Mathematics and Statistics

The mathematics program provides students the opportunity to complete the lower-division coursework required for four-year programs in mathematics. For students who plan to transfer, completion of the CSU General-Breadth or IGETC general education pattern is encouraged. It is highly recommended that students meet with a counselor because major and general education requirements vary for each college/university. These courses also fulfill general education requirements for allied health, biological sciences, physical sciences, computer science and engineering.

Career Options

Mathematicians work as statisticians, analysts, computer programmers, actuaries, researchers, planners and educators. The mathematics program provides students the opportunity to complete the lower-division coursework required for four-year programs in mathematics.

Dean

Angelena Lambert (/about-us/contact-us/faculty-and-staff-directory/angelena-lambert)

Joseph Steever (/about-us/contact-us/faculty-and-staff-directory/joseph-steever)

 (916) 558-2202
 Rebeca.Rodriguez@scc.losrios.edu

Associate Degrees for Transfer

A.S.-T. in Mathematics

The mathematics program provides students the opportunity to complete the lower-division coursework required for four-year programs in mathematics. This program is for students who plan to transfer to a California State University (CSU). Completion of the CSU General-Breadth or IGETC general education pattern is required. It is highly recommended that students meet with a counselor because major and general education requirements vary for each college/university.

The Associate Degree for Transfer (ADT) student completion requirements (as stated in SB1440 law):

(1) Completion of 60 semester units or 90 quarter units that are eligible for transfer to the California State University, including both of the following:
   (A) The Intersegmental General Education Transfer Curriculum (IGETC) or the California State University General Education-Breadth Requirements (CSU GE-Breadth).
   (B) A minimum of 18 semester units or 27 quarter units in a major or area of emphasis, as determined by the community college district.

(2) Obtainment of a minimum grade point average of 2.0.

ADTs also require that students must earn a “C” or better in all courses required for the major or area of emphasis.

Catalog Date: June 1, 2020

Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 400</td>
<td>Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 401</td>
<td>Calculus II</td>
<td>5</td>
</tr>
<tr>
<td>MATH 402</td>
<td>Calculus III</td>
<td>5</td>
</tr>
<tr>
<td>MATH 410</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 420</td>
<td>Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>Total Units:</td>
<td></td>
<td>22</td>
</tr>
</tbody>
</table>

The Associate in Science in Mathematics for Transfer (AS-T) degree may be obtained by completion of 60 transferable, semester units with a minimum 2.0 GPA, including (a) the major or area of emphasis described in the Required Program, and (b) either the Intersegmental General Education Transfer Curriculum (IGETC) or the California State University General Education-Breadth Requirements.

Student Learning Outcomes

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

- explain and apply basic concepts of single variable calculus including various forms of derivatives and integrals, their interconnections, and their uses in analyzing and solving real-world problems.
Career Information

Mathematicians work as statisticians, analysts, computer programmers, actuaries, researchers, planners, and educators. This major is designed to meet the lower-division requirements for most bachelor’s degrees in Mathematics.

Associate Degrees

A.S. in Mathematics

The mathematics program provides students the opportunity to complete the lower-division coursework required for four-year programs in mathematics. For students who plan to transfer, completion of the CSU General-Breadth or IGETC general education pattern is encouraged. It is highly recommended that students meet with a counselor because major and general education requirements vary for each college/university. These courses also fulfill general education requirements for allied health, biological sciences, physical sciences, computer science, and engineering.

Note: Students planning to transfer to four-year institutions are advised to meet with a counselor for general education requirements.

Note: The University of California has a credit restriction on certain combinations of mathematics courses. See counselor for detailed information on current UC Transferable Course Agreement.

Catalog Date: June 1, 2020

Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 400</td>
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<td>MATH 401</td>
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<td>5</td>
</tr>
<tr>
<td>MATH 410</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 420</td>
<td>Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>A minimum of 3 units from the following:</td>
<td></td>
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<tr>
<td>CISP 360</td>
<td>Introduction to Structured Programming (4)</td>
<td></td>
</tr>
<tr>
<td>CISP 400</td>
<td>Object Oriented Programming with C++ (4)</td>
<td></td>
</tr>
<tr>
<td>CISP 401</td>
<td>Object Oriented Programming with Java (4)</td>
<td></td>
</tr>
<tr>
<td>ENGR 405</td>
<td>Engineering Problem Solving (3)</td>
<td></td>
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<tr>
<td>PHIL 325</td>
<td>Symbolic Logic (3)</td>
<td></td>
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<tr>
<td>STAT 300</td>
<td>Introduction to Probability and Statistics (4)</td>
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</tr>
<tr>
<td>or STAT 480</td>
<td>Introduction to Probability and Statistics - Honors (4)</td>
<td></td>
</tr>
</tbody>
</table>

Total Units: 25

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 SCC graduation requirements.

Student Learning Outcomes

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

- explain and apply basic concepts of single variable calculus including various forms of derivatives and integrals, their interconnections, and their uses in analyzing and solving real-world problems.
- explain and apply basic concepts of multivariable calculus, linear algebra, or differential equation techniques, their interconnections, and their uses in analyzing and solving real-world problems.
- write logical proofs of basic theorems.
- analyze and evaluate various theoretical and real-world problems and analyze existing solutions or create and evaluate novel solutions using mathematics, logic, and technology as appropriate.

Career Information

Mathematicians work as statisticians, analysts, computer programmers, actuaries, researchers, planners, and educators. This major is designed to meet the lower-division requirements for most bachelor’s degrees in Mathematics.
Mathematics (MATH)

MATH 14 Preparation for Math - Success Academy

Units: 1
Hours: 18 hours LEC
Prerequisite: Placement through the assessment process.
Catalog Date: June 1, 2020

This course provides an introduction to student learning expectations and the outcomes of higher education. This course has a specific focus on math preparation through the implementation of individualized group instruction for students. This course is primarily intended for students who will be taking an Arithmetic, Pre-Algebra, Elementary Algebra, or Intermediate Algebra course in the upcoming semester.

Student Learning Outcomes

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

- demonstrate an increased ability to reason about mathematics.
- identify areas of further development in mathematics and plan for remediation.
- identify the resources available to math students seeking help at SCC.
- differentiate between lack of preparation and test anxiety.

MATH 27 Self-Paced Basic Skills Mathematics

Units: 0.5 - 2
Prerequisite: None.
Catalog Date: June 1, 2020

This is a self-paced course in basic mathematics skills including the basic operations of addition, subtraction, multiplication, and division applied to the whole numbers, fractions, and decimals. This course is graded Pass/No Pass. Credit is earned in one-half unit increments and is dependent on progress in the course and class participation. This is an open-entry/open-exit course which may be taken for a maximum of two units. This course does not fulfill the learning skills requirement for graduation.

Student Learning Outcomes

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

- perform basic operations and applications of addition, subtraction, multiplication, and division with whole numbers.
- perform basic operations and applications of addition, subtraction, multiplication, and division with non-negative rational numbers in fraction notation.
- perform basic operations and applications of addition, subtraction, multiplication, and division with non-negative rational numbers in decimal notation.
- translate simple English phrases and sentences into simple algebraic expressions and equations.
- evaluate simple expressions and solve one-step single variable linear equations.
- compute ratios and rates.
- set up ratios and proportions for use in applications.
- perform basic operations and applications of addition, subtraction, multiplication, and division with non-negative rational numbers in percent notation.

MATH 28 Basic Skills Mathematics

Units: 3
Hours: 54 hours LEC; 18 hours LAB
Prerequisite: None.
Catalog Date: June 1, 2020

This is a lecture course with lab time in basic mathematics skills including the basic operations of addition, subtraction, multiplication, and division applied to the whole numbers, fractions, and decimals. This course does not fulfill the learning skills requirement for graduation.

