

- I. Word problems in all areas
- II. Whole numbers
  - A. Decimal system
  - B. Reading and writing
  - D. Subtraction
  - E. Multiplication
  - F. Division
  - G. Estimating
  - H. Rounding
  - I. Average
  - J. Exponents
  - K. Order of operations
  - L. Divisibility tests
  - M. Prime/composite
  - N. Prime factorization
  - O. Least common multiple (LCM)
- III. Fractions
  - A. Greatest common factor (GCF)
  - B. Reducing
  - C. Multiplication
  - D. Division
  - E. Addition
  - F. Subtraction
  - G. Order of operations
  - H. Complex
- IV. Mixed numbers
  - A. Converting mixed numbers to fractions
  - B. Converting fractions to mixed numbers
  - C. Multiplication
  - D. Division
  - E. Addition
  - F. Subtraction
  - G. Complex fractions involving mixed numbers
  - H. Order of operations
- V. Decimals
  - A. Reading and writing
  - B. Rounding
  - C. Addition
  - D. Subtraction
  - E. Multiplication
  - F. Division
  - G. Estimating
  - H. Converting decimals (terminating and repeating) to fractions - see supplement
  - I. Converting fractions to decimals
  - J. Order of operations
- VI. Percents
  - A. Converting decimals/whole numbers to percents
  - B. Converting fractions to percents
  - C. Converting percents to decimals/whole numbers
  - D. Converting percents to fractions
  - E. Solving the three basic types of percentage problems
- VII. Ratio and proportion
  - A. Writing ratios
  - B. Finding the unknown term in a proportion
  - C. Setting up proportions for word problems (solving)
  - D. Converting units within the metric system
  - E. Converting units from one system to another - standard (English)/metric
- VIII. Negative numbers
  - A. Addition
  - B. Subtraction
  - C. Multiplication
  - D. Division
  - E. Order of operations
- IX. Polynomials

- A. Combining like terms
- B. Evaluating

- X. Equations
  - A. Linear
  - B. Solution of an Equation
  - C. Solving Linear Equations

Date Adopted: 1999  
Date Reviewed: 2000, 2001  
Date Revised: 2000, 2001

MTH 091s

DEVELOPMENTAL ALGEBRA I - 2 HR

Credit 2ic

- I. Exponents
  - A. Natural numbers as exponents
  - B. Laws of exponents
  - C. Using the laws of exponents
  
- II. Polynomials
  - A. Definitions
    - 1. Monomial, binomial, trinomial
    - 2. Degree
    - 3. Coefficient
    - 4. Term
    - 5. Like Terms
  - B. Polynomial Operations
    - 1. Addition
    - 2. Subtraction
    - 3. Multiplication
      - a) Distribution (including FOIL)
      - b) Special products
    - 4. Division by a monomial divisor
  - C. Common Monomial Factoring
  
- III. Rational Expressions Involving Monomial Numerator and Denominator
  - A. Reduction
  - B. Multiplication
  - C. Division
  - D. Addition
    - 1. Like denominators
    - 2. Unlike denominators
  - E. Subtraction
    - 1. Like denominators
    - 2. Unlike denominators
  
- IV. Equations
  - A. Linear
    - 1. Definition
    - 2. Solution (Definition and number of)
    - 3. Solving and checking
  - B. Literal equations
  - C. Factored Equations
    - 1. Using the zero-factor property
    - 2. Involving greatest common monomial factoring
  - D. Percent and proportion equations
  - E. Word Problems
    - 1. Involving linear equations
    - 2. Involving percents and proportions

## V. Graphing

### A. Rectangular coordinate system

1. Constructing the Cartesian plane
2. Plotting a point given its coordinates
3. Identifying the coordinates of a plotted point

### B. Drawing Lines

1. Given two points
2. Given one point and a slope
3. Identifying significant points on graphed lines
  - a) X-intercept
  - b) Y-intercept
  - c) Point of intersection

Date Adopted: 1999  
Date Reviewed: 2000  
Date Revised: 2001

MTH 092

DEVELOPMENTAL ALGEBRA II - 2 HR

Credit 2ic

- I. Exponents
  - A. Integral exponents
  - B. Laws of exponents
  - C. Using the laws of exponents
  
- II. Polynomials
  - A. Definitions
    - 1. Degree
    - 2. Coefficients
    - 3. Term
  - B. Factoring (over the integers)
    - 1. Common binomial factoring
    - 2. Difference of Squares
    - 3. Grouping (2 and 2)
    - 4. Trinomials (Including perfect squares)
    - 5. Combinations
  
- I. Rational Expressions Involving Polynomial Numerator and Denominator
  - A. Reduction
  - B. Multiplication
  - C. Division
  - D. Addition
    - 1. Fractions with like denominators
    - 2. Fractions with unlike monomial denominators
  - E. Subtraction
    - 1. Fractions with like denominators
    - 2. Fractions with unlike monomial denominators
  
- III. Equations
  - A. Quadratic equations by factoring
  - B. Solving a system of two equations and two unknowns algebraically
    - 1. Substitution
    - 2. Addition/Subtraction
  - C. Graphing
    - 1. Linear equations in two variables by selecting points
    - 2. Linear equations by slope-intercept
    - 3. Solving a system of two equations and two unknowns by graphing
  
- IV. Applications
  - A. Word problems involving systems
  - B. Word problems involving percents
  - C. Word problems involving quadratic equations

