

Area: Mathematics
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Degree: A.S. - Mathematics
 A.S. - Physical Science/Mathematics

Mathematics Degree

The A.S. degree in mathematics provides a foundation of mathematics for students in preparation for transfer to a four-year program in mathematics or statistics. Course work includes a three-semester calculus series, differential equations, linear algebra, and statistics and/or symbolic logic.

Student Learning Outcomes

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

- Identify, formulate, and solve applied problems (using calculus and linear algebra) in verbal, numeric, graphical, and symbolic form related to science, economics, or business.
- Recognize and construct valid arguments using deductive and inductive reasoning skills.
- Define and utilize terminology of mathematics with emphasis in calculus, linear algebra, and either statistics, logic or problem solving.
- Calculate derivatives and integrals using a variety of defined rules and strategies of calculus, algebraic properties and trigonometric identities.

Requirements for Degree	25 Units
MATH 400 Calculus I	5
MATH 401 Calculus II	5
MATH 402 Calculus III	5
MATH 410 Introduction to Linear Algebra	3
MATH 420 Differential Equations	4
And a minimum of 3 units from the following:	3
MATH 320 Symbolic Logic (3)	
or PHIL 325 Symbolic Logic (3)	
STAT 301 Introduction to Probability and Statistics (3)	

Associate Degree Requirements: The Mathematics Associate in Science (A.S.) Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Physical Science/Mathematics Degree

This program provides a broad study in fields of physical science and mathematics. It provides a good foundation for transfer to a four-year program in science.

Student Learning Outcomes

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

- Recognize and utilize correctly the terminology of math, statistics and/or science.
- Analyze and interpret data, charts and graphs using quantitative and qualitative methods.
- Recognize and construct valid arguments using deductive and inductive reasoning.
- Evaluate new and accepted ideas about the natural universe using testable methodology.

Career Opportunities

This program is intended to provide a broad foundation of skills and knowledge to help students succeed in the completion of a bachelor's degree in a variety of science, math or engineering-related areas.

Requirements for Degree 18 Units

A minimum of 18 units from the following:.....18
 Transferable courses must be selected from the following areas: astronomy, chemistry, engineering, geology, mathematics, physical geography, physical science, physics, and statistics.

Associate Degree Requirements: The Physical Science/Mathematics Associate in Science (A.S.) Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Mathematics

MATH 10 Developing Confidence in Math 1 Unit

*Advisory: Concurrent enrollment in another math course.
 Hours: 18 hours LEC*

This course helps students to recognize common fears and misconceptions of mathematics, and to overcome math anxiety and avoidance. Strategies to achieve success in mathematical situations are discussed. This course is also useful for tutors, counselors, and teachers interested in helping others overcome their math anxiety. Credit/No Credit only.

MATH 23 Computational Arithmetic - Part I 2 Units

*Advisory: Confirm placement using ARC's Math Self-Assessment System
 Hours: 36 hours LEC*

This course introduces the fundamentals of arithmetic with an emphasis on computational skills. Topics include whole numbers, exponents, order of operations, factors, fractions, problem solving, and applications.

MATH 24 Computational Arithmetic - Part II 2 Units

*Prerequisite: MATH 23 with a grade of "C" or better
 Hours: 36 hours LEC*

This course completes the fundamentals of arithmetic with an emphasis on computational skills. Topics include rounding decimals, operations on decimals, ratios, rates, proportions, percents, problem solving, and applications.

MATH 25 Computational Arithmetic 3 Units

*Advisory: Confirm placement using ARC's Math Self-Assessment System.
 Hours: 54 hours LEC*

This course covers fundamentals of arithmetic with an emphasis on computational skills. Topics include whole numbers, fractions, decimals, problem solving, and applications.

MATH 32 Pre-Algebra 3 Units

Prerequisite: MATH 24 or 25 with a grade of "C" or better; or placement through the assessment process.

Hours: 54 hours LEC

This course will briefly review the fundamentals of arithmetic, including whole numbers, fractions, and decimals. Course content will include order of operations, signed numbers, concepts of variables, exponents, ratios and proportions, area/perimeter/volume of geometric figures, and solving equations.

MATH 38 Pre-Algebra - Part I 2 Units

Prerequisite: MATH 24 or 25 with a grade of "C" or better; or placement through the assessment process.