Student Learning Outcomes

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

- perform basic operations and applications of addition, subtraction, multiplication, and division with whole numbers.
- perform basic operations and applications of addition, subtraction, multiplication, and division with non-negative rational numbers in fraction notation.
- perform basic operations and applications of addition, subtraction, multiplication, and division with non-negative rational numbers in decimal notation.
- translate simple English phrases and sentences into simple algebraic expressions and equations.
- evaluate simple expressions and solve one-step single variable linear equations.
- compute ratios and rates.
- set up ratios and proportions for use in applications.
- perform basic operations and applications of addition, subtraction, multiplication, and division with non-negative rational numbers in percent notation.
- state and write simple arguments that are mathematically correct.
MATH 34 Pre-algebra

Units: 4
Hours: 72 hours LEC
Prerequisite: MATH 28 with a “C” or better, or completion of the MATH 27 curriculum (80% or higher on all six chapter tests), or placement through the assessment process.
Catalog Date: June 1, 2020

The emphasis in this course will be on skills necessary for success in elementary algebra. Course content will include review of fundamentals of arithmetic including whole numbers, common fractions, decimal fractions, and percentages. Other topics include order of operations, signed numbers, complex fractions, exponents, and scientific notation. There will be an introduction to the algebra of polynomials and/or an introduction to graphing lines, as time permits.

Student Learning Outcomes

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

- perform basic operations and applications of addition, subtraction, multiplication, and division with whole numbers, integers, rational numbers, and percentages.
- apply the order of operations to simplify expressions involving whole numbers, integers, and rational numbers.
- simplify complex fractions containing numerical expressions.
- apply rules of exponents in simplifying algebraic expressions involving integer exponents.
- simplify and evaluate radical expressions.
- apply appropriate solving techniques to linear equations.
- translate English phrases and sentences into algebraic expressions and equations.

MATH 80 Mathematics Study Skills

Units: 1
Hours: 18 hours LEC
Prerequisite: MATH 28 with a grade of “C” or better, or completion of the MATH 27 curriculum (80% or higher on all six chapter tests), or placement through the assessment process, or concurrent enrollment in either MATH 27 or MATH 28.
Advisory: ENGRD 110 with a grade of “C” or better
Catalog Date: June 1, 2020

This course will help students increase their motivation and confidence and maximize their abilities in any mathematics course. Students will consider their current levels of math and test anxieties and make progress in lowering them to a productive level. Students will gain strategies to overcome barriers to mathematical success. Specific concepts will be designed for the current level of each student. This course is primarily intended for students who will be taking another mathematics or statistics course concurrently, but students may also take this course as preparation before enrolling in a mathematics or statistics course. This course is graded as Pass/No Pass.

Student Learning Outcomes

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

- demonstrate an increased ability to think clearly about mathematics.
- identify weaknesses and develop plans for remediation.
- identify resources and increase assertiveness in using them.
- differentiate between lack of preparation and test anxiety.

MATH 100 Elementary Algebra

Units: 5
Hours: 90 hours LEC
Prerequisite: MATH 34 with a grade of "C" or better, or placement through the assessment process.
Catalog Date: June 1, 2020

This course includes the fundamental concepts and operations of algebra with problem solving skills emphasized throughout. Topics include properties of real numbers, linear equations and inequalities, integer exponents, polynomials, polynomial factorization, rational expressions and equations, radical expressions and equations, rational exponents, systems of linear equations and inequalities, the rectangular coordinate system, graphs and equations of lines, and quadratic equations.

Student Learning Outcomes

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

- demonstrate mastery in simplifying and performing basic operations on rational numbers and exponential, polynomial, rational, and radical expressions.
- classify polynomials according to type and apply appropriate factoring techniques.
- apply appropriate solving techniques to linear, quadratic, rational, and radical equations, linear inequalities, and systems of linear equations in two variables.
- graph linear equations in two variables and find equations of lines.
- apply algebraic methods and critical thinking skills when solving application problems.

MATH 103 Elementary Algebra, Part I

Units: 3
Hours: 54 hours LEC
This course will cover the first half of the traditional MATH 100 course. 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.

**Student Learning Outcomes**

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

- demonstrate mastery in simplifying and performing basic operations on rational numbers and on exponential and polynomial expressions.
- apply appropriate solving techniques to linear equations, linear inequalities, and systems of linear equations in two variables.
- graph linear equations in two variables and find equations of lines.
- apply algebraic methods and critical thinking skills when solving application problems.

**MATH 104 Elementary Algebra, Part II**

| Units: | 3 |
| Hours: | 54 hours LEC |
| Prerequisite: | MATH 103 or 134 with a grade of "C" or better |
| Catalog Date: | June 1, 2020 |

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.

**Student Learning Outcomes**

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

- simplify and perform basic operations on polynomial, rational, and radical expressions.
- classify polynomials according to type and apply appropriate factoring techniques.
- apply appropriate solving techniques to quadratic, rational, and radical equations.
- apply algebraic methods and critical thinking skills when solving application problems.

**MATH 109 Fundamentals of Algebra for Liberal Arts Mathematics and Statistics**

| Units: | 4 |
| Hours: | 72 hours LEC |
| Prerequisite: | MATH 34 with a grade of "C" or better, or placement through the assessment process. |
| Catalog Date: | June 1, 2020 |

This course consists of elements of beginning and intermediate algebra needed for STAT 300, MATH 300, or MATH 310. Topics include modeling using expressions, equations, functions, and graphs; polynomial inequalities. Note: This course is not intended for students pursuing business or STEM majors and who plan to take courses in science, computer information science, engineering, mathematics, physics, chemistry, business or economics.

**Student Learning Outcomes**

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

- solve linear, quadratic, absolute value, square root, exponential, logarithmic equations.
- solve systems of linear equations in two variables and linear and absolute value inequalities.
- graph linear, quadratic, absolute value, exponential, and logarithmic functions.
- apply elementary operations on functions.
- use mathematical modeling to solve applications.

**MATH 110 Elementary Geometry**

| Units: | 5 |
| Hours: | 90 hours LEC |
| 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) |
| Catalog Date: | June 1, 2020 |

This course introduces Euclidean Geometry. Topics include sets, definitions, postulates, theorems, deductive and inductive reasoning, proof, parallel lines, triangles, polygons, congruence, similarity, constructions, the Pythagorean Theorem, right triangle trigonometry, circles, analytic geometry, and elementary solid geometry.

**Student Learning Outcomes**

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

- clearly state Euclidean definitions, postulates, and theorems.
- find missing side lengths and angle measures in a diagram using appropriate theorems.
• use compass and straightedge to perform constructions and use a protractor to measure angles.
• write 2-column direct proofs and indirect proofs using the definitions, postulates, and theorems of Euclidean geometry.
• apply appropriate formulas when finding areas of planar figures, surface area and volume of solids, and when analyzing diagrams in the Cartesian coordinate system.

MATH 120 Intermediate Algebra

Units: 5
Hours: 90 hours LEC
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)
Catalog Date: June 1, 2020

This course reviews and extends the concepts of elementary algebra, with problem solving skills emphasized throughout. Topics that are reviewed and extended include linear and quadratic equations, factoring polynomials, rational expressions, exponents, radicals, equations of lines, and systems of equations. New topics include graphs and their translations and reflections, functions, exponential and logarithmic functions, graphs of quadratic functions, conic sections, nonlinear systems of equations, polynomial, rational, and absolute value inequalities, sequences, series, and the Binomial Theorem.

Student Learning Outcomes

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

• simplify expressions and solve equations involving absolute values, polynomials, rational expressions, radicals, exponentials, and logarithms.
• solve systems of equations and solve linear, polynomial, rational, and absolute value inequalities.
• demonstrate an understanding of the definition of a function and use function notation, including the algebra of functions, composite functions, and inverse functions.
• sketch the graphs of basic functions, quadratic functions, transformations of these functions, and conic sections.
• apply algebraic methods when solving word problems.

