transcriptional factors (proteins) facilitate transcription.</p> <p>g. Describe how a change in chromosomal structure affects which genes are expressed.</p> <p>h. Explain how one gene in a multicellular eukaryote might be able to produce different products</p>	T	R	I

<p>in different types of cells.</p> <p>i. Describe types of regulatory controls that can be exerted in eukaryotes after the mature mRNA is formed.</p>			
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## Course/Program Learning Outcomes Alignment and Review

Course Title: Biology Seminar I

Prefix: BIOL

Number: 1021

Description (from the catalog): Discussion and presentations of current biological topics by students, faculty and guest lecturers.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate basic knowledge of biological disciplines and reading comprehension.	T		I

## Course Outcomes Matrix

Course Title: General Biology

Prefix: BIOL

Course Number: 1025

Course Description (from the catalog): A lecture/laboratory course in general biology. The purpose of this course is to provide first year biology majors with an in depth knowledge of general biology that satisfies the prerequisites for entry into health professional and graduate schools.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Demonstrates knowledge of the terms phenotype, genotype, locus, allele (dominant/recessive), homozygous and heterozygous.	T	R	I
Applies knowledge of Mendel's principles of segregation and independent assortment to solve genetic problems involving monohybrid, dihybrid and test crosses	T	R	I
Applies knowledge of the product rule and sum rule when predicting the outcomes of genetic events.		R	I
Recognizes the interrelatedness among loci, genes and alleles			R
Applies knowledge of X-linked inheritance to solve genetic problems.	T		
Demonstrates knowledge of how DNA replicated.	T		
Applies knowledge of DNA structure to describe the flow of information in cells from DNA – RNA – Protein(s)	T		
Understands the differences between gene expression and gene regulation in prokaryotes vs. eukaryotes.	T		
Applies knowledge gene expression to construct a genomic and chromosome library via recombinant DNA technology.	T		I

Demonstrates knowledge of the basic structure and function of the animal body.	T		I
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## Course/Program Learning Outcomes Alignment and Review

Course Title: Biology Seminar II

Prefix: BIOL

Number: 1031

Description (from the catalog): Discussion and presentations of current biological topics by students, faculty and guest lecturers.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate basic knowledge of biological disciplines and reading comprehension.	T		I

## Course/Program Learning Outcomes Alignment and Review

Course Title: Botany

Prefix: BIOL

Number: 1034

Description (from the catalog): Morphology and physiology of flowering plants. Structure, method of reproduction, and biotic relationships of type representatives of lower plants.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate an understanding of monocot and dicot plants.	T		I
Demonstrate an understanding of the basic anatomy of plants.	T		
Demonstrate knowledge of the classification of plants.	T		I
Demonstrate an understanding of plant reproduction.	T		
Demonstrate an understanding of the diversity of plant life and their importance to man.	T	R	I
Demonstrate an understanding of the physiological and genetic aspects of ecological adaptations of plants.	T		
Demonstrate an understanding of the scientific method and its importance in solving our life long problems.	T		

## Course/Program Learning Outcomes Alignment and Review

Course Title: Anatomy and Physiology I (Non-majors)

Prefix: BIOL

Number: 1054

Description (from the catalog): Structure and functions of the human body. The structure of each of the systems demonstrated by models, charts, and animal dissections with their functions studied by experiments.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate an understanding of the functions of the body parts and their interrelationships.	T		
Demonstrate an understanding of applying physiological principles to anatomical situations.	T	R	I
Demonstrate knowledge and understanding of current health problems	T		

## Course/Program Learning Outcomes Alignment and Review

Course Title: Anatomy and Physiology II (Non-majors)

Prefix: BIOL

Number: 1064

Description (from the catalog): Structure and functions of the human body. The structure of each of the systems demonstrated by models, charts, and animal dissections with their functions studied by experiments.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate an understanding of the functions of the body parts and their interrelationships.	T		
Demonstrate an understanding of applying physiological principles to anatomical situations.	T	R	I
Demonstrate knowledge and understanding of current health problems	T		