Hours: 36 hours LEC

This course introduces material that is essential for success in algebra. Topics include order of operations, signed numbers, application problems, concepts of variables, exponents, and solving equations. In addition, the fundamentals of arithmetic are briefly reviewed, including operations on whole numbers, fractions, and decimals.

MATH 39 Pre-Algebra - Part II 2 Units

Prerequisite: MATH 38 with a grade of "C" or better

Hours: 36 hours LEC

This course completes material that is essential for success in algebra. Topics include percent problems, proportions, solving algebraic equations, applications of equations, polynomials, graphing points and lines, and area/perimeter/volume of geometric figures.

MATH 100 Elementary Algebra 5 Units

Prerequisite: MATH 32 or 39 with a grade of "C" or better; or placement through the assessment process.

Hours: 90 hours LEC

This course includes the fundamental concepts and operations of algebra with problem solving skills emphasized. Topics include properties of real numbers, linear equations and inequalities, integer exponents, polynomials, and factoring polynomials. Other topics include rational exponents and rational/radical expressions with associated equations. Additional topics introducing the rectangular coordinate system, focus on graphs and equations of lines, systems of linear equations/inequalities, and solving quadratic equations.

MATH 103 Elementary Algebra, Part I 3 Units

Prerequisite: MATH 32 or 39 with a grade of "C" or better; or placement through the assessment process.

Hours: 54 hours LEC

This course covers the first half of the traditional MATH 100 course and includes the fundamental concepts and operations of algebra with problem solving skills emphasized. Topics include properties of real numbers, linear equations and inequalities, integer exponents, polynomials, systems of linear equations and inequalities, the rectangular coordinate system, graphs and equations of lines, and applications.

MATH 104 Elementary Algebra, Part II 3 Units

Prerequisite: MATH 103 with a grade of "C" or better

Hours: 54 hours LEC

This course covers the second half of the traditional MATH 100 course. Topics include polynomial factorization, rational expressions and equations, radical expressions and equations, rational exponents, quadratic equations, and applications.

MATH 110 Elementary Geometry 5 Units

Prerequisite: MATH 100 or 104 with a grade of "C" or better; or placement through the assessment process.

Hours: 90 hours LEC

This course covers aspects of elementary geometry. Topics include terms and definitions, properties of parallel lines and parallelograms, congruent and similar triangles, properties of triangles, right triangles, and basic trigonometry. Later topics include properties of circles, construction of loci, areas, and volumes. The course also emphasizes problem solving strategies, elementary logic, and reading and writing proofs.

MATH 120 Intermediate Algebra 5 Units

Prerequisite: MATH 100 or 104 with a grade of "C" or better; or placement through the assessment process.

General Education: AA/AS Area II(b)

Hours: 90 hours LEC

This course reviews and extends the concepts of elementary algebra with an emphasis on problem solving. Topics which are reviewed and extended include linear and quadratic equations, factoring polynomials, rational expressions, exponents, radicals, graphing, and system of equations. New topics include graphs and their translations and reflections, functions, exponential and logarithmic functions, graphs of quadratic and polynomial functions, nonlinear systems of equations, polynomial and rational inequalities, and an introduction to conic sections.

MATH 123 Intermediate Algebra, Part I 3 Units

Prerequisite: MATH 100 or 104 with a grade of "C" or better; or placement through the assessment process.

Hours: 54 hours LEC

This course reviews and extends the concepts of elementary algebra with an emphasis on problem solving. Topics include solving linear equations and inequalities, factoring of polynomials, solving quadratic equations, rational expressions, exponents, solving equations containing rational expressions, equations of lines, functions, and absolute value equations and inequalities.

MATH 124 Intermediate Algebra, Part II 3 Units

Prerequisite: MATH 123 with a grade of "C" or better

General Education: AA/AS Area II(b) (effective Summer 2009)

Hours: 54 hours LEC

This course extends the concepts of elementary algebra and MATH 123 with problem solving skills emphasized throughout. Topics include graphs and their translations and reflections, radicals and complex numbers, composite and inverse functions, exponential and logarithmic functions, graphs of quadratic and polynomial functions, nonlinear systems of equations, and an introduction to conic sections.