MATH 121 Intermediate Algebra with Lab

Units: 5
Hours: 90 hours LEC; 18 hours LAB
Prerequisite: MATH 100 or 104 with a grade of "C" or better, or placement through the assessment process.
Catalog Date: June 1, 2020

This is an intermediate algebra course designed for students who need more classroom time in order to be successful in algebra. This course reviews and extends the concepts of elementary algebra with problem solving skills emphasized throughout. Topics that are reviewed and extended include linear and quadratic equations, factoring polynomials, rational expressions, exponents, radicals, equations of lines, and systems of equations. New topics include graphs and their translations and reflections, functions, exponential and logarithmic functions, graphs of quadratic functions, conic sections, nonlinear systems of equations, polynomial, rational, and absolute value inequalities, sequences, series, and the Binomial Theorem.

Student Learning Outcomes

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

• simplify expressions and solve equations involving absolute values, polynomials, rational expressions, radicals, exponentials, and logarithms.
• solve systems of equations and solve linear, polynomial, rational, and absolute value inequalities.
• demonstrate an understanding of the definition of a function and use function notation, including the algebra of functions, composite functions, and inverse functions.
• sketch the graphs of basic functions, quadratic functions, transformations of these functions, and conic sections.
• apply algebraic methods when solving word problems.

MATH 123 Intermediate Algebra, Part I

Units: 3
Hours: 54 hours LEC
Prerequisite: MATH 100 or 104 with a grade of "C" or better, or placement through the assessment process.
Catalog Date: June 1, 2020

This course will cover the first half of the traditional MATH 120 course. Topics include solving linear equations and inequalities, factoring of polynomials, rational expressions, exponents, radicals, solving equations containing rational and radical expressions, equations of lines, functions and absolute value equations and inequalities, and complex numbers.

Student Learning Outcomes

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

• simplify expressions and solve equations involving absolute values, polynomials, rational expressions, and radicals.
• solve linear and absolute value inequalities.
• demonstrate an understanding of the definition of a function, use function notation, and perform the four arithmetic operations on functions.
• sketch the graphs of basic functions and transformations of the functions.
• apply algebraic methods when solving word problems.

MATH 124 Intermediate Algebra, Part II

Units: 3

This course will cover the second half of the traditional MATH 120 course. Topics include solving linear equations and inequalities, factoring of polynomials, rational expressions, exponents, radicals, solving equations containing rational and radical expressions, equations of lines, functions and absolute value equations and inequalities, and complex numbers.
This course will cover the second half of the traditional MATH 120 course. Topics include quadratic expressions, equations, inequalities and graphs, conic sections, linear and nonlinear systems of equations, composite and inverse functions, exponential and logarithmic functions, and sequences and series.

**Student Learning Outcomes**

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

- solve quadratic equations using a variety of methods, solve exponential and logarithmic equations, and solve equations quadratic in form.
- solve linear and nonlinear systems of equations and solve polynomial and rational inequalities.
- find composite and inverse functions.
- graph quadratic functions, conic sections, exponential functions, and logarithmic functions, including transformations.
- apply algebraic methods when solving word problems.

**MATH 134 Prealgebra and Algebra for Statistics Part I**

**Units:** 6  
**Hours:** 108 hours LEC  
**Prerequisite:** MATH 27 or 28 with a grade of "C" or better, or placement through the assessment process.  
**Catalog Date:** June 1, 2020

This is the first part of a two-course sequence preparing students for a course in Elementary Statistics. This course covers the arithmetic of whole, signed, fractional, mixed, and decimal numbers, linear equations in one variable, lines and linear equations in two variables, systems of equations in two variables, and arithmetic operations on polynomials. This course is not intended as preparation for Trigonometry.

**Student Learning Outcomes**

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

- demonstrate mastery in simplifying and performing basic operations on whole numbers, integers, rational numbers, and polynomials.
- apply the order of operations to simplify expressions involving whole numbers, integers, and rational numbers.
- apply rules of exponents in simplifying algebraic expressions involving integer exponents.
- apply appropriate solving techniques to linear equations of one variable and systems of linear equations of two variables.
- graph linear equations in two variables and find equations of lines.
- classify polynomials according to type, simplify, and perform basic operations on polynomials.
- apply algebraic methods and critical thinking skills when solving application problems.

**MATH 135 Prealgebra and Algebra for Statistics Part II**

**Units:** 6  
**Hours:** 108 hours LEC  
**Prerequisite:** MATH 100, 103, or 134 with a grade of "C" or better, or placement through the assessment process.  
**Catalog Date:** June 1, 2020

This is the second part of a two-course sequence preparing students for a course in Elementary Statistics. This course covers polynomial factoring, rational expressions and equations, radical expressions and equations, the algebra of functions, graphs of elementary functions, modelling with functions, exponential and logarithmic functions, systems of equations in three variables, solving quadratic equations, and summation notation. This course is only intended as preparation for STAT 300 and MATH 300.

**Student Learning Outcomes**

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

- simplify expressions and solve equations involving absolute values, polynomials, rational expressions, radicals, exponentials, and logarithms.
- solve nonlinear systems of equations and solve quadratic, polynomial, rational, and absolute value inequalities.
- demonstrate an understanding of the definition of a function and use function notation, including the algebra of functions, composite functions, and inverse functions.
- sketch the graphs of basic functions, quadratic functions, and transformations of these functions.
- solve problems involving arithmetic, geometric, and other types of sequences and series. Use the Binomial Theorem to expand binomials.
- apply algebraic methods when solving word problems.

**MATH 140 Mathematics Competency**

**Units:** 4  
**Hours:** 72 hours LEC  
**Prerequisite:** MATH 100 or 104 with a grade of "C" or better, or placement through the assessment process.  
**Catalog Date:** June 1, 2020
This course introduces students to everyday uses of mathematics. Topics will include measurement systems, reasoning and logic, elections, inflation and other indexes, chance and risk, and finances. Students will conclude the course by selecting a module of mathematical interest from a list of available topics drawn from career technical programs and contemporary careers including but not limited to nursing, occupational therapy, flight technology, and cosmetology.

Student Learning Outcomes

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

- choose appropriate mathematical models for analyzing democratic and social phenomenon.
- compare and choose among financial options such as loans and annuities or make other relevant financial decisions.
- compute and compare risk factors in various situations.
- create visual and graphical representations of data relevant to topics.
- design and implement experiments to test hypotheses of relevant topics.
- explain positions on topics using valid arguments.
- demonstrate the use of mathematics and critical thinking in contemporary vocational and technical fields.

MATH 170 Algebra Review for Calculus

<table>
<thead>
<tr>
<th>Units:</th>
<th>2</th>
</tr>
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<tbody>
<tr>
<td>Hours:</td>
<td>36 hours LEC</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>None.</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This is a review of college preparatory high school algebra. It includes the necessary skills for success in higher mathematics courses including calculus. Topics include real numbers, linear equations and inequalities, properties of lines, absolute values, polynomials and factoring, rational expressions, exponents, quadratic equations, and functions.

Student Learning Outcomes

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

- demonstrate preparedness for subsequent UC Davis mathematics courses such as precalculus or calculus. The students will place into the next mathematics course based on scores from the UCD Mathematics Placement Exam, which they will take upon completion of MATH 170.
- demonstrate an understanding of polynomials, rational expressions, equations and inequalities, exponents, radical, and logarithms and demonstrate conceptual rather than strictly procedural knowledge of these topics.
- demonstrate increased competence in problem solving, including application problems, and a higher level of mathematical maturity.
- model substantive interpretation of algebraic problems.

