A.A. in LIBERAL ARTS: NATURAL SCIENCES

College Learning Outcomes Matrix: Rate each course from 1 to 5 with 5 being the most important.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	Year of SLO Review	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:	GE	DEGREE
ANTH 101 Intro to Physical/Biological Anthropology	Fall 12	4	3	5	2	X	X
ANTH 101L Intro to Physical/Biological Anthropology Laboratory	Fall 12	2	4	5	0	X	X
ASTR 101 Introduction to Astronomy	Fall 12	2	4	4/3	3	X	X
ASTR 117L Introduction to Astronomy Lab	Fall 12	3	4	4/3	3	X	X

A.A. in LIBERAL ARTS: NATURAL SCIENCES

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	Year of SLO Review	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:	GE	DEGREE
BIOL 100 Nutrition *	**13/14**	3	3	4	3	X	X
BIOL 107 / PE 107 Human Biology	12/13	**3**	**3**	**4**	**3**	X	X
BIOL 109 Heredity and Evolution	NOT OFFERED					X	X
BIOL 110 Introduction to Biology	**11/12**	3	4	5	2	X	X
BIOL 110L Introduction to Biology Laboratory	**11/12**	4	5	5	1	X	X
BIOL 112A Biology for Biology Majors I	**11/12**	3	4	4	3	X	X
BIOL 112B Biology for Biology Majors II	**11/12**	3	4	4	4	X	X
BIOL 112C Biology for Biology Majors III *	**11/12**	3	5	4	3	X	X
BIOL 120 Human Anatomy *	**11/12**	4	3	5	2	X	X
BIOL 138/GEOL 138 Introduction to Environmental Science *	**13/14**	2	4	5	3	X	X
BIOL 142 Environmental Policy and Planning	**Spring 13**						X

A.A. in LIBERAL ARTS: NATURAL SCIENCES

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	Year of SLO Review	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:	GE	DEGREE
BIOL 145 Ethics in Science	**13/14**	3	3	3	3		X
BIOL 147 Food, People, and the Environment	**12/13**	3	4	5	5		X
BIOL/ELND 160 Soil: Ecology and Management	**13/14**	4	3	5	3	X	X
BIOL 162 General Ecology	**13/14**	3	3	5	2	X	X
BIOL 171 Biology of Marine Mammals	**12/13**	3	3	3	2		X
BIOL 224 Human Physiology *	**11/13**	3	5	4	3	X	X
BIOL 235 General Marine Biology	**13/14**	3	4	4	3	X	X
BIO 240 Microbiology	**12/13**	4	4	4	3	X	X
BIOL/GEOL 250 Scientific Research and Reporting		5	5	5	3		X

A.A. in LIBERAL ARTS: NATURAL SCIENCES

College Learning Outcomes Matrix: Rate each course from 1 to 5 with 5 being the most important.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	Year of SLO Review	1. EFFECTIVE Communication	2. Scientific or Quantitative Reasoning:	3. Critical Thinking	4. Problem Solving	5. Information Literacy	GE	DEGREE
CHEM 105 Chemistry for Allied Health Sciences	**Spring 12**	3	4	4	4	3	X	X
CHEM 114 Introduction to Chemistry	**Fall 12**	3	5	5	5	1	X	X
CHEM115 Survey of Organic and Biochemistry	**Spring 12**	3	5	5	5	3	X	X
CHEM 131 General Chemistry I	**Fall 12**	4	5	5	5	2	X	X
CHEM 132 General Chemistry II	**Spring 12**	4	5	5	5	2	X	X
CHEM 231 Organic Chemistry I	**Fall 12**	3	5	5	5	2	X	X
CHEM 232 Organic Chemistry II	**Spring 12**	4	5	5	5	3	X	X

A.A. in LIBERAL ARTS: NATURAL SCIENCES

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	Year of SLO Review	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:	GE	DEGREE
GEOG 101 The Physical Environment	F 12	5				X	X
GEOG 101L Physical Environment Lab	F 12	5		4		X	X
GEOG 112 Meteorology and Climatology	SP 13	5	3	3	3	X	X
GEOG 125 Intro to GIS	12/13	4	2	4	3		X
GEOL 103 Environmental Geology	12/13	5	3	3	1	X	X
GEOL 109 General Oceanography	12/13	5	3	3	1	X	X
GEOL 114 Geology of California	12/13	5	3	3	1	X	X
GEOL 115 Volcanoes	13/14	5	3	3	1		X
GEOL 116 Volcanoes and Earthquakes	13/14	5	3	3	1		X
GEOL 120 Physical Geology	12/13	5	3	3	2	X	X
GEOL 120L Physical Geology Lab	12/13	4	5	3	3	X	X
GEOL 121 Historical Geology	12/13	5	3	4	2	X	X
GEOL 125 Field Geology I	12/13	3	5	5	2		X
GEOL 126 Field Geology II	12/13	3	5	5	3		X
GEOL 142+ Environmental Policy and Planning (See Bio142)							X
GEOL 145+* Ethics in Science (See Bio145)	13/14	3	3	3	3	X	X
GEOL 201 Elementary Mineralogy		5	3	3	1		X

A.A. in LIBERAL ARTS: NATURAL SCIENCES

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	Year of SLO Review	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:	GE	DEGREE
MATH 105 College Algebra	12/13	3	3	5	1	X	X
MATH 109 Pre-Calculus College Algebra and Trigonometry	12/13	3	3	5	1	X	X
MATH 114 Finite Mathematics	12/13	3	3	5	1	X	X
MATH 115*** Probability and Statistics STAT 115	12/13	3	3	5	1	X	X
MATH 121 Calculus I with applications	12/13	3	3	5	1	X	X
MATH 122 Calculus II with applications	12/13	3	3	5	1	X	X
MATH 123 Analytic Geometry and Calculus	12/13	3	3	5	1	X	X
MATH 124 Analytic Geometry and Calculus II	12/13	3	3	5	1	X	X
MATH 223 Analytic Geometry, Vector Analysis and Calculus III	12/13	3	3	5	1		X
MATH 224 Elementary Differential Equations	12/13	3	3	5	1		X

A.A. in LIBERAL ARTS: NATURAL SCIENCES

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	Year of SLO Review	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:	GE	DEGREE
PHYS 108A General Physics I	Fall 12	4	5	5	3	X	X
PHYS 108B General Physics II	Spr 12	4	5	5	3	X	X
PHYS 110 Introductory Physics	Spr 12	3	3	4	4	X	X
PHYS 110L Conceptual Physics Lab	N/A	4	4	4	3		X
PHYS 207A Mechanics and Properties of Matter	Fall 12	4	5	5	3	X	X
PHYS 207B Electricity and Magnetism	Fall 12	4	5	4	1	X	X
PHYS 207C Heat, Light, Sound, and Modern Physics	Spr 12	4	5	4	1	X	X

A.A. in LIBERAL ARTS: NATURAL SCIENCES

GENERAL EDUCATION SLOS. WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:
ANTH 101 Intro to Physical/Biological Anthropology	In-class activities, article summaries, video notes, essays and objective tests		In-class activities, article summaries, video notes, essays and objective tests	
ANTH 101L Intro to Physical/Biological Anthropology Laboratory		Hands-on activities, looking at osteological materials, lab practicals	Hands-on activities, looking at osteological materials, lab practicals	
ASTR 101 Introduction to Astronomy		Exam Questions	Exam Questions	
ASTR 117L Introduction to Astronomy Lab		Lab Reports	Lab Reports	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

GENERAL EDUCATION SLOS. WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:
BIOL 100 Nutrition	Essays, MC Test	Essays, MC Test	Essays, MC Test	Essays, MC Test
BIOL 107 / PE 107 Human Biology	Essays, MC Test, term paper	Essays, questions applying scientific method	Essays, MC Tests, Case studies	Essays, MC Tests, term paper
BIOL 110 Introduction to Biology	Essays, MC Test	Research paper/exam, Essays, MC Test	Research papers, Essays, MC Test	Essays, MC Test
BIOL 110L Introduction to Biology Laboratory	Essays, MC Test	Essays, MC Test	Essays, MC Test	Essays, MC Test
BIOL 112A Biology for Biology Majors I		questions applying scientific method	Case studies	
BIOL 112B Biology for Biology Majors II	Essays, MC Test	Essays, MC Test	Essays, MC Test	Essays, MC Test
BIOL 112C Biology for Biology Majors III		Laboratory exercises & experiments	Genetics problems; restriction fragment analysis; notebook discussions.	
BIOL 120 Human Anatomy	Exam/practical questions, digestive journey, muscle packet	Exam/practical, muscle packet	Case studies, exams/practicals, muscle packet, digestive journey	
BIOL 138 Introduction to Environmental Science	Oral written exams/research papers	Oral written exams/research papers	Research papers	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