- I. Connections between subsets of the real numbers
- II. Using different forms of real numbers in solving problems
- III. Applications using proportions and percents
- IV. Exponents
  - A. Natural numbers as exponents
  - B. Integral exponents
  - C. Laws of exponents
  - D. Using the laws of exponents
- V. Polynomials
  - A. Definitions
  - B. Degree
  - C. Review operations involving polynomials
    - 1. Addition
    - 2. Subtraction
    - 3. Multiplication
      - a. Distributive
      - b. Special products
    - 4. Division involving monomials divisors
  - D. Order of operations
  - E. Factoring (over the integers)
    - 1. Common
    - 2. Difference of squares
    - 3. Perfect square trinomials
    - 4. Trinomials
    - 5. Grouping (2 and 2)
    - 6. Combinations
- VI. Rational algebraic expressions
  - A. Reduction
  - B. Operations involving rational expressions
    - 1. Addition with like denominators
    - 2. Subtraction with like denominators
    - 3. Multiplication
    - 4. Division
- VII. Equations
  - A. Linear
    - 1. Definition
    - 2. Solution (definition and number of)
    - 3. Solving and checking
    - 4. Solving a system of two equations in two unknowns by substitution and addition/subtraction
  - B. Literal
    - 1. Definition
    - 2. Solution (definition and number of)
    - 3. Solving and checking
  - C. Quadratic equations by factoring
  - D. Percent and proportion equations
  - E. Word Problems (include real numbers)
  - F. Graphing
    - 1. Rectangular coordinate
    - 2. Linear equations in two variables by selecting points
    - 3. Graphing by slope-intercept
    - 4. Solving a system of two equations and two unknowns by graphing



- I. Factoring
  - A. Sum of cubes
  - B. Difference of cubes
  - C. Common factoring of type found in calculus
  
- II. Rational expressions
  - A. Addition with unlike denominators
  - B. Subtraction with unlike denominators
  - C. Complex fractions
  
- III. Exponents
  - A. Rational exponents
  - B. Literal exponents
  - C. Laws of rational exponents
  - D. Simplifying expressions using the laws of exponents
  
- IV. Radicals
  - A. Definition
  - B. Notation, including changing from exponential  $\leftrightarrow$  radical
  - C. Simplifying radicals
  - D. Addition and subtraction of radical expressions
  - E. Multiplication of radical expressions
  - F. Division of radical expressions
    - 1. Rationalization of denominators
    - 2. Rationalization of numerator
  
- V. Equations and inequalities
  - A. Fractional equations
  - B. Solving equations involving radical expressions
  - C. Quadratic
    - 1. Definition
    - 2. Real solutions
    - 3. Solving by factoring (reals)
    - 4. Solving by completing the square
    - 5. Quadratic formula
  - D. Equations that lead to quadratics
  - E. Coordinate geometry
    - 1. Distance formula
    - 2. Midpoint
    - 3. Slope
      - a. Finding by formula
      - b. Classifying pairs of lines as perpendicular, parallel, or neither
    - 4. Graphing linear inequalities
  - F. Forms of linear equalities in two variables
    - 1. Standard/general form
    - 2. Slope-intercept form
  - G. Writing equations of lines

**MTH 100 (cont'd)**

- H. Systems of linear equations
  - 1. In three variables
  - 2. Solving by addition/subtraction method
- I. Word problems with quadratics, systems, fractional equations, and inequalities
- J. Solving linear inequalities in one-variable (interval notation)
- K. Solving absolute value equations and inequalities using linear expressions
- VI. Functions
  - A. Definition
  - B. Domain - (find)
  - C. Range - (find)
  - D. Notation
  - E. Identifying from sets, equalities and graphs
  - F. Addition, subtraction, multiplication and division of functions
  - G. Equality of functions
  - H. Graphing
    - 1. Linear functions
    - 2. Quadratic functions

Date Adopted: July 1, 1998

Date Reviewed:

Date Revised:

MTH 110

FINITE MATHEMATICS

3 Credit Hrs.

Approved: April 3, 1998

- I. Linear functions
  - A. Cartesian coordinate system
  - B. Lines, functions, and mathematical models
  - C. Linear modeling
  - D. Geometric relationships of lines
  - E. Regression and correlation (optional)
- II. Matrix algebra
  - A. Operations with matrices
    - 1. Addition
    - 2. Subtraction
    - 3. Multiplication
    - 4. Scalar product
    - 5. Transpose of a matrix
  - B. Inverse of a matrix
  - C. Solving linear systems by using matrices
  - D. Applications related to Markov chains and decision theory
- III. Sets and counting
  - A. Sets and set operations
  - B. Applications of venn diagrams
  - C. The generalized multiplication principle
  - D. Permutations
  - E. Combinations
  - F. Tree diagram
- IV. Basic concepts of probability
  - A. Sample spaces, experiments, and events
  - B. Outcomes and odds
  - C. Discrete random variables and expected value
  - D. Addition rules of probability
  - E. Conditional probability
  - F. Multiplication rules and independent events
  - G. Baye's Theorem
- V. Statistics
  - A. Organizing data using frequency distributions
  - B. Measures of central tendency
  - C. Measures of dispersion of data
  - D. Binomial distributions
  - E. Normal distributions
  - F. Normal approximation to the binomial distribution
- VI. Linear programming
  - A. Modeling linear programming models
  - B. Linear inequalities in two variables
  - C. Solving linear programming problems graphically
  - D. The simplex method (optional)

Date Adopted: April 3, 1998  
Date Reviewed: May 1, 1998,2002  
Date Revised: May 1, 1998,2002