### Course Outcomes Matrix

Course Title: GENETICS

Prefix: BIOL

Course Number: 2054

Course Description (from the catalog): Analysis of the structure, function, and transmission of genetic materials.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Demonstrate knowledge of basic understanding of the principles of transmission, molecular and population genetics	T		
Develop and experience the methodologies of classical and modern genetics research.	T		
Develop problem-based learning skills involving integration of knowledge from genetic fields.		R	
Gain ability to synthesize and apply knowledge of genetics to specific contemporary issues.		R	I
Apply knowledge acquired to written laboratory reports summarizing laboratory investigations and/or short research projects.			I
Application of knowledge demonstrated by documentation of student's learning; the assembly a genetics portfolio containing essays and lab activities.			I

## Course Outcomes Matrix

Course Title: Human Anatomy and Physiology

Prefix: BIOL

Course Number: 3014

Course Description (from the catalog): A lecture/laboratory course in human anatomy and physiology. Lecture and laboratory exercises have been designed to provide an in-depth knowledge of human structure and function.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Demonstrates knowledge of the principle of complementarity of structure and function of the human body	T	R	I
Demonstrates knowledge of the concept of homeostasis including the components of a homeostatic control mechanism and the differences between positive and negative feedback mechanisms.	T	R	I
Demonstrates and understanding membrane transport comparing passive vs. active transport.		R	I
Applies knowledge of membrane transport and ion permeability to calculate the resting membrane potential of a typical cell.			R
Recognizes the structural and functional differences between the four primary tissue types of the human body.	T		
Demonstrates an understanding the of the role of parathyroid hormone in calcium homeostasis	T		
Demonstrates an understanding of ion transport and the role of antidiuretic hormone in the regulation of blood plasma osmolarity.	T		
Recognizes the interrelatedness of the axial and appendicular skeleton.	T		
Applies knowledge of membrane potential to describe the generation of electrical signals by skeletal muscle fibers.			I

Demonstrates an understanding of the process of excitation contraction coupling associated with the skeletal muscle fiber.			I
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## Course Outcomes Matrix

Course Title: Human Anatomy and Physiology

Prefix: BIOL

Course Number: 3024

Course Description (from the catalog): A lecture/laboratory course in human anatomy and physiology. Lecture and laboratory exercises have been designed to provide an in-depth knowledge of human structure and function.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Demonstrates knowledge of the electrical activity of the nerve cell including post-synaptic potentials (EPSP/IPSP) and action potentials.	T	R	I
Demonstrates knowledge of the diversity of cell structure and function associated with neural tissue(s)	T	R	I
Recognizes the interrelatedness between the CNS, PNS and the ANS.		R	I
Applies knowledge of synaptic transmission to describe the cortical pathway involved in speaking a written word.			R
Demonstrates and understanding of the molecular mechanism associated with memory (long term potentiation).	T		
Applies knowledge of the structure and function of the endocrine system (ES), to describe how the ES plays a key role in regulating homeostasis	T		
Demonstrates an understanding of the differences in the mechanism of action of polar hormones vs. lipophilic hormones on their target cells.	T		
Demonstrates an understanding of the mechanical and electrical properties of the heart.	T		
Applies knowledge of hemodynamics to describe the pathology of cardiovascular disorders i.e. congestive heart failure, atherosclerosis and hypertension	T		I

Demonstrates knowledge of the anatomy, histology and functions of the digestive system	T		I
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### Course/Program Learning Outcomes Alignment and Review

Course Title: Molecular Biology

Prefix: BIOL

Number: 3073

Description (from the catalog): The dynamics of carbohydrates, fat, protein and nucleic acid metabolism; recombinant DNA revolution, gene structure and function in specialized eukaryotic systems.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrates knowledge of thermodynamics.	T	R	I
Demonstrates an understanding of oxidation and reduction reactions permitting quantitative descriptions of reduction/oxidation changes in metabolic pathways.	T		
Demonstrates an understanding of catabolic processes and oxidative degradation.	T		I
Demonstrates an understanding of oxidative phosphorylation and photophosphorylation.	T		I
Demonstrates an understanding of major enzymatic cofactors and classes of biochemical reactions.	T	R	

Course Title: Immunology

Prefix: BIOL

Course Number: 3044

- I. Course Description (from the catalog): (3-1) Credit 4 semester hours.  
Fundamentals aspects of immunology, antigenic systems, hypersensitivity, and serology.