MATH 295 Independent Studies in Mathematics

<table>
<thead>
<tr>
<th>Units:</th>
<th>1 - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 - 162 hours LAB</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>None.</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This is an independent studies course. The topics are to be arranged between the instructor and the student.

Student Learning Outcomes

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

- demonstrate understanding of the mathematical concepts studied in the course.
- demonstrate competence in the mathematical skills studied in the course.

MATH 300 Introduction to Mathematical Ideas

<table>
<thead>
<tr>
<th>Units:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 hours LEC</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>MATH 109, 120, 121, 124, or 135 with a grade of &quot;C&quot; or better, or placement through the assessment process.</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU; UC</td>
</tr>
<tr>
<td>General Education:</td>
<td>AA/AS Area II(b); CSU Area B4; IGETC Area 2</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This course is intended to help the non-Mathematics major student relate to the spirit of mathematics through a study of some engaging ideas of mathematics. Several specific topics will be chosen from: numeration systems, logic, sets, number theory, algebraic modeling, geometry, combinatorics, probability, statistics, consumer mathematics, graph theory, voting and apportionment, matrices, and perhaps others. This course is not recommended for students entering elementary school teaching or for business administration majors.

Student Learning Outcomes

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

- analyze inferences and conjectures present in a variety of mathematical ideas and systems.
- construct well written solutions to mathematical exercises.
- apply critical thinking skills developed in studying a mathematical topic to issues that transcend mathematics.
MATH 310 Mathematical Discovery

Units: 3
Hours: 54 hours LEC
Prerequisite: MATH 109, MATH 120, MATH 121, MATH 124, or MATH 135 with a grade of "C" or better or placement through the assessment process; AND MATH 110 or two semesters of high school Geometry with grades of "C" or better.
Transferable: CSU; UC
General Education: AA/AS Area II(b); CSU Area B4
Catalog Date: June 1, 2020

This course is designed to introduce students to the spirit of mathematics by involving them in aspects of mathematical processes of exploration, conjecture, and proof. Students will examine mathematical patterns and relations, formulate conjectures, and prove their conjectures. Educational standards and issues are a focus throughout the content of the course. Areas of mathematics from which content may be derived include number theory, statistics, probability, geometry, and sequences and series. This course is recommended for students interested in a career in education.

Student Learning Outcomes

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

- explain mathematical relationships inherent in problems and situations.
- make conjectures about mathematical relationships and content.
- prove or disprove conjectures about mathematical relationships and content.
- develop an appreciation of mathematical relevance to everyday life.
- analyze documents directing the study of mathematics in American schools, as well as the strategies, procedures, and emphases advocated in those documents.

MATH 335 Trigonometry with College Algebra

Units: 5
Hours: 90 hours LEC
Prerequisite: MATH 120, 121 or MATH 124 with a grade of "C" or placement through the assessment process; AND MATH 110 or a college Geometry course or two semesters of high school Geometry with a grade of "C" or better.
Transferable: CSU
General Education: AA/AS Area II(b); CSU Area B4
C-ID: C-ID MATH 851
Catalog Date: June 1, 2020

This is a full trigonometry course with algebra concepts reviewed, extended, and integrated when they are relevant to the trigonometric concepts. The trigonometric topics include right triangle trigonometry, unit circle trigonometry, graphs of trigonometric functions, proofs of trigonometric identities, solving trigonometric equations, applications of trigonometric functions (laws of sines and cosines), inverse trigonometric functions, the polar coordinate system, and vectors. The algebra topics include translations and stretches of graphs, graphs of polynomial and rational functions, domain and range, even and odd functions, inverse functions, simplifying and factoring expressions, and equation solving.

Student Learning Outcomes

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

- apply trigonometric functions to the angles of a right triangle and arcs on the unit circle.
- evaluate trigonometric functions of common angles (using both radian and degree measure) and inverse trigonometric functions.
- recognize, apply, and prove trigonometric identities and solve trigonometric equations.
- create and analyze graphs of polynomial functions, rational functions, trigonometric functions, inverse trigonometric functions, curves in parametric form, and curves in polar form. (Trigonometric function graphing will include changes in period, phase, and amplitude.)
- convert between polar and rectangular coordinates and equations, compute and solve equations involving complex numbers in standard and trigonometric form, and use DeMoivre's Theorem to evaluate powers and roots of complex numbers.
- apply trigonometric and algebraic concepts as problem-solving tools by modeling problems with appropriate equations, including use of the Laws of Sines and Cosines and vector applications with vectors represented in both (a, b) and ai+bj form.

MATH 340 Calculus for Business and Economics

Units: 3
Hours: 54 hours LEC
Prerequisite: MATH 120, 121, or 124 with a grade of "C" or better, or placement through the assessment process.
Transferable: CSU; UC
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
C-ID: C-ID MATH 140
Catalog Date: June 1, 2020

The content of this course includes review of the logarithmic and exponential functions, intuitive introduction to limits, and development of the derivative and definite integral. Application of these concepts to economics and business will be emphasized.

Student Learning Outcomes

Upon completion of this course, the student will be able to:
- find the derivatives of polynomial, rational, exponential, and logarithmic functions.
- find the derivatives of functions involving constants, sums, differences, products, quotients, and the chain rule.
- sketch the graphs of functions using horizontal and vertical asymptotes, intercepts, first and second derivatives to determine intervals where the function is increasing and decreasing, maximum and minimum values, intervals of concavity, and points of inflection.
- analyze the marginal cost, profit, and revenue when given the appropriate function.
- determine maxima and minima in optimization problems using the derivative.
- use derivatives to find rates of change and tangent lines.
- use calculus to analyze revenue, cost, and profit.
- find definite and indefinite integrals by using the general integral formulas, integration by substitution, and other integration techniques.
- use integration in business and economics applications.

**MATH 342 Modern Business Mathematics**

<table>
<thead>
<tr>
<th>Units:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 hours LEC</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>MATH 120, 121, or 124 with a grade of &quot;C&quot; or better, or placement through the assessment process.</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU; UC</td>
</tr>
<tr>
<td>General Education:</td>
<td>AA/AS Area II(b); CSU Area B4; IGETC Area 2</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

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

**Student Learning Outcomes**

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

- analyze formulas, tables, graphs, and data sets in order to form conclusions or make predictions.
- calculate both present and future values involving compound interest and annuities.
- analyze applications of annuities involving loan amortization and sinking funds, applying necessary formulas.
- identify and graph linear, quadratic, power, polynomial, exponential, and logarithmic functions.
- formulate and apply exponential growth or decay functions pertaining to business applications.
- evaluate rates of change for a variety of elementary functions and apply them to marginal analysis.
- find and interpret optimum values related to business applications.
- solve linear programming problems using a graphical approach.

**MATH 350 Calculus for the Life and Social Sciences I**

<table>
<thead>
<tr>
<th>Units:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 hours LEC</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>MATH 335 with a grade of &quot;C&quot; or better, or placement through the assessment process.</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU; UC</td>
</tr>
<tr>
<td>General Education:</td>
<td>AA/AS Area II(b); CSU Area B4; IGETC Area 2</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This course is an introduction to calculus. Topics include functions, trigonometric functions, limits, analytic geometry, and differential calculus with applications to biological and social sciences. This course is intended for students majoring in the biological and social sciences and some business majors.

**Student Learning Outcomes**

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

- simplify algebraic and trigonometric expressions as they appear in calculus computations.
- compute limits and discuss the continuity of a given function.
- find derivatives of functions and interpret derivatives as rates of change.
- apply differentiation techniques to curve sketching and optimization problems.
- solve problems in life and social science areas involving exponential, logarithmic and trigonometric functions through the application of calculus techniques.
- find antiderivatives of algebraic and trigonometric functions.