MTH 112

PRECALCULUS ALGEBRA

3 Credit Hrs.

- I. Inequalities
  - A. Review order in the real numbers and interval notation(include a graphing method)
  - B. Solving polynomial and rational inequalities (include a graphing method)
  - C. Solving nonlinear inequalities and absolute value inequalities
  - D. Solving systems of inequalities.
- II. Complex numbers
  - A. Rectangular form
  - B. Operations using complex numbers
- III. Functions
  - A. Review - definition, notation, domain, and range
  - B. Finding the composition of functions and their domains
  - C. Inverse of functions
    - 1. Definition of inverse function
    - 2. One-to-one functions
    - 3. Finding the inverse
- IV. Graphing
  - A. All types of functions listed including inverses
  - B. Symmetry and increasing/decreasing functions
  - C. Transformations
- V. Linear functions
  - A. Definition
  - B. Writing an equation of a linear function
- VI. Quadratic functions
  - A. Definition
  - B. Maximum and minimum value
  - C. Finding vertex and axis of symmetry by completing the square
- VII. Higher degree polynomial functions
  - A. Definition
  - B. Long division, synthetic division, Remainder and Factor Theorems
  - C. Complex and real solutions
  - D. Fundamental Theorem of Algebra
- VIII. Rational Functions
  - A. Definition
  - B. Asymptotes - horizontal, vertical, slant
  - C. Reducible

**MTH 112 - 3 hr. (cont'd)**

IX. Exponential and logarithm functions

- A. Definitions
- B. Properties of logarithms
- C. Logarithmic and exponential equations
- D. Exponential growth and decay

X. Additional functions

- A. Absolute value
- B. Piecewise
- C. Radical

XI. Applications using functions

XII. Solving nonlinear systems of equations

XIII. Binomial Theorem

Date Adopted: April 3, 1998  
Date Reviewed: 2002  
Date Revised: 2002

MTH 113                      PRECALCULUS TRIGONOMETRY                      3 Credit Hrs.

- I. Trigonometric and circular functions
  - A. Degree and radians, definition of the trigonometric and circular functions
  - B. Graphing trigonometric functions and transformations of these graphs
  - C. Inverse trigonometric functions and their graphs
  - D. Special values
  
- II. Analytical Trigonometry
  - A. Basic identities
  - B. Trigonometric formulas including addition, subtraction, double angle, and half angle formulas
  - C. Verifying identities
  - D. Solving trigonometric equations
  
- III. Solving Triangles
  - A. Right triangles
  - B. Laws of sines
  - C. Law of cosines
  
- IV. Applications of trigonometry
  
- V. Complex numbers in polar form
  - A. Multiplication & Division
  - B. DeMoivre's Theorem, the  $n^{\text{th}}$  roots of a complex number
  
- VI. Conic sections
  - A. Graphing
    - 1. translation
    - 2. rotation (optional)
  - B. Equations
  
- VII. Polar coordinate system
  - A. Polar coordinates
    - 1. changing from rectangular to polar
    - 2. changing from polar to rectangular
    - 3. plotting points
  - B. Graphing of polar equations
  - C. Using parametric equations to graph polar equations
  
- VIII. Vectors
  - A. Algebra of vectors using components and unit vector
  - B. Dot product
  - C. Cross product
  - D. Norm of a vector
  - E. Find a unit vector
  - F. Projections



Date Adopted: May 1, 1998  
Date Reviewed:  
Date Revised:

**MTH 115S                      PRECALCULUS TRIGONOMETRY                      4 Credit Hrs.**

- I. Inequalities
  - A. Review order in the real numbers, and interval notation (include a graphing method)
  - B. Solving polynomial and rational inequalities (include a graphing method)
  - C. Solving nonlinear inequalities and absolute value inequalities
  - D. Solving systems of inequalities
  
- II. Complex numbers
  - A. Rectangular form
  - B. Polar form
  - C. Operations using complex numbers
  - D. DeMoivre's Theorem, the  $n^{\text{th}}$  roots
  
- III. Functions
  - A. Review - definition, notation, domain, and range
  - B. Finding the composition of functions and their domains
  - C. Inverse of functions
    - 1. Definition of inverse function
    - 2. One-to-one functions
    - 3. Finding the inverse
  
- IV. Graphing
  - A. All types of functions listed including inverses
  - B. Symmetry and increasing/decreasing functions
  - C. Transformations
  
- V. Linear functions
  - A. Definition
  - B. Writing an equation of a linear function
  
- VI. Quadratic functions
  - A. Definition
  - B. Maximum and minimum value
  - C. Finding vertex and axis of symmetry by completing the square
  
- VII. Higher degree polynomial functions
  - A. Definition
  - B. Long division, synthetic division, Remainder and Factor Theorems
  - C. Complex and real solutions
  - D. Fundamental Theorem of Algebra
  
- VIII. Rational functions
  - A. Definition
  - B. Asymptotes - horizontal, vertical, slant
  - C. Reducible

**MTH 115S - 4 hr. (cont'd)**

- IX. Exponential and logarithms functions
  - A. Definitions
  - B. Properties of logarithms
  - C. Logarithmic and exponential equations
  
- X. Additional functions
  - A. Absolute value
  - B. Piecewise
  - C. Radical
  
- XI. Trigonometric and circular functions
  - A. Degrees and radians, definition of the trigonometric and circular functions
  - B. Graphing trigonometric functions and transformations of these graphs
  - C. Inverse trigonometric functions and their graphs
  - D. Special values
  
