Revised: July 2012

Luna Community College

General Science Program Curriculum
2012 – 2015 Catalog

Program Goals: The overall goal of the general science program is to provide students with first two-years of general education core and a diverse offering of introductory science courses to prepare the students for transfer to the university in any of the life or physical science fields of study.

Upon completion of the General Science program, graduates will be prepared to:

1. develop a conceptual idea or hypothesis into a rigorous scientific experiment – demonstrate and communicate a working knowledge the scientific method
2. demonstrate theoretical knowledge of physical/biological phenomena found in the natural world
3. demonstrate competent laboratory skills
4. transfer to a four-year university program in a physical or life science discipline with freshman and sophomore requirement s achieved.

NM LAB SCIENCE COMPETENCIES: In addition to the individual course learning outcomes all lab science courses will address the following state competencies.

1. Students will describe the process of scientific inquiry.

Students should:

a. Understand that scientists rely on evidence obtained from observations rather than authority, tradition, doctrine, or intuition.
b. Students should value science as a way to develop reliable knowledge about the world.

2. Students will solve problems scientifically.

Students should:

a. Be able to construct and test hypotheses using modern lab equipment (such as microscopes, scales, computer technology) and appropriate quantitative methods.
b. Be able to evaluate isolated observations about the physical universe and relate them to hierarchically organized explanatory frameworks (theories).

3. Students will communicate scientific information.

Students should:

Communicate effectively about science (e.g., write lab reports in standard format and explain basic scientific concepts, procedures, and results using written, oral, and graphic presentation techniques.)

4. Students will apply quantitative analysis to scientific problems.

Students should:

a. Select and perform appropriate quantitative analyses of scientific observations.
b. Show familiarity with the metric system, use a calculator to perform appropriate mathematical operations, and present results in tables and graphs.

5. Students will apply scientific thinking to real world problems.

Students should:

a. Critically evaluate scientific reports or accounts presented in the popular media.
b. Understand the basic scientific facts related to important contemporary issues (e.g., global warming, stem cell research, cosmology), and ask informed questions about those issues.

GENERAL SCIENCE
Associate of Science Degree
Minimum of 66 Credit Hours

The General Science degree program is an interdisciplinary degree track that can lead to an advance degree in medicine, research, teaching or related field. The program is focused on the fundamentals of science and is designed to be flexible in preparing students for upper division studies at the university. Through proper advising and course selection, students can use the general science degree to pursue many diverse science fields. Students should be familiar with the admission requirements of the university they plan to attend.

Degree Requirements **Credit Hours: 66**

General Education Core ..... (36 hours)
Area I. Communications ..... (9 hours)
ENG111 Freshman Composition I 3
ENG115 Freshman Composition II 3
SPCH111 Public Speaking 3

Area II. Mathematics ..... (4 hours)
MATH180 College Algebra 4
Area III. Laboratory Science ..... (8 hours)
BIO110 General Biology I 4
CHEM111 General Chemistry I 4
Area IV. Social and Behavioral Sciences ..... (6 hours)
Area V. Humanities and Fine Arts ..... (9 hours)
Program Requirements ..... (10 hours)
ENVS102 Environmental Science 4
SMET101 Introduction to Science, Math and Engineering Technology 3
SMET105 Computer Use for Technology 3
Approved Electives ..... (20 hours)
BIO111 General Biology II 4
BIO127 General Botany 4
BIO142 General Zoology 4
BIO201 Medical Microbiology4
BIO217 Human Anatomy and Physiology I 4
BIO218 Human Anatomy and Physiology II 4
CHEM105 Introduction to Chemistry 4
CHEM112 General Chemistry II 4
GEOL101 Survey of Earth Science 4

GEOL202 Earth History	4
MATH190 Trigonometry	4
MATH195 Calculus I	4
MATH212 Calculus II	4
PHYS111 Introduction to Physics	4
PHYS115 General Physics I	4
PHYS116 General Physics II	4
PHYS161 Calculus Physics I	4
PHYS162 Calculus Physics II	4

Alignment of LCC General Science A.S. and ABET Student Outcomes for A.S.
(Applied Science Programs)

Program Student Outcomes for A.S.