MATH 290 PACE: Applications of Mathematics 1 Unit

Hours: 18 hours LEC

This course presents extended applications of mathematics not generally covered in the classroom. Topics include 2-D and 3-D geometry, measurement, proportion, and budgetary analysis. The course incorporates computer software as a learning tool. It culminates in a final project and presentation.

MATH 294 Topics in Mathematics .5-4 Units

Hours: 9-72 hours LEC

This course is designed to give students an opportunity to study topics in mathematics not included in current course offerings. Individualized topics are developed to foster, complement and build upon arithmetic, geometric and algebraic skills with an emphasis on critical thinking. The course may be taken four times for a maximum of 6 credits with no duplication of topics.

MATH 300 Introduction to Mathematical Ideas 3 Units

Prerequisite: MATH 120 or 124 with a grade of “C” or better
General Education: AA/AS Area II(b); CSU Area B4
Course Transferable to UC/CSU
Hours: 54 hours LEC

This course focuses on elements of mathematical systems. It is designed to make fundamental concepts and processes more meaningful to the general student. Its content may include systems, logic, geometry, combinatorics, probability, statistics, sets, matrices, and number theory. Not recommended for students entering elementary school teaching or business administration majors.

MATH 310 Mathematical Discovery 3 Units

Prerequisite: MATH 110 and (MATH 120 or MATH 124) with grades of “C” or better
General Education: AA/AS Area II(b); CSU Area B4
Course Transferable to UC/CSU
Hours: 54 hours LEC

This course explores mathematical patterns and relations, and formulation and proof of conjectures. Topics from number theory, probability and statistics, and geometry will be investigated. Recommended for students interested in education.

MATH 315 Exploratory Field Experience in Mathematics 3 Units

Prerequisite: MATH 120 or 124 with a grade of “C” or better
General Education: AA/AS Area III(b)
Enrollment Limitation: Current TB clearance is required prior to work in schools. Fingerprinting may also be required.
Course Transferable to UC/CSU
Hours: 36 hours LEC; 54 hours LAB

This course is an education-based field experience in mathematics allowing students to explore teaching as a career choice. Students are assigned to area schools to observe and/or assist in a mathematics classroom. Students have the opportunity to learn and practice essential skills to assist younger students with their progress through the mathematics sequence, and to learn about social, cultural, and educational issues related to mathematics and the school environment. Weekly seminars allow students to share experiences and compare observations. This course is recommended for those who may wish to pursue a single-subject credential in mathematics.

MATH 320 Symbolic Logic 3 Units

Same As: PHIL 325
Prerequisite: (PHIL 320 or MATH 110) and (MATH 120 or MATH 124) with a grade of “C” or better.
General Education: AA/AS Area II(b)
Course Transferable to UC/CSU
Hours: 54 hours LEC

This course covers an introduction to symbolic logic including the logic of sentences (the statement of calculus) and the logic of classes and relations (the predicate calculus) together with an introduction to the nature and development of deductive systems. Applications include examples of logic used in elementary mathematics and the analysis of verbal arguments. Not open to students who have completed PHIL 325.

MATH 325 Problem-Solving 3 Units

Prerequisite: MATH 120 or 124 with a grade of “C” or better
General Education: AA/AS Area II(b); CSU Area B4
Course Transferable to CSU
Hours: 54 hours LEC

This course focuses on the problem-solving skills necessary to solve both real-life and nontraditional mathematics problems. Problem-solving strategies presented in this course include: drawing a diagram, eliminating possibilities, making a systematic list, looking for a pattern, guessing and checking, solving an easier related problem, work-

ing backward, algebraic representation, finite differences, and other related techniques. Divergent thinking, group work, and the clear presentation of mathematical work will be emphasized throughout the course.

MATH 330 Trigonometry 3 Units

Prerequisite: MATH 110 and (MATH 120 or MATH 124) with a grade of “C” or better.
General Education: AA/AS Area II(b); CSU Area B4
Course Transferable to CSU
Hours: 54 hours LEC

This course presents the fundamentals of trigonometry. Topics include definitions of trigonometric and circular functions, graphs, identities and applications. Other material covered includes solving trigonometric equations, solving triangles using the Laws of Sines and Cosines, vectors, polar coordinates and polar representations of complex numbers.