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

<table>
<thead>
<tr>
<th>Units:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 hours LEC</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>MATH 350 with a grade of &quot;C&quot; or better</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU; UC</td>
</tr>
<tr>
<td>General Education:</td>
<td>AA/AS Area II(b); CSU Area B4; IGETC Area 2</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This course is a continuation of MATH 350. Topics include: definite and indefinite integrals, power series, analytic geometry, multivariate calculus, and differential equations, with applications to life and social sciences.
Upon completion of this course, the student will be able to:

- apply differentiation and integration techniques to algebraic, exponential, logarithmic, and trigonometric functions.
- calculate definite, double, and improper integrals; find indefinite integrals; demonstrate a variety of techniques including numerical approximation methods; and use integration to find the area between curves and the volume of solids.
- calculate partial derivatives of functions of several variables and calculate and explain the significance of extrema of these functions in applied settings.
- analyze surfaces and graph functions of two variables in the three-dimensional coordinate system.
- confirm the convergence or divergence of infinite series using appropriate justification and compute Taylor and Maclaurin series of functions.
- solve separable and first-order linear differential equations.
- interpret results of the analysis of mathematical modeling in applications of population growth or decay, manufacturer and consumer perspectives, chemical mixtures and reactions, and other course topics.

MATH 352 Calculus for the Life and Social Sciences III

This course, along with MATH 350 and MATH 351, completes the UC calculus sequence for some biology and medicine majors. The topics include solving first-order linear differential equations using integrating factors, equilibria and stability, matrices, eigenvalues and eigenvectors, analytic geometry, directional derivatives and gradient vectors, chain rule for functions of several variables, optimization and applications, theory, modeling and applications of linear and nonlinear systems of ordinary differential equations, permutations and combinations, probability, conditional probability, independence, and Bayes’ formula and applications.

Student Learning Outcomes

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

- evaluate and apply the chain rule, directional derivatives, and gradient vectors for functions of several variables.
- apply geometric methods for vectors, lines, and planes.
- devise models and solve linear and nonlinear systems of ordinary differential equations.
- analyze results of computing eigenvalues and eigenvectors.
- compute counts and probabilities in a variety of experimental events.
- compute and apply Bayes’ Formula.

MATH 355 Calculus for Biology and Medicine I

This course is an introduction to differential calculus and elementary differential equations via applications in biology and medicine. It covers limits, derivatives of polynomials, trigonometric and exponential functions, graphing, and applications of the derivative to biology and medicine. Topics include the Fundamental Theorem of Calculus and techniques of integration, including integral tables and numerical methods. This course does not meet the prerequisite for PHYS 410.

Student Learning Outcomes

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

- simplify algebraic and trigonometric expressions as they appear in calculus computations.
- compute limits and discuss the continuity of a given function.
- apply differentiation and integration techniques to algebraic, exponential, logarithmic, and trigonometric functions.
- apply differentiation techniques to curve sketching and optimization problems.
- solve problems in life and social science areas involving exponential, logarithmic, and trigonometric functions through the application of calculus techniques.
- apply the Fundamental Theorem of Calculus to the evaluation of definite integrals.
- solve separable and first-order linear differential equations.
- interpret results of the analysis of mathematical modeling in applications of population growth or decay, manufacturer and consumer perspectives, chemical mixtures and reactions, and other course topics.

MATH 356 Calculus for Biology and Medicine II

This course is an introduction to differential calculus and elementary differential equations via applications in biology and medicine. It covers limits, derivatives of polynomials, trigonometric and exponential functions, graphing, and applications of the derivative to biology and medicine. Topics include the Fundamental Theorem of Calculus and techniques of integration, including integral tables and numerical methods. This course does not meet the prerequisite for PHYS 410.
This course is the continuation of MATH 355. It covers matrix algebra with eigenvalues and eigenvectors, systems of linear equations, functions of several variables, partial derivatives, systems of differential equations, probability, and applications to biology and medicine. This course does not meet the prerequisite for PHYS 410 or PHYS 420.

Student Learning Outcomes

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

- calculate double integrals.
- calculate partial derivatives of functions of several variables and calculate and explain the significance of extrema of these functions in applied settings.
- analyze surfaces and graph functions of two variables in the three-dimensional coordinate system.
- solve separable and first-order linear differential equations; devise models and solve linear and nonlinear systems of ordinary differential equations.
- evaluate and apply the chain rule, directional derivatives, and gradient vectors for functions of several variables.
- analyze results of computing eigenvalues and eigenvectors.
- compute counts and probabilities in a variety of experimental events.
- compute and apply Bayes’ Formula.

MATH 370 Pre-Calculus Mathematics

Units: 5
Hours: 90 hours LEC
Prerequisite: MATH 335 with a grade of “C” or better, or placement through the assessment process.
Transferable: CSU; UC
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
Catalog Date: June 1, 2020

This course is designed to prepare students for MATH 400, 401, and 402. A brief review is followed by an in-depth extension of the properties of polynomial, rational, exponential, logarithmic, and trigonometric functions. Additional topics include inequalities, systems of non-linear equations, conic sections, sequences and series, analytic geometry, polar and parametric equations, and matrices. Graphing calculators may be required for this course.

Student Learning Outcomes

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

- solve equations and inequalities and manipulate expressions.
- demonstrate a deep understanding of functions and their properties.
- graph a variety of curves (showing intercepts, asymptotes, vertices, etc.) defined by a rectangular, polar, and parametric equations.
- solve application problems by creating and using mathematical models that involve synthesis of course concepts.
- prove simple mathematical facts.

MATH 372 College Algebra for Calculus

Units: 4
Hours: 72 hours LEC
Prerequisite: MATH 120 or 124 with a grade of “C” or better, or placement through the assessment process.
Transferable: CSU
General Education: AA/AS Area II(b)
Catalog Date: June 1, 2020

This course provides a rigorous treatment of college-level algebra and its applications, with a particular focus on preparing students for the calculus sequence for Science, Technology, Engineering, and Mathematics (STEM) majors. Topics include polynomial, rational, radical, exponential, absolute value, and logarithmic functions, graphs, and equations; systems of equations; the theory of polynomial equations; analytic geometry including conics; sequences and series; and mathematical induction. Emphasis is given to analytical reasoning and problem-solving. This course may be taken concurrently with MATH 373, Trigonometry for Calculus. Completion of both MATH 372 AND MATH 373 with grades of “C” or better meets the prerequisite for MATH 400, Calculus I.

Student Learning Outcomes

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

- solve equations and inequalities and manipulate expressions.
- solve systems of equations and inequalities.
- demonstrate a deep understanding of functions and their properties.
- graph a variety of curves (showing intercepts, asymptotes, vertices, etc.).
- solve application problems by creating and using mathematical models that involve synthesis of course concepts.

MATH 373 Trigonometry for Calculus

Units: 4
This course provides a rigorous treatment of trigonometry and its applications, with a particular focus on preparing students for the calculus sequence for Science, Technology, Engineering, and Mathematics (STEM) majors. Topics include right triangle trigonometry, unit circle trigonometry, graphs of trigonometric functions, proofs of trigonometric identities, solving trigonometric equations, applications of trigonometric functions (laws of sines and cosines), inverse trigonometric functions, the polar coordinate system, and vectors. Emphasis is given to analytical reasoning and problem-solving. This course may be taken concurrently with MATH 372, College-Algebra for Calculus. Completion of both MATH 372 AND MATH 373 with grades of "C" or better meets the prerequisite for MATH 400, Calculus I.

