

2005 Colorado College  
catalog  
degree requirements

# The College Academic Program

Colorado College seeks to provide a broad education. The college therefore requires students to gain some knowledge and experience in a variety of areas and to study at least one academic discipline in depth. During the second year at the college, a student chooses a major field in which to take concentrated work. The major may be in one of the following academic fields: anthropology, art, Asian studies, biology, biochemistry, chemistry, classics, dance, drama, economics, English, environmental science, French, geology, German, history, mathematics, music, neuroscience, philosophy, physics, political science, psychology, religion, Romance languages, Russian, sociology, Spanish, and women's studies. Students may take a business concentration within the economics major and a computer science concentration within the mathematics major. Many other majors allow special concentrations within broad disciplinary study.

The college also offers several combined or distributed majors for students whose interests require concentrated work in more than one department. Such major fields are classics-history-politics, comparative literature, history-philosophy, history-political science, and political economy. Self-designed majors are possible under the heading of liberal arts and sciences.

Requirements for graduation in each major field are listed under the appropriate titles in the Departmental Courses section.

## All-College Requirements for the Bachelor of Arts Degree (B.A.) at Colorado College

- I. Students must satisfactorily complete 32 units of academic credit. To achieve the breadth central to liberal learning, students must take and pass at least one full unit in each division, excluding adjuncts and extended format courses. International Baccalaureate and Advanced Placement credits will not substitute for this requirement.
- II. Students must satisfactorily complete a major course of study. No major may require more than 14 units in any one department and no more than 16 over all (including prerequisites). (In departmentally-based majors, the two units beyond the 14 unit limit can be courses outside the department or adjunct courses.)
- III. Completion of the Critical Perspectives requirement: Diverse Cultures and Critiques (3 units); The West in Time (1 two block course, 2 units); Scientific Investigation of the Natural World (2 units, including at least one lab or field course).

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program is 14 months in length, consisting of intervening academic year. After successful completion of the appropriate state license examination passing grade on the appropriate state license examination and are recommended to the state of Colorado degree and are recommended to the state of Colorado The program for elementary school teachers is applied positions in elementary schools. The secondary school for teaching art, English, French, German, Latin, mathematics, or Spanish in middle/junior high school and studies, or Spanish in middle/junior high school and studies, or Spanish in middle/junior high school and studies, or Spanish in middle/junior high school and studies about the program for prospective teachers is available at [www.ColoradoCollege.edu/Dept/ED](http://www.ColoradoCollege.edu/Dept/ED).

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Students taken at other institutions will be granted as much equivalent credit as appropriate by the registrar's office.

Minimum Grade Point Average (GPA) of at least 2.00.

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[1] *Critical Perspectives: Diverse Cultures and Critiques* helps students understand the unique perspective of their own culture by confronting other perspectives, both those within the culture and those outside it. In contrast to the *West in Time* requirement, this requirement urges students to consider the different arrangements of human society across space. These courses will examine one or more of the following:

- some facet of a non-western society;
- some aspects of marginalized communities within the western tradition;
- critiques of the western tradition.
- Students may take three unrelated courses or three courses that address a common theme, group, or area of the world.

[2] *Critical Perspectives: The West in Time* asks students to position their knowledge of the broader world not just through multifaceted inquiry into "the here and now" but through critical inquiry across time as well. As an all-college requirement, *The West in Time* acknowledges the crucial importance of understanding the past as the context out of which contemporary modes of inquiry and contemporary fields of study have grown.

*The West in Time* is a two-block, two-unit course in which students will explore compelling aspects of the Western experience over a significant period of time (antiquity to the modern period or the Middle Ages to the modern period). This *Critical Perspectives* requirement acknowledges the modern Western propensity to create cultural and historical narratives which assume development and progress over time. It also insists on the importance of understanding the contemporary Western 'self' in the context of previous iterations of the 'self'. Courses in this area of inquiry will accomplish some combination of the following:

- engage students in an exploration of the past through examination of ideas, events, cultural institutions, and practices;
- enable students to expand their understanding of narratives of the development of the Western tradition over time and provide them with the analytical tools to critique those narratives;
- engage students in critical analysis of the connections between the past and the present;
- encourage students to consider how our understanding of contemporary events is informed by our grasp of the historical past.

[3] *Critical Perspectives: Scientific Investigation of the Natural World* enhances students' understanding of the natural world and of the methods central to modern science. It gives students opportunities to explore the broader earth system and universe, a sphere of inquiry which includes but is not limited to humans. In a world influenced by science and technology, informed citizens need to be familiar with the distinctive ways of thinking characteristic of the sciences and need to cultivate skill in quantitative reasoning. This requirement complements the *West in Time* and the *Diverse Cultures and Critiques* requirements by addressing a distinct approach to the understanding of the world which originated in the west but currently exercises global influence. These courses will meet the description of the preceding paragraph and will accomplish some combination of the following:

- explicitly address the nature of the scientific method;
- give students direct experience in the gathering and analysis of scientific data;
- emphasize the use of quantitative reasoning;

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*degree requirements continued*

**2005 Colorado College**

- introduce the foundations and principles of scientific knowledge;
- enhance scientific literacy.