MATH 340 Calculus for Business and Economics 3 Units

Prerequisite: MATH 120 or 124 with a grade of “C” or better
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 54 hours LEC

This course is an introduction to differential and integral calculus with applications in the fields of business, economics, social science and biological science. It is not recommended for mathematics and physical science majors.

MATH 342 Modern Business Mathematics 3 Units

Prerequisite: MATH 120 or 124 with a grade of “C” or better
General Education: AA/AS Area II(b); CSU Area B4
Course Transferable to CSU
Hours: 54 hours LEC

This course is designed around applications of mathematics in economic and business contexts. Specific topics include functions and related business formulas, tables and graphs, finance (interest and exponential models in economics), rates of change including applications and optimization, and linear programming.

MATH 344 Finite Mathematics 3 Units

Prerequisite: MATH 120 or 124 with a grade of “C” or better
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 54 hours LEC; 18 hours LAB

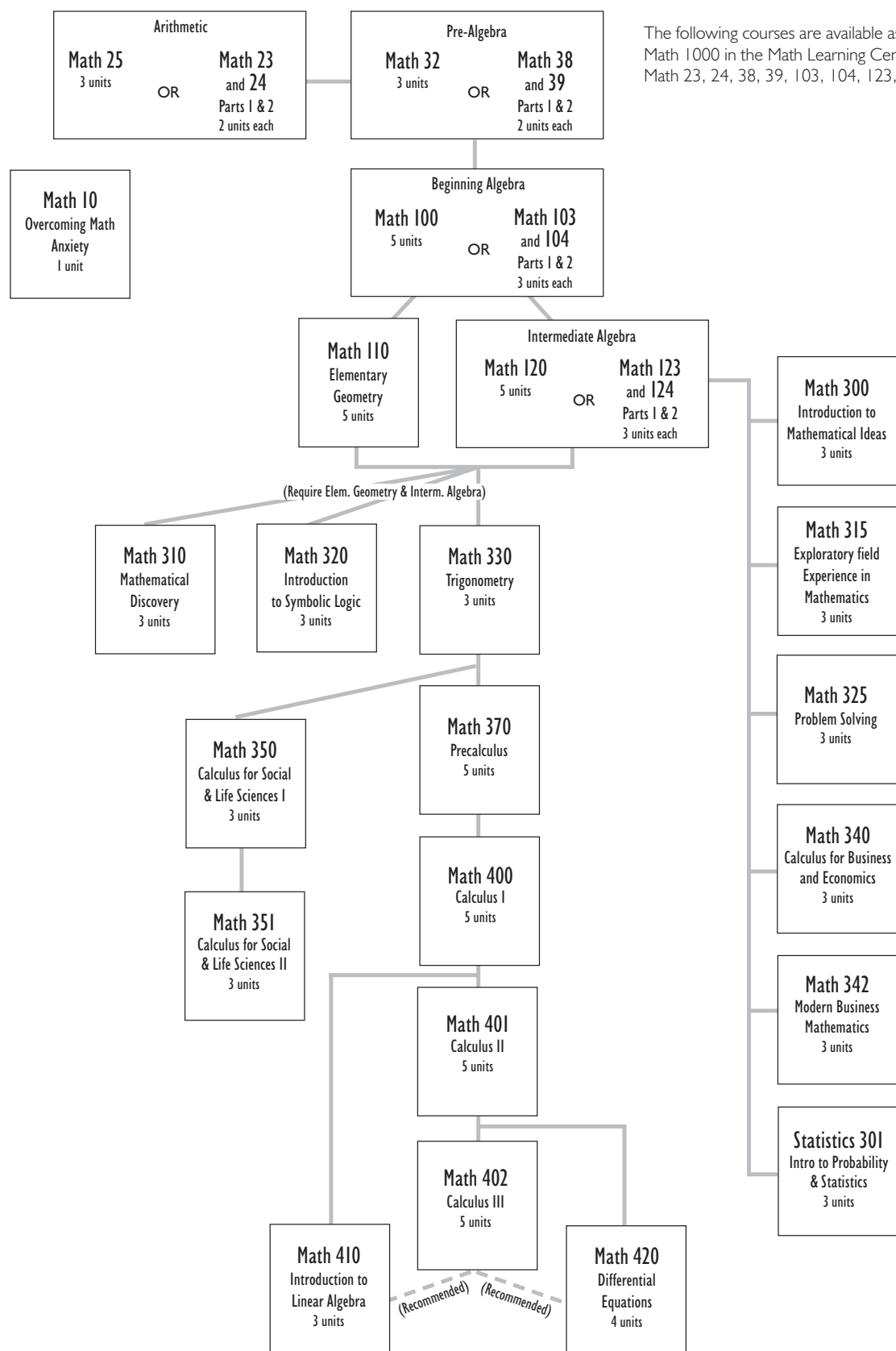
This course covers sets, probability and combinatorics, expected value, matrix theory systems of equations and inequalities, linear programming, and mathematics of finance with emphasis on applications in business administration, biological sciences, and social science. It also includes computer applications.

