Luna Community College

STEM Department
Pre-Engineering Program Curriculum Profile

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Mission:

To Promote a STEM Culture that Inspires Completion

Vision:

To Become the Premier STEM Program in Northeastern New Mexico

Program Educational Objectives are statements that describe what our graduates are expected to attain within a few years of graduation. Program educational objectives for Pre-Engineering are as follows.

1. Our graduates will continue their education by obtaining a four-year degree at a university or other professional education.

2. Our graduates will demonstrate a commitment to teamwork, communicate effectively, and demonstrate leadership qualities.

3. Our graduates will become productive citizens who are responsible and professional, while promoting the value of diversity.

Program Student Outcomes for Pre-Engineering are based on the ABET Applied Science Accreditation Commission. Our Pre-Engineering associate degree programs will demonstrate that graduates have:

1. an ability to apply knowledge of mathematics, sciences, and other related disciplines
2. an ability to conduct experiments, as well as to analyze and interpret data
3. an ability to identify, formulate, and solve applied science problems
4. an ability to function on teams
5. an understanding of professional and ethical responsibility
6. an ability to communicate effectively
7. a recognition of the need for and an ability to engage in life-long learning
8. a knowledge of contemporary issues
9. an ability to use the techniques, skills, and modern applied science tools necessary for professional practice.

Program Educational Objectives

	PSO ABET 1	PSO ABET 2	PSO ABET 3
ENG 111	X		X
ENG 115	X		X
SPCH 111	X		X
MATH 075	X		X
MATH 095	X		X
MATH116	X		X
MATH 180	X		X
CHEM 111	X	X	X
PHYS 115	X	X	X
CS 105	X	X	X
Math 190	X		X
Math 195	X		X
SMET 101	X	X	X
SMET 105	X	X	X
SMET 117	X	X	X
ASE 101	X		X
ASE 202	X		X
CS 112	X		X
CS 121	X		X
DTEC 101	X		X
DTEC 107	X		X
DTEC 109	X		X
ELEC 101	X		X
ELEC 102	X		X
ELEC 204	X		X
MATH 130	X		X
MATH 202	X		X
MATH 212	X		X
MATH 213	X		X
PHYS 161	X	X	X
PHYS 162	X	X	X

Pre-Engineering Program
Program Student Outcomes

	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		X
MATH 095	X	X	X			X	X		X
MATH116	X	X	X			X	X		X
MATH 180	X	X	X			X	X		X
CHEM 111	X	X	X	X	X	X	X	X	
PHYS 115	X	X	X	X	X	X	X	X	X
CS 105	X			X	X		X	X	X
Math 190	X	X	X				X		
Math 195	X	X	X				X		
SMET 101				X	X	X	X	X	
SMET 105				X	X	X	X	X	
SMET 117				X	X	X	X		
ASE 101					X				
ASE 202					X				
CS 112		X			X				
CS 121		X			X				
DTEC 101					X	X	X		X
DTEC 107					X	X	X		X
DTEC 109					X	X	X		X
ELEC 101					X		X		X
ELEC 102					X		X		X
ELEC 204					X		X		X
MATH 130	X								X
MATH 202	X								
MATH 212	X	X	X						
MATH 213	X	X	X						
PHYS 161	X	X	X	X	X	X	X	X	X
PHYS 162	X	X	X	X	X	X	X	X	X

PRE-ENGINEERING
Associate of Science Degree
Minimum of 63 Credit Hours

The Associate of Science degree in Pre-Engineering is designed to provide students a set of skills and courses that will transfer into a four-year engineering program, mathematics, or related field. The intent of the program is to develop student interest in Science, Technology, Engineering and Mathematics (STEM), expose students to STEM curriculum, and foster the pursuit of advance degrees at the university level. Students are strongly encouraged to consult with their LCC advisor for proper advising and course selection.