At least one of the two units must involve significant laboratory or field experience.

**IV. Basic competency in a foreign language (2 blocks elementary or the equivalent).**

Colorado College believes that learning a language gives any student an important intellectual experience of cultural difference. A student may learn about other cultures in a variety of ways, but we believe interpreting and expressing individual experience and cultural values in another language is necessary for enhanced international and multicultural awareness. This requirement reflects the conviction that a liberal education is incomplete when it includes no language study. Learning a language other than one's native tongue is not equivalent simply to acquiring a tool for practical use. It is a means to enter fully and directly into the vital perspectives and unique workings of another culture.

The language requirement may be fulfilled in any one of the following seven ways:

- the study of the same non-English language for four full years in high school
- an acceptable score (at least 5) on the International Baccalaureate language examination or an acceptable score of the Advanced Placement language examination (3, 4, or 5, depending on departmental policies in different languages at CC)
- the placement examination administered by the language departments, with a score allowing placement at, or above, the 201 level, or a special proficiency examination administered by a certified proficiency examiner
- a beginning course in any of the languages offered at Colorado College, ordinarily a course numbered 101 (2 units), unless the student presents acceptable evidence of a learning disability making language study impossible
- an acceptable language program at any accredited college or university, in any non-English language, equivalent to the 101 level at Colorado College, if approved by the registrar's office
- substantial use of a non-English language either in course work or in the living situation (Programs abroad will be assessed and certified by the registrar's office independently to determine which programs fulfill the requirement.)
- Students who are native speakers of a language other than English are considered to have satisfied the requirement.

V. FYE: A two-block course required of all first year students addressing issues likely to stimulate debate and including critical reading, effective writing, and a research project.

VI. A cumulative grade point average (GPA) of at least 2.00.

VII. Courses taken at other institutions will be granted as much equivalent credit as deemed appropriate by the registrar's office.

VIII. All students must complete 32 units of credit to qualify for a Colorado College B.A. degree. Those students who have one unit or less to complete toward their 32 units (in both all-college and the major requirements) may be allowed to march in commencement ceremonies without receiving a diploma.

There are no exceptions and a specified number of the 32 unit College, or through Colorado affiliated off-campus and ACM p

The following rules apply to

• Students who enter Colorado (complete 24 units at Colorado campus or ACM programs. minimum of 16 units at Colorado campus or ACM programs.

• All Colorado College students at Colorado College, except for affiliated, off-campus or ACM p at Colorado College may petition up to four units of the eight-un

Because different departments their major, students should consider any off-campus study in their ma

These policies should not be college housing.

IX. In extended-format courses, student degree requirement for each semester one extended-format course per permission for an overload.

X. In each adjunct course, students requirement for each semester of adjunct courses per semester, unless overload.

**Requirements for the Master's (MAT) at Colorado College**

Colorado College offers two distinct who wish to become licensed to teach German, Latin, mathematics, music, elementary level, and one for experienced

The MAT programs for prospective designed for liberal arts graduates who program is 14 months in length, covering intervening academic year. After successfully passing grade on the appropriate state degree and are recommended to the state

The program for elementary school positions in elementary schools. The secondary for teaching art, English, French, German studies, or Spanish in middle/junior high about the program for prospective teachers department ([www.ColoradoCollege.edu](http://www.ColoradoCollege.edu)).

department ([www.ColoradoCollege.edu/Dept/ED](http://www.ColoradoCollege.edu/Dept/ED)). about the program for prospective teachers is available in middle/junior high school and studies, or Spanish in middle/junior high school and for teaching art, English, French, German, Latin, mathematics in elementary schools. The secondary school positions in elementary school teachers is appropriate by the registrar's office.

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There are no exceptions and no appeals to this policy. As described below, a specified number of the 32 units must be taken in residence, here at Colorado College, or through Colorado College-sponsored programs, including those affiliated off-campus and ACM programs detailed elsewhere in this catalog.

The following rules apply to the academic residence requirement:

- Students who enter Colorado College as first-semester, first-year students must complete 24 units at Colorado College or Colorado College-affiliated, off-campus or ACM programs. Transfer students are required to complete a minimum of 16 units at Colorado College or Colorado College-affiliated, off-campus or ACM programs.
- All Colorado College students are required to complete their last eight units at Colorado College, except for students participating in Colorado College-affiliated, off-campus or ACM programs. Students who have completed 16 units at Colorado College may petition to the Dean's Advisory Committee to waive up to four units of the eight-unit rule.

Because different departments have their own residence requirements for their major, students should consult their major department before conducting any off-campus study in their major.

These policies should not be confused with residential life policies regarding college housing.

- IX. In extended-format courses, students normally earn one-half unit toward their degree requirement for each semester of work. Students may take no more than one extended-format course per semester unless the dean of the college grants permission for an overload.
- X. In each adjunct course, students may earn one-quarter unit toward their degree requirement for each semester of work. Students may take no more than three adjunct courses per semester, unless the registrar's office grants permission for an overload.

