F22

Biology		*Course to Program Map*						
Program Outcomes: Upon completion of the program, graduates will be able to…	**Essential Skills**	**express the organization and classification principles employed in biological sciences.**	**demonstrate knowledge of the biomechanical processes.**	**demonstrate knowledge of the developmental processes.**	**explain the importance of biological diversity.**	**acquire laboratory competence by developing and refining technical skills.**	**acquire laboratory competence by developing analytical skills.**	**critically examine information and discover new knowledge through rigorous scientific reasoning.**
Courses								
BIOL 114 Biology I		IRA	IRA	IRA	IRA	IRA	IRA	IRA
BIOL 115 Biology II	3	RMA	R	R	RMA	RMA	RMA	RMA
BIOL 210 A & P		IR	IR	IR	IR	IR	IR	IR
BIOL 211 A & P I	2	RMA	RMA	RMA	RMA	RMA	RMA	RMA
BIOL 212 A & P II	1	RMA	RMA	RMA	RMA	RMA	RMA	RMA
	4							
BIOL 1102 Special Topics In Science						RMA	MA	
BIOL 213 Microbiology	5	MA	MA	MA	MA	MA	MA	MA
CHEM 109 College Chemistry I		IR	IR			IR	RA	IRMA
CHEM 110 College Chemistry II		R	R	R		RMA	MA	MA
CHEM 206 Organic Chemistry I		IRMA	IRMA	IRMA	RMA	RMA	IR	MA
CHEM 207 Organic Chemistry II		IR	IRMA	MA	RMA	RMA	RMA	RMA
PHYS 205 General Physics I			IR			IR	IR	I
PHYS 206 General Physics II			RA			RA	RA	R

Mapping	
I	Introduced
R	Reinforced
M	Mastered
A	Assessed/Artifact

Essential Skills	
1	written communication
2	oral communication
3	critical thinking
4	cultural diversity
5	social responsibility

Employability Skills	
C	communication
P	problem solving
W	work ethic

BIOL 114 Biology I	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
demonstrate an understanding of the nature of science: scientific processes, scientific methods.	**I**			**I**	**I**		**I**
demonstrate an understanding of the levels of organization and emergent properties of life: basic biological chemistry, structure and function of biological molecules, cellular structure and functions.		**IA**	**IR**				
demonstrate an understanding of bioenergetics: enzyme activity, cellular respiration, photosynthesis.		**R**		**RA**	**I**		**R**
demonstrate an understanding of cellular reproduction: binary fission, mitosis, meiosis.			**IA**			**I**	
identify the basic principles of Mendelian and molecular genetics, and relate these to the basic principles of Natural Selection and evolution: classical genetics, molecular genetics, DNA replication, gene expression and regulation.						**RA**	**RA**
design and perform experiments in a laboratory setting: microscopy, quantitative measurement skills incorporating the metric system, analytic and statistical skills including presenting and/or interpreting graphs and tables, experience with living organisms in the laboratory.					**RA**	**I**	

BIOL 115 Biology II	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
summarize and explain the processes and mechanisms of evolution.			R	MA		R	R
interpret organismal diversity using phylogenetic hypotheses.	MA	R		MA			R
relate structure to function in organisms.	R		R	MA		R	
explain how organisms interact with their environments.				R			R
design and perform experiments incorporating organisms in a laboratory setting.					R	R	R
develop observational skills from the microscopic to the macroscopic and ecological levels.				MA	MA	MA	MA
apply quantitative measurement skills incorporating the metric system.					MA	MA	MA
interpret and communicate data using appropriate analytical and statistical skills.						MA	