Degree Requirements Credit Hours: 63

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 ....(8 hours)

CHEM111 General Chemistry I	4
PHYS115 General Physics I	4

Area IV. Social and Behavioral Sciences..(9 hours)

Area V. Humanities and Fine Arts..(6 hours)

Program Requirements..(20 hours)

CS105 Introduction to Computer Science	3
MATH190 Trigonometry	4
MATH195 Calculus I	4
SMET101 Introduction to Science, Math and Engineering Technology	3
SMET105 Computer Use for Technology	3
SMET117 Introduction to Engineering	3

Approved Electives..(7 hours)

ASE101 Introduction to Renewable Energy	3
ASE202 Solar and Wind Energy	4
CS112 Introduction to Operating Systems	3
CS121 Introduction to Programming	4
DTEC101 Engineering Graphics and Basic AutoCAD	3
DTEC107 Intermediate AutoCAD	3
DTEC109 Introduction to Architectural Drafting	3
ELEC101 Electronic Circuits/DC	4

ELEC102 Electronic Circuits/AC	4
ELEC204 Digital Electronic Circuits	4
MATH130 Statistics	3
MATH202 Discrete Mathematics	4
MATH212 Calculus II	4
MATH213 Calculus III	4
PHYS161 Calculus Physics I	4
PHYS162 Calculus Physics II	4

Pre-Engineering – Course Descriptions and Learning Outcomes

CS105 Introduction to Computer Science 3:(2,2)

This course is an introduction to computer science and computer information systems. The intent of this course is to prepare students and provide them with the terminology and a brief understanding of concepts within the computing field. Topics will include computer history, algorithms, computer architecture, programming languages, applications, social issues and ethics. Students should have an understanding of how to use a computer and basic software such as MS Word and the internet prior to taking this course.

Course Objectives:
- Have students become versed in the terminology of computer science
- Introduce students to programming and applications
- Address social and ethical issues related to the fast and ever-changing field of computers

Learning Outcomes: Upon completion of the course with a "C" (70%) or better the student will be able to:
- Summarize and interpret the history and evolution of computer systems.
- Demonstrate a knowledge of the algorithmic foundation of computer science
- Demonstrate a basic knowledge of introductory programming languages
- Distinguish between the hardware and software of a computer system
- Identify various application as well as social issues involving computers
- Apply a basic understanding of networking, Internet, and Webpage design

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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" (70%) 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 “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

SMET117 Introduction to Engineering 3:(2,2)

This course introduces the engineering design process using a project-oriented, team-based approach. Students will employ engineering graphics and computational skills using computer applications such as AutoCAD and spreadsheets to solve engineering problems. Lab topics will include design and fabrication of scale models with specific projects addressing sound decision making, the ability to communicate effectively, defining and solving problems and functioning efficiently in a team environment.

Course Objectives: This course introduces the concepts of static and dynamic forces in engineering and explores the engineering fields. The course promotes teamwork and collaboration to problem solve in the field of engineering.

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

- Demonstrate teamwork skills
- Demonstrate a basic understanding of statics and dynamics in the engineering field
- Fabricate scale models for testing purposes
- Employ AutoCAD and spreadsheet applications to solve problems.

ASE101 Introduction to Renewable Energy 3:(3,0)

This course investigates the recent technological developments and increasing concern over the sustainability and environmental impact of conventional fuel usage and the prospect of producing clean, sustainable power in substantial quantities from renewable energy sources. The course provides a comprehensive overview of the principal types of renewable energy--including solar thermal and photovoltaics, bioenergy, hydro, tidal, wind, wave, and geothermal. In addition, the course investigates the underlying physical and technological principles of renewable energy and examines the environmental impact and prospects of different energy sources. *Prerequisites: ENG 104 and READ 105 or equivalent COMPASS/ACT scores.*

Course Objectives: The course will provide the basics in the various types of renewable energy and their uses. The course is intended to provide a broad background in renewable energy topics as a foundation for continued studies.

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

- demonstrate an understanding of the various types of renewable energy and their appropriate application.
- articulate the problems with current petroleum based economy, including finite supply of petroleum fuels and the population problem.
- describe the basic science behind the various types of alternative energy systems presented in class.
- Identify the environmental impacts for each type of renewable energy source.
- Identify the future prospects for each type of renewable energy source.

ASE 202 Solar and Wind Energy 4:(3,2)

This course is designed to give the student theoretical and practical knowledge of electrical power generation and will investigate the new trend of distributed, stand alone power generation systems and renewable energy sources in electrical power systems. Students will gain an understanding of basic electricity, the electrical power industry, and the economics of electrical energy distribution. Students will also gain an understanding of the theory, design, applications, and installation of both stand-alone and grid-tied solar and wind energy generation systems with the laboratory providing examples of topics covered in lecture. *Prerequisites: ASE101, ENG 104 and READ 105 or equivalent COMPASS/ACT scores.*

Course Objectives: The course is designed to focus on solar PV and Wind energy systems and their potential uses. The lab provides hands-on learning opportunities allowing students to apply learned skills and develop a hybrid solar/wind system.