Course Learning Outcomes	Competencies (T, R, I)		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
1. Develop an understanding of the fundamental concepts and principles of immunology.	T	R	I
2. Develop an understanding of the principles of innate immunity.	T	R	I
3. Develop an understanding of the principles of adaptive immunity.	T	R	I
4. Develop an understanding of the various cellular molecules and mechanisms that function in immunology to protect humans and other mammals from infection by prokaryotes, viruses, protozoa, fungi, toxins, and cancer.	T	R	I
5. Develop an understanding of immunodeficiency diseases.	T	R	I
6. Develop an understanding for the scientific method and its applications to problem solving of clinical case studies in immunology.	T	R	I
7. Students become intellectually self-reliant and enhance their critical thinking skills through case study discussion	T	R	I

## Course/Program Learning Outcomes Alignment and Review

Course Title: Histology

Prefix: BIOL

Number: 3064

Description (from the catalog): Microscopic study of tissues and organs of vertebrates. Relation of structure to function.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate an understanding of the relationship for histology as it relates to the structure and function of plant and animal bodies.	T	R	I
Demonstrate the ability to develop techniques for tissue preparation for microscopic analysis.	T	R	I
Demonstrate knowledge of the mastery of microscopes in the laboratory.	T		I

## Course/Program Learning Outcomes Alignment and Review

Course Title: Molecular Biology II

Prefix: BIOL

Number: 3083

Description (from the catalog): Regulation of gene function in bacterial cells; the functioning of eukaryotic chromosomes; the extraordinary diversity of eukaryotic viruses.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate knowledge of the regulation of gluconeogenesis and the Cori Cycle.	T	R	I
Demonstrate knowledge of the major physiological functions of fatty acids.	T		
Demonstrate an understanding of the difference between fatty acid oxidation and fatty acid synthesis.	T		I
Demonstrate an understanding of the regulation of amino acid biosynthesis.	T		
Demonstrate an understanding of nucleotide regulation.	T	R	I

## Course/Program Learning Outcomes Alignment and Review

Course Title: Molecular Biology II

Prefix: BIOL

Number: 3083

Description (from the catalog): Regulation of gene function in bacterial cells; the functioning of eukaryotic chromosomes; the extraordinary diversity of eukaryotic viruses.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate knowledge of the regulation of gluconeogenesis and the Cori Cycle.	T	R	I
Demonstrate knowledge of the major physiological functions of fatty acids.	T		
Demonstrate an understanding of the difference between fatty acid oxidation and fatty acid synthesis.	T		I
Demonstrate an understanding of the regulation of amino acid biosynthesis.	T		
Demonstrate an understanding of nucleotide regulation.	T	R	I

## Course Outcomes Matrix

Course Title: Cell Biology

Prefix: Biol

Course Number: 3124

Course Description (from the catalog): A study of the ultrastructure and macro-molecular organization of cells, with emphasis on eukaryotic cells. The convergence of structure and function in life phenomena will be highlighted. Prerequisites: BIOL. 1015 and CHEM. 2043.