	PSO ABET 1	PSO ABET 2	PSO ABET 3	PSO ABET 4	PSO ABET 5	PSO ABET 6	PSO ABET 7	PSO ABET 8	PSO ABET 9
ENG 111					X	X	X		
ENG 115					X	X	X		
SPCH 111					X	X	X		
MATH 075	X	X	X				X		X
MATH 095	X	X	X				X		X
MATH116	X	X	X				X		X
MATH 180	X	X	X				X		X
BIO 110	X	X	X	X	X	X	X		X
CHEM 111	X	X	X	X	X	X	X		X
ENVS 102	X	X	X	X	X	X	X		X
SMET 101				X	X	X	X	X	
SMET 105				X	X	X	X	X	
BIO 111	X	X	X	X	X	X	X		X
BIO127	X	X	X	X	X	X	X		X
BIO 142	X	X	X	X	X	X	X		X
BIO 201	X	X	X	X	X	X	X		X
BIO 217	X	X	X	X	X	X	X		X
BIO 218	X	X	X	X	X	X	X		X
CHEM 105	X	X	X	X	X	X	X		X

CHEM 112	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
GEOL 101	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
GEOL 202	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
MATH 190	**X**	**X**	**X**				**X**		**X**
MATH 195	**X**	**X**	**X**				**X**		**X**
MATH 212	**X**	**X**	**X**				**X**		**X**
PHYS 111	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
PHYS 115	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
PHYS 116	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
PHYS 161	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
PHYS 162	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**

ABET Program Student Outcomes for A.S.

Associate degree programs must demonstrate that graduates have:

(PSO ABET 1) an ability to apply knowledge of mathematics, sciences, and other related disciplines

(PSO ABET 2) an ability to conduct experiments, as well as to analyze and interpret data

(PSO ABET 3) an ability to identify, formulate, and solve applied science problems

(PSO ABET 4) an ability to function on teams

(PSO ABET 5) an understanding of professional and ethical responsibility

(PSO ABET 6) an ability to communicate effectively

(PSO ABET 7) a recognition of the need for and an ability to engage in life-long learning

(PSO ABET 8) a knowledge of contemporary issues

(PSO ABET 9) an ability to use the techniques, skills, and modern applied science tools necessary for professional practice

General Science Associate of Science Degree Program – Course Descriptions and Learning Outcomes

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SMET101 Intro to Science, Math, & Engineering Technology 3:(3,0)

This course is designed to develop a better understanding of the learning process within the domain of science, math and engineering technology. The course will use flexible learning strategies and creative problem solving techniques to include critical thinking skills. The ultimate goal of the course is to assist students in successfully meeting the demands of the technology field.

Course Objectives: The objectives of this course include introducing students to the various fields within science and engineering along with exploring the potential careers and ethical issues. The course offers strategies for success in the STEM fields at the community college and beyond.

Learning Outcomes: Upon completion of the course with a "C" or better the student will be able to:

- Select from a variety of problem solving strategies and use them to design potential problem solutions.
- Apply collaborative learning and teamwork skills in class assignments and team projects.
- Identify majors and career opportunities in engineering disciplines and be able to explain academic decisions.
- Identify and describe personal and professional strengths, abilities, and goals.
- Develop and initiate an individualized Academic Achievement Plan (AAP).
- Identify and effectively use LCC campus resources and services.

SMET105 Computer Use for Technology 3:(2,2)

This course is the study of the fundamentals of computer technology software used in engineering technology fields. Emphasis will be placed on technical and scientific computer applications. Topics to be covered will include an introduction to computer concepts, Windows, Microsoft Word, Excel, Access, and PowerPoint, and other specific software applications used to interface various engineering technologies fields.

Course Objectives: The objective of the course is to provide students with the computer basics for success in the STEM disciplines. Students will become proficient at basic Microsoft programs and will be introduced to AutoCAD software.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Demonstrate a knowledge of the course content through quizzes, projects, and exams
- Apply the concepts learned in class to unit projects
- Demonstrate a working knowledge of both Microsoft and AutoCAD software
- Demonstrate a working knowledge of hardware and components

ENVS102 **Environmental Science** **4;(3,2)**

This course includes a survey of environmental science and ecology with an introduction to problems of pollution, population, land use, energy, nutrients cycling, agriculture, and pest control. Laboratory provides observation and experimentation relating to topics covered in the lecture. *NM Common Course Number: ENVS1114.*

Course Objectives: Students will gain a general understanding of the function of environments and ecosystems and how the two are interrelated. Students will gain a general understanding of the scientific method and how it is used daily by scientists to discover facts about the natural world.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Demonstrate a knowledge of the basic concepts and vocabulary of environmental science
- Apply the basic concepts of ecology
- Demonstrate an understanding of animal and plant diversity and the biogeographic distribution of life on planet Earth
- Demonstrate an understanding of the development of environmental science as the concepts of ecology developed