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

- describe the components of a solar, wind, or hybrid energy system.
- describe the process of installing a solar, wind, or hybrid energy system as a stand alone or grid-tied system.
- demonstrate an understanding of the current electrical power industry and the distribution grid
- explain the net-metering laws of New Mexico
- demonstrate a knowledge of the theory underlying solar and wind power systems.

CS112 Introduction to Operating Systems 3:(2,2)

This course offers a brief introduction to operating systems where students will gain an understanding of the terms process, scheduling, memory, file management, processes and threads. Students will learn to use editors, compilers, linkers, assemblers, debuggers, and program assembly using libraries. Students will master concepts of process, threads, forks, and dinner's problem done with Linux. *Prerequisite: CS105*

Course Objectives: The course is designed to introduce students to the various types of operating systems and their functions.

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

- describe the various types of operating systems and the uses in industry and business.
- demonstrate an understanding of the operating systems and the processes involved
- explain the differences in operating systems and their appropriate uses
- demonstrate a knowledge of the theory underlying the various operating systems

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CS121 — Introduction to Programming — 4: (3,2)

This course presents computer programming language along with a model of how a computer works as a problem-solving machine. Basic programming concepts such as variables, flow control, and functions will be explored. Introduction to programming with C++, Java, and HTML using variables, loops, functions, and objects. *Prerequisite: CS105*

Course Objectives: The course is designed to give students an introduction to programming languages as a foundation for continuation in the CS program.

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

- Prepare an algorithm prior to constructing a functional program
- Describe the function and purpose of a compiler
- Compare the multiple data types and create class definitions
- Analyze and provide a program based solution for a given problem
- Identify and define various I/O, operators and expressions

DTEC101 — Engineering Graphics and Basic AutoCAD — 3(2,2)

This course describes basic industrial drafting techniques utilizing conventional drafting equipment and supplies as well as Computer-Aided Drafting (CAD) software. Topics include basic CAD software techniques for two dimensional drafting, multi-view drawings, dimensioning, tolerancing, sectional views, auxiliary views, and pictorial drawings with an emphasis on isometric drawings.

Course Objectives: Introduce student to architectural and construction drafting techniques. Introduce the student to industry standard software. Prepare students with the fundamentals of drafting and design

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

- demonstrate a comprehension of basic AutoCAD software commands
- operate the AutoCAD software
- develop site plans that include front, side and plan drawings
- create sectional views
- save files for later viewing

DTEC107 **Intermediate AutoCAD** 3(2,2)

This course is a continuation of the CAD objectives described in Engineering Graphics and Basic AutoCAD course. Topics include advanced drafting, importing and exporting files, attaching attribute data, database links, three dimensional design, rendering and imaging, and toolbar customization.
Prerequisite: DTEC101

Course Objectives: Advance student knowledge in architectural and construction drafting techniques. Further develop student knowledge in industry standard software. Advance student knowledge in drafting and design

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

- generate multi-view drawings
- apply accurate dimensioning to drawings
- utilize paper space and model space for layouts
- place information on appropriate layers.
- utilize toolbars and alias' to assist with drawing techniques
- relate AutoCAD knowledge to current applications used in the modern world.

DTEC109 **Introduction to Architectural Drafting** 3(2,2)

This course is the study of architectural drafting. Topics to be covered will include discussion/construction of floor plans, footing and foundation plans, elevation plans, typical wall section plans, roof plans, and detail views. Plans will be enhanced with perspective visual aids. The topics of drafting/planning theory will be addressed by utilizing modern CAD techniques.
Prerequisite: DTEC101

Course Objectives: • Continue with AutoCAD drafting techniques. Introduce the student to architectural planning theory. Development of original site and construction plans by students

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

- develop and design layout plans
- construct plans in multiple views using AutoCAD software
- demonstrate an understanding of basic planning theory through exams and lab projects

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ELEC101 **Electronics I/DC Circuits** 4:(3,2)

This course is a study of the analysis and design of direct current (DC) circuits. Topics to be covered will include Ohm's Law, Kirchoff's Laws, mesh, and nodal analysis. The physical laws will demonstrate the relationship between voltage, resistance, current, and power while the analytical methods will give the student an in-depth understanding of the behavior of a DC electronic circuit. Hands-on experimentation will be conducted in the laboratory using equipment such as multimeters, DC power supplies, and breadboards.
Prerequisite: MATH105 or equivalent COMPASS/ACT score.