MATH 350 Calculus for the Life and Social Sciences I 3 Units

Prerequisite: MATH 330 with a grade of “C” or better
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 54 hours LEC

This course covers functions, limits, and derivatives, and introduces antiderivatives. Algebraic and computational techniques are emphasized in applications from business, and social and biological sciences. It is not recommended for math or engineering majors.

Mathematics Courses



The following courses are available as Math 1000 in the Math Learning Center:
Math 23, 24, 38, 39, 103, 104, 123, 124

MATH 351 Calculus for the Life and Social Sciences II **3 Units**

Prerequisite: MATH 350 with a grade of "C" or better
General Education: CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 54 hours LEC

This course is the continuation of MATH 350. It covers integration and differentiation of commonly used functions and applications of analytic geometry and calculus.

MATH 360 Introduction to Scientific Graphing Calculators **1 Unit**

Prerequisite: MATH 330 with a grade of "C" or better.
Course Transferable to CSU
Hours: 18 hours LEC

This course introduces the basic functions and applications of scientific graphic calculators. It covers plotting, evaluating, and solving functions. It also discusses calculator-based solutions of problems from algebra and trigonometry; and introduces techniques that will be useful in subsequent courses like precalculus and calculus. A calculator of a model and type that will be specified by instructor is required.

MATH 370 Pre-Calculus Mathematics **5 Units**

Prerequisite: MATH 330 with a grade of "C" or better
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 90 hours LEC

This course includes application and graphing of polynomial, logarithmic, exponential and trigonometric functions, as well as systems of linear and non-linear equations and inequalities. It also covers analytic geometry including straight lines, conic sections, graphing and curve sketching.

MATH 400 Calculus I **5 Units**

Prerequisite: MATH 370 with a grade of "C" or better
Advisory: Students who took Precalculus in a non-college setting should confirm adequate preparation for MATH 400 using ARC's Math Self-Assessment System
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 90 hours LEC

This course is an introduction to differential and integral calculus. It includes limits, continuity, differentiation and integration of algebraic, trigonometric, logarithmic, exponential, and other transcendental functions. Some applications are also covered.

MATH 401 Calculus II **5 Units**

Prerequisite: MATH 400 with a grade of "C" or better
General Education: CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 90 hours LEC

This course is a continuation of MATH 400. It includes techniques of integration, indeterminate forms of limits, improper integrals, infinite series, polar coordinates, and parametric and polar equations. Many calculus applications are also covered.

MATH 402 Calculus III **5 Units**

Prerequisite: MATH 401 with a grade of "C" or better
General Education: CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 90 hours LEC

This course is a continuation of MATH 401. It extends the concepts of limits, derivatives, and integrals to vector-valued functions and multi-variable functions. The topics include: multi-variable functions, partial derivatives, extrema of multi-variable functions, iterated

integrals, development of vector calculus, line integrals, three dimensional analytic geometry, and Green's, Gauss' (Divergence), and Stokes' Theorems. Many applications of calculus are also covered.

MATH 410 Introduction to Linear Algebra **3 Units**

Prerequisite: MATH 400 with a grade of "C" or better
Advisory: MATH 402
General Education: CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 54 hours LEC

This course provides an introduction to linear algebra including matrices, determinants, vector spaces, linear transformations, and eigenvectors. It is intended for majors in mathematics, engineering, economics, science, and related fields.