GENERAL EDUCATION SLOS. WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:
BIOL 142/GEOL 142 Environmental Policy and Planning				
BIOL 145 /GEOL 145 Ethics in Science				
BIOL 147 Food, People, and the Environment				
BIOL/ELND 160 Soil: Ecology and Management	Essays, MC Test	Essays, MC Test	Essays, MC Test	Essays, MC Test
BIOL 162 General Ecology	Essays, MC Test	Essays, MC Test, Field research papers/oral written exam	Essays, MC Test, Field research papers/oral written exam	Essays, MC Test
BIOL 171 Biology of Marine Mammals				
BIOL 224 Human Physiology		questions applying scientific method	Case studies	
BIOL 235 General Marine Biology	Field research papers/oral written exam	Field research papers/oral written exam	Research papers	
BIOL 240 Microbiology	Essays, MC Test	Essays, MC Test	Essays, MC Test	Essays, MC Test
BIOL/GEOL 250 Scientific Research and Reporting	Research project	Research project	Research project	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

GENERAL EDUCATION SLOS. WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:
GEOG 101 The Physical Environment	Essays, presentations	Essays, presentations	Research project	Research project
GEOG 101L Physical Environment Lab	Essays, presentations	Calculations of problems	Essays, presentations	Research project
GEOG 112 Meteorology and Climatology	Essays, presentations	Calculations of problems		
GEOG 125 Intro to GIS	Essays, presentations	Essays, presentations	Map project	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

GENERAL EDUCATION SLOS. WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:
GEOL 103 Environmental Geology	Essays, presentations	Essays, presentations	Research project	
GEOL 109 General Oceanography	Essays, presentations			
GEOL 114 Geology of California	Essays, presentations			
GEOL 115 Volcanoes	Essays, presentations			
GEOL 116 Volcanoes and Earthquakes	Essays, presentations			
GEOL 120 Physical Geology	Essays, presentations	Essays, presentations		Research project
GEOL 120L Physical Geology Lab	Essays, presentations	Essays, presentations, calculations	Research project	Research project
GEOL 121 Historical Geology	Exams/oral presentation interpret past environment		Research project	
GEOL 125 Field Geology I		Measurement/ survey in field	Measurement/ survey in field; Mapping project	
GEOL 126 Field Geology II		Measurement/ survey in field	Measurement/ survey in field; Mapping project	
GEOL 201 Elementary Mineralogy	Essays, presentations			

A.A. in LIBERAL ARTS: NATURAL SCIENCES

GENERAL EDUCATION SLOS. WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:
MATH 105 College Algebra		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 109 Pre-Calculus College Algebra and Trigonometry		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 114 Finite Mathematics		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 115*** Probability and Statistics STAT 115		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 121 Calculus I with applications		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 122 Calculus II with applications		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 123 Analytic Geometry and Calculus		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 124 Analytic Geometry and Calculus II		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 223 Analytic Geometry, Vector Analysis and Calculus III		Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 224 Elementary Differential Equations		Final Exam (course SLO questions)	Final Exam (course SLO questions)	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

GENERAL EDUCATION SLOS. WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning	3. Critical Thinking/ Problem Solving	4. Information Literacy:
PHYS 108A General Physics I	Lab Reports, Exam Problems	Lab Reports, Exam Problems	Lab Reports, Exam Problems	
PHYS 108B General Physics II	Lab Reports, Exam Problems	Lab Reports, Exam Problems	Lab Reports, Exam Problems	
PHYS 110 Introductory Physics			Exam Problems	Research Paper
PHYS 110L Conceptual Physics Lab	Lab Reports	Lab Reports	Lab Reports	
PHYS 207A Mechanics and Properties of Matter	Lab Reports, Exam Problems	Lab Reports, Exam Problems	Lab Reports, Exam Problems	
PHYS 207B Electricity and Magnetism	Lab Reports, Exam Problems	Lab Reports, Exam Problems	Lab Reports, Exam Problems	
PHYS 207C Heat, Light, Sound, and Modern Physics	Lab Reports, Exam Problems	Lab Reports, Exam Problems	Lab Reports, Exam Problems	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

A.S. IN LIBERAL ARTS: NATURAL SCIENCES REQUIREMENTS
18 units of study across 3 disciplines below

ANTH 101 Intro to Physical/Biological Anthropology
ANTH 101L Intro to Physical/Biological Anthropology Laboratory

ASTR 101 Introduction to Astronomy
ASTR 117L

BIOL 100 Nutrition
BIOL 107++ Human Biology
BIOL 109 Heredity and Evolution
BIOL 110 Introduction to Biology
BIOL 110L Introduction to Biology Lab
BIOL 112A Biology for Biology Majors I
BIOL 112B Biology for Biology Majors II
BIOL 112C Biology for Biology Majors III
BIOL 120 Human Anatomy
BIOL 138*+ Intro to Environmental Science
BIOL 142+ Environmental Policy and Planning
BIOL 145+* Ethics in Science
BIOL 147 Food, People and Environment
BIOL 160 Soil: Ecology and Management
BIOL 162 General Ecology
BIOL 171 Biology of Marine Mammals
BIOL 224 Human Physiology
BIOL 235 General Marine Biology

BIOL 240 Microbiology
BIOL 250** Scientific Research and Reporting

CHEM 105 Chemistry for Allied Health Sciences
CHEM 114 Introduction to Chemistry
CHEM115 Survey of Organic and Biochemistry
CHEM 131 General Chemistry I
CHEM 132 General Chemistry II
CHEM 231 Organic Chemistry I
CHEM 232 Organic Chemistry II

GEOG 101 The Physical Environment
GEOG 101L Physical Environment Lab
GEOG 112 Meteorology and Climatology
GEOG 125 Intro to GIS

GEOL 103 Environmental Geology
GEOL 109 General Oceanography
GEOL 114 Geology of California
GEOL 115 Volcanoes
GEOL 116 Volcanoes and Earthquakes
GEOL 120 Physical Geology
GEOL 120L Physical Geology Lab
GEOL 121 Historical Geology
GEOL 125 Field Geology I
GEOL 126 Field Geology II
GEOL 142+ Environmental Policy and Planning
GEOL 145+* Ethics in Science

GEOL 201 Elementary Mineralogy
GEOL 250** Scientific Research and Reporting

MATH 105 College Algebra
MATH 109 Pre-Calculus College Algebra and Trigonometry
MATH 114 Finite Mathematics
MATH 115*** Probability and Statistics
MATH 121 Calculus I with applications
MATH 122 Calculus II with applications
MATH 123 Analytic Geometry and Calculus
MATH 124 Analytic Geometry and Calculus II
MATH 223 Analytic Geometry, Vector Analysis and Calculus III
MATH 224 Elementary Differential Equations

PE 107++ Human Biology

PHYS 108A General Physics I
PHYS 108B General Physics II
PHYS 110 Introductory Physics
PHYS 207A Mechanics and Properties of Matter
PHYS 207B Electricity and Magnetism
PHYS 207C Heat, Light, Sound and Modern Physics
STAT 115*** Probability and Statistics

STUDENT LEARNING OUTCOMES
Students who have completed the requirements for this degree will be able to:

1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.
2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.
3. Predict likely changes to local communities and ecosystems under different conditions.

A.A. in LIBERAL ARTS: NATURAL SCIENCES

THESE DEGREE SLOS OUTCOMES EQUAL WHICH COURSE OUTCOMES FOR THESE COURSES?

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
ANTH 101 Intro to Physical/Biological Anthropology	8	1, 2 , 4, 5, 7, 9	3, 6
ANTH 101L Intro to Physical/Biological Anthropology Laboratory	3, 5, 6, 9, 10	7, 8,	1, 2, 4
ASTR 101 Introduction to Astronomy		1,3	1,2,3,4
ASTR 117L Introduction to Astronomy Lab		1,3	1,2,3,4
BIOL 100 Nutrition	D,G,H,I,J,K	A,B,C,D,E,F,G,H,I,J	
BIOL 109 Heredity and Evolution	2	1,4	3
BIOL 110 Introduction to Biology	C1, C2	B1-6	A1-4
BIOL 110L Introduction to Biology Laboratory	2,3,5,6,8,9		1,2,3,4,5,6,7,8,9,10
BIOL 112A Biology for Biology Majors I	2, 3	1,4	1,2,3
BIOL 112B Biology for Biology Majors II	4, 5	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13	4, 5, 6, 7
BIOL 112C Biology for Biology Majors III	3	1	2, 4
BIOL 120 Human Anatomy	4	1, 2, 3, 4, 5, 6, 7	4
BIOL 138 Introduction to Environmental Science	5	1, 2, 3	4, 6, 7
BIOL 142 / GEOL 142 Environmental Policy and Planning		2	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

THESE DEGREE SLOS OUTCOMES EQUAL WHICH COURSE OUTCOMES FOR THESE COURSES?