Course Objectives: The course will provide students with the basics in DC electricity as a foundation for continued study. Students will learn basic electronics lab techniques and lab safety.

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

- Identify and demonstrate the safe and correct use of measurement equipment (voltmeter, ammeters and ohmmeters).
- Demonstrate the use of laboratory equipment such as DC power supplies/sources and breadboards / components.
- Demonstrate the skill of taking a schematic diagram: solve for all required component values; solve for all required voltage, current and power requirements; build the circuit selecting component measure values using skills learned in #1 above and document and explain difference, if any, between calculated and measured results.
- Trouble shoots a circuit supplied by the instructor which will have some programmed problem.

ELEC102 Electronic Circuits/AC Circuits 4:(3,2)

This course is a study of the analysis and design of alternating current (AC) circuits. Topics to be covered include electro-magnetic induction, inductive and capacitive reactance, impedance, series and parallel resonance, and basic transformer characteristics. Experimental AC circuit analysis will be performed using multimeters, oscilloscopes, AC power supplies, and function generators in the laboratory. *Prerequisite: ELEC101.*

Course Objectives: The course will provide students with the basics in AC electricity as a foundation for continued study. Students will learn basic electronics lab techniques and lab safety.

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

- Identify and demonstrate the safe and correct use of measurement equipment (voltmeter, ammeters and ohmmeters).
- Demonstrate the use of laboratory equipment such as AC power supplies/sources and breadboards / components.
- Demonstrate the skill of taking a schematic diagram: solve for all required component values; solve for all required voltage, current and power requirements; build the circuit selecting component measure values using skills learned in #1 above and document and explain difference, if any, between calculated and measured results.
- Trouble shoots a circuit supplied by the instructor which will have some programmed problem.

ELEC204 **Digital Electronic Circuits** 4:(3,2)

This course is a study of the basic principles of digital electronic circuits. Topics to be covered include the binary and other number systems, logic gates, Boolean algebra and other simplification techniques, and memory devices. The implementation of digital
circuits using breadboards, integrated circuits, electronic test equipment, and oscilloscopes will be an integral part of the course. *Prerequisite: MATH116*

Course Objectives: The objective of the course is to give students a foundation in digital electronics, building on the material delivered in DC/AC courses.

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

- Convert between binary and other number systems
- Determine theoretically and develop experimental truth tables for logic gates
- Apply basic laws and rules of Boolean algebra and combine logic simplification techniques
- Use Karnaugh maps to simplify Boolean expressions
- Define basic memory characteristics – ROM and RAM
- Construct digital circuits using breadboards and integrated circuits

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MATH075 **General Mathematics** 4;(4,0)

This course is a review of basic mathematical principles including whole numbers, addition, subtraction, multiplication, division, fractions, and decimals. This course will emphasize problem solving and word problems.will cover skills/concepts of arithmetic with an introduction to basic algebra for students needing to strengthen their basic mathematical background. Emphasis will be placed on ratios, proportions, percents, measurement, graphs, geometric concepts, real number systems concepts, signed numbers, and linear equations in one variable. *Prerequisite: MATH055 or equivalent COMPASS/ACT score.*

Course Objectives: This course is designed to prepare the student for Algebra with Applications.

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

- Perform addition, subtraction, division and multiplication on whole numbers, decimals, mixed numbers, fractions, improper fractions both individually and in application problems.
- Factor numbers and find prime factorization, determine Least Common Multiple (LCM) and Greatest Common Factor (GCF).
- Determine reasonableness of answer.
- Write rates and unit rates.
- Solve proportions and tell if they are true or not. Simplify expressions and exponents.
- Write numbers and decimals in expanded and standard form and round then to a given place value.
- Write percent a as a fraction and solve percent problems.
- Use signed numbers to perform addition, subtraction, multiplication and division.
- Read graphs and tables for statistical information, have a basic understanding of statistics.
- Use and understand algebraic formulas to solve algebraic equations.

