

Physics		Course to Program Map				
Program Outcomes: Upon completion of the program, graduates will be able to...	Institutional Skills	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Courses						
CHEM 109 College Chemistry I	235	IRA	IRA	IRA	IRA	RA
MATH 122 Calculus & Analytic Geometry I	123	RA			R	
MATH 123 Calculus & Analytic Geometry II	123	RA	R		R	RA
PHYS 205 General Physics I	235	IRA	IRA	IRA	IA	IR
PHYS 206 General Physics II	123	IRA	IRA	IRA	RMA	RMA
PHYS 207 Engineering Physics I	123	IR	IR	IR	IA	IR
PHYS 208 Engineering Physics II	123	MA	MA	MA	RMA	RMA
CHEM 110 College Chemistry II	123	RA	RA	RA	RA	RA
CSCI 102 Introduction to Programming	34	IRA			IA	
PHSC 2053 Physical Geology Lecture	234	IA			IRA	
MATH 206 Differential Equations	123	RA			R	RA

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

CHEM 109 College Chemistry I	<i>Curriculum Map</i>				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
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.	IR	IR	IR	I	R
explain the design and significance of experiments that led to the adoption of modern atomic theory.		IRA		R	R
recognize and interpret isotopic notation; understanding the relationship between average atomic masses and isotopic masses.	IR	R			
relate atomic mass to composition in terms of subatomic particles.	IA	R			RA
descriptive chemistry of ionic and covalent compounds.		IR		IR	R
describe the general properties of solutions, solubility of materials, and procedures for preparing a solution of known molarity.			IRA	R	
explain types of chemical reactions and perform stoichiometric calculations involving mass, moles, and solution molarity.	IR	IR	IRA		
explain the properties of solids, liquids, and gases.		IR		R	

describe, define, and perform calculations involving the basic concepts of thermodynamics.	IRA	IRA			RA
conceptually and quantitatively relate spectroscopic observation of atoms to quantum mechanical theories.	IRA	IRA	IR		RA
explain the nature of molecular bonding and structure.		IR		IR	
work in the laboratory in accordance with good laboratory practices.			IR		
gather and record qualitative and quantitative data accurately.			IRA	R	
handle and evaluate data in logical, productive, and meaningful ways.	IR	IR	IRA	R	RA
correlate laboratory work with principal topics in Chemistry I lecture.	RA		RA	RA	RA

MATH 122 Calculus & Analytic Geometry I	Curriculum Map				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
evaluate the limit of a function at a point both algebraically and graphically.	RA			R	
evaluate the limit of a function at infinity both algebraically and graphically.	RA			R	
use the definition of a limit to verify a value for the limit of a function.	RA			R	
use the limit to determine the continuity of a function.	RA			R	
apply the Intermediate-Value Theorem.	RA			R	
use the limit to determine differentiability of a function.	RA			R	
use the limiting process to find the derivative of a function.	RA			R	
find derivatives involving powers, exponents, and sums.	RA			R	
find derivatives involving products and quotients.	RA			R	
find derivatives involving the chain rule.	RA			R	
find derivatives involving exponential, logarithmic, and trigonometric functions.	RA			R	
find derivatives involving implicit differentiation.	RA			R	
use the first derivative to find critical points.	RA			R	
apply the Mean-Value Theorem for derivatives.	RA			R	

determine the behavior of a function using the first derivative.	RA			R	
use the second derivative to find inflection points.	RA			R	
determine the concavity of a function using the second derivative.	RA			R	
sketch the graph of the function using information gathered from the first and second derivatives.	RA			R	
interpret graphs of functions.	RA			R	
use the derivative to find velocity, acceleration, and other rates of change.	RA			R	
use the derivative to find the equation of a line tangent to a curve at a given point.	RA			R	
use optimization techniques in areas such as economics, the life sciences, the physical sciences, and geometry.	RA			R	
solve related rates problems.	RA			R	
use Newton's Method.	RA			R	
use differentials to estimate change.	RA			R	
find area using Riemann sums and integrals.	RA			R	
express the limit of a Riemann sum as a definite integral.	RA			R	
evaluate the definite integral using geometry.	RA			R	
integrate algebraic, exponential, and trigonometric functions.	RA			R	
evaluate definite integrals using the Fundamental Theorem of Calculus.	RA			R	
apply the Mean-Value Theorem for integrals.	RA			R	
integrate indefinite integrals.	RA			R	
integrate using substitution.	RA			R	
approximate integrals using Simpson's Rule and the Trapezoidal Rule.	RA			R	

MATH 123 Calculus & Analytic Geometry II	Curriculum Map				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
use integration to find area between curves and arc length of curves.	RA	R		R	RA
use integration to find volume and surface area of a surface of revolution.	RA	R		R	RA
use integration to find work and force.	RA	R		R	RA
use integration to find centroids.	RA	R		R	RA
apply integration by parts, trigonometric substitution, & partial fractions to solve integrals.	RA	R		R	RA
identify when to use and apply L'Hopital's Rule.	RA	R		R	RA
evaluate improper integrals.	RA	R		R	RA
determine and compute convergence/divergence of sequences and series.	RA	R		R	RA
find power series and Taylor and Maclaurin series representations of a given function and determine their intervals of convergence.	RA	R		R	RA
identify conic sections and their features.	RA	R		R	RA
represent curves by parametric equations, and apply the methods of calculus to them.	RA	R		R	RA
represent curves by polar equations.	RA	R		R	RA
determine the area of a solid formed by a polar function.	RA	R		R	RA
determine the arc length of a curve of a polar function.	RA	R		R	RA