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
BIOL 145 / GEOL 145 Ethics in Science			3, 4, 5
BIOL 147 Food, People, and the Environment	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	
BIOL/ELND 160 Soil: Ecology and Management	BC	AB	AB
BIOL 162 General Ecology		1, 2, 3, 4	
BIOL 171 Biology of Marine Mammals		1, 2	3
BIOL 224 Human Physiology	4, 6	1, 2, 3, 4, 5	6, 7, 8, 9
BIOL 235 General Marine Biology	2, 9	1, 2, 3, 4, 5, 6, 7	4, 8
BIOL 240 Microbiology	2	1, 4	3, 5
BIOL/GEOL 250 Scientific Research and Reporting	1, 2, 3, 4		1, 2, 3, 4

A.A. in LIBERAL ARTS: NATURAL SCIENCES

THESE DEGREE SLOS OUTCOMES EQUAL WHICH COURSE OUTCOMES FOR THESE COURSES?

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
GEOG 101 The Physical Environment	1, 2, 3	1, 2, 3	1, 2, 3
GEOG 101L Physical Environment Lab	1, 2, 3	1	2
GEOG 112 Meteorology and Climatology	5	1, 2, 3	4
GEOG 125 Intro to GIS	2, 4, 5	1, 3	6, 7
GEOL 103 Environmental Geology	1, 2	2	1
GEOL 109 General Oceanography	2, 3	4	1
GEOL 114 Geology of California	5	4	8
GEOL 115 Volcanoes	4	2	1
GEOL 116 Volcanoes and Earthquakes	4	1	5
GEOL 120 Physical Geology	3	1	1
GEOL 120L Physical Geology Lab	1	4	8, 10
GEOL 121 Historical Geology	1	9	1, 2
GEOL 125 Field Geology I	1	2	3
GEOL 126 Field Geology II	2	1	3
GEOL 201 Elementary Mineralogy	1	2	4

A.A. in LIBERAL ARTS: NATURAL SCIENCES

THESE DEGREE SLOS OUTCOMES EQUAL WHICH COURSE OUTCOMES FOR THESE COURSES?

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
MATH 105 College Algebra	1,2,3		
MATH 109 Pre-Calculus College Algebra and Trigonometry	1,2,3		
MATH 114 Finite Mathematics	1,2,3		
MATH 115*** Probability and Statistics STAT 115	1,2,3		
MATH 121 Calculus I with applications	1,2,3		
MATH 122 Calculus II with applications	1,2,3		
MATH 123 Analytic Geometry and Calculus	1,2,3		
MATH 124 Analytic Geometry and Calculus II	1,2,3		
MATH 223 Analytic Geometry, Vector Analysis and Calculus III	1,2,3		

A.A. in LIBERAL ARTS: NATURAL SCIENCES

THESE DEGREE SLOS OUTCOMES EQUAL WHICH COURSE OUTCOMES FOR THESE COURSES?

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
PHYS 108A General Physics I	1, 2, 3,4, 6	1, 2	3, 4, 5
PHYS 108B General Physics II	1, 2, 3,4, 6	1, 2	3, 4, 5
PHYS 110L Conceptual Physics Lab		1	2,3,4
PHYS 110 Introductory Physics		1,2,3	1
PHYS 207A Mechanics and Properties of Matter	2	1	3
PHYS 207B Electricity and Magnetism	1	2	3
PHYS 207C Heat, Light, Sound, and Modern Physics	2	1	3

A.A. in LIBERAL ARTS: NATURAL SCIENCES

IN WHICH COURSES ARE THESE DEGREE SLOS ASSESSED? Use "I" for Intro, "P" for Practice and "M" for Mastery.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
ANTH 101 Intro to Physical/Biological Anthropology	I	I	I
ANTH 101L Intro to Physical/Biological Anthropology Laboratory	I	I	I
ASTR 101 Introduction to Astronomy		I	I
ASTR 117L Introduction to Astronomy Lab		I	I
BIOL 100 Nutrition	I	P	
BIOL 107 Human Biology		I	
BIOL 109 Heredity and Evolution			
BIOL 110 Introduction to Biology	P	P	I
BIOL 110L Introduction to Biology Laboratory	P	P	I
BIOL 112A Biology for Biology Majors I	P	P	P
BIOL 112B Biology for Biology Majors II	P	P	P
BIOL 112C Biology for Biology Majors III	P	P	P
BIOL 120 Human Anatomy	I	P	I
BIOL 138 Introduction to Environmental Science	P	P	P
BIOL 142 / GEOL 142 Environmental Policy and Planning		I	

A.A. in LIBERAL ARTS: NATURAL SCIENCES

IN WHICH COURSES ARE THESE DEGREE SLOS ASSESSED? Use "I" for Intro, "P" for Practice and "M" for Mastery.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
BIOL 145 / GEOL 145 Ethics in Science			
BIOL 147 Food, People, and the Environment	I	P	
BIOL/ELND 160 Soil: Ecology and Management	P	P	P
BIOL 162 General Ecology		P	
BIOL 171 Biology of Marine Mammals			
BIOL 224 Human Physiology	P	P	P
BIOL 235 General Marine Biology	P	P	P
BIOL 240 Microbiology	P	P	P
BIOL/GEOL 250 Scientific Research and Reporting			

A.A. in LIBERAL ARTS: NATURAL SCIENCES

IN WHICH COURSES ARE THESE DEGREE SLOS ASSESSED? Use "I" for Intro, "P" for Practice and "M" for Mastery.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
GEOG 101 The Physical Environment	I	I	I
GEOG 101L Physical Environment Lab	I	I	I
GEOG 112 Meteorology and Climatology	I	I	I
GEOG 125 Intro to GIS	I	I	I
GEOL 103 Environmental Geology	I	I	I
GEOL 109 General Oceanography	I	I	I
GEOL 114 Geology of California	I	I	I
GEOL 115 Volcanoes	I	I	I
GEOL 116 Volcanoes and Earthquakes	I	I	I
GEOL 120 Physical Geology	I	I	P
GEOL 120L Physical Geology Lab	P	I	P
GEOL 121 Historical Geology	I	I	P
GEOL 125 Field Geology I	I	I	I
GEOL 201 Elementary Mineralogy	I	I	I

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MATH 105 College Algebra	I		
MATH 109 Pre-Calculus College Algebra and Trigonometry	I		
MATH 114 Finite Mathematics	I		
MATH 115*** Probability and Statistics STAT 115	I		
MATH 121 Calculus I with applications	I		
MATH 122 Calculus II with applications	I		
MATH 123 Analytic Geometry and Calculus	I		
MATH 124 Analytic Geometry and Calculus II	I		
MATH 223 Analytic Geometry, Vector Analysis and Calculus III	I		
MATH 224 Elementary Differential Equations	I		

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PHYS 108A General Physics I	I	I	I
PHYS 108B General Physics II	P	P	P
PHYS 110 Introductory Physics		I	I
PHYS 110L Conceptual Physics Lab		I	I
PHYS 207A Mechanics and Properties of Matter	I	I	I
PHYS 207B Electricity and Magnetism	P	P	P
PHYS 207C Heat, Light, Sound, and Modern Physics	P	P	P

A.A. in LIBERAL ARTS: NATURAL SCIENCES

DEGREE SLOS
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A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
ANTH 101 Intro to Physical/Biological Anthropology	Hands-on activities, lab practicals, looking at osteological materials	Objective tests	Article summaries, video notes, essays
ANTH 101L Intro to Physical/Biological Anthropology Laboratory	Hands-on activities, lab practicals, looking at osteological materials	Objective tests	Article summaries, video notes, essays
BIOL 100 Nutrition	Relative proportions of nutrients in diet	Digestive system discussion	Epidemics in Biology
BIOL 107 Human Biology	Essays, questions applying scientific method	Essays, MC Test,	Essays, MC Tests, term paper, term paper
BIOL 110 Introduction to Biology	Exams	Food web problem	GMO Foods debate
BIOL 110L Introduction to Biology Laboratory	Lab 6	Lab 6	Lab 6
BIOL 112A Biology for Biology Majors I	Labs with Data	Exams	Original research
BIOL 112B Biology for Biology Majors II	Essay evaluations	Describe energy flow in food webs	Propose experiments to assess primary production in ecosystems
BIOL 112C Biology for Biology Majors III	Laboratory exercises & experiments; especially written discussions.	Exam questions including short essays.	Laboratory exercises & experiments; especially written discussions.
BIOL 120 Human Anatomy	Exam/practical questions, muscle packet	Exam/practical questions, digestive journey, muscle packet	Case studies, exams/practical questions
BIOL 138 Introduction to Environmental Science	Energy analysis of food production	Nutrient cycles	Sampling process to describe ecosystem
BIOL 142/ GEO 142 Environmental Policy and Planning			