MATH 420 Differential Equations **4 Units**

Prerequisite: MATH 401 with a grade of "C" or better
Advisory: MATH 402
General Education: CSU Area B4; IGETC Area 2
Course Transferable to UC/CSU
Hours: 72 hours LEC

This course is a study of ordinary differential equations with emphasis on linear equations and systems of linear equations. It includes infinite series and Laplace transform and matrix methods of solution. It stresses applications to engineering problems. It is recommended for electrical, mechanical, industrial, ceramic, and petroleum engineers, and for mathematics and physical science majors.

MATH 481 Honors Applications of Calculus **1 Unit**

Prerequisite: Cumulative GPA of 3.0 or better; MATH 402 with a grade of "C" or better, and ENGLWR 300 or 480 with a grade of "C" or better.
Course Transferable to UC/CSU
Hours: 18 hours LEC

This course focuses on professional applications of mathematics in such fields as biomathematics, economics, political science, computer science, earth science, social sciences and psychology. AA/AS area 4C

MATH 1000 Individualized Mathematics **2-3 Units**

Prerequisite: To enroll in a "Part II" course, students must first complete the corresponding "Part I" course.
Advisory: To enroll in a "Part I" course, confirm placement using ARC's Math Self-Assessment System
Hours: 36-54 hours LEC

This program is an open-entry/open-exit, independent study approach for students wishing to take MATH 23 (Computational Arithmetic - Part I, 2 units), MATH 24 (Computational Arithmetic - Part II, 2 units), MATH 38 (Pre-Algebra - Part I, 2 units), MATH 39 (Pre-Algebra - Part II, 2 units), MATH 103 (Elementary Algebra, Part I, 3 units), MATH 104 (Elementary Algebra, Part II, 3 units), MATH 123 (Intermediate Algebra, Part I, 3 units), or MATH 124 (Intermediate Algebra, Part II, 3 units). During the first class meeting, students choose the specific course in which to enroll. To enroll in MATH 23, MATH 38, MATH 103, or MATH 123, students should either meet the prerequisite or complete ARC's on-line self-assessment system. To enroll in MATH 24, MATH 39, MATH 104, or MATH 124, students must show proof of meeting the prerequisite. Students who complete one course may advance immediately to the next one. Students may choose to complete a course as quickly as possible or may take up to one semester's worth of time. Unit credit is only awarded for the semester in which the course is completed. Students who receive a notation of ?In Progress? must register in the same individualized course the following semester in order to complete the course and receive full unit credit. Computer-based instruction via the Internet is an integral component.

Statistics

STAT 300 Introduction to Probability and Statistics **4 Units**

Prerequisite: MATH 120 or 124 with a grade of "C" or better

General Education: AA/AS Area II(b) (effective Summer 2009)

Course Transferable to CSU

Hours: 72 hours LEC

This course is an introduction to probability and statistics. Topics include elementary principles and applications of descriptive statistics, counting principles, elementary probability principles, probability distributions, estimation of parameters, hypothesis testing, linear regression and correlation, and Analysis of Variance (ANOVA). This course is currently under review for UC transferability and will be submitted in 2009 for CSU GE and IGETC, effective Fall 2010. Check with a counselor before taking this course. A calculator with two-variable statistics capabilities is required.

STAT 301 Introduction to Probability and Statistics **3 Units**

Prerequisite: MATH 120 or 124 with a grade of "C" or better

Advisory: ENGRD 116

General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2

Course Transferable to UC/CSU

Hours: 54 hours LEC

This course will introduce basic concepts of probability and statistics. It will include analysis of data, probability, distributions, test of hypothesis, estimation, regression and correlation, and analysis of variance. Related applications to psychology, social science, natural science, business, and engineering will be explored. A scientific calculator that has a stat package (2-variable) is used throughout the course.

STAT 360 Introduction to Scientific Graphing Calculators for Statistics **1 Unit**

Prerequisite: MATH 120 or 124 with a grade of "C" or better

Corequisite: STAT 301

Course Transferable to CSU

Hours: 18 hours LEC

This course introduces the basic statistics functions and applications of scientific graphing calculators with a statistics package. Topics include graphical representations of data, measures of position, probability, normal distributions, confidence intervals, hypothesis testing, and regression. A scientific graphing calculator of a model and type that will be specified by the instructor is required.