Student Learning Outcomes

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

- apply trigonometric functions to the angles of a right triangle and arcs on the unit circle.
- evaluate trigonometric functions of common angles (using both radian and degree measure) and inverse trigonometric functions.
- recognize, apply, and prove trigonometric identities and solve trigonometric equations.
- create and analyze graphs of trigonometric functions, inverse trigonometric functions, curves in parametric form, and curves in polar form. (Trigonometric function graphing will include changes in period, phase, and amplitude.)
- convert between polar and rectangular coordinates and equations, compute and solve equations involving complex numbers in standard and trigonometric form, and use DeMoivre's Theorem to evaluate powers and roots of complex numbers.
- apply trigonometric and algebraic concepts as problem-solving tools by modeling problems with appropriate equations, including use of the Laws of Sines and Cosines and vector applications with vectors represented in both (a, b) and ai+bj form.
- prove simple mathematical facts.

MATH 400 Calculus I

Units: 5
Hours: 90 hours LEC
Prerequisite: MATH 372 and MATH 373, or MATH 370 or placement through the assessment process
Transferable: CSU; UC
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
C-ID: C-ID MATH 210
Catalog Date: June 1, 2020

This course explores the basic concepts of analytic geometry, limits (including indeterminate forms), derivatives, and integrals. The topics covered will include graphs, derivatives, and integrals of algebraic, trigonometric, exponential, logarithmic, and hyperbolic functions. Standard proofs will be covered, such as delta-epsilon proofs and proofs of some theorems. Applications will be covered, including those involving rectilinear motion, differentials, related rates, graphing, and optimization.

Student Learning Outcomes

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

- compute limits of algebraic, exponential, logarithmic, and trigonometric functions.
- calculate derivatives of algebraic, exponential, logarithmic, and trigonometric functions.
- evaluate integrals of algebraic, exponential, logarithmic, and trigonometric functions.
- apply derivatives and integrals to solve physics, economic, geometric, and/or other problems.
- prove basic theorems related to limits, continuity, and differentiability, including delta-epsilon proofs.

MATH 401 Calculus II

Units: 5
Hours: 90 hours LEC
Prerequisite: MATH 400 with a grade of "C" or better
Transferable: CSU; UC
General Education: AA/AS Area II(b); CSU Area B4; IGETC Area 2
C-ID: C-ID MATH 220
Catalog Date: June 1, 2020

This course is a continuation of MATH 400. Topics covered will include techniques of integration, numerical integration, improper integrals, infinite series, parametric equations, polar coordinates, and possibly conic sections. Many applications will be covered including those involving areas between plane regions, volumes of revolution, work, moments and centers of mass, average value, arc length, and surface area.

Student Learning Outcomes

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

- evaluate integrals using a variety of integration techniques including integration by parts, partial fraction decomposition, trigonometric substitution and others.
- devise and evaluate integrals to find the volume and surface area of a solid of revolution, total work, the length of a curve, the center of mass of a solid, and other applications of integration.
- estimate integrals using numerical techniques.
- evaluate improper integrals.
- evaluate the calculus components of parametric and polar relations including finding tangent lines, areas, and arc lengths.
- prove convergence or divergence of sequences and series such as alternating series, harmonic series, Maclaurin and Taylor series, and power series and determine radius and intervals of convergence.
- construct power series representations of functions, derivatives, and integrals.
- estimate and determine maximum errors in finding function values using infinite and finite power series.
- solve separable differential equations.

MATH 402 Calculus III

| Units:   | 5 |
| Hours:   | 90 hours LEC |
| Prerequisite: | MATH 401 with a grade of "C" or better |
| Transferable: | CSU; UC |
| General Education: | AA/AS Area II(b); CSU Area B4; IGETC Area 2 |
| C-ID: | C-ID MATH 230 |
| Catalog Date: | June 1, 2020 |

This course extends the concepts of limits, derivatives, and integrals to vector-valued functions and functions of more than one variable. The topics covered include three-dimensional analytic geometry and vectors, partial derivatives, multiple integrals, line integrals, surface integrals, and the theorems of Green, Gauss (Divergence), and Stokes. Many applications of calculus are included.

Student Learning Outcomes

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

- find the distance between a point and a line, a point and a plane, two parallel planes, or two skew lines; Find the equations of lines and planes.
- calculate the arc length and curvature at any point for a space curve.
- evaluate partial derivatives and directional derivatives. Find the extrema for functions of two variables; find the maximum and minimum values of a function subject to the given constraints.
- evaluate double and triple integrals using rectangular, polar, cylindrical, and spherical coordinate systems as well as change of variables using the Jacobian; apply double and triple integrals to solving geometry and physics problems.
- evaluate line and surface integrals using Green's Theorem, Stoke's Theorem, and the Divergence Theorem.

MATH 410 Introduction to Linear Algebra

| Units:   | 3 |
| Hours:   | 54 hours LEC |
| Prerequisite: | MATH 401 with a grade of "C" or better |
| Transferable: | CSU; UC |
| General Education: | AA/AS Area II(b); CSU Area B4; IGETC Area 2 |
| C-ID: | C-ID MATH 250 |
| Catalog Date: | June 1, 2020 |

This course is an introductory course in linear algebra. Topics include matrices, determinants, systems of equations, vector spaces, linear transformations, eigenvectors, and applications. Proofs of elementary theorems of basic linear algebra will be covered. The course is intended for majors in mathematics, engineering, science, and related fields.

Student Learning Outcomes

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

- SLO 1: prove basic results of linear algebra, using appropriate proof-writing techniques.
- Objective: prove theorems on linear independence of vectors; properties of subspaces; linearity, injectivity and surjectivity of functions; and properties of eigenvectors and eigenvalues.
- SLO 2: solve linear systems using matrices and matrix operations.
- Objective: solve linear systems using Gaussian and Gauss-Jordan elimination.
- SLO 3: demonstrate an understanding of abstract concepts such as Euclidian n-space, multidimensional vector spaces, subspaces of vector spaces, and the relationship between matrices and n-tuples.
- Objective: find the dimension of spaces such as those associated with matrices and linear transformations.
- SLO 4: demonstrate an understanding of the relationships between systems of equations, matrices, determinants, inverse matrices, vectors, linear transformations, row space, column space, null space, kernel, eigenvalues, and eigenvectors in linear algebra problems.
- Objective: find eigenvalues and eigenvectors and use them in applications.
- Objective: use properties of inner product spaces to determine linear independence, normal vectors, bases, change of basis, orthogonality, diagonalization, and orthogonal diagonalization.

MATH 420 Differential Equations

| Units:   | 4 |
| Hours:   | 72 hours LEC |
| Prerequisite: | MATH 401 with a grade of "C" or better |
| Transferable: | CSU; UC |
| General Education: | AA/AS Area II(b); CSU Area B4; IGETC Area 2 |
This course will cover the theory and applications of solutions to ordinary differential equations and systems of ordinary differential equations. Students will be introduced to various topics useful in the solution of these differential equations including power series, Laplace transforms, matrices, eigenvalues and eigenvectors, and numerical methods.

**Student Learning Outcomes**

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

- solve a variety of ordinary differential equations using techniques such as reduction of order, method of undetermined coefficients, variation of parameters, power series, and Laplace transforms.
- analyze, model, and solve elementary applied science problems such as Newton’s Law of Cooling, mixing, falling bodies, and Newton’s Second Law of Motion with ordinary differential equations.
- identify differential equations such as linear, separable, exact, and Cauchy-Euler.
- solve systems of linear differential equations.

**MATH 494 Topics in Mathematics**

<table>
<thead>
<tr>
<th>Units</th>
<th>0.5 - 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>9 - 72 hours LEC</td>
</tr>
<tr>
<td>Prerequisite</td>
<td>None.</td>
</tr>
<tr>
<td>Transferable</td>
<td>CSU</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This course provides the ability to take a course in mathematics that covers topics that are not part of the regular curriculum. This course may only be taken once, even if course offerings cover different topics. UC transfer credit will be awarded only after the course has been evaluated by the enrolling UC campus. The units completed for this course cannot be counted towards the minimum 60 units required for admissions.