A.A. in LIBERAL ARTS: NATURAL SCIENCES

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A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
BIOL 145 / GEO 145 Ethics in Science			
BIOL 147 Food, People, and the Environment			
BIOL/ELND 160 Soil: Ecology and Management	Diagnose causes of a soil problem	Explain the role of an element in a soil problem	Describe a process to solve a soil problem
BIOL 162 General Ecology	Oak 1° production	PSN + Biomass accumulation	Statistical variation in ecosystem sampling
BIOL 171 Biology of Marine Mammals			
BIOL 224 Human Physiology	Labs with Data	Exams	Original research
BIOL 235 General Marine Biology	Field research papers/oral written exam	Field research papers/oral written exam	Field research papers/oral written exam
BIOL 240 Microbiology	Essays, MC Test	Essays, MC Test	Essays, MC Test
BIOL/GEOL 250 Scientific Research and Reporting			

A.A. in LIBERAL ARTS: NATURAL SCIENCES

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A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
GEOG 101 The Physical Environment	Test questions; calculate deforestation areas	Test questions; determine effect of potential deforestation	Test questions; quantify effects of deforestation on ecosystems
GEOG 101L Physical Environment Lab	Test questions; calculate deforestation areas	Test questions; determine effect of potential deforestation	Test questions; quantify effects of deforestation on ecosystems
GEOG 112 Meteorology and Climatology	Biome and precipitation; changing water needs	Biome and Precipitation, cloud study	Changing Water needs
GEOG 125 Intro to GIS	Use GIS to calculate efficacy of potential wetland reclamation sites	Design map identifying areas of endangered habitats overlapping with potential future development	Design maps using intersecting layers to identify feasible uses of land

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A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
GEOL 103 Environmental Geology	Test questions; calculations of slope, related to landslide hazard	Test questions	Appropriate use of peer-reviewed articles in assigned papers
GEOL 109 General Oceanography	Essay questions	Essay questions regarding evolutionary history of marine organisms	Appropriate use of peer-reviewed articles in assigned papers
GEOL 114 Geology of California	Essay questions	Essay questions	Appropriate use of peer-reviewed articles in assigned papers
GEOL 115 Volcanoes	Essay questions	Essay questions	Appropriate use of peer-reviewed articles in assigned papers
GEOL 116 Volcanoes and Earthquakes	Essay questions	Essay questions	Appropriate use of peer-reviewed articles in assigned papers
GEOL 120 Physical Geology	Test questions; serpentine soils and plant type; sea level change	Test questions; serpentine soils and plant type; sea level change	Test questions; serpentine soils and plant type; sea level change
GEOL 120L Physical Geology Lab	Test questions; serpentine soils and plant type; sea level change	Test questions; serpentine soils and plant type; sea level change	Test questions; serpentine soils and plant type; sea level change
GEOL 125 Field Geology I	Watershed analysis; Rock ID project	Landslide hazards	Landslide hazards
GEOL 201 Elementary Mineralogy	Essay questions	Essay questions	Appropriate use of peer-reviewed articles in assigned papers

A.A. in LIBERAL ARTS: NATURAL SCIENCES

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MATH 105 College Algebra	N/A	N/A	N/A
MATH 109 Pre-Calculus College Algebra and Trigonometry	N/A	N/A	N/A
MATH 114 Finite Mathematics	N/A	N/A	N/A
MATH 115*** Probability and Statistics STAT 115	N/A	N/A	N/A
MATH 121 Calculus I with applications	N/A	N/A	N/A
MATH 122 Calculus II with applications	N/A	N/A	N/A
MATH 123 Analytic Geometry and Calculus	N/A	N/A	N/A
MATH 124 Analytic Geometry and Calculus II	N/A	N/A	N/A
MATH 223 Analytic Geometry, Vector Analysis and Calculus III	N/A	N/A	N/A
MATH 224 Elementary Differential Equations	N/A	N/A	N/A

A.A. in LIBERAL ARTS: NATURAL SCIENCES

DEGREE SLOS
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What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

A.A. IN LIBERAL ARTS: NATURAL SCIENCES	1. Apply mathematical and quantitative reasoning skills to questions in the natural sciences, including the fields of biology, geology, geography, astronomy, physics and/or anthropology.	2. Demonstrate basic understanding of the facts and principles that form the foundation of living and non-living systems.	3. Identify and apply the methodologies of science to modern research in the natural sciences, both in the laboratory and the field, and identify and describe the limitations of the same.
PHYS 108A General Physics I	Exam Problems	Exam Problems	Lab Reports
PHYS 108B General Physics II	Exam Problems	Exam Problems	Lab Reports
PHYS 110 Introductory Physics		Exam Problems	
PHYS 110L Conceptual Physics Lab		Lab Reports	Lab Reports
PHYS 207A Mechanics and Properties of Matter	Exam Problems	Exam Problems	Lab Reports
PHYS 207B Electricity and Magnetism	Exam Problems	Exam Problems	Lab Reports
PHYS 207C Heat, Light, Sound, and Modern Physics	Exam Problems	Exam Problems	Lab Reports

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BIOL_100	Nutrition	Revise Course
Expected Outcomes for Student:		
A. Enumerate the types of nutrients necessary for health and fitness B. Identify the nutrients that provide energy for metabolism C. Illustrate how vitamins and mineral contribute to a healthy diet D. Analyze the role of various nutrients in human metabolism E. Describe characteristics of a healthy diet F. Illustrate how the human body uses nutrients G. Estimate energy requirements of a person H. Investigate how food is produced and the amount of energy needed for food production I. Evaluate their food intake and its effect on sustainability J. Propose modifications to their diet for better health and sustainability K. Conduct library and internet research to prepare reports and communicate their findings		

BIOL_107 PE_107	Human Biology	Revise Course
Expected Outcomes for Student:		
Upon completion of this course, students will be able to: 1. Discuss the important structures and functions of the body's major systems, as well as the interactions between these systems. 2. Apply this knowledge as a context to gain deeper understandings into disease processes and treatments, as well as current medical and ethical debates relating to human biology. 3. Apply their knowledge of human biology to make informed decisions regarding the maintenance/improvement of their own health, as well as community health issues. 4. Analyze and appreciate the strengths and limitations of the scientific method to explore and find solutions to specific questions. 5. Identify the foundations in human biology required to take national certifications in wellness-related fields such as personal training and group fitness instruction.		

BIOL_109	HEREDITY AND EVOLUTION	Revise Course
Expected Outcomes for Student:		
1. Discuss historically, our approach to the understanding of genetics and evolution. 2. Analyze problems using the rules of genetics. 3. Compare the potential benefits and risks associated with new genetic technologies. 4. Evaluate the risks in ignoring natural selection and evolution when determining medical and environmental policy.		

A.A. in LIBERAL ARTS: NATURAL SCIENCES

BIOL_110	Introduction to Biology	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:

A. demonstrate general understanding of biology as a science by:
  1. comparing and contrasting the subject matter of biology and other natural sciences with respect to scale and other unique properties
  2. describing the important areas of biology and organizing them by scale or other characteristics
  3. comparing and contrasting scientific methods and non-scientific methods of explaining phenomena and producing information
  4. distinguishing science from pseudoscience and primary scientific information from secondary scientific information

B. use major principles, generalizations or theories of biology and related sciences to explain specific phenomena, including,
  1. use of plate tectonic theory to explain current positions and characteristics of continents and ocean basins.
  2. use of atomic theory to explain properties of different atoms and molecules, (especially biological macromolecules) and changes in chemical reactions.
  3. use of cell theory and genetic theory to explain the continuity and change in cells and multicellular organisms, including inheritance of observable traits and interactions between genes and their environment.
  4. use of principles of homeostasis and positive and negative feedback to explain changes in physiological status of organisms, including health and disease.
  5. use of ecological theory to explain structure of communities and ecosystems and movement of energy and nutrients within the biosphere.
  6. use of evolutionary theory to explain the Earth's biological diversity.

C. apply understanding of biology to suggest solutions to major problems of current human society, including
  1. threats to environmental health, including massive species extinctions, disruption of community relationships and altered ecosystem function.
  2. threats to human health, including starvation, disease and lowered quality of life.