- XII. Applications using functions
  
- XIII. Solving nonlinear systems of equations
  
- XIV. Binomial Theorem
  
- XV. Analytical Trigonometry
  - A. Basic identities
  - B. Trigonometric formulas including addition, subtraction, double angle, and half angle formulas
  - C. Verifying identities
  - D. Solving trigonometric equations
  
- XVI. Solving triangles
  - A. Right triangles
  - B. Laws of sines
  - C. Law of cosines
  
- XVII. Applications of trigonometry
  
- XVIII. Conic sections
  - A. Graphing
    - 1. Translation
    - 2. Rotation (optional)
  - B. Equations
  
- XIX. Polar coordinate system
  - A. Polar coordinates
    - 1. Changing from rectangular to polar
    - 2. Changing from polar to rectangular
    - 3. Plotting points
  - B. Graphing of polar equations
  - C. Using parametric equations to graph polar equations

(Mth 115 cont'd)

XX. Vectors

- A. Algebra of vectors using components and unit vector
- B. Dot product
- C. Cross product
- D. Norm of a vector
- E. Find a unit vector
- F. Projections

Date Adopted: May 2004  
Date Reviewed: \_\_\_\_\_  
Date Revised: \_\_\_\_\_

## COURSE OUTLINE

- I. Course Number and Title: MTH 116 – Mathematical Applications
- II. Course Description: This course provides practical applications of mathematics and includes selected topics from consumer math and algebra. Some types included are integers, percent, interest, ratio and proportion, metric system, probability, linear equations, and problem solving. This is a terminal course designed for students seeking an AAS degree and does not meet the general core requirement for mathematics.
- III. Prerequisite: MTH 090 or appropriate mathematics placement score
- IV. Credit Hours and Contact Hours: 3 credit/3 contact
- V. Course Objectives:
  - A. The student will acquire knowledge of mathematical terminology and formulas.
  - B. The student will be able to demonstrate knowledge of basic algebraic concepts.
  - C. The student will demonstrate the ability the ability to use elementary numerical and algebraic techniques to solve applied problems.
- VI. Course Content:
  - A. Sets of Numbers
    1. Symbol Shock
    2. Addition of Integers
    3. Subtraction of Integers
    4. Multiplication of Integers
    5. Division of Integers
    6. Rational and Irrational Numbers
    7. Summary and Review
  - B. Introduction to Algebra
    1. Polynomials
    2. Similar Terms
    3. Simplification
    4. Equations
    5. Solving Equations
    6. Problem Solving with Algebra
    7. Inequalities
    8. Summary and Review

- C. Percents and Problem Solving
  - 1. Ratio and Proportion
  - 2. Problem Solving with Proportions
  - 3. Percent
  - 4. Problem Solving with Percents
  - 5. Summary and Review
  
- D. Measurement and Problem Solving
  - 1. Precision, Accuracy, and Estimation
  - 2. Perimeter
  - 3. Area
  - 4. Volume and Capacity
  - 5. Summary and Review
  
- E. Applications of Percent
  - 1. Discount, Sale Price, Sales Tax
  - 2. Simple Interest
  - 3. Buying on Credit
  - 4. Credit Card Interest
  - 5. Compound Interest
  - 6. Buying a Home
  - 7. Summary and Review
  
- F. Probability
  - 1. Introduction to Probability
  - 2. Probability Models
  - 3. Summary and Review

VII. Class Activities:

- A. Lecture
- B. Recitation
- C. Discussion
- D. Individual Instruction
- E. Testing

VIII. Criteria for Evaluation:

A. College requirements: Examinations should be given by instructors periodically throughout their courses. Faculty are encouraged to give evaluative work early in the term so that students will have a clear understanding of the progress they are making. Final examinations will be given in all classes, and all students enrolled for academic credit will take the final examination. (College Handbook, section 3.7)

B. Grading system as stated in the college catalog:

\*A - Excellent (90-100)

\*B - Good (80-89)

\*C - Average (70-79)

D - Poor (60-69)

F - Failure (below 60)

W - Withdrawal (before midterm)

WP - Withdrawal passing (after midterm)

WF - Withdrawal failure (after midterm)

I - Incomplete

AU - Audit

RW - Required withdrawal

\*Satisfactory grades

C. Criteria for evaluation:

1. Recitation

2. Daily assignments

3. Written assignments

4. To receive a grade of "C" or higher, the student must obtain an average of at least 70% on written test(s) and other evaluation criteria as determined by the instructor.

IX. Text: Mathematics: Its Power and Utility, 7<sup>th</sup> Edition, Karl J. Smith, Brooks/Cole – Thomason Learning, 2003.

**MTH 117 COLLEGE MATHEMATICS WITH APPLICATIONS 3 Credit Hrs.**

I. Variations

- A. Ratios
- B. Proportions
- C. Variation
  - 1. Direct
  - 2. Inverse (indirect)
  - 3. Joint
  - 4. Combined

II. Functions

- A. Definition
- B. Domain
- C. Range
- D. Notation
- E. Properties and graphs
  - 1. Linear functions
  - 2. Quadratic functions
  - 3. Exponential functions
  - 4. Logarithmic functions

III. Equations, inequalities, and systems

- A. Equations
  - 1. Solving
    - a. Linear
    - b. Quadratic
    - c. Exponential
    - d. Logarithmic
  - 2. Solving a system of two equations in two unknowns
- B. Linear inequalities
  - 1. Solving
  - 2. Solving a system of two linear inequalities in two unknowns by graphing
- C. Linear programming by graphing