**Student Learning Outcomes**

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

- demonstrate understanding of the mathematical concepts studied in the course.
- demonstrate competence in the mathematical skills studied in the course.

**MATH 495 Independent Studies in Mathematics**

<table>
<thead>
<tr>
<th>Units</th>
<th>1 - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>54 - 162 hours LAB</td>
</tr>
<tr>
<td>Prerequisite</td>
<td>None.</td>
</tr>
<tr>
<td>Transferable</td>
<td>CSU</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This is an independent studies course. The topics are to be arranged between the instructor and the student. UC transfer credit will be awarded only after the course has been evaluated by the enrolling UC campus. The units completed for this course cannot be counted towards the minimum 60 units required for admissions.

**Student Learning Outcomes**

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

- demonstrate understanding of the mathematical concepts studied in the course.
- demonstrate competence in the mathematical skills studied in the course.

**Mathematics Support (MATHS)**

**MATHS 20 Support for Intermediate Algebra**

<table>
<thead>
<tr>
<th>Units</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>Hours</td>
<td>54 hours LEC</td>
</tr>
<tr>
<td>Prerequisite</td>
<td>Placement through the assessment process.</td>
</tr>
<tr>
<td>Corequisite</td>
<td>MATH 120</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in MATH 120, Intermediate Algebra. Topics and homework assignments are often connected to the students’ assignments in MATH 120. Students who completed this topic as MATHS 299 are not eligible to take this course. This course is graded as Pass/No Pass. This course was formerly known as MATHS 120.

**Student Learning Outcomes**

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

- use support mathematics skills to simplify expressions and solve equations involving absolute values, polynomials, rational expressions, radicals, exponentials, and logarithms.
• use support mathematics skills to solve systems of equations and solve linear, polynomial, rational, and absolute value inequalities.
• use support mathematics skills to demonstrate an understanding of the definition of a function and use function notation, including the algebra of functions, composite functions, and inverse functions.
• use support mathematics skills to sketch the graphs of basic functions, quadratic functions, transformations of these functions, and conic sections.
• use support mathematics skills to apply algebraic methods when solving word problems.

MATHS 35 Support for Trigonometry with College Algebra

Units: 3
Hours: 54 hours LEC
Prerequisite: Placement through the assessment process.
Corequisite: MATH 335
Catalog Date: June 1, 2020

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in MATH 335: Trigonometry with College Algebra. Topics and homework assignments are often connected to the students' assignments in MATH 335. The course includes applications of the concepts and skills covered. Students who completed this topic as MATHS 299 are not eligible to take this course. This course is graded as Pass/No Pass. This course was formerly known as MATHS 135.

Student Learning Outcomes

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

• use support mathematics skills to apply trigonometric functions to the angles of a right triangle and arcs on the unit circle.
• use support mathematics skills to evaluate trigonometric functions of common angles (using both radian and degree measure) and inverse trigonometric functions.
• use support mathematics skills to recognize, apply, and prove trigonometric identities and solve trigonometric equations.
• use support mathematics skills to create and analyze graphs of polynomial functions, rational functions, trigonometric functions, inverse trigonometric functions, curves in parametric form, and curves in polar form. (Trigonometric function graphing will include changes in period, phase, and amplitude.)
• use support mathematics skills to convert between polar and rectangular coordinates and equations, compute and solve equations involving complex numbers in standard and trigonometric form, and use DeMoivre's Theorem to evaluate powers and roots of complex numbers.
• use support mathematics skills to apply trigonometric and algebraic concepts as problem-solving tools by modeling problems with appropriate equations, including use of the Laws of Sines and Cosines and vector applications with vectors represented in both (a, b) and a+bi form.

MATHS 40 Support for Calculus for Business and Economics

Units: 3
Hours: 54 hours LEC
Prerequisite: Placement through the assessment process.
Corequisite: MATH 340
Catalog Date: June 1, 2020

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in Calculus for Business and Economics (MATH 340). Topics and homework assignments are often connected to the students' assignments in MATH 340. The course includes applications of the concepts and skills covered. This course is graded as Pass/No Pass. Students who have taken this course as MATHS 299 are not eligible to take this course. This course was formerly known as MATHS 140.

Student Learning Outcomes

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

• use support mathematics skills to find the derivatives of polynomial, rational, exponential, and logarithmic functions.
• use support mathematics skills to find the derivatives of functions involving constants, sums, differences, products, quotients, and the chain rule.
• use support mathematics skills to sketch the graphs of functions using horizontal and vertical asymptotes, intercepts, first and second derivatives to determine intervals where the function is increasing and decreasing, maximum and minimum values, intervals of concavity, and points of inflection.
• use support mathematics skills to analyze the marginal cost, profit, and revenue when given the appropriate function.
• use support mathematics skills to determine maxima and minima in optimization problems using the derivative.
• use support mathematics skills to find rates of change and tangent lines.
• use support mathematics skills to analyze revenue, cost, and profit.
• use support mathematics skills to find definite and indefinite integrals when applying the general integral formulas, integration by substitution, and other integration techniques.
• use support mathematics skills in business and economics applications.

MATHS 42 Support for Modern Business Mathematics

Units: 3
Hours: 54 hours LEC
Prerequisite: Placement through the assessment process.
Corequisite: MATH 342
Catalog Date: June 1, 2020

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in Modern Business Mathematics. Topics and homework assignments are often connected to the students' assignments in MATH 342. The course includes applications of the concepts and skills covered. Students who completed this topic as MATHS 299 are not eligible to take this course. This course is graded as Pass/No Pass. This course was formerly known as MATHS 142.
Student Learning Outcomes

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

- use support mathematics skills to analyze formulas, tables, graphs, and data sets in order to form conclusions or make predictions.
- use support mathematics skills to calculate both present and future values involving compound interest and annuities.
- use support mathematics skills to analyze applications of annuities involving loan amortization and sinking funds, applying necessary formulas.
- use support mathematics skills to identify and graph linear, quadratic, power, polynomial, exponential, and logarithmic functions.
- use support mathematics skills to formulate and apply exponential growth or decay functions pertaining to business applications.
- use support mathematics skills to evaluate rates of change for a variety of elementary functions and apply them to marginal analysis.
- use support mathematics skills to find and interpret optimum values related to business applications.
- use support mathematics skills to solve linear programming problems using a graphical approach.

MATHS 70 Support for College Algebra for Calculus

<table>
<thead>
<tr>
<th>Units:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 hours LEC</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>Placement through the assessment process.</td>
</tr>
<tr>
<td>Corequisite:</td>
<td>MATH 372</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
</tr>
</tbody>
</table>

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in MATH 372: College Algebra for Calculus. Topics and homework assignments are often connected to the students' assignments in MATH 372. The course includes applications of the concepts and skills covered. This course is graded as Pass/No Pass. This course was formerly known as MATHS 172.

Student Learning Outcomes

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

- use mathematics support skills to solve equations and inequalities and manipulate expressions.
- use mathematics support skills to solve systems of equations and inequalities.
- use mathematics support skills to demonstrate a deep understanding of functions and their properties.
- use mathematics support skills to graph a variety of curves (showing intercepts, asymptotes, vertices, etc.).
- use mathematics support skills to solve application problems by creating and using mathematical models that involve synthesis of course concepts.