BIOL_110L	Introduction to Biology Laboratory	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:

1. Carry out observations, construct hypotheses, perform experiments and interpret them in the context of important biological theories.
2. Use correctly the international system (SI or metric system) of measurement.
3. Select correct kind of microscope for viewing small specimens, prepare specimens for viewing and bring them into good focus with optimum illumination.
4. Use Bunsen burners, glassware and other laboratory equipment safely and effectively.
5. Use ecological measuring equipment safely and effectively in the field.
6. Carry out random sampling procedures of large populations.
7. Produce simple, well-labeled lined drawings.
8. Make simple mathematical summaries of data.
9. Draw and interpret simple graphs and construct and interpret data tables.
10. Produce coherent written records of laboratory and field work.
11. Work effectively in small groups.

A.A. in LIBERAL ARTS: NATURAL SCIENCES

BIOL_112A	Majors' Biology: Animals, Protozoa, Evolution and Classification	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. Demonstrate the ability to engage in clear and careful scientific inquiry and show that they can ask pertinent questions about zoological phenomena and formulate hypotheses based on those questions, drawing on scientific concepts and principles.
2. Apply deliberate and through observational skills in conducting an experiment and collecting data and be able to test hypotheses, and show that they can organize and summarize data and render them in a way that is accurate and comprehensible in both verbal and graphical modes.
3. Draw conclusions from data that allow the students to support or refute hypothesis and make a case for alternative hypotheses.
4. Understand and will be able to demonstrate knowledge of the characteristics of all the major animal phyla as well as a thorough understanding of the circumstances under which these phyla evolved.

BIOL_112B	Majors' Biology: Plants, Algae, Fungi and Ecology	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. Describe the scope and goals of ecology in relation to other biological and non-biological areas of inquiry
2. Describe the major levels of ecological structure and function and their essential and emergent properties
3. Describe a species' habitat and niche
4. Construct simple population models and explain their usefulness
5. Perform a biodiversity assessment
6. Conduct a trophic analysis of ecological communities
7. Explain the importance of ecological engineering in analysis of ecosystems
8. Explain the importance of the major types of ecological interactions in the world
9. Describe the structure and function of vascular plants at the organismal, organ, organ system, tissue and cell levels of organization
10. Describe the reproductive biology of vascular plants, showing understanding of the structures involved
11. Name the major groups of algae, plants and fungi and place correctly in the modern biological classification system
12. Describe the reproductive biology of major groups of fungi, showing understanding of the structures involved
13. Explain the special features of the ecology of algae plants and fungi

BIOL_112C	Majors' Biology: Molecules, Cells, Prokaryotes and Genetics	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. Apply the basic principles of biology that govern cells and organisms.
2. Apply skill in applying the scientific method.
3. Critically evaluate scientific data.
4. Apply the fundamentals of writing and presenting scientific studies.

A.A. in LIBERAL ARTS: NATURAL SCIENCES

BIOL_120	Human Anatomy	Revise Course
Expected Outcomes for Student:		

1. Describe the basic anatomical design of the human body, including its bilateral symmetry, tube within a tube design, cavities, and fluid compartments.
2. Recall the organ systems of the body and describe their basic structural design and function.
3. Recognize and describe the major organs of each system, including their location in the body, gross anatomy, histological features, and function.
4. Differentiate under the microscope the four major tissue types, identify the subtypes of each of the major tissue types, and locate them in body structures.
5. Identify the specific anatomical structures listed in the lab manual using models, charts, specimens, microscope slides, prosections, cadavers, and skeletons.
6. Identify and use a variety of written, multimedia, online and other resources for learning anatomy.
7. Perform a simple dissection of some major organs or structures in both human and non-human animal specimens.

BIOL_138	Introduction to Environmental Sciences	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. describe how ecosystems provide the necessary services for all life on earth.
2. Discuss alternative perspectives concerning various world views that can lead to valuing the earth system.
3. Explain how science will provide us with the foundations and processes needed to understand human systems and how our activities affect the planet.
4. Explain how an understanding of science will assist us in finding and implementing scientific, technological, economic, and political solutions to environmental problems.
5. Assess and apply environmental, ecology and sustainability principles to modern life and a technologically based society in a lab setting.
6. Assess the methodology utilized by environmental professionals to apply environmental indicators to assess current trends in our environment.
7. Examine the application of a systems approach to environmental and ecological principles used by government agencies, industry and other organizations to minimize environmental impact on natural resources.

BIOL_142	Environmental Policy and Decision-Making	Revise Course
Expected Outcomes for Student:		

1. Describe main features of the most important pieces of federal, state, and local environmental legislation.
2. Examine critically an environmental issue of choice.
3. Identify and understand impacts of federal, state, or local policies or regulations that apply to the issue.
4. Specify the history, benefits, and/or drawbacks of our current environmental policies and planning processes.

BIOL_145	Ethics in Science	Revise Course
Expected Outcomes for Student:		

1. Identify basic concepts that underlie ordinary morality and how they apply scientific practice.
2. Identify key ethical theories as a framework for analyzing bioethical and other scientific-related ethical problems
3. Describe what leads to ethical problems including causes inherent in the social context of the practice of science.
4. Identify and describe significant contemporary problems in bioethics and identify the moral questions that medical practice and the health issues raise.
5. Critically analyze ethical problems related to the development of technology and medicine and apply ethical theories these problems.
6. Apply moral reasoning to specific situations and defend the conclusions of that reasoning.

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BIOL_147	Food, People, Health and the Environment	Revise Course
Expected Outcomes for Student:		

1. Describe the major components of the global food system: production, distribution and consumption.
2. Give a brief outline of the history of food procurement by humans
3. Describe the contributions of remaining hunting, gathering and fishing systems in the modern world.
4. Describe the major types of modern agricultural production: pastoral, un-irrigated agriculture and irrigated agriculture
5. Describe the major modern agricultural production systems and give the major inputs, outputs and environmental impacts involved in each.
6. Describe the modern food distribution system and its recent changes.
7. Describe the history of human population growth, including significant points of change.
8. Describe the history of eating patterns in different populations, noting common parallels
9. Explain significant human health conditions affected by eating patterns and nutrition.
10. Describe divergent views on the future of the food system, including those of the cornucopians, and the catastrophists, the conventional, organic and sustainable farmers, the concentrated and the dispersed distribution systems and the vegetarian, carnivore, omnivore and locavore consumers.

BIOL_160	Soil: Ecology and Management	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:

After completion of this class students will be able to:

A. Discuss the process of soil formation and development
B. Analyze how soil geological origins determine soil properties
C. Utilize knowledge about soil physical, chemical and biological properties to make decission to use soils to promote development of ecologicall sound plant communities.

BIOL_162	General Ecology	Revise Course
Expected Outcomes for Student:		

1. describe how the study of ecosystems can provide students insight into the dynamic mechanisms that shape the ecology of local biotic communities
2. describe how the study of biotic variables can provide students insight into the dynamic mechanisms that shape the ecology of the planet.
3. Identify the natural history and biotic interactions of key organisms of local biotic communities.
4. discuss the interrelationships of all levels of ecological study.

BIOL_171	Biology of Marine Mammals	Revise Course
Expected Outcomes for Student:		

1) analyze, compare, contrast and distinguish various survival strategies of the most common Pinnipeds and Cetaceans living within the waters of the Central California coast, Arctic and Antarctic.
2) investigate the diversity of local taxa and differentiate the fundamental abiotic and biotic variables of which these species must endure to survive.
3) evaluate concepts and debate in local natural history along with the differences and similarities in terrestrial life systems.

A.A. in LIBERAL ARTS: NATURAL SCIENCES

BIOL_224	Human Physiology	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. List the general functions of the body systems.
2. Explain physical and chemical principles related to cellular activity.
3. Explain relationships between structure and function at the molecular, cellular, and systems level of biological organization.
4. Recognize the complex interrelationships between various systems and processes in the body.
5. Summarize the homeostatic mechanisms by which body functions are known to be regulated. Distinguish between basic physiological changes and pathological changes in the body.
6. Practice several basic clinical and research techniques for studying and measuring various physiological parameters, including blood pressure, hematocrit, urine parameters, electrocardiograms, and respiratory volumes and flows.
7. Identify the processes of scientific investigation and be able to design and carry out an independent study in physiology.
8. Interpret and evaluate data with respect to the hypotheses, as well as previously published research.
9. Demonstrate work through formal scientific writing.

BIOL_235	General Marine Biology	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to demonstrate that they:
1) analyze, compare, contrast and distinguish various survival strategies of the most common species of marine invertebrate and vertebrates living in the rocky, sand flat, and mud flat intertidal regions of Central California
2) inventory the diversity of marine taxa and differentiate the fundamental oceanographic processes of which these species must endure to survive
3) discuss concepts and debate in marine biology along with the differences and similarities in terrestrial and other life systems
4) relate to the scientific method and research techniques to understand marine ecosystems
5) examine a fish or shark and inspect anatomical functional morphology
6) appraise and differentiate local holoplankton as well as meroplankton using a microscope
7) interpret, recognize and discuss the foundation knowledge and skills to commence to upper division studies in marine sciences
8) demonstrate they are safe while conducting marine-related field work or teaching in a variety of marine habitats.
9) explain the extent of and how human actions are interfering with the functioning of and contributing to the collapse of marine ecosystems.