- Demonstrate an understanding of and perform conversions between U.S. Customary Units and Metric Units.
- Demonstrate an understanding of basic geometry, including perimeter, circumference, are, volume, similar triangles, square roots and the Pythagorean Theorem.

MATH095 **Algebra with Applications** **4;(4,0)**

This course will provide a mathematically sound and comprehensive coverage of the basic computational skills involved in introductory algebra. Emphasis will be placed on solving linear equations/inequalities, absolute value equations, inequalities, graphing simple functions, finding the slope/equation of a straight line, study of parallel/perpendicular lines, and graphing linear inequalities in two variables. This course will also provide extensive coverage of applied geometry as it relates to calculating perimeters, areas, surface areas and volumes. *Prerequisite: MATH075 or equivalent COMPASS/ACT score.215*

Course Objectives: Introduce students to algebraic functions, develop basic algebra skills to prepare for Intermediate Algebra.

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

- Understand, evaluate, simplify and solve algebraic and linear equations.
- Graph both linear equations and linear inequalities.
- Solve systems of linear equations using substitution, elimination and graphing. Solve linear inequalities.
- Understand exponents, scientific notation and perform addition, subtraction, multiplication, division and perform factoring of polynomials.
- Comprehend factoring by grouping of polynomials up to trinomials, the difference of squares and the sum of squares.

MATH116 **Intermediate Algebra** **4;(4,0)**

This course is the study of linear equations and inequalities, linear functions in two variables, systems of linear equations, polynomials and rational expressions, factoring and its applications, solving quadratic equations, evaluating and simplifying radicals and the quadratic formula. Applications in the areas of technology, medicine and business will be emphasized. *Prerequisite: MATH095 or equivalent COMPASS/ACT score.*

Course Objectives: Introduce students to quadratic functions, develop advanced algebraic skills to prepare for College Algebra.

Learning Outcomes: Upon Completion of the course with a grade of 'C' (70%) or better the student will be able to:

- Utilize exponents and scientific notation.
- Add, subtract, multiply and divide polynomials.
- Factor and solve polynomials, including the quadratic equation.
- Utilize and solve rational expressions and equations.
- Utilize and interpret algebraic functions and inverse functions.

- Utilize and solve radical expressions, functions, and equations.
- Solve and graph quadratic equations and rational inequalities.

MATH130 Statistics 3;(3,0)

This course is an introduction to descriptive and inferential statistics. Topics to be covered will include sampling procedures, experimental design, measures of center, variation, z-scores, the digression equation with linear correlation and basic probability. *Prerequisite: MATH116 or equivalent COMPASS/ACT score. NM Common Course Number: MATH2113.*

Course Objective: The course is designed to give the student an introduction to statistics as a foundation for continued studies.

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

- Use descriptive statistics (graph representations, numerical measures).
- Apply basic probability concepts.
- Use discrete probability distributions.
- Use various sampling methods.
- Conduct one-sample and two-sample tests of hypothesis.
- Develop a regression line and determine the strength of a correlation.
- Use statistical software (Excel recommended).
- Apply statistical analysis to decision making.

MATH180 College Algebra 4;(4,0)

This course is the study of exponentials, evaluating/simplifying radical expressions, simplifying/factoring polynomial expressions, evaluating/simplifying functions, graphing functions, finding and graphing inverse functions, properties of linear and polynomial functions, graphing rational functions, evaluating and graphing exponential and logarithmic functions. Additionally, this course serves as a preparatory course for trigonometry or calculus. *Prerequisite: MATH116 or equivalent COMPASS/ACT score*

Course Objectives: Develop advanced skills to prepare for Trigonometry and develop critical thinking and problem solving skills.

LEARNING OUTCOMES - Upon completion of the course with a “C” (70%) or better the student will be able to:

- Solve polynomials and rational expressions
- Identify, solve, and simplify radical and rational expressions
- Evaluate and analyze graphs of functions (linear, quadratic, and higher degree polynomials) and find their domain
- Identify and graph shifts, reflections, and non-rigid transformations of functions
- Find arithmetic combinations and compositions along with inverse functions graphically
- Solve and use equations and inequalities algebraically (linear, quadratic, and higher degree)
- Solve and graph rational, exponential and logarithmic functions
- Model real-life situations through graphs (linear, quadratic, exponential and logarithmic)

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 and develop critical thinking and problem solving skills.