MATHS 71 Support for Trigonometry for Calculus

<table>
<thead>
<tr>
<th>Units:</th>
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<tbody>
<tr>
<td>Hours:</td>
<td>36 hours LEC</td>
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<tr>
<td>Prerequisite:</td>
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</tr>
<tr>
<td>Corequisite:</td>
<td>MATH 373</td>
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<td>Catalog Date:</td>
<td>June 1, 2020</td>
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This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in MATH 373: Trigonometry for Calculus. Topics and homework assignments are often connected to the students' assignments in MATH 373. The course includes applications of the concepts and skills covered. This course is graded as Pass/No Pass. This course was formerly known as MATHS 173.

Student Learning Outcomes

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

- use mathematics support skills to apply trigonometric functions to the angles of a right triangle and arcs on the unit circle.
- use mathematics support skills to evaluate trigonometric functions of common angles (using both radian and degree measure) and inverse trigonometric functions.
- use mathematics support skills to recognize, apply, and prove trigonometric identities and solve trigonometric equations.
- use mathematics support skills to create and analyze graphs of trigonometric functions, inverse trigonometric functions, curves in parametric form, and curves in polar form. (Trigonometric function graphing will include changes in period, phase, and amplitude.)
- use mathematics support skills to convert between polar and rectangular coordinates and equations, compute and solve equations involving complex numbers in standard and trigonometric form, and use DeMoivre's Theorem to evaluate powers and roots of complex numbers.
- use mathematics support skills to apply trigonometric and algebraic concepts as problem-solving tools by modeling problems with appropriate equations, including use of the Laws of Sines and Cosines and vector applications with vectors represented in both $(a, b)$ and $ai+bj$ form.
- use mathematics support skills to prove simple mathematical facts.

MATHS 95 Support for Introduction to Mathematical Ideas

<table>
<thead>
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<th>Units:</th>
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</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>36 hours LEC</td>
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<tr>
<td>Prerequisite:</td>
<td>Placement through the assessment process.</td>
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<tr>
<td>Corequisite:</td>
<td>MATH 300</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2020</td>
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</table>

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in Introduction to Mathematical Ideas. Topics and
Student Learning Outcomes

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

- use support mathematics skills to analyze inferences and conjectures present in a variety of mathematical ideas and systems.
- use support mathematics skills to construct well written solutions to mathematical exercises.
- use support mathematics skills to apply critical thinking skills developed in studying a mathematical topic to issues that transcend mathematics.
- use support mathematics skills to research and demonstrate an understanding of and explain mathematical ideas that are at an appropriate skill level.

MATHS 96 Support for Mathematical Discovery

### Units: 2
### Hours: 36 hours LEC
### Prerequisite: Placement through the assessment process.
### Corequisite: MATH 310
### Catalog Date: June 1, 2020

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in Mathematical Discovery (MATH 310). Topics and homework assignments are often connected to the students' assignments in MATH 310. This course is graded as Pass/No Pass. This course was formerly known as MATHS 110.

Student Learning Outcomes

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

- use support mathematics skills to explain mathematical relationships inherent in problems and situations.
- use support mathematics skills to make conjectures about mathematical relationships and content.
- use support mathematics skills to prove or disprove conjectures about mathematical relationships and content.
- use support mathematics skills in developing an appreciation of mathematical relevance to everyday life.
- use support mathematics skills to analyze documents directing the study of mathematics in American schools, as well as the strategies, procedures, and emphases advocated in those documents.

Statistics (STAT)

STAT 10 Support for Introduction to Probability and Statistics

### Units: 2
### Hours: 36 hours LEC
### Prerequisite: Placement through the assessment process.
### Corequisite: STAT 300
### Catalog Date: June 1, 2020

This course provides intensive instruction and practice in the core mathematical skills, competencies, and concepts necessary for success in Introduction to Probability and Statistics (STAT 300). Topics and homework assignments are often connected to the students' assignments in STAT 300. The course includes applications of the concepts and skills covered. This course is graded as Pass/No Pass. Students who have taken this course as MATH 299 are not eligible to take this course. This course was formerly known as STAT 110.

Student Learning Outcomes

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

- use support mathematics skills to summarize and display data.
- use support mathematics skills to compute and interpret probabilities.
- use support mathematics skills to construct confidence intervals for various parameters.
- use support mathematics skills to perform various hypothesis tests.
- use support mathematics skills to analyze the correlation coefficient and regression equation of bivariate data.
- use support mathematics skills when using technology to perform statistical tasks.
- use support mathematics skills when applying the concepts and techniques of statistics to real world applications.

STAT 100 Pre-Statistics

### Units: 4
### Hours: 72 hours LEC
### Prerequisite: MATH 34 with a grade of "C" or better, or placement through the assessment process.
### Catalog Date: June 1, 2020

This course prepares students for transfer-level Statistics. Topics include ratios, rates, and proportional reasoning; arithmetic with fractions, decimals and percents; evaluating expressions, solving equations, and analyzing formulas to understand statistical measures; use of linear and exponential functions to model bivariate data; graphical and numerical descriptive statistics for quantitative and categorical data. Note: This course is not intended for students who plan to take courses in science, computer information science, engineering, mathematics, physics, chemistry, or business and economics.
Upon completion of this course, the student will be able to:

- simplify linear expressions, solve linear equations and inequalities, and evaluate statistical formulas using the order of operations agreement.
- sketch the graphs of linear and exponential functions, and find equations of linear and exponential functions given two points on the line or curve.
- apply and interpret algebraic and statistical models when solving word problems.

### STAT 300 Introduction to Probability and Statistics

- **Units:** 4
- **Hours:** 72 hours LEC
- **Prerequisite:** MATH 109, MATH 120, MATH 121, MATH 124, MATH 135, or STAT 100 with a grade of "C" or better, or placement through the assessment process.
- **Transferable:** CSU; UC
- **General Education:** AA/AS Area II(b); CSU Area B4; IGETC Area 2
- **C-ID:** C-ID MATH 110
- **Catalog Date:** June 1, 2020

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 ANOVA. Scientific calculators with two-variable statistical capabilities are required for this class.

### Student Learning Outcomes

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

- summarize and display data.
- compute and interpret probabilities.
- construct confidence intervals for various parameters.
- perform various hypothesis tests.
- use correlation and regression to analyze bivariate data.
- utilize technology to perform statistical tasks.
- apply the concepts and techniques of statistics to real world applications.

### STAT 480 Introduction to Probability and Statistics - Honors

- **Units:** 4
- **Hours:** 72 hours LEC
- **Prerequisite:** MATH 120, 121, or 124 with a grade of "C" or better, or placement through the assessment process.
- **Advisory:** A 3.0 GPA or better in high school or college, or be eligible to take ENGWR 300
- **Transferable:** CSU; UC
- **General Education:** AA/AS Area II(b); CSU Area B4; IGETC Area 2
- **C-ID:** C-ID MATH 110
- **Catalog Date:** June 1, 2020

This course is an introduction to probability and statistics designed for students in the honors program. 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 ANOVA. Scientific calculators with two-variable statistical capabilities may be required for this class. This honors section uses an intensive instructional methodology designed to challenge motivated students. Credit will be awarded for either STAT 480 or STAT 300, not both.

### Student Learning Outcomes

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

- summarize and display data.
- compute and interpret probabilities.
- construct confidence intervals for various parameters.
- perform various hypothesis tests.
- use correlation and regression to analyze bivariate data.
- utilize technology to perform statistical tasks.
- apply the concepts and techniques of statistics to real world applications.

### STAT 495 Independent Studies in Statistics

- **Units:** 1 - 3
- **Hours:** 54 - 162 hours LAB
- **Prerequisite:** None.
- **Transferable:** CSU
- **Catalog Date:** June 1, 2020

This is an independent studies course. The topics are to be arranged between the instructor and the student. UC transfer credit will be awarded only after the course has been evaluated by the enrolling UC campus. The units completed for this course cannot be counted towards the minimum 60 units required for admissions.
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