Course Learning Outcomes	Competencies (T, R, I)		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Increase individual understanding with regard to ethical and health issues related to cell biology	T		
Foster research skills and ability to apply mathematical data analyses and interpret observed phenomena	T	R	
Relate concepts of chemistry and physics to cell biological systems			I
Improve skills in analyzing and communicating scientific information	T	R	I

## Course Outcomes Matrix

Course Title: MEDICAL TERMINOLOGY

Prefix: BIOL

Course Number: 4012

Course Description (from the catalog): Emphasis is on understanding basic medical terms and learning how they are used in documenting and reporting patient care procedures.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Improve vocabulary skills by understanding why specific word parts are selected to form specialized compound medical, scientific, and English terms.	T		
Spell and define prefixes, suffixes, and stem words. Identify and explain the function of specific word parts. Describe how medical compound terms are constructed. Build compound terms using multiple word parts in a combining form.	T		
Fracture and analyze key compound medical terms found on the Word Part. Define key compound medical terms found both literally and actually. Spell and define medical equipment, treatment, disease, and diagnostic compound terms.	T		
Demonstrate knowledge of the word part and compound term through memorization, repetition, and reinforcement needed to assure mastery of the language of medicine/science.		R	
Identify visually and describe verbally some of the medical problems; disorders, and diseases presented in the course.		R	I
Applies knowledge of how to 1) Interpret and Understand medical course content, literature, records, and research and 2) interpret and understand word (term) meanings from a wide variety of academic, such as disciplines in the Arts, Sciences, Humanities, Education, Agriculture, and Technology.		R	I

## Course Outcomes Matrix

Course Title: Topics in Genomics

Prefix: Biol

Course Number: 4013

Course Description (from the catalog): The study of the Human Genome in a holistic manner. Physical mapping and large scale DNA sequencing of the human genome; gene expression and microarrays; the application of genome data to the incidence of disease; used as disease markers and gene based therapeutics. Prerequisites: Biol. 2054; Chem. 2043.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Develop a comprehensive understanding of the human genome	T		
Analyze and interpret the data generated from the human genome and other genomes	T	R	
Apply genomic information to determine the incidence of disease; identify disease markers and formulate models for gene-based therapies			I
Evaluate the quality and significance of genomic data		R	I
Develop critical thinking skills	T	R	I
Enhance the aesthetic appreciation of the simplicity yet intricacy of the design of the human genome	T	R	I

## Course Outcomes Matrix

Course Title: Vertebrate Embryology

Prefix: Biol

Course Number: 4014

Course Description (from the catalog): Structure, principles and progress in vertebrate development

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Demonstrates knowledge of phases of ontogenetic developmental in vertebrates	T		
Understands main trends of thought and history of embryology	T		
Demonstrates knowledge of cellular events, cytoplasmic and nuclear during gametogenesis	T		
Understands the structure of the reproductive organs, testes and ovaries, and the hormones involved during the reproductive process and sexual cycles	T		
Demonstrates knowledge of the phases of fertilization and the difference between sexual and asexual reproduction	T		
Demonstrates knowledge of cleavage types based upon egg organization, cell types and cell patterns	T		
Demonstrates knowledge of stem cells, cell potency, cell competence, embryonic induction and cell determination	T		
Understands the process by which the body form develops, the formation of extra-embryonic membranes and their functions, as well as their fate	T		
Demonstrates knowledge of the process by which major organ-systems occur	T		



## Course/Program Learning Outcomes Alignment and Review

Course Title: Practicum

Prefix: BIOL

Number: 4034

Description (from the catalog): Recent advances in biology. Emphasis placed on investigation and inquiry as a means of acquiring knowledge in biology.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/integ rated
Demonstrate an understanding of the classification of insects.	T		I
Demonstrate an understanding of leaf identification.	T		I
Demonstrate knowledge of how the biosphere developed.	T		
Demonstrate an understanding of plants and microorganisms.	T		

## Course Outcomes Matrix

Course Title: Research

Prefix: BIOL

Course Number: 4051

- I.** Course Description (from the catalog): (34) Credit 1 semester hour. Basis of life, cell theory, cell structure, energy transformation, reproduction, and variability. Origins of Diversity of Organization