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

- Demonstrate and understanding of trigonometric functions as they apply to: o 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: o Fundamental identities
    - Solving trigonometric equations
    - Sum and difference formulae
- Apply the laws of sines and cosines
- Demonstrate concepts in analytic geometry related to: o 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 Common Course Number: MATH1614.*

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

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

- Apply methods of calculus to optimization, graphing, and approximation.
- Find extreme points, understand the graphs of a function and its 1st and 2nd derivatives and how they relate, apply Newton's method, and use differentials to approximate functions.
- Apply differential and integral calculus to problems in geometry, physics, and other fields.
- Understand that calculus has many uses in science, business, and other fields.
- Students should be able to solve application problems involving rates of change, optimization, related rates, and acceleration/velocity.

- Demonstrate an understanding of the Integration Techniques
- Demonstrate an understanding of the theoretical, geometrical underpinnings of the calculus.
- Demonstrate algebraically and graphically an understanding of a limit, tangent line, difference quotient, fundamental theorem of calculus, and Riemann sums
- Demonstrate the concepts of function, limit, continuity, derivative, and integral.
- Apply the theory of calculus through manipulations involving finding of limits, using differentiation techniques, working with transcendental & trigonometric functions, and determining points of discontinuity and intervals of continuity.

MATH202 Discrete Mathematics 4;(4,0)

This course is an introduction to discrete mathematics as used in computer science. Topics to be covered will include logic, proofs, basic digital logic circuits, computer algorithms, Boolean logic, elementary number theory, methods of proof, mathematical induction, and combinatorial reasoning. *Corequisite: MATH180.*

Course Objective: The course is designed to give the student an introduction to discrete math as used in computer science as a foundation for continued studies.

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

- Convert between binary and other number systems
- Determine theoretically and develop experimental truth tables for basic digital logic circuits
- Apply basic laws and rules of Boolean algebra and combine logic simplification techniques
- Apply number theory
- Implement combinatorial reasoning and induction practices

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: Upon completion of the course with a “C” (70%) or better the student will be able to:

- Demonstrate an ability to evaluate integrals using basic integration techniques, integrations by parts, trigonometric integrals, trigonometric integrals, trigonometric substitution, partial fractions, and integration by tables
- Demonstrate an understanding of applications of the integration process
- Demonstrate an ability to calculate the area between two curves, volume of the surface of revolution using the disc method and shell method, surface area of a surface

revolution, arc length of a curve and work
- Demonstrate an understanding of infinite series
- Demonstrate the ability to find limits using L'Hopital's Rule, improper integrals, and infinite sequences
- Demonstrate an understanding of infinite series
- Determine the convergence or divergence of an infinite series using integral test, direct comparison tests, alternating series test, and ratio and root tests
- Demonstrate an understanding of functions as infinite power series using geometric series and Taylor and MacClaurin Series

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MATH213 Calculus III 4(4,0)

A study of vectors and vector operations, differentiation and integration of vector—valued functions, partial derivatives of functions of several variables and their applications, multiple integration. *Prerequisite: MATH212. NM Common Course Number: MATH2614.*

Course Objectives: Prepare the student for continuation into differential equations and higher level math courses.

Learning Outcomes: Upon completion of the course with a "C" (70%) or better the student will be able to:
- Demonstrate an understanding of vectors and vector operations
- Demonstrate an ability to graph vectors in 2-dimentional and 3-dimentional space, find the dot product of two vectors, find the cross-product of two vectors, find the cross-product of two vectors, and use vectors to find the equations of lines and planes in space
- Demonstrate an understanding of vector-valued functions
- Demonstrate an ability to find the derivative and integral of a vector valued function, velocity and acceleration, tangent and normal vectors, and arc length and curvature
- Demonstrate an understanding of functions of several variables
- Demonstrate an ability to find limits and points of discontinuity, partial derivatives, differentials, directional derivatives and gradients, tangent planes and normal lines, and extrema of a function
- Demonstrate an understanding of multiple integrals
- Demonstrate an ability to find integrated integrals and area in a plane, double integrals and volume, double integrals in a polar coordinates, mass, surface area, triple integrals and volume, and triple integrals in spherical and cylindrical coordinates

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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 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 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.

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.

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	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	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 2014 for additional information.
Academic Integrity	See Academic Policies and Procedures Manual 2014 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 2014 for additional information.