BIOL 210 Anatomy & Physiology	*Curriculum Map*						
Program Outcomes	**express the organization and classification principles employed in biological sciences.**	**demonstrate knowledge of the biomechanical processes.**	**demonstrate knowledge of the developmental processes.**	**explain the importance of biological diversity.**	**acquire laboratory competence by developing and refining technical skills.**	**acquire laboratory competence by developing analytical skills.**	**critically examine information and discover new knowledge through rigorous scientific reasoning.**
Course SLO: Students will be able to							
demonstrate measurable understanding of descriptive anatomical and directional terminology.	**R**	**I**		**I**			**I**
demonstrate measurable understanding of the basic concept of homeostasis and how homeostatic mechanisms apply to body systems.	**I**	**R**			**I**	**R**	**R**
demonstrate measurable understanding of basic chemistry and cellular structures and function.	**R**	**R**	**I**	**I**	**R**	**I**	**R**
demonstrate measurable understanding of the basic tissues of the body, their location and functions.	**R**	**R**		**R**	R	**R**	R
demonstrate measurable understanding of major gross and microscopic anatomical components of the integumentary system and describe the functions of the system.	**R**	**I**		I		**R**	I
demonstrate measurable understanding of major gross and microscopic anatomical components of the skeletal system and explain their functional roles in osteogenesis, repair, and body movement.	**I**	**R**	**R**		I		R
demonstrate measurable understanding of major gross and microscopic anatomical components of the muscular system and explain their functional roles in body movement, maintenance of posture, and heat production.	**R**	**R**			R		
demonstrate measurable understanding of the major gross and microscopic anatomical components of the nervous system and explain their functional roles in communication, control, and integration.	**R**	**R**					

demonstrate measurable understanding of the major gross and microscopic anatomical components of the eye and ear and explain their functional roles in vision, hearing and equilibrium - Students should also be able to identify and locate the receptors responsible for olfaction and gustation and briefly describe the physiology of smell and taste.	**I**	**R**				**R**	R
demonstrate measurable understanding of the major gross and microscopic anatomical components of the endocrine system and explain the functional roles of their respective hormones in communication, control, and integration.	**I**	**I**					
demonstrate measurable understanding of the major gross and microscopic anatomical components of the cardiovascular system and explain their functional roles in transport and hemodynamics.	**I**	**R**	**I**	I	I	**R**	R
demonstrate measurable understanding of the major gross and microscopic anatomical components of the lymphatic system and explain their functional roles in fluid dynamics and immunity.		**I**					
demonstrate measurable understanding of the major gross and microscopic anatomical components of the respiratory system and explain their functional roles in breathing/ventilation and in the processes of external and internal respiration.	**I**	**R**	**I**			**R**	R
demonstrate measurable understanding of the major gross and microscopic anatomical components of the digestive system and explain their functional roles in digestion, absorption, excretion and elimination.	**I**	**R**	**I**			**R**	R
demonstrate measurable understanding of the functional relationship among cellular, tissue and organ level metabolism, the role nutrition plays in metabolism, and the mechanisms by which metabolic rate is regulated in the body.	**I**	**R**				**R**	R

demonstrate measurable understanding of the major gross and microscopic anatomical components of the urinary system and explain their functional roles, including the following topics, general functions of the urinary system, gross & microscopic anatomy of the urinary tract.	**I**	**R**	**I**			**R**	R
demonstrate measurable understanding of the physiology of the homeostatic mechanisms that control fluid/electrolyte and acid/base balance, including the following topics- regulation of water intake & output, description of the major fluid compartments.	**I**	**R**					R
demonstrate measurable understanding of the major gross and microscopic anatomical components of the reproductive system and explain their functional roles in reproduction and inheritance.	**I**	**R**	**I**			**R**	R