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BIO110 **General Biology I** **4:(3,2)**

This course introduces the fundamental concepts of biology with consideration of the diversity of life, the origin of species, and ecology. Laboratory hands-on assignments complement the lecture. Simple Mendelian genetics will be introduced. *Prerequisites: ENG104 and READ105 or equivalent COMPASS/ACT scores. NM Common Course Number: BIOL1214.*

Course Objectives: Students will gain a general understanding of macro-biology and its related concepts. Students will come to understand the development of biology as a science and investigate evolution on the population level.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Demonstrate a knowledge of the basic concepts of the evolutionary process
- Demonstrate an understanding of the basic biology of plants and animals
- Apply the basic concepts of ecology and biogeographic distribution of life
- Demonstrate an understanding of animal and plant diversity
- Demonstrate an understanding of the origin of life and the development of body plans

BIO111 **General Biology II** **4(3,2)**

This course includes a survey of fundamental concepts of cell biology including structure and function of cell organelles, tissues, or 6 organ systems, and an introduction to biochemical pathways, enzyme function, and mitosis. *Prerequisite: BIO110 or BIO217. NM Common Course Number: BIOL1224.*

Course Objectives: Students will gain a general understanding of micro-biology and its related concepts. Students will come to understand the development of biology as a science and investigate evolution on the species and genetic levels.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Apply basic concepts of evolutionary process
- Demonstrate and understanding of macromolecules and the origin of life
- Demonstrate an understanding of cell structure and function
- Demonstrate an understanding of DNA and RNA and their roles in heredity and protein production
- Demonstrate Mendelian Laws of inheritance

BIO127 **General Botany** **4(3,2)**

General Botany presents basic concepts of plant biology focusing on the plant characteristics, unity, diversity, growth, and reproduction. Students discuss current ideas in agriculture, horticulture, medicine, biotechnology, ecology, conservation, and environmental issues. The course covers the nomenclature, classification, field study, and laboratory identification of common plant families. Laboratory work includes greenhouse and field studies. *Prerequisite: BIO105 or BIO110.*

Course Objectives: Students will gain a general understanding of hierarchical classification of plants, their uses, and related concepts. Students will come to understand the development of botany as a science and investigate the various types of plants (function and morphology) and their various uses.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Demonstrate an understanding of plant cells, tissues, and parts including their functions
- Demonstrate an understanding of plant metabolism and reproduction
- Apply the laws of genetics and plant breeding
- Demonstrate an understanding of plant names and classification
- Demonstrate an understanding of the different kingdoms of plants

BIO142 **General Zoology** **4(3,2)**

Zoology is the study of the diversity of invertebrate and vertebrate animals. The goals of this course are to examine the evolutionary mechanisms that lead to the diversity of animals, to survey the animal kingdom by comparing the unique structures and functions that are used to classify organisms into major phylogenetic groups, and to gain experience with these organisms in the laboratory. The laboratory portion of the course includes: examination of representative organisms using slides, specimens and dissections. *Prerequisite: BIO105 or BIO110.*

Course Objectives: Students will gain a general understanding of hierarchical classification of animals, the evolutionary development of various body plans, and related concepts. Students will come to understand the development of zoology as a science and investigate the various types of animals including phenotypes and genotypes.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Demonstrate an understanding of animal cells, tissues, and organs including their functions
- Demonstrate an understanding of animal metabolism and reproduction
- Apply the laws of genetics to understand artificial selection
- Demonstrate an understanding of animal scientific names and classification
- Demonstrate an understanding of the different groups within kingdom animalia

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BIO201 **Medical Microbiology** **4;(3,2)**

This course is designed to give the student a basic understanding of the microbial world and the role of microbes in human disease. Microbial identification, metabolism, and reproduction will be addressed. Diseases of the organ systems will be identified along with diagnosis and treatment of microbial infections. *Prerequisites: ENG095 and READ095 or equivalent COMPASS/ACT scores. NM Common Course Number: BIOL2514.*

Course Objectives: Students will gain a general understanding of the world of microbes and the role they play in human diseases. Students will be versed in diagnosis and treatment of microbial infections.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Discuss the role of microbes in normal human health
- Discuss the immune system and how it functions
- Discuss the diagnosis and treatment of microbial infection
- Identify an unknown bacterial species by utilizing a variety of laboratory techniques
- Explain how antibiotics and other antimicrobials exert their antimicrobial action