IV. Consumer math

- A. Percent (including mixture problems)
- B. Consumer credit, discount, mark-up, finance charge
- C. Interest
  - 1. Simple
  - 2. Compound
  - 3. Continuous
- D. Reading and interpreting graphs found in newspapers and magazines

V. Geometry

- A. Perimeter, circumference, area, and volume
- B. Using right triangle trigonometry to solve applied problems
- C. Metric system
  - 1. Familiarity with metric units
  - 2. Conversion within the metric system

VI. Counting principles

- A. Systematic listing
- B. Fundamental counting principles
- C. Permutation and combinations

VII. Introduction to statistics

- A. Measures of central tendency
- B. Measures of dispersion
- C. Measures of position

VIII. Applications in each general area

Date Adopted: April 3, 1998  
Date Reviewed:  
Date Revised:

**MTH 118      TECHNICAL MATHEMATICS I**

**3 Credit Hrs**

- I. Variations
  - A. Ratios
  - B. Proportions
  - C. Direct, indirect, joint
  
- II. Determinants
  - A. Properties
  - B. Solving systems of equations using determinants
  
- III. Graphing conics
  
- IV. Exponential and logarithmic functions
  - A. Definition
  - B. Properties
  - C. Exponential and logarithmic equations
  
- V. Vectors
  - A. Definition
  - B. Addition by components
  - C. Operations using vectors
  
- VI. Trigonometry
  - A. Definition
  - B. Finding values of trigonometry functions
  - C. Right triangles
  - D. Basic identities - formulas (sum, difference, half, and double)
  - E. Inverse trigonometry functions
  - F. Equations
  - G. Graphing
  - H. Complex numbers
    - 1. Rectangular form
    - 2. Trigonometric form
    - 3. Operations
  - I. Laws of sines and cosines
  
- VII. Applications in each general area

Date Adopted: April 3, 1998  
Date Reviewed:  
Date Revised:

**MTH 120          CALCULUS AND ITS APPLICATION          3 Credit Hrs.**

- I. Limits
  - A. Definition of a limit of a function
  - B. Properties of limits
  - C. Indeterminate forms
  - D. Limit of a function at infinity
  
- II. Continuity
  - A. Definition
  - B. Finding points of discontinuity
  
- III. Differentiation
  - A. Definition of the derivative of a function
  - B. Rules for differentiation
  - C. Higher order derivatives
  - D. Implicit differentiation
  - E. Applications for differentiation
    - 1. Marginal functions in economics
    - 2. Curve sketching
    - 3. Optimization
    - 4. Differentials
  
- IV. Integration
  - A. Antiderivatives and rules of integration
  - B. Techniques of integration
    - 1. By substitution
    - 2. By using table
  - C. The Fundamental Theorem of Calculus
  - D. The Definite Integral
    - 1. Definition of definite integral
    - 2. Area
    - 3. Applications
  - E. Multiple integration
  
- V. Exponential and logarithm functions
  - A. Differentiation of exponential and logarithmic functions
  - B. Applications
  
- VI. Calculus of several variables
  - A. Functions of several variables
  - B. Partial derivatives
  - C. Maxima and minima for functions of several variables
  - D. Method of Lagrange multipliers

MTH 125S      ANALYTIC GEOMETRY AND CALCULUS I      4 Credit Hrs.

- I. Functions and limits
  - A. Limits
    - 1. Intuitive introduction
    - 2. Computational techniques
    - 3. Epsilon: Delta
    - 4. Infinite limits
    - 5. Continuity and one-sided limits
    - 6. Limits and continuity of trigonometry functions
  
- II. Differentiation
  - A. Tangent lines and rates of change
  - B. Definition of derivatives
  - C. Techniques of differentiation
  - D. Derivatives of trigonometric functions
  - E. Chain rule
  - F. Implicit differentiation
  - G. Higher derivatives
  - H. Differentials
    - 1. Definition
    - 2. Approximation of relative error
  
- III. Applications of differentiation
  - A. Related rates
  - B. Maximum and minimum values of a function
  - C. Applied maximum and minimum word problems
  - D. Sketching graphs
    - 1. Relative extrema and intervals of increase/decrease
    - 2. Points of inflection and concavity
    - 3. Asymptotes
  - E. Newton's Method
  - F. Rolle's Theorem and Mean Value Theorem
  - G. Indeterminant forms and L'Hopital's Rule
  
- IV. Integration
  - A. Antiderivatives; the indefinite integral
  - B. Integration by substitution
  - C. Sigma notation
  - D. Areas
  - E. The definite integral
  - F. The First Fundamental Theorem for Integrals
  - G. The Mean-Value Theorem for Integrals
  - H. Riemann sums and the definite integral
  - I. The Second Fundamental Theorem of Calculus
  
- V. Logarithmic and Exponential Functions
  - A. Definition
  - B. Properties of the natural logarithm
  - C. Derivatives and integrals of logarithmic and exponential functions
  - D. The Hyperbolic functions
    - 1. Definition
    - 2. Domain and range
    - 3. Inverse
    - 4. Derivatives and integrals of hyperbolic functions
    - 5. Logarithmic differentiation
  - E. First-order differential equations and applications including exponential growth and decay
  
- VI. Inverse trigonometric and hyperbolic functions
  - A. Inverse trigonometric functions
  - B. Derivatives and integrals involving inverse trigonometric functions



Date Adopted: July 15, 1998

Date Reviewed:

Date Revised:

**MTH 126S      ANALYTIC GEOMETRY AND CALCULUS II      4 Credit Hrs.**

- I. Applications of the definite integral
  - A. Volumes
    - 1. Disks and washers
    - 2. Cylindrical shells
  - B. Arc length of a plane curve
  - C. Area of a surface of revolution
  - D. Average value
  - E. Work
  
- II. Techniques of integration
  - A. Integration by parts
  - B. Integrating powers of sine, cosine, secant, tangent
  - C. Trigonometric substitutions
  - D. Rational functions; Partial fractions
  - E. Tables of Integrals
  - F. Numerical integration; Simpson's Rule
  - G. Improper integrals
  
- III. Infinite series
  - A. Sequences
  - B. Monotone sequences
  - C. Infinite series
  - D. Convergence tests
  - E. Alternating series
    - 1. Conditional convergence
    - 2. Absolute convergence
    - 3. Divergence
  - F. Power series
  - G. Taylor and Maclaurin series
  - H. Taylor Formula with remainder
  - I. Computations using Taylor series
  
- IV. Polar coordinates and parametric equations
  - A. Polar coordinates
  - B. Graphs and area in polar coordinates
  - C. Parametric equations
  - D. Curves defined by parametric equations
  - E. Tangent lines and arc length in polar coordinates
  
- V. Three-dimensional space
  - A. Rectangular coordinates
  - B. Vectors in two-space and three-space
  - C. Dot product
  - D. Cross product
  - E. Equations of lines and planes
  - F. Planes

Date Adopted: July 15, 1998  
Date Reviewed:  
Date Revised:

MTH 227      ANALYTIC GEOMETRY AND CALCULUS III      4 Credit Hrs.

- I. Surfaces in space
  - A. Quadric surfaces
  - B. Spherical and cylindrical coordinates
  
- II. Vector-valued functions
  - A. Introduction to vector-valued functions
  - B. Calculus of vector-valued functions
  - C. Change of parameter: arc length
  - D. Unit tangent and normal vectors
  - E. Curvature
  - F. Motion along a curve
  
- III. Partial derivatives
  - A. Functions of two variables
  - B. Limits, continuity, and differentiability
  - C. Partial derivatives
  - D. The chain rule
  - E. Differentials
  - F. Tangent planes
  - G. Directional derivatives; gradient
  - H. Functions of three variables
  - I. Functions of n variables
  - J. Maxima and minima of functions for two variables
  - K. LaGrange multipliers (optional)
  
- IV. Multiple Integrals
  - A. Double integrals
  - B. Triple integrals (including cylindrical and spherical coordinates)
  
- V. Vector Calculus
  - A. Vector fields
  - B. Line integrals
  - C. Line integral independent of path
  - D. Green's Theorem
  - E. Surface integrals
  - F. Curl and divergence
  - G. Divergence Theorem
  - H. Stokes' Theorem

Date Adopted: May 1, 1998  
Date Reviewed:  
Date Revised:

- MTH 231**            **MATH FOR THE ELEMENTARY TEACHER**    **I**            **3 Credit Hrs.**  
I. Problem solving
- A. Critical thinking
  - B. Inductive reasoning
  - C. Strategies for problem solving
- II. Logic
- A. Statements
    - 1. Conjunction
    - 2. Disjunction
    - 3. Negation
  - B. Conditionals
  - C. Quantifiers
  - D. Valid arguments
- III. Sets, relations, and functions
- A. Set notation and operations
  - B. Cartesian product
  - C. Relations
  - D. Functions
- IV. The Real number system
- A. Whole numbers
    - 1. Operations
    - 2. Algorithms
    - 3. History
    - 4. Nondecimal bases
  - B. Integers
    - 1. Operations
    - 2. Primes, composites, and factorization
    - 3. Greatest common divisor
    - 4. Least common multiple
    - 5. Modular arithmetic
  - C. Rational numbers
    - 1. Operations
    - 2. Ratio and proportion
    - 3. Decimals
    - 4. Percent
  - D. Irrational numbers
- V. Informal geometry
- A. Basic ideas
  - B. Lines, planes, and angles
  - C. Simple closed curves
  - D. Simple closed surfaces
- VI. Linear measure and the metric system
- A. Measurement
  - B. SI units of measure
  - C. The metric system

Date Adopted: May 1, 1998  
Date Reviewed:  
Date Revised:

MTH 232 MATH FOR THE ELEMENTARY TEACHER II

3 Credit Hrs.

- I. Introduction to probability
  - A. Language of probability
  - B. Events and properties
  - C. Expected value and simulation
  - D. Fundamental principle of counting
  - E. Permutations
  - F. Combinations
  
- II. Statistics
  - A. Frequency distributions and graphs
  - B. Measures of central tendency
  - C. Measures of scattering
  - D. The normal distribution
  
- III. Measurement of geometric figures
  - A. Perimeter
  - B. Area
  - C. Surface area
  - D. Volume
  
- IV. Geometry
  - A. Congruence and triangles
  - B. Constructions
  - C. Similarity
  - D. Topological equivalence
  - E. Networks
  
- V. Coordinate geometry and transformations
  - A. Coordinate geometry
  - B. Reflections
  - C. Translations
  - D. Rotations
  - E. Successive motions
  
- VI. Algebraic modeling
  - A. Linear equations
  - B. Quadratic equations
  - C. Systems of linear equations
  
- VII. Use of technology in the classroom
  - A. Introduction to the appropriate use of calculators
  - B. Introduction to computers
    - 1. Internet sites
    - 2. Resources