BIOL 211 Anatomy & Physiology I	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
demonstrate measurable understanding of descriptive anatomical and directional terminology.	**R**		**R**				**R**
demonstrate measurable understanding of the basic concept of homeostasis and how homeostatic mechanisms apply to body systems.		**R**	**R**				**R**
demonstrate measurable understanding of basic chemistry and cellular structures and function.	**M**	**R**	**R**				
demonstrate measurable understanding of the basic tissues of the body, their location and functions.	**RMA**	**R**	**R**	**R**	**R**	**RMA**	
demonstrate measurable understanding of major gross and microscopic anatomical components of the integumentary system and describe the functions of the system.	**R**	**R**	**R**	**R**	**R**	**R**	**R**

demonstrate measurable understanding of major gross and microscopic anatomical components of the skeletal system and explain their functional roles in osteogenesis, repair, and body movement.	**R**	**R**	**RMA**		**RMA**	**RMA**	**R**
demonstrate measurable understanding of major gross and microscopic anatomical components of the muscular system and explain their functional roles in body movement, maintenance of posture, and heat production.	**R**	**R**	**R**	**R**	**RMA**	**RMA**	**RMA**
demonstrate measurable understanding of the major gross and microscopic anatomical components of the nervous system and explain their functional roles in communication, control, and integration.	**RMA**	**RMA**	**R**	**RMA**	**R**	**RMA**	**RMA**

BIOL 212 Anatomy & Physiology II	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
demonstrate measurable understanding of the major gross and microscopic anatomical components of the eye and ear and explain their functional roles in vision, hearing and equilibrium - Students should also be able to identify and locate the receptors responsible for olfaction and gustation and briefly describe the physiology of smell and taste.	R	MA	R	R	R	R	R
demonstrate measurable understanding of the major gross and microscopic anatomical components of the endocrine system and explain the functional roles of their respective hormones in communication, control, and integration.	R	MA	MA	R	MA	MA	R
demonstrate measurable understanding of the major gross and microscopic anatomical components of the cardiovascular system and explain their functional roles in transport and hemodynamics.	MA	MA	MA		MA	MA	R
demonstrate measurable understanding of the major gross and microscopic anatomical components of the lymphatic system and explain their functional roles in fluid dynamics and immunity.	MA	MA	MA			MA	MA

demonstrate measurable understanding of the major gross and microscopic anatomical components of the respiratory system and explain their functional roles in breathing/ventilation and in the processes of external and internal respiration.	MA	MA	MA		MA	MA	MA
demonstrate measurable understanding of the major gross and microscopic anatomical components of the digestive system and explain their functional roles in digestion, absorption, excretion and elimination.	MA	MA	MA		MA	MA	MA
demonstrate measurable understanding of the functional relationship among cellular, tissue and organ level metabolism, the role nutrition plays in metabolism, and the mechanisms by which metabolic rate is regulated in the body.	R	MA					
demonstrate measurable understanding of the major gross and microscopic anatomical components of the urinary system and explain their functional roles, including the following topics, general functions of the urinary system, gross & microscopic anatomy of the urinary tract.	MA	MA			MA	MA	MA
demonstrate measurable understanding of the physiology of the homeostatic mechanisms that control fluid/electrolyte and acid/base balance, including the following topics- regulation of water intake & output, description of the major fluid compartments.	R	MA			MA	MA	
demonstrate measurable understanding of the major gross and microscopic anatomical components of the reproductive system and explain their functional roles in reproduction and inheritance.	MA	MA	MA	MA	MA	MA	MA

BIOL 1102 Special Topics in Science	*Curriculum Map*						
Program Outcomes	**express the organization and classification principles employed in biological sciences.**	**demonstrate knowledge of the biomechanical processes.**	**demonstrate knowledge of the developmental processes.**	**explain the importance of biological diversity.**	**acquire laboratory competence by developing and refining technical skills.**	**acquire laboratory competence by developing analytical skills.**	**critically examine information and discover new knowledge through rigorous scientific reasoning.**
Course SLO: Students will be able to							
proficiently use of dissection tools, terminology, and various techniques of appropriately visualizing structures.					**MA**	**MA**	
identify surface anatomical landmarks and give detailed description of the underlying gross anatomical structures.					**R**		
demonstrate proficient knowledge of bony skeletal landmarks.					**R**	**MA**	
identify and describe the major gross and microscopic anatomical components of the endocrine system with adequate explanation of the function(s) of selected hormones.					**R**		
identify and describe the major gross and microscopic anatomical components of the cardiovascular system.					**R**	**MA**	
accurately describe the tissues supplied and/or drained by selected vascular structures in the region of dissection.					**R**	**MA**	
identify and describe the major gross and microscopic anatomical components of the lymphatic system.					**R**		
identify and describe the major gross and microscopic anatomical components of the digestive system.					**R**	**MA**	
identify and describe the major gross and microscopic anatomical components of the renal system.					**R**		
identify and describe the major gross and microscopic anatomical components of the male and female reproductive systems.					**R**		
demonstrate knowledge of each of the above by presenting completed dissections to their peers, course instructor, and selected members of the public.					**MA**		