BIO217 **Human Anatomy and Physiology I** **4;(3,2)**

Course includes the structure and function of the human body at the cellular, tissue, organ, and organ system levels of organization. The integumentary, skeletal, muscular and nervous systems are addressed in detail. *Prerequisites: ENG095 and READ095 or equivalent COMPASS/ACT scores. NM Common Course Number: BIOL2414.*

Course Objectives: Students will gain a general understanding of human body at all levels of organization from cellular to organ systems.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Identify and scientifically discuss the fundamental parts of the human body within the realm of anatomy and physiology
- Demonstrate an understanding of those same parts and their role in normal functioning of the human body
- Identify and scientifically discuss the fundamental parts of the body within the scheme of organ systems
- Discuss the origin, prognosis, and treatment of major homeostatic imbalances of major organ systems

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BIO218 **Human Anatomy and Physiology II** **4;(3,2)**

This course includes the nervous, endocrine, cardiovascular, lymphatic, immune, respiratory, urinary, reproductive systems with genetics and fetal development. *Prerequisites: ENG095 and READ095 or equivalent COMPASS/ACT scores. NM Common Course Number: BIOL2424.*

Course Objectives: Students will gain a general understanding of human body at all levels of organization from cellular to organ systems.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Identify and scientifically discuss the fundamental parts of the human body within the realm of anatomy and physiology
- Demonstrate an understanding of those same parts and their role in normal functioning of the human body
- Identify and scientifically discuss the fundamental parts of the body within the scheme of organ systems
- Discuss the origin, prognosis, and treatment of major homeostatic imbalances of major organ systems

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GEOL101 **Survey of Earth Science** **4(3,2)**

This course is an introduction for the science and non-science major. The broad spectrum of modern earth sciences includes: astronomy, meteorology, oceanography and physical geology. Volcanoes, earthquakes, continental drift, glaciers, wind action, ground water, rivers and landslides are some of the topics discussed. *Prerequisites: ENG104 and READ105 or equivalent COMPASS/ACT scores. NM Common Course Number: GEOL1114.*

Course Objectives: Students will gain a broad understanding of the physical sciences as related to the study of the Earth. Students will be exposed to the scientific method and learn how geology developed historically. Students will learn that earth science relies on biology, chemistry, and physics.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Articulate the development of geology as a modern science
- Demonstrate an understanding of Earth Materials
- Demonstrate an understanding of processes that occur on the Earths' surface and processes that occur beneath the surface
- Articulate how the processes benefit humanity through the use of natural resources
- Describe the natural hazards that result from earth processes

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GEOL 202 **Earth History** **4(3,2)**

This course is a survey of Historical Geology that follows the Survey of Earth Science course. Course content includes the evolution of the Earth and Life covering all periods of Earth history. The course explores the physical, chemical, and biological events of earth history covering such topics such as the origin of the earth, the birth of ocean basins, continents, and mountain ranges, the beginning of life in the oceans and on the continents, and patterns and causes of climate changes, continent shifting, and mass extinction. *Prerequisites: GEOL 101, ENG104 and READ105 or equivalent COMPASS/ACT scores.*

Course Objectives: Students will gain a broad understanding of the physical and biological sciences as related to the study of Earth history. Students will be exposed to the scientific method and learn how paleontology developed historically. Students will learn that earth science relies on biology, chemistry, and physics.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- describe the process of scientific inquiry as it relates to geology and earth history;
- solve problems scientifically through application of the scientific method;
- communicate scientific information relating to earth history through written and oral reports; .
- apply quantitative analysis to scientific problems in the laboratory relating to population dynamics and speciation/extinction events in earth history;
- apply scientific thinking to real world problems related to the diversity of life through time.

CHEM105 Introduction to Chemistry 4(3,2)

Previously offered as CHEM105 and CHEM106. Now a combined course.

Introduction to Chemistry is a review course that includes the fundamental principles in chemistry, including units of measurements, characteristics of elements and compounds, atomic structure, chemical bonding, gas characteristics and behavior, energy, solutions and solubility, redox reactions, theory of gases, chemical bonding, molecular geometry, chemical equilibrium, acid/base chemistry, thermodynamics, and nuclear chemistry. *NM Common Course Number: CHEM1114.*

Course Objectives: The objective of the course is to provide an introduction or review of basic chemistry for those who need to continue in General Chemistry.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- describe the process of scientific inquiry and explain the advances in modern chemistry;
- solve problems scientifically through hypothesis development and lab experiments;
- communicate scientific information through exams and lab reports;
- apply quantitative analysis to scientific problems in the laboratory setting;
- apply scientific thinking to real world problems related to the science of chemistry;