BIOL_240	Microbiology	Revise Course
Expected Outcomes for Student:		

1. Recognize the importance of microorganisms to the ecology of the planet.
2. Describe the role that microorganisms play in health and disease.
3. Evaluate the major issues surrounding biotechnology research and development.
4. Isolate and identify common disease producing organisms.
5. Demonstrate proper handling of microorganisms in a laboratory.

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BIOL_250 GEOL_250	Scientific Research and Reporting	Revise Course
Expected Outcomes for Student:		
1. Conduct a scientific literature search. 2. Formulate a hypothesis. 3. Conduct scientific research. 4. Report findings both orally and written.		

CHEM_105	Chemistry in the Human Environment	Revise Course
Expected Outcomes for Student:		
1) Analyze everyday phenomena and current issues in modern society as they relate to the scientific method in general, and to chemical concepts in particular. 2) Provide a basic description of the organizational structure of matter from the subatomic to the macroscopic levels. 3) Demonstrate a basic understanding of how the properties of a material relate to its atomic-level structure, including concepts of energy, bonding, and chemical reactivity. 4) Recognize and apply several major classifications of chemical structure and patterns of reactivity.		

CHEM_114	Introduction to Chemistry	Revise Course
Expected Outcomes for Student:		
1) Develop explanations of everyday situations at the level of individual atoms and molecules. 2) Solve different types of chemistry problems using quantitative and qualitative techniques, and articulate your answers. 3) Assess and record careful laboratory measurements and observations, and carry out qualitative and quantitative analyses of these data.		

CHEM_115	Survey of Organic and Biochemistry	Revise Course
Expected Outcomes for Student:		
1. Demonstrate knowledge of IUPAC nomenclature for a variety of functional groups and apply to a wide variety of organic compounds. 2. Compare and contrast the structure, properties, and stereochemistry of organic compounds and how they relate to reactivity both in the lab and in biological systems. 3. Predict and explain trends in physical properties of organic compounds; 4. Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report.		

CHEM_131	General Chemistry I	Revise Course
Expected Outcomes for Student:		
1) Explain the macroscopic physical and chemical properties of a substance in terms of its atomic-level structure. 2) Develop solutions to complex chemistry problems using quantitative and qualitative techniques, and articulate your answers. 3) Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report.		

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CHEM_132	General Chemistry II	Revise Course
Expected Outcomes for Student:		
1) Predict chemical reactivity based on your knowledge of chemical kinetics, thermodynamics and equilibrium. 2) Develop solutions to complex chemistry problems using quantitative and qualitative techniques, and articulate your answers. 3) Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report.		

CHEM_231	Organic Chemistry I	Revise Course
Expected Outcomes for Student:		
Upon completion of the course, students will be able to: 1. gain knowledge of structure, properties, and stereochemistry of organic compounds and use this information in a comprehensive analysis to explain reactivity. 2. compare and contrast functional group transformations with carbon carbon bond forming reactions to synthesize (theoretically and practically) compounds from these reactions. 3. demonstrate knowledge of IUPAC nomenclature for functional groups and apply knowledge to a wide variety of organic compounds to communicate them to the scientific community. 4. use nuclear magnetic resonance, infrared spectroscopy, mass spectrometry and/or UV/Vis data to identify unknown compounds and/or confirm the structure of a target molecule in a synthesis.		

CHEM_232	Organic Chemistry II	Revise Course
Expected Outcomes for Student:		
Upon completion of the course, students will be able to: 1) synthesize a target molecule given a list of starting materials and readily available reagents, while following common safety protocols. 2) use analytical techniques such as HNMR, CNMR, FTIR, GC/MS, chemical analysis and physical properties to identify the structure of an unknown compound or confirm the structure of a known compound or synthetic target molecule. 3) interpret patterns of reactivity on the basis of mechanistic reasoning and report results in scientific terms.		

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GEOG_101	The Physical Environment	Revise Course
Expected Outcomes for Student:		
Students will be able to: 1. analyze the controls, distribution, and classification of world climates. 2. Describe seasonal Earth-Sun relations and explain resulting physical phenomena on Earth's surface. 3. Describe the Theory of Plate Tectonics, provide scientific evidence in its support, and explain its correlation to the creation of landforms.		

GEOG_101L	Physical Environment Laboratory	Revise Course
Expected Outcomes for Student:		
A) Analyze and interpret various types of maps, graphs, and tables depicting topographic, geologic, meteorologic, climatic and cartographic data. B) Collect, interpret, and present data obtained during field trips, from aerial photographs, and from the Internet. C) Analyze the relationship between the atmosphere, biosphere, hydrosphere, and lithosphere.		

GEOG_112	Meteorology and Climatology	Revise Course
Expected Outcomes for Student:		
1. Explain how energy is transferred throughout the Earth system. 2. Identify forcing mechanisms for upward vertical motions and explain how they can lead to cloud and precipitation formation. 3. Apply basic knowledge of atmospheric processes to dissect and explain weather phenomenon or climate systems. 4. Use the scientific method to assess atmospheric processes. 5. Analyze and interpret data presented in graphs, weather maps, and statistical analysis.		

GEOG_125	Introduction to Geographic Information Systems	Revise Course
Expected Outcomes for Student:		
Upon completion of this course, students will be able to: 1. Understand what Geographical Information Systems (GIS) are and what it can do with spatial data. 2. Use a computer, the world wide web and "ArcGIS" software to acquire, store, manage, analyze, manipulate and communicate with spatial data. 3. Define common terms used in GIS and with ArcGIS software, such as feature class, attributes, shapefiles, geodatabases, geoprocessing, metadata, etc. 4. Symbolize, classify and label spatial data using that data's attribute information. 5. Query spatial data using GIS software using database and spatial selection methods. 6. Analyze spatial data to find patterns, spatial relationships, solve problems or answer questions and develop spatial thinking skills using ArcGIS. 7. Evaluate, judge and design maps using fundamental cartographic principles and cartographic elements. 8. Communicate spatial data or the outputs of spatial analysis in cartographic form in either electronic or hard copy media.		

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GEOL_103	Environmental Geology	Revise Course
Expected Outcomes for Student:		
Upon completion of this course, students will be able to: 1. Evaluate geologic hazards, including potential earthquake damage, flooding, and volcanic eruptions. 2. Judge the most probably effects of anthropogenic climate change. 3. Appraise the risks in particular areas from landslides 4. Compare the effects on coastal erosion from human activities		

GEOL_109	General Oceanography	Revise Course
Expected Outcomes for Student:		
1. Describe the scientific method using examples such as the proof of Earth?s spherical nature or its rotation; 2. Explain direct inverse relationships as illustrated using the factors related to the law of gravitation and the development of empirical laws; 3. Explain gravitation, the earth?s rotation and revolution in the production of the tide producing forces and observed tide curve characteristics; 4. Discuss physical, chemical, and evolutionary models of: the Earth?s internal zones (oceanic and continental crust, mantle and core as well as lithosphere/ asthenosphere models); the ocean?s water, salts and gasses; the atmosphere; and the marine biosphere; 5. Distinguish the interactions between atmosphere and oceans which create wind waves as well as surface and thermohaline ocean currents 6. Explain the interactions between lithosphere and oceans in the production of seismic sea waves which contribute to the variety of shorelines; 7. Identify the interactions between oceans, land and organisms in marginal ocean environments which contribute to the variety of shorelines; 8. Define the interrelationships between physics, chemistry, crustal geology and the distribution of marine sediments; 9. Identify the physical, chemical, geological and biological characteristics of the San Francisco Bay estuary, ways in which man has altered the natural environment, and the implications of such alterations.		