BIOL 213 Microbiology	*Curriculum Map*						
Program Outcomes	**express the organization and classification principles employed in biological sciences.**	**demonstrate knowledge of the biomechanical processes.**	**demonstrate knowledge of the developmental processes.**	**explain the importance of biological diversity.**	**acquire laboratory competence by developing and refining technical skills.**	**acquire laboratory competence by developing analytical skills.**	**critically examine information and discover new knowledge through rigorous scientific reasoning.**
Course SLO: Students will be able to							
understand major contributions to the development of the field of microbiology.							**MA**
describe chemical principles as they apply to microorganisms.		**MA**		**MA**			
appreciate the diversity of the microbial world.	**MA**						
describe the basic morphology of prokaryotic organisms.				**MA**			
describe how microorganisms grow and their respective nutritional requirement.						**MA**	**MA**
describe basic metabolic pathways utilized by microorganisms.		**MA**					
describe genetic mechanisms utilized by microorganisms and how they exchange information.					**MA**	**MA**	
describe the nature of disease and how host organisms defend against disease.			**MA**				

CHEM 109 College Chemistry I	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
explain the processes involved in the scientific method, and be able to apply it to investigate natural phenomena and solve problems.	I	I			IR	R	IR
explain the design and significance of experiments that led to the adoption of modern atomic theory.	I	R					
recognize and interpret isotopic notation; understanding the relationship between average atomic masses and isotopic masses.							
relate atomic mass to composition in terms of subatomic particles.	R	R			R	R	IR
descriptive chemistry of ionic and covalent compounds.	R	R					
describe the general properties of solutions, solubility of materials, and procedures for preparing a solution of known molarity.					R	R	MA

explain types of chemical reactions and perform stoichiometric calculations involving mass, moles, and solution molarity.		**R**					
explain the properties of solids, liquids, and gases.							
describe, define, and perform calculations involving the basic concepts of thermodynamics.		**R**					
conceptually and quantitatively relate spectroscopic observation of atoms to quantum mechanical theories.							
explain the nature of molecular bonding and structure.	**R**	**R**				**R**	**MA**
work in the laboratory in accordance with good laboratory practices.						**R**	**MA**
gather and record qualitative and quantitative data accurately.						**R**	**MA**
handle and evaluate data in logical, productive, and meaningful ways.						**RA**	**MA**
correlate laboratory work with principle topics in Chemistry I lecture.						**R**	**MA**

CHEM 110 College Chemistry II	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
describe the basic (colligative) properties of solutions.		R					
describe the fundamentals of acid/base equilibria, including pH calculations, buffer behavior, acid/base titrations, and their relationship to electrophiles and nucleophiles.		R	R		R	MA	MA
describe the thermodynamic and kinetic forces involved in chemical reactions which determine how much and how soon products are formed.	R	R	R		R		
describe the basics of electrochemistry, and the relationship of electrical parameters to thermodynamic and stoichiometric parameters.	R	R			R	MA	MA
describe current bonding models for simple inorganic and organic molecules in order to predict structures and important bonding parameters.	R	R			R	MA	MA
describe general periodicity patterns of (organic/inorganic) molecules, and the ability to design synthetic approaches to such species.	R	R	R				
describe solubility and complex ion equilibria.							
describe the basic aspects of nuclear chemistry.							
work in the laboratory in accordance with good laboratory practices.					MA	MA	MA
gather and record qualitative and quantitative data accurately.					MA	MA	MA
handle and evaluate data in logical, productive, and meaningful ways.					MA	MA	MA
correlate laboratory work with principal topics in College Chemistry II lecture.					MA	MA	MA