CHEM111 General Chemistry I 4(3,2)

Topics covered are chemical calculations, inorganic nomenclature, chemical reactions, thermochemistry, gases, atomic structure, configurations, periodicity, oxidation-reduction, and chemical bonding. The Lab portion of the course explores chemical and physical properties of substances, types of chemical reactions, energy changes, chemical separations, and quantitative analysis procedures. Designed to accompany the lecture, this laboratory enhances the student's understanding of the lecture topics and teaches basic chemical laboratory techniques. *Prerequisites: MATH180 or consent of the instructor. Corequisite: CHEM111L. NM Common Course Number CHEM1213.*

Course Objectives: The objective of the course is to gain an in-depth understanding of the basic chemical processes and the vocabulary of chemistry. Lab safety and a general knowledge of chemical reactions are desired with successful completion of the course.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- describe the process of scientific inquiry and explain the advances in modern chemistry;
- solve problems scientifically through hypothesis development and lab experiments;
- communicate scientific information through exams and lab reports;
- apply quantitative analysis to scientific problems in the laboratory setting;
- apply scientific thinking to real world problems related to the science of chemistry;
- pass the ACS general chemistry final exam with a "C" or better.

CHEM112 General Chemistry II 4(3,2)

Topics include solids, liquids, gases, colligative properties, kinetics, gaseous equilibria, nuclear chemistry, weak electrolyte equilibria, solubility equilibria, entropy, free energy, and electrochemistry. The first half of the lab course emphasizes qualitative and quantitative analysis techniques to expand the student's knowledge of oxidation-reduction, gravimetric analysis, colligative properties, reaction rates, electrochemistry, chemical equilibrium and electrolytes. The second half of the lab course focuses on the chemical and physical techniques to identify unknown substances. Designed to accompany the lecture, this laboratory enhances the student's understanding of the lecture topics and teaches basic chemical laboratory techniques. . *Prerequisites: CHEM111; Corequisite: CHEM112L. NM Common Course Number 1223.*

Course Objectives: The objective of the course is to gain an in-depth understanding of the more advanced chemical processes and the vocabulary of chemistry. Lab safety and a general knowledge of chemical reactions are desired with successful completion of the course.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- describe the process of scientific inquiry and explain the advances in modern chemistry;
- solve problems scientifically through hypothesis development and lab experiments;
- communicate scientific information through exams and lab reports;
- apply quantitative analysis to scientific problems in the laboratory setting;
- apply scientific thinking to real world problems related to the science of chemistry;
- pass the ACS general chemistry final exam with a "C" or better.

PHYS115 General Physics I 4:(3,2)

This course is an introduction to vector algebra, construction of free body diagrams, Newtonian particle/rigid body dynamics, torque, acceleration, work, energy, power, impulse, and momentum. Laboratory exercises will be conducted with the algebra-based sequence of lecture. *Prerequisites: ENG104, READ105 and MATH180 or equivalent COMPASS/ACT scores. NM Common Course Number: PHYS1114.*

Course Objectives: The objective of the course is to introduce the student to algebra based physics concepts and to develop problem solving skills and confidence in mathematics. Students will gain the appreciation that mathematics is the language of science.

Learning Outcomes: upon completion of the course with a grade of “C” (70%) or better, the student will be able to:

Course-Level Student Learning Outcomes

Upon successful completion of this course, the student will be able to:

- Demonstrate knowledge of Newton's Laws of Motion and apply them to simple physical systems (e.g. transitional and rotational motion).
- Demonstrate knowledge of the Law of Conservation of Energy and apply it to simple mechanical systems.
- Demonstrate knowledge of the Law of Conservation of Momentum and apply it to simple mechanical systems.
- Demonstrate knowledge of the Laws of Rotational Dynamics and learn how to apply them to simple mechanical systems.
- Demonstrate knowledge of the concepts and phenomena of wave motion, oscillations, and gravity and learn how to apply them to simple mechanical systems.
- Demonstrate knowledge of the concepts and phenomena in the fields of heat, thermodynamics, and thermal physics and apply them to simple mechanical systems.
- Demonstrate the ability to translate common language descriptions into the language of physics and into physical diagrams.
- Demonstrate the ability to interpret physical diagrams in the language of physics.
- Demonstrate the ability to collect, evaluate, interpret, and communicate scientific information in terms of fundamental mechanical concepts.
- Demonstrate the ability to interpret and evaluate data in terms of fundamental mathematical and statistical concepts

General Education Student Learning Outcomes

Upon completion of this course, students will demonstrate competence in:

- **Critical Thinking:** Gathering, analyzing, synthesizing, evaluating and applying information.
- **Interpersonal Skills:** Interacting collaboratively to achieve common goals.
- **Quantitative and Empirical Reasoning:** Applying mathematical, logical and scientific principles and methods.
- **Technology Skills:** Using appropriate technology to retrieve, manage, analyze, and present information.