GEOL_114	Geology of California	Revise Course
Expected Outcomes for Student:		
1. recognize and define the difference between a Resource and a Reserve and be able to report the prospectus of future hydrocarbon availability as defined by M. King Hubbert. 2. define the global locations where base and precious metal and energy Resources and Reserves are most likely to be found 3. discuss with a high level of geotechnical expertise the various types of mineral and energy extraction and beneficiation methods and the environmental impact produced or emitted from such methods 4. define the tectonic relationships between seismicity and volcanism and define the geo-tectonic processes that have formed the State of California 5. interpret Topographic and Geologic maps 6. sketch from a geologic map a structural cross-section illustrating the subsurface conditions and by applying the fundamental principles of Geology, define the chronological steps, geo-tectonic forces and lithospheric processes that have led to the formation of the terrain illustrated by the structural cross-section. 7. identify the dissolved, suspended, and bed load, i.e. the total mean daily load, of any stream system as well as the discharge of that stream system. 8. replicate the Eras, Periods, and epochs of the Geological Society of Americas Geologic Time Chart 9. locate the epicenter of a seismic event and discuss at a high level of geotechnical expertise the modified Richter Scale and have the ability to discuss the major strike slip faults of the San Andreas Transform boundary. 10. discuss in specific detail the various canals associated with the California Water Project and relate the problems of providing fresh potable water to the ever		

increasing population of our state.
11. recognize glacial, coastal, riverine and structural land forms.
12. discuss the problems associated with the Eel and Russian river watersheds.
13. identify representative samples of the most common igneous, sedimentary and metamorphic rocks
14. recognize common massive sulfide minerals and relate the mineral to the economic metal extracted from that mineral.
15. discuss the more common elements extracted from common minerals with sufficient cartographic skills to define the Longitude and Latitude of a point on planet Earth, provide the Land Office Grid System Coordinates of any given area defined by any scale of Topographic or Geologic map presented and have the skills to read both Azimuth and Compass Quadrant compass systems.

GEOL_115	Volcanoes	Revise Course

Expected Outcomes for Student:

1. Develop an awareness of the Earth?s natural processes and how scientists study them.
2. Promote an understanding of the human benefits and hazards of volcanic events.
3. Describe the name, location and types of volcanic landforms that affect the lives of those that live under their threat.
4. Locate and name the major volcanic landforms on Earth
5. Recognize and name the more common rock types generated by common volcanic eruptions.
6. Relate in written and illustration the tectonic processes that generate volcanoes.
7. Describe the various economic and health hazards associated with volcanic eruptions.

GEOL_116	Volcanoes and Earthquakes	Revise Course

Expected Outcomes for Student:

1. Evaluate how the theory of plate tectonics integrates core concepts that explain and predict the behavior of earthquakes and volcanoes
2. Assess risk factors resulting from volcanoes
3. Interpret how volcanic rock type can be used to understand volcanic hazards
4. Estimate risk factors resulting from earthquakes
5. Judge the effectiveness of hazard preparations

GEOL_120	Physical Geology	Revise Course

Expected Outcomes for Student:

1. define endogenic and exogenic forces and processes that drive and resist the forces of change to the quasi equilibrium conditions of our Earth's lithospheric regime
2. recognize basic mineral and rock types, geologic structures.
3. recognize problematic concerns of our ever-shrinking natural resources
4. explain the significance of geologic time.

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GEOL_120L	Physical Geology Laboratory	Revise Course
Expected Outcomes for Student:		

At the conclusion of this course, the student should be able to:
1. Describe and discuss the principles of physical geology
2. Identify rock and mineral specimens common to earth
3. Describe and discuss the geology and fossils of each geologic period, and
4. Identify fossils representative of each geologic period.
5. Reconnoiter the earth with high precision using a topographic map, compass and protractor
6. Calculate stream discharge, read a flood frequency and hydrography and predict flood events based on the data provided
7. Make structural cross-sections from geologic maps and develop the geologic history of the area based on that cross-section
8. Demonstrate the ability to use a microscope
9. Exhibit the ability to record field observations of exposed rock.
10. Using a brunton compass, obtain the attitude of bedding plains, joints, and faults in the field
11. Identify the common forms of faults and folds expressed in exposed rock

GEOL_121	Historical Geology	Revise Course
Expected Outcomes for Student:		

At the conclusion of this course, the student should be able to:
1. describe and discuss the principles of historical geology
2. describe the origin of the earth
3. describe and discuss the geology and fossils of each geologic period, and
4. identify fossils representative of each geologic period.
5. Read at the highest level topographic and geologic maps
6. Have the ability to generate a geologic map of a basic area
7. Have the ability to measure stratigraphic sections of rock and collect in a representative fashion samples that reflect the lithology and paleontology of that stratigraphic section
8. Read and analyze the geology of an area from aerial photographs
9. Use Index fossils to appropriately place a stratigraphic section into the proper time period or epoch
10. Exhibit a high level of skill with a transit or compass

GEOG_125	Introduction to Geographic Information Systems	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. Understand what Geographical Information Systems (GIS) are and what it can do with spatial data.
2. Use a computer, the world wide web and "ArcGIS" software to acquire, store, manage, analyze, manipulate and communicate with spatial data.
3. Define common terms used in GIS and with ArcGIS software, such as feature class, attributes, shapefiles, geodatabases, geoprocessing, metadata, etc.
4. Symbolize, classify and label spatial data using that data's attribute information.
5. Query spatial data using GIS software using database and spatial selection methods.
6. Analyze spatial data to find patterns, spatial relationships, solve problems or answer questions and develop spatial thinking skills using ArcGIS.
7. Evaluate, judge and design maps using fundamental cartographic principles and cartographic elements.
8. Communicate spatial data or the outputs of spatial analysis in cartographic form in either electronic or hard copy media.

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GEOL_126	Field Geology II	Revise Course
Expected Outcomes for Student:		

It is important to note that the basis for permitting students to take this course up to four times is that if the trip is to a different area then the rock type and structures will vary. Although the principles of the science remain the same, the more rock the student sees the better the geologist they become.
1. Discuss the geography, the regional geologic setting, geologic history, landforms, erosional processes, natural resources and unique geological features observed during this trip.
2. Possess sufficient cartographic skills such that they will be able to locate their position within 15 feet to the exact position through the use of a compass, protractor and topographic map.
3. Define the geological history as exposed in a road cut or out crop by employing the principles of the science of geology.
4. Identify common igneous, sedimentary and metamorphic rock types. They will have the ability to identify common Paleozoic invertebrates such as Trilobites, Cephalopods, and Brachiopods. Using standard identify keys they will be able to define the relative time period these organisms lived and thus define the age of the rock these critters came from.
5. Recognize common geologic structures and relate the forces that formed these structures.
6. Explain the current model for Basin and Range extension.

GEOL_142	Environmental Policy and Decision Making	Revise Course
Expected Outcomes for Student:		

1. Describe main features of the most important pieces of federal, state, and local environmental legislation.
2. Examine critically an environmental issue of choice.
3. Identify and understand impacts of federal, state, or local policies or regulations that apply to the issue.
4. Specify the history, benefits, and/or drawbacks of our current environmental policies and planning processes.

GEOL_201	Elementary Mineralogy	Revise Course
Expected Outcomes for Student:		

1. identify the major rock forming minerals and those minerals species exploration geologist seek in order to suffice the never ending elemental demands of the industrialized world.
2. discuss the elemental composition of these mineral species, the geo-tectonic processes involved in their formation and the chemical characteristics of these minerals species that make them so coveted in the modern industrial world.
3. discuss in specific terms exploration techniques and targets, the regions from which the various economic mineral species are recovered and the mining techniques employed in their recovery.
4. Explain beneficiation methodologies and the environmental consequences inherent in the use of the elements recovered will be well engrained in the students cerebral cortex.

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MATH_105	College Algebra	Revise Course
Expected Outcomes for Student:		

1. Algebraically determine the real and/or complex roots of a polynomial of fifth or less than can be factored using the standard methods of college algebra.

2. Determine the horizontal asymptotes of a rational function.

3. Solve an exponential equation of the level of difficulty equal to that of solving for the domain variable of one of the hyperbolic functions.

MATH_109	Precalculus College Algebra and Trigonometry	Revise Course
Expected Outcomes for Student:		

1. Algebraically determine the real and/or complex roots of a polynomial of fifth or less than can be factored using the standard methods of college algebra.

2. Determine the horizontal asymptotes of a rational function.

3. Determine the period and phase shift of either a sine or cosine function such as $y = A\sin(\omega t + \phi)$ and correctly draw the graph of that function.

MATH_115	Probability and Statistics	Revise Course
Expected Outcomes for Student:		

Upon completion of this course,
Students will be able to:

1. Solve problems involving the basics of probability theory.
2. Calculate various types of measures of central tendency and measures of dispersion.
3. Interpret and construct graphical representations of data.
4. Apply uniform, binomial, and Poisson distributions.
5. Solve problems that use a continuous random variable and the normal distribution and the t-distribution.
6. Compute point and interval estimates for population parameters, and be able to determine sample sizes for fixed interval estimates.
7. Perform hypotheses tests for populations parameters;
8. Solve problems with chi-square procedures, tests of independence and tests of homogeneity.
9. Derive the linear regression equation;
10. Calculate a least squares fit;
11. Perform estimation and prediction.
12. Perform hypothesis testing using analysis of variance.