Date Adopted: May 1, 1998

Date Reviewed:

Date Revised:

**MTH 237**

**LINEAR ALGEBRA**

**3 Credit Hrs.**

- I. Systems of linear equations and matrices
  - A. Introduction to systems of linear equations
  - B. Matrices and matrix operations
  - C. Inverses
  - D. Elementary matrices
  - E. Diagonal, triangular, and symmetric matrices
  - F. Applications
    - 1. Gaussian elimination and Gauss-Jordan elimination
    - 2. Solving linear systems by matrix inversing
  
- II. Determinants
  - A. The determinant
  - B. Evaluation of determinants
  - C. Properties of determinants
  - D. Applications
  
- III. Vector spaces
  - A. Euclidean n-space
  - B. Real vector spaces
  - C. Subspaces
  - D. Linear independence
  - E. Basis and dimension
  - F. Row space, column space, and nullspace
  - G. Rank and nullity
  
- IV. Inner product spaces
  - A. Inner products
  - B. Angle and orthogonality in inner product spaces
  - C. Orthonormal bases, Gram-Schmidt process, and QR-Decomposition
  - D. Orthogonal Matrices - QR - Decomposition
  
- V. Eigenvalues and eigenvectors
  - A. Eigenvalue and eigenvectors
  - B. Diagonalization
  - C. Orthogonal diagonalization
  
- VI. Linear transformations
  - A. Linear transformation from  $\mathbb{R}^n$  to  $\mathbb{R}^m$
  - B. Properties of linear transformations from  $\mathbb{R}^n$  to  $\mathbb{R}^m$
  - C. General linear transformations
  - D. Kernel and range
  - E. Inverse linear transformations
  - F. Similarity

Date Adopted: May 1, 1998

Date Reviewed:

Date Revised:

**MTH 238                      APPLIED DIFFERENTIAL EQUATION I                      3 Credit Hrs.**

- I. Equations of order one
  - A. Separation of variables
  - B. Homogeneous functions
  - C. Equations with homogeneous coefficients
  - D. Exact equations
  - E. The linear equation of order one
  - F. The general solution of a linear equation
  
- II. Additional topics of order one
  - A. Integrating factors found by inspection
  - B. The determination of integrating factors
  - C. Substitution
  - D. Bernoulli's equation
  - E. Coefficients linear in the two variables
  
- III. Linear differential equations
  - A. General solution of a homogeneous equation
  - B. General solution of a nonhomogeneous equation
  - C. Differential operators
  - D. The fundamental laws of operation
  - E. Properties of differential operators
  
- IV. Linear equations with constant coefficients
  - A. The auxiliary equation: distinct roots
  - B. The auxiliary equation: repeated roots
  - C. Definition of  $\exp z$  for imaginary  $z$
  - D. The auxiliary equation: imaginary roots
  
- V. Nonhomogeneous equations: undetermined coefficients
  - A. Introduction
  - B. Construction of a homogeneous from a specific solution
  - C. Solution of a nonhomogeneous equation
  - D. The method of undetermined coefficients
  
- VI. Variation of parameters
  - A. Introduction
  - B. Variation of parameters
  
- VII. Applications
  - A. Vibrations of a spring
  - B. Undamped vibrations
  - C. Damped vibrations
  - D. The simple pendulum
  - E. Population or growth
  - F. Mixing
  
- VIII. The laplace transform
  - A. The transform concept
  - B. Definition of the laplace transform
  - C. Transforms of elementary functions
  - D. Transforms of derivatives
  - E. Derivatives of transforms
  - F. The Gamma function
  - G. Periodic functions
  - H. Summary table

**MTH 238 (cont'd)**

- IX. Inverse transforms
  - A. Definition of an inverse transform
  - B. Partial fractions
  - C. Initial value problems
  - D. Systems of equations
  
- X. Power series solutions
  - A. Linear equations and power series
  - B. Solutions near an ordinary point
  
- XI. Solutions near regular singular points
  - A. Regular singular points
  - B. The indicial equation
  - C. Indicial equation with difference of roots nonintegral
  - D. Indicial equation with difference of roots a positive integer:  
nonlogarithmic case



Date Adopted: 1965  
Date Reviewed: 1985  
Date Revised: 1986  
Date Reviewed: 1996  
Date Revised: 1998,2001

**JEFFERSON STATE JUNIOR COLLEGE**  
**COURSE OUTLINE**

**I. COURSE NUMBER AND TITLE**

Physical Science 111: Physical Science I

**II. COURSE DESCRIPTION**

This course provides the non-technical student with an introduction to the basic principles of geology, cosmology, meteorology, and astronomy.