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PHYS116 **General Physics II** **4(3,2)**

This course is a continuation of PHYS115, General Physics I. Topics to be covered include simple machines, thermodynamics, mechanical waves, sound, electricity, magnetic fields and forces, and optics. Laboratory exercises will be conducted with the algebra-based sequence of lecture. *Prerequisite: PHYS115. NM Common Course Number: PHYS1124.*

Course Objectives: The objective of the course is to introduce the student to algebra based physics concepts and to develop problem solving skills and confidence in mathematics. Students will gain the appreciation that mathematics is the language of science.

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- an understanding of the concepts of electric and magnetic fields.
- a clear appreciation of the description of energy storage in terms of field concepts.
- an understanding of the role of electromagnetic interactions in the behavior of materials.
- an understanding of the role of electromagnetic fields in technology.
- improved analytical skills in relation to problem solving.

MATH190 **Trigonometry** **4:(4,0)**

This course is the study of trigonometric functions, radian and degree measure, graphs, basic trigonometry identities and inverse trigonometric functions, study of conic sections and basic geometry principles. *NM Common Course Number: MATH1213. Prerequisite: MATH180 or equivalent COMPASS/ACT score.*

Course Objectives:

- Introduce students to trigonometric functions
- Develop advanced skills to prepare for calculus
- Develop critical thinking and problem solving skills

Learning Outcomes: upon completion of the course with a grade of "C" (70%) or better, the student will be able to:

- Demonstrate and understanding of trigonometric functions as they apply to: ○ Angles and measures
  - Right angle trigonometry
  - Trigonometric functions of any angle
  - Graphs of sine and cosine functions
  - Inverse trigonometric functions

- Demonstrate concepts of analytic trigonometry related to:
  - Fundamental identities
  - Solving trigonometric equations
  - Sum and difference formulae

- Apply the laws of sines and cosines
- Demonstrate concepts in analytic geometry related to:
  - Circles and parabolas
  - Ellipses
  - Hyperbolas

MATH195 **Calculus I** **4(4,0)**

The study of finite and infinite limits of functions, finding the derivative of a function, applications of differentiation (such as curve sketching), finding relative and absolute maxima and minima of a function and solving related rate problems. Integration and simple integral formulas are also introduced, as well as application to finding the area beneath a curve**.** *Prerequisite: MATH190. NM Com* 14 *Course Number: MATH1614.*

Course Objectives: Introduce the student to the calculus and prepare them for continuation to CALC II.

Learning Outcomes for Calculus I, II, and III are covered in the state competencies outlined below. CALC195 – Competencies 1 & 2

MATH212 **Calculus II** **4(4,0)**

This course is a study of integration techniques. Topics to be covered will include integration by parts, trigonometric substitution, partial fractions, evaluation of limits, L'Hospital's Rule, and convergence/divergence of sequences/series. *Prerequisite: MATH195. NM Common Course Number: MATH1624.*

Course Objectives: Introduce the student to concepts of the calculus and prepare them for continuation to CALC III.

Learning Outcomes for Calculus I, II, and III are covered in the state competencies outlined below.
CALC212 – Competency 3
CALC213 – Competency 4

NM State Competencies - Calculus (applies to Calculus I, II, & III)

1. Students will demonstrate an understanding of the theoretical, geometrical underpinnings of the calculus.
Students should:
Algebraically and graphically demonstrate an understanding of:

a. Limit
b. Tangent line
c. Difference quotient
d. Fundamental theorem of calculus
e. Riemann sums

2. Students will use concepts of function, limit, continuity, derivative, and integral.

Students should:

Apply the theory of calculus through manipulations involving:

a. The finding of limits.
b. Using differentiation techniques.
c. Working with transcendental & trigonometric functions.
d. Determining points of discontinuity and intervals of continuity.

3. Students will apply methods of calculus to optimization, graphing, and approximation.

Students should be able to:

a. Find extreme points.
b. Understand the graphs of a function and its 1st and 2nd derivatives and how they relate.
c. Apply Newton's method

d. Use differentials to approximate functions.