MATH_121	Calculus I with Applications	Revise Course
Expected Outcomes for Student:		

1. Students will know and be able to apply :

a. The power rule for differentiation
b. The constant multiple rule for differentiation
c. The sum rule for differentiation

d. The chain rule for differentiation
e. The product rule for differentiation
f. The quotient rule for differentiation
g. The power rule for integration
h. The method for differentiating and integrating exponential functions
i. The method for differentiating logarithmic functions
j. The methods to calculate integrals of the form f(x) = 1/x and for exponential functions
k. The method for integrating by substitution
l. The method for finding higher order derivatives
m. The method for implicit differentiation
n. The methods for calculating both definite and indefinite integrals
o. The method of logarithmic differentiation

2. Students will be able to demonstrate mastery of the concept of a limit in the following ways:

a. Know the definition of a derivative
b. Determine whether a function is continuous and/or differentiable
c. Perform a secant line calculation of the derivative
d. Calculate limits of various polynomial and rational functions
e. Calculate Riemann Sums and understand their limits and some applications

3. Students will be able to demonstrate mastery of the concept and applications of a derivative in the following ways:

a. Find the slope of a tangent to a curve.
b. Write the equation of a tangent line to a curve at a given point
c. Graph polynomial and rational equations using calculus
d. Explain the relationship between instantaneous rate of change and average rate of change
e. Set up and solve optimization (min/max) problems
f. Explain the relationship between slope of a tangent line and instantaneous rate of change
g. Explain marginal profit/revenue/cost and their relationships to the derivative
h. Find marginal profit/revenue/cost; position/velocity/acceleration
i. Set up and solve related rates problems
j. Analyze a set of graphs whose relationship is a function and its derivative; be able to determine which is which
k. Solve a differential equation of the form y' = ky

4. Students will be able to demonstrate mastery of the concept and applications of the integral in the following ways:

a. Explain, in a heuristic manner, the Fundamental Theorem of Calculus and the definite integral
b. Solve applications problems for definite integrals such as finding areas in the xy-plane, volumes of revolution, average values, and future values
c. Solve applications that go from rates of change to values of functions

5. Students will be able to demonstrate mastery of logarithmic and exponential functions in the following ways:

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a. Manipulate logarithmic and exponential expressions
b. Graph logarithmic and exponential functions
c. Solve logarithmic and exponential equations
d. Solve applications of exponential and logarithmic functions such as growth and decay and compound interest problems

MATH_122	Calculus II with Applications	Revise Course

Expected Outcomes for Student:

At the end of Math 122, after studying and learning the content, a student will be able to do the following:
1. Determine partial derivatives and total differentials.
2. Construct and solve optimization models involving functions of several variables.
3. Construct and solve models using the method of least squares.
4. Determine indefinite and definite integrals by applying basic integration techniques such as: substitution method, integration by parts, numerical integration including the trapezoidal rule and Simpson?s Rule.
5. Evaluate improper integrals and double integrals.
6. Determine indefinite and definite integrals involving trigonometric, logarithmic, and exponential functions.
7. Solve differential equations, including initial value problems, by applying the following techniques: anti-differentiation, separation of variables, Euler?s Method, and constructing solution sketches.
8. Construct and solve models using integrals for applications in elementary probability theory.
9. Construct and solve models using differential equations for applications in business, biology and chemistry.
10. Approximate a function using a Taylor Polynomial.
11. Apply sigma notation in the representation of a series.
12. Determine the sums of geometric series.
13. Determine if a geometric series is convergent.

MATH_123	Analytic Geometry and Calculus I	Revise Course

Expected Outcomes for Student:

Student learning outcomes for Math 123 include but are not limited to the following:
1. Calculate limits using epsilon-delta definition and theorems for the limit of a function at a point;
2. Determine continuity and understand the intermediate value theorem;
3. Work with the definition of derivative, tangent lines;
4. Work with the derivatives of trigonometric functions;
5. Work with the differentiation rules (sum, product, quotient, chain) and implicit differentiation;
6. Make linear approximations and calculate the differential;
7. Apply Newton's method and solve related rates problems;
8. Sketch curves using extrema and critical points, first and second derivative tests.
9. Solve optimization problems;
10. Use the Mean Value Theorem;
11. Calculate Riemann sums, the Riemann integral, and understand its properties and existence;
12. Apply the Fundamental Theorems of Calculus;
13. Calculate change of variables and do numerical integration;
14. Calculate areas of plane regions, volumes; arc length and area of a surface of revolution; center of mass; work; fluid force on submerged lamina and other applications.

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MATH_124	Analytic Geometry and Calculus II	Revise Course
Expected Outcomes for Student:		
Student learning outcomes for Math 124 include the following: 1. Find an indefinite integral that requires the method of partial fraction decomposition. 2. Evaluate the limit of an indeterminate form.4. indeterminate forms; 3. Find the interval of convergence of a power series.		

MATH_223	Analytic Geometry, Vector Analysis, and Calculus III	Revise Course
Expected Outcomes for Student:		
1. Find the gradient of a particular scalar field $z = f(x,y)$, the value $D\_u(f)(p)$ of the directional derivative of f at point p in the direction of the unit vector u, and the direction v and magnitude ||grad f|| of the maximum rate of increase of f at point p. 2. Set up and evaluate a double, iterated integral in polar coordinates. 3. Use the divergence theorem to evaluate the total flux integral of a particular vector field F through a bounded surface that encloses a simply connected region.		

MATH_224	Elementary Differential Equations	Revise Course
Expected Outcomes for Student:		
1. Solve a standard first order initial value problem showing a proper written display of the appropriate method. 2. Solve a second order linear with constant coefficients, non homogeneous initial value problem showing (a) the solution of the associated non homogeneous problem and (b) a derivation of the particular solution. 3. Solve a second order boundary value problem, listing the eigenvalues and the eigenfunctions.		

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PHYS_108A	General Physics 1	Revise Course
Expected Outcomes for Student:		

Upon completion of the course, the student will:
1.Communicate and utilize the physical laws of kinematics and thermodynamics via problem solving
2. Apply the physical laws of kinematics and thermodynamics to word problems in order to obtain clear solutions by mathematical analysis.
3.Conduct an experiment, collect and analyze data, including such tools as graphs, regressions and statistical analysis, and interpret results within the framework of the physical laws of kinematics and thermodynamics
4. Write a lab report explaining, both qualitatively and quantitatively, the scientific results of an experiment and the certainty of those results.
5.Use modern scientific practices relevant to the field of physics: including the formulation of a scientific theory based on and consistent with quantified observations.
6.Demonstrate critical thinking skills

PHYS_108B	General Physics II	Revise Course
Expected Outcomes for Student:		

Upon completion of the course, the student will:
1.Communicate and utilize the physical laws of electricity and magnetism via problem solving
2.Apply the physical laws and techniques of electricity and magnetism to word problems and obtain clear solutions through mathematical analysis of these laws.
3.Conduct an experiment, collect and analyze data, including such tools as graphs, regressions and statistical analysis, and interpret results within the framework of the physical laws of electricity and magnetism
4.Write a lab report explaining, both qualitatively and quantitatively, scientific results of an experiment based in the field of electricity and magnetism and report the certainty of those results.
5.Use modern scientific practices relevant to the field of electricity and magnetism: including the formulation of a scientific theory based on and consistent with quantified observations.
6.Demonstrate critical thinking skills

PHYS_207A	Mechanics and Properties of Matter	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. Demonstrate a basic conceptual understanding of the fundamental concepts and definitions needed to solve problems in classical Newtonian mechanics.
2. Develop logical, causal and quantitative reasoning skills to obtain numerical or algebraic solutions to applied problems in Newtonian mechanics that are consistent with predictions and results
3. Carry out laboratory work, plan experiments, make observations and communicate results.

PHYS_207B	Electricity and Magnetism	Revise Course
Expected Outcomes for Student:		

Upon completion of this course, students will be able to:
1. Use the fundamental concepts and definitions to solve problems in classical Newtonian mechanics.

2. Explain applications and uses of the concepts of electricity and magnetism to real world problems and situations.
3. Carry out laboratory work, plan experiments, make observations and communicate results.

PHYS_207C	Heat, Light, Sound and Modern Physics	Revise Course

Expected Outcomes for Student:

Upon completion of this course, students will be able to:
1. Demonstrate a basic conceptual understanding of the fundamental concepts and definitions needed to solve problems in classical Newtonian mechanics.
2. Develop logical, causal and quantitative reasoning skills to obtain numerical or algebraic solutions to applied problems in waves and modern physics that are consistent with predictions and results
3. Carry out laboratory work, plan experiments, make observations and communicate results.