CHEM 206 Organic Chemistry I	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
use VSEPR theory to drawn Lewis Structure.	**RM**		**RM**	**R**			
proficiency in drawing resonance structures.		**RM**		**M**			
develop an understanding in the reactions of alkanes, alkene and alkynes.	**RM**			**IR**			**M**
understand how stereochemistry determines a molecule's stability.					**M**	**R**	
understand the reactions with organometallics.			**R**	**R**			
understand the reactivity of alcohols and ethers.	**IR**	**IR**		**IR**			
proficiency in understanding SN1, SN2, E1 and E2 reactions.	**IR**				**R**	**IR**	
explain how electron delocalization can influence reactions.							

CHEM 207 Organic Chemistry II	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
understand the use of NMR, IR and MS to identify organic compounds.			M	MA		RA	
understand the fundamentals of electronic structure and bonding in conjugated and aromatic systems.	R						
understand the fundamental electronic structure and bonding in carbonyl compounds.	R	IR	IR				
understand how substituents effect on pK_a (in the case of carboxylic acids).		R	R				
understand the reactivity of carbonyl compounds with both hard and soft nucleophiles (carboxylic acids, aldehydes and ketones).	IR		R		RMA	RM	RM
understand how kinetics and thermodynamics affect carbonyl condensation reactions.	R	R	R				
understand the fundamental properties and reactivity of biologically important molecules (e.g. carbohydrates, amines and amino-acids).	R	RMA	RM			M	MA

PHYS 205 General Physics I	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
evaluate situations involving Physics I topics by choosing the appropriate conceptual frameworks.		I			IR	IR	I
recall relevant physical models and to successfully apply these models using techniques of symbolic and numerical analysis in order to generate solutions to problems in Physics I topics.		R			I	IR	I
think critically by utilizing problem solving techniques to evaluate and analyze context rich, multi-step problems in Physics I topics, selecting relevant information, selecting an approach to solving the problem and carrying out the analysis needed to generate and communicate solution(s).		R			IR	IR	I
perform measurements using physical apparatus, analyze the collected data including appropriate treatment of errors and uncertainties, generate and communicate conclusions based on the data and analysis for experimental investigations in Physics I topics.		I			I	IR	I

PHYS 206 General Physics II	*Curriculum Map*						
Program Outcomes	express the organization and classification principles employed in biological sciences.	demonstrate knowledge of the biomechanical processes.	demonstrate knowledge of the developmental processes.	explain the importance of biological diversity.	acquire laboratory competence by developing and refining technical skills.	acquire laboratory competence by developing analytical skills.	critically examine information and discover new knowledge through rigorous scientific reasoning.
Course SLO: Students will be able to							
evaluate situations involving Physics II topics by choosing the appropriate conceptual frameworks.		**R**			**R**	**R**	**R**
recall relevant physical models and to successfully apply these models using techniques of symbolic and numerical analysis in order to generate solutions to problems in Physics II topics.		**RA**			**RA**	**RA**	**R**
think critically by utilizing problem solving techniques to evaluate and analyze context rich, multi-step problems in Physics II topics, selecting relevant information, selecting an approach to solving the problem and carry out the analysis needed to generate and communicate solution(s).		**R**			**RA**	**R**	
perform measurements using physical apparatus, analyze the collected data including appropriate treatment of errors and uncertainties, generate and communicate conclusions based on the data and analysis for experimental investigations in Physics II topics.		**R**					