4. Students will apply differential and integral calculus to problems in geometry, physics, and other fields.

Students should:

a. Understand that calculus has many uses in science, business, and other fields.
b. Students should be able to solve application problems involving rates of change, optimization, related rates, and acceleration/velocity.

PHYS111 Introduction to Physics 4;(3,2)

Introduction to Physics is a Liberal Studies course for the non-science major seeking a connection between science and the world we live in. The student will gain an understanding of concepts in physics such as Newton's Law's of motion, gravity, energy, thermodynamics, waves, electricity, magnetism, optics and relativity. The emphasis is on learning to think logically in order to analyze and solve problems, to develop and expand your intuition for the physical world, and to learn how things work. The laboratories will emphasize hands-on investigation of topics covered in lecture. *Prerequisites: ENG095, MATH095 and READ095 or equivalent COMPASS/ACT scores.*

Course Objectives: The objective of the course is to give the student a conceptual understanding of the process involved in physical science phenomena. Students are expected to apply basic knowledge learned in mathematics to physics and understand that mathematics is the language of physics.

Learning Outcomes: upon successful completion of the course with a "C" (70%) or better the student will be able to:

- Employ formulas from given variables for motion
- Calculate the acceleration and rate of change
- Calculate work and energy parameters
- Describe the process of scientific inquiry as applied to physical phenomenon;
- Solve problems scientifically through rational and logical thinking;
- Communicate scientific information through written and oral presentations;
- Apply quantitative analysis to scientific problems in physics;
- Apply scientific thinking to real world problems in the area of modern physics.

PHYS161 Calculus Physics I 4:(3,2)

This calculus-based physics course is for engineers and physical science majors. The course examines motion, vectors, forces, work, energy, rotational motion and fluid mechanics. Lab experience for PHYS 161; Experiments are conducted that investigate topics such as measurement, vectors, kinematics and graphical analysis of motion, friction, projectiles, energy, ballistics, collisions, satellites, rotational motion and fluids. NMCCNS: PHYS 1213. *Prerequisite: MATH195 Calculus I*

Course Objectives: The objective of the course is to give the student a broad understanding of the process involved in the derivation and solving of physics problems using calculus. Students are expected to apply knowledge learned in mathematics to physics and understand that mathematics is the language of physics.

Learning Outcomes: upon successful completion of the course with a "C" (70%) or better the student will be able to:

- Derive formulas from given variables for motion
- Calculate the acceleration and rate of change
- Calculate work and energy parameters
- Employ necessary mathematics to solve complex problems
- describe the process of scientific inquiry as applied to physical phenomenon;
- solve problems scientifically through rational and logical thinking;
- communicate scientific information through written and oral presentations;
- apply quantitative analysis to scientific problems in physics;
- apply scientific thinking to real world problems in the area of modern physics.

PHYS162 Calculus Physics II 4:(3,2)

This is the second calculus-based physics courses for engineers and physical science majors. The course examines temperature, heat transfer, laws of thermodynamics, electric fields, electric potential, DC and AC circuits, magnetic fields, induction and Maxwell's equations. Lab experience for PHYS 162. Experiments are conducted that investigate topics such as thermal expansion, heat transfer, electrostatics, electric fields, Gauss' Law, capacitance, DC and AC circuits and electromagnetic induction. NMCCNS: PHYS 1221. *Prerequisite: PHYS161.*

Course Objectives: The objective of the course is to give the student a broad understanding of the process involved in the derivation and solving of physics problems using calculus. Students are expected to apply knowledge learned in mathematics to physics and understand that mathematics is the language of physics.

Learning Outcomes: upon successful completion of the course with a "C" (70%) or better the student will be able to:

- Derive formulas from given variables for thermodynamics
- Calculate parameters related to electricity and electromagnetic radiation
- Derive formulas for electricity and electromagnetic radiation
- Employ necessary mathematics to solve complex problems
- describe the process of scientific inquiry as applied to physical phenomenon;
- solve problems scientifically through rational and logical thinking;
- communicate scientific information through written and oral presentations;
- apply quantitative analysis to scientific problems in physics;
- apply scientific thinking to real world problems in the area of modern physics.

New Mexico Lab Science Competencies

In addition to the learning objectives for each lab science course, all lab science courses must also meet the New Mexico Lab Science Competencies.