**III. PREREQUISITE**

None

**IV. CREDIT HOURS AND CONTACT HOURS**

Credit hours: 4

Contact hours: Lecture - 3                      Lab - 2

**V. COURSE OBJECTIVES**

- A. To promote an understanding of some of the basic concepts of astronomy; earth materials (geology); the atmosphere and hydrosphere; and the earth's interior (including volcanos, massive earth movements, earthquakes, and continent
- B. To relate these disciplines and their terminology to the common environment of the earth
- C. To trace the historical development and significance of these disciplinary concepts
- D. To emphasize the use of the scientific method
- E. To provide an opportunity for experimentation

**VI. COURSE CONTENT**

- A. Some basic astronomical observation
  1. Rising and setting of celestial bodies
  2. Daily motion of the earth
  3. Annual motion of the earth
  4. Tilt of the earth's axis
  5. Factors controlling the seasons
  6. Rotation, revolution, and time
  7. Eastward drift of the sun among the stars
  8. Precession of the equinoxes
  9. Motions of the moon
  10. Eclipses, lunar and solar
  11. The ptolemaic hypothesis
  12. Establishment of the Copernican system
  13. Kepler's laws
- B. Astronomy
  1. The sun
  2. The planets
  3. Galaxies
  4. Red shifts
  5. Quasars
  6. Evolution of the universe
- C. Earth materials (geology)
  1. The earth's crust
  2. Minerals
  3. Rocks
  4. Soil
- D. Atmosphere and hydrosphere
  1. The atmosphere
  2. Weather
  3. Climate
  4. The oceans

- E. The changing crust of the earth
  - 1. Erosion
  - 2. Sedimentation
  - 3. Vulcanism
  - 4. Diastrophic movement
- F. The earth's interior
  - 1. Earthquakes
  - 2. Composition
  - 3. Continental drift

**VI. CLASS ACTIVITIES**

- A. Lecture
- B. Discussion
- C. Experimentation
- D. Demonstration
- E. Recitation
- F. Written examination

**VIII. CRITERIA FOR EVALUATION**

- A. Recitation
- B. Written reports
- C. Written examinations

## COURSE OUTLINE

### I. COURSE NUMBER AND TITLE

Physics 201: General Physics I - Trig-Based

### II. COURSE DESCRIPTION

This course is designed to cover general physics at a level that assumes previous exposure to college algebra and basic trigonometry. Specific topics are mechanics and properties of matter and energy, thermodynamics, and periodic motion. A laboratory is required.

### III. PREREQUISITE

Trigonometry or equivalent math placement score

### IV. CREDIT HOURS AND CONTACT HOURS

Credit hours: 4

Contact hours: Lecture 3; Lab 2

### V. COURSE OBJECTIVES

This course is an introduction to classical physics with the emphasis on and understanding of the general concepts and their applications.

### VI. COURSE CONTENT

A. Lecture (topical outline)

1. Measurement basic mathematics
  - a. British and metric system
  - b. Accuracy, precision, error, scientific notation
  - c. Length, time, mass, and force
  - d. Trigonometric ratios
  - e. Vectors (components, addition, and subtraction)
2. Equilibrium
  - a. Translational equilibrium
  - b. Rotational equilibrium
3. Motion of particles
  - a. Velocity, speed, and acceleration in a straight line
  - b. Free fall, projectile motion
4. Newton's three laws of motion
  - a. The effect of force on motion
  - b. Friction
  - c. Centripetal acceleration and force
5. Work, energy, power, and momentum
  - a. Work against inertia, gravity, and friction
  - b. Kinetic and potential energy, conservation of energy
  - c. Power and efficiency
  - d. Conservation of momentum during collisions, impulse
6. Rotational motion
  - a. Angular velocity and acceleration
  - b. Moment of inertia
7. Mechanical properties of matter
  - a. Density
  - b. Young's shear, and bulk moduli
  - c. Pressure
  - d. Buoyant force
  - e. Fluid flow

### VII. CLASS ACTIVITIES

- A. Lecture
- B. Problem solving
- C. Laboratory exercises

### VIII. CRITERIA FOR EVALUATION

- A. Periodic exams
- B. Final exams
- C. Lab reports

Adopted: 1980  
Reviewed: 1985  
Revised: 1990, 1998, 2001

## COURSE OUTLINE

### I. COURSE NUMBER AND TITLE

Physics 213S: General Physics I With Calculus

### II. COURSE DESCRIPTION

This course provides a calculus-based treatment of the principle subdivisions of classical physics: mechanics and energy. Laboratory is required.

### III. PREREQUISITE

Math 125S or permission.

### IV. CREDIT HOURS AND CONTACT HOURS

Credit hours: 4

Contact hours: Lecture 3; Lab 2

### V. COURSE OBJECTIVES

- A. To promote an understanding of the basic concept of Newton's Laws.
- B. To provide the student with the opportunity to develop problem solving skills.
- C. To provide the student with the background material necessary for entry into the engineering fields.
- D. To provide the student with basic laboratory skills.

### VI. COURSE CONTENT

- A. Measurement
  1. Standards
  2. Dimensional analysis
  3. Conversion of units
  4. Significant figures
- B. Vectors
  1. Coordinate systems
  2. Properties of vectors
  3. Components of vectors
- C. Kinematics
  1. Average velocity
  2. Instantaneous velocity
  3. Acceleration
  4. One-dimensional motion
  5. Two-dimensional motion
  6. Projectile motion
  7. Uniform circular motion
- D. Laws of Motion
  1. Forces
  2. Newton's first law
  3. Newton's second law
  4. Newton's third law
- E. Work and energy
  1. Work and Kinetic energy
  2. Potential energy
  3. Conservation of energy
- F. Linear momentum and collisions
  1. Linear momentum and impulse
  2. Conservation of momentum
- G. Rotations

1. Rigid bodies
2. Angular momentum
3. Static equilibrium

- H. Oscillatory motion
1. Simple harmonic motion
  2. The pendulum
  3. Damped oscillations
  4. Forced oscillations

**VII. CLASS ACTIVITIES**

- A. Lecture
- B. Discussion
- C. Experimentation
- D. Demonstrations
- E. Written examinations

**VIII. CRITERIA FOR EVALUATION**

- A. Written examinations
- B. Home work
- C. Lab reports