PHYS 205 General Physics I	Curriculum Map				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
evaluate situations involving Physics I topics by choosing the appropriate conceptual frameworks.	IRA	IRA	IRA	IA	IR
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.	IRA	IRA	IRA	IA	IR
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).	IRA	IRA	IRA	IA	IR
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.	IRA	IRA	IRA	IA	IR

PHYS 206 General Physics II	Curriculum Map				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
evaluate situations involving Physics II topics by choosing the appropriate conceptual frameworks.	IRA	IRA	IRA	RA	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.	IRA	IRA	IRA	MA	MA
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).	IRA	IRA	IRA	MA	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.	IRA	IRA	IRA	MA	MA



PHYS 207 Engineering Physics I	<i>Curriculum Map</i>				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
evaluate situations involving Engineering Physics I topics by choosing the appropriate conceptual frameworks.	IR	IR	IR	IA	IR
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 Engineering Physics I topics.	IR	IR	IR	IA	IR
think critically by utilizing problem solving techniques to evaluate and analyze context rich, multi-step problems in Engineering 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).	IR	IR	IR	IA	IR
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 Engineering Physics I topics.	IR	IR	IR	IA	IR

PHYS 208: Engineering Physics II	<i>Curriculum Map</i>				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
evaluate situations involving Engineering Physics II topics by choosing the appropriate conceptual frameworks.	MA	MA	MA	RA	RMA
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 Engineering Physics II topics.	MA	MA	MA	RMA	RA
think critically by utilizing problem solving techniques to evaluate and analyze context rich, multi-step problems in Engineering 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).	MA	MA	MA	RA	RMA
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 Engineering Physics II topics.	MA	MA	MA	RMA	RMA

CHEM 110 College Chemistry II	Curriculum Map				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
describe the basic (colligative) properties of solutions.		RA	RA	RA	RA
describe the fundamentals of acid/base equilibria, including pH calculations, buffer behavior, acid/base titrations, and their relationship to electrophiles and nucleophiles.	RA	RA	RA	RA	RA
describe the thermodynamic and kinetic forces involved in chemical reactions which determine how much and how soon products are formed.	RA	RA		RA	RA
describe the basics of electrochemistry, and the relationship of electrical parameters to thermodynamic and stoichiometric parameters.	RA	RA	RA	RA	RA
describe current bonding models for simple inorganic and organic molecules in order to predict structures and important bonding parameters.	RA	RA		RA	RA
describe general periodicity patterns of (organic/inorganic) molecules, and the ability to design synthetic approaches to such species.	RA	RA	RA	RA	RA
describe solubility and complex ion equilibria.		RA		RA	
describe the basic aspects of nuclear chemistry.	RA	RA		RA	
work in the laboratory in accordance with good laboratory practices.			RA		
gather and record qualitative and quantitative data accurately.			RA	RA	

handle and evaluate data in logical, productive, and meaningful ways.	RA	RA	RA	RA	RA
correlate laboratory work with principal topics in College Chemistry II lecture.	RA		RA	RA	RA

CSCI 102 Introduction to Programming	Curriculum Map				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
identify and describe general computer and programming topics such as operating systems, networking, databases, algorithms, control structures, data types, data storage, files and arrays.	IRA			IA	
demonstrate structured programming principles, such as top-down modular design and proper program documentation and style.	IRA			IA	
demonstrate the use of certain basic tools and algorithms, such as data validation, defensive programming, calculating sums and averages, and searching and sorting lists.	IRA			IA	
describe and articulate other programming paradigms, such as object-oriented and event-driven programming.	IRA			IA	

PHSC 2053 Physical Geology Lecture	<i>Curriculum Map</i>				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
explain the nature of scientific inquiry and how it leads to our understanding of geologic processes.		IA		IRA	
identify and describe a range of Earth materials, including minerals, rocks, soils, and fossils.		IA		IRA	
discuss basic geologic principles including Geologic Time and Plate Tectonics.		I		IRA	
read and interpret topographic and geologic maps.		I		IRA	

MATH 206 Differential Equations	Curriculum Map				
Program Outcomes	demonstrate logical reasoning in problem solving by using the appropriate levels of mathematics (college algebra and calculus), diagrams, and the principles of physics.	indicate the fundamental laws of the nature and express the principles of physics to resolve the associated phenomena.	work individually and in teams to demonstrate proper and safe use of instrumentation and software in performing laboratory measurements and analysis to develop a growing sense of errors.	apply effective written and oral communications.	use critical thinking skills in solving physics problems and examining physics related scenarios.
Course SLO: Students will be able to					
explain the Basic Terminology and Definitions for the Study of Differential Equations.	RA			R	RA
show proficiency with First-Order Differential Equations.	RA			R	RA
show proficiency in Modeling First-Order Differential Equations.	RA			R	RA
show proficiency with Higher Order Differential Equations.	RA			R	RA
show proficiency in Modeling Higher Order Differential Equations.	RA			R	RA
show proficiency with Series Solutions of Linear Equations.	RA			R	RA
show proficiency in Laplace Transform.	RA			R	RA
show proficiency in the System of Linear First-Order Differential Equations.	RA			R	RA
show proficiency in Numerical Solutions of Ordinary Differential Equations. (if time permits).	RA			R	RA