1. Students will describe the process of scientific inquiry.
Students should:

a. Understand that scientists rely on evidence obtained from observations rather than authority, tradition, doctrine, or intuition.
b. Students should value science as a way to develop reliable knowledge about the world.

2. Students will solve problems scientifically.
Students should:

a. Be able to construct and test hypotheses using modern lab equipment (such as microscopes, scales, computer technology) and appropriate quantitative methods.
b. Be able to evaluate isolated observations about the physical universe and relate them to hierarchically organized explanatory frameworks (theories).

3. Students will communicate scientific information.
Students should:
Communicate effectively about science (e.g., write lab reports in standard format and explain basic scientific concepts, procedures, and results using written, oral, and graphic presentation techniques.)

4. Students will apply quantitative analysis to scientific problems.
Students should:

a. Select and perform appropriate quantitative analyses of scientific observations.
b. Show familiarity with the metric system, use a calculator to perform appropriate

mathematical operations, and present results in tables and graphs.

5. Students will apply scientific thinking to real world problems.

Students should:

a. Critically evaluate scientific reports or accounts presented in the popular media.

b. Understand the basic scientific facts related to important contemporary issues (e.g., global warming, stem cell research, cosmology), and ask informed questions about those issues.

Assessment

Luna Community College defines assessment as a process that will lead to the improvement of student learning. The process must follow four steps as illustrated below.

LCC Assessment Plan

All course offerings, including degree and certificate programs, at Luna Community College are required to follow the four-step assessment process. They include:

1. A list of expected learning outcomes
2. Assessment tools that directly measure those learning outcomes
3. The results of the data, and
4. How the data will be used to improve student learning

Academic Departments at Luna Community College are required to participate in semester "Improving Student Learning" assessment reporting and Student Learning Outcomes Assessment (SLOA) Committee presentations. Every semester, academic departments focus on specific learning outcomes with a targeted student population.

Faculty are selected to participate in SLOA; selected faculty participate in developing assessment methods and procedures for their particular course or courses. The faculty give oral presentations at the end of the semester and information gathered is disseminated among SLOA members, faculty and staff. The purpose is to provide a baseline for future improvements.

Visit our web site at www.luna.edu to review LCC's Improving Student Learning (ISL) reports. LCC also abides by the New Mexico state competencies for general education.

Appendix "A"

LUNA COMMUNITY COLLEGE
Standard "Minimal" Requirements for Course Syllabus

Course	course title and other course information including meeting times, dates, room number, credits, semester, prerequisites and/or co-requisites
Faculty	information about the instructor and his or her contact information (e.g., phone number and email). List time and day of office hours for full time faculty
Course Description	use catalog description, 2012-2015
Expectations of Students	What do you expect from your students? For example, description of students' responsibilities in the learning process; how you hope the students will approach the course subject/content; take responsibility for their learning; the amount of study time expected in the course, and suggestions on how to succeed in the course.
Course Learning Outcomes (Competencies)	this section will include a list of skills or techniques students will develop from the course. This list will consists of a minimum of four to six quantifiable statements about what students will be able to do after completing the course.
New Mexico CORE Competencies	If teaching a CORE course, the State HED competencies must be stated (e.g., Communications, Mathematics,

		Laboratory Science, Social & Behavioral Sciences, Humanities & Fine Arts).
Methods of Measuring Learning Outcomes (Competencies)		What tools are used to measure student success based on the learning outcomes?
Evaluation	21	Indicate how the student will earn a particular grade, such as information about assignments including types of assignments, nature of exams (e.g., take home, open book, in-class) due dates, grading criteria and so forth.
Course Schedule		Add a tentative schedule indicating the course content that will be covered throughout the course (e.g., eight week or sixteen week schedule).
Policies		Include policies such as attendance, academic responsibilities, late assignments, missed exams, cell phones, etc. Add a statement that indicates: for additional student information, refer to the 2012-2015 Student Handbook
Grading Standard		Refer to the LCC 2012-2015 Catalog
Textbook(s)		Name of required textbooks(s) and any recommended materials. Include ISBN number(s)
Important Dates		List important dates such as last day to withdraw from the course, holidays, add/drop, midterm, final exam week, spring break and other important dates.
ADA Statement		Add a statement regarding accommodations for students with disabilities. See Academic Policies & Procedures Manual 2012-2013 for additional information.
Academic Integrity		See Academic Policies and Procedures Manual 2012-2013 for additional information.

Syllabus Revisions or Changes	Add a statement that indicates the syllabus is subject to change
Internet Courses	See Academic Policies & Procedures Manual 2012-2013 for additional information.