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
1. Conduct of laboratory investigations using safe, environmentally appropriate, and ethical practices.	T	R	I
2. The use of the scientific method during laboratory investigations. Students are expected to: a. Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting instruments and technology. b. Collect data, organize it, analyze it, evaluate, make inferences, and predict trends. c. Communicate valid conclusions.	T	R	I
3. Use critical thinking and scientific problem solving to make informed decisions. a. Analyze, review, and critique scientific explanations, including hypotheses and theories using scientific evidence and information b. Draw inferences based on data.			
4. Demonstrate an understanding of the four types of organic molecules and how they are isolated, purified and researched to understand their specific functions in living organisms .	T	R	I
5. Demonstrate knowledge of recombinant DNA techniques used in genetic engineering research.	T	R	I
6. Demonstrate knowledge of research approaches and techniques used to study genomes of organisms including humans.	T	R	I
7. Demonstrate knowledge of immunological research techniques that are applied to most biological studies.	T	R	I
8. Demonstrate knowledge of basic microbiological laboratory techniques.	T	R	I

## Course Outcomes Matrix

Course Title: Research

Prefix: Biol

Course Number: 4061

Course Description (from the catalog): Library and laboratory work in specific biological problems.

<b>Course Learning Outcomes</b>	<b>Competencies (T, R, I)</b>		
	T competency is taught	R Competency is reinforced	I Competency is utilized/ integrated
Understand the process of scientific research	T		
Understand the principles and appreciate the skills that are required in biological research	T	I	
Use of library facilities and the internet in research	T		I
Read and interpret scientific manuscripts	T	R	
Make presentations of interpretations of recently published scientific papers	T	R	

## Course/Program Learning Outcomes Alignment and Review

### Degree Program Outcomes Matrix

		Program Learning Outcomes and Measure							
		1. Students will demonstrate knowledge of the chemical basis of life.	2. Students will demonstrate knowledge of the central concepts of Genetics.	3. Students will demonstrate knowledge of Cell Biology.	4. Students will demonstrate knowledge of Organismal Biology.	5. Students will demonstrate knowledge in scientific communication.			
Course Prefix, Number	Course Title								
BIOL 1015	General Biology	T, R, I	T, R, I	T, R	T, R	T, R			
BIOL 1021	Biology Seminar					T, R, I			
BIOL 1025	General Biology	T, R, I	T, R, I	T, R	T, R	T, R			
BIOL 1031	Biology Seminar					T, R, I			
BIOL 1034	Botany	T, R, I	T, R	T, R	T	T, R			
BIOL 1054	Anatomy /Physiology I (Non Majors)								
BIOL 1064	Anatomy /Physiology II (Non Majors)								
BIOL 2054	Genetics	T, R	T, R, I	T	T	R			
BIOL 3014	Human Anatomy/Physiology	T, R, I	R, I	I	T	T, R			
BIOL 3024	Human Anatomy/Physiology	T, R, I	R, I	I	T	T, R			
BIOL 3034	Microbiology	R, I		R, I	T, R, I				
BIOL 3073	Molecular Biology I	T, R, I		T, R, I	R, I	R, I			
BIOL 3044	Immunology	T, R, I		R, I	R, I	R, I			
BIOL 3064	Histology	T, R, I		R, I	R, I	R, I			

BIOL 3083	Molecular Biology II	T, R, I		T, R, I	R, I	R, I			
BIOL 3124	Cell Biology	T, R, I	R, I	T, R, I	R, I	R, I			
BIOL 4012	Medical Terminology					T, R, I			
BIOL 4013	Topics in Genomics	T, R, I	R, I	R, I	R, I	R, I			
BIOL 4014	Vertebrate Embryology	T, R, I	R, I	R, I	I	I			
BIOL 4024	Comparative Anatomy	T, R, I	R, I	I	T	R, I			
BIOL 4034	Practicum	T, R, I	R, I	I	I	R, I			
BIOL 4051	Research					R, I			
BIOL 4061	Research					R, I			

T – Competency is taught

R – Competency is reinforced

I – Competency is utilized/integrated