### Requirements for the Master of Arts in Teaching Degree (MAT) at Colorado College

Colorado College offers two distinct MAT programs — one for college graduates who wish to become licensed to teach at the secondary level in art, English, French, German, Latin, mathematics, music, science, social studies, and Spanish or at the elementary level, and one for experienced teachers.

The MAT programs for prospective elementary and secondary school teachers are designed for liberal arts graduates who have taken few, if any, education courses. Each program is 14 months in length, consisting of two Summer Sessions and one intervening academic year. After successful completion of the program and receipt of a passing grade on the appropriate state license examination, students receive the MAT degree and are recommended to the state of Colorado for licensure.

The program for elementary school teachers is appropriate for all general teaching positions in elementary schools. The secondary school teaching program is appropriate for teaching art, English, French, German, Latin, mathematics, music, science, social studies, or Spanish in middle/junior high school and senior high school. Information about the program for prospective teachers is available through the education department ([www.ColoradoCollege.edu/Dept/ED](http://www.ColoradoCollege.edu/Dept/ED)).

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ative grade point average (GPA) of at least 2.00.

A student majoring in international political economy must complete a minimum of 16 units of credit, including the following requirements:

- a) At least five units of credit in political science, including 101 or 103 and 306 or 309 or 311 or 325. The remaining units must come from the comparative and international relations subfields, including at least one unit from each.
- b) At least five units of credit in economics, including: 150 (or 151 and 152), 207 or 209, 342 or 344, and 334 or 337 or 339.
- c) Demonstrate second-year college proficiency in a modern foreign language or earn at least three units of credit from an approved program of studies outside the United States.
- d) EC/PS 375 (normally taken in the junior year).
- e) Statistics (EC 200, MA 117 or BY 220).
- f) Capstone Research Experience — student must complete one of the following: PS 470 (or 410 or 412), EC 498, or PS 450. Senior IPE majors must also participate in a non-credit, extended-format seminar to present their project and discuss the projects of their peers.

## Mathematics

[www.ColoradoCollege.edu/Dept/MA/](http://www.ColoradoCollege.edu/Dept/MA/)

Professors M. ANDERSON (Assistant Chair), JANKE (Chair), M. SIDDOWAY, TINSLEY, J. WATKINS; Associate Professor McDOUGALL; Assistant Professors BREDIN, BROWN, ERICKSON, KOSEK, LAISON, MELARA; Visiting Professor WILSON; Emeritus Professors MERRILL, ROEDER

A student may major in either mathematics or in computer science; for details about the computer science major and a list of computer science (CP) courses, see the listing under computer science elsewhere in the catalog.

In addition to the general college requirements, a major in mathematics must complete:

- 126 and 128 (or equivalent).
- 203, 220 and 251 (a student should complete these before declaring the major).
- 321 and 375.
- 322 or 376 or 417, which should be taken in the same year as its prerequisite whenever possible.
- Three other 300–400 level one unit courses, or two other 300-400 level one unit courses and two other 200-level one unit courses (not meeting one of the requirements above), excluding 255, 355, 455. EC392 can also count as a 200-level elective.

A student majoring in mathematics must also attend at least four departmental seminars or department-approved talks after declaring the major, and submit a one-page summary of each to the chair within one week of the seminar. This should be completed by the end of Block 7 of the student's senior year.

To be considered for graduation with Distinction in Mathematics, a student must complete three courses with a 300-level prerequisite, one of which must be 410. In addition, such students must complete a senior project and be approved by a vote of the department faculty. Further information is available from the department.

### THE MINOR:

To minor in mathematics, a student must complete each of the following:

- I. 128 and 203.
- II. 251 or 220.
- III. Either III.A or III.B:
  - a) Two 200-level courses in addition to those courses satisfying I and II and one 300-level course.
  - b) Two 300-level courses.
- IV. Obtain approval of the choice of courses from a member of the mathematics department.

A student cannot meet any of the requirements in II and III, by taking 255/355/455, or by taking any 1/2 or 1/4 unit courses in mathematics.

**110 Mathematical Explorations.** An introduction to mathematical thinking through specified topics drawn from number theory, geometry, graph theory, algebra or combinatorics. The course will focus on giving students the opportunity to discover mathematics on their own. No previous mathematical background is required, but students will be expected to come with curiosity and a willingness to experiment. Not recommended for math majors.

**Block 4: Mathematical Exploration** beauty of mathematics; about perceiving the world in a new way; about seeking understanding; about stopping and thinking; about doing so carefully; and about having fun. (Meets the Critical Perspectives requirement.) 1 unit — Lais

**Block 6: Mathematical Exploration** throughout human history; how to synchronize years (one revolution of the earth on its axis) and months; will look at the history of Roman calendars, among other things. Some fun and interesting projects. (Meets the Critical Perspectives requirement.) 1 unit — Anderson

**Block 7: Mathematical Explorations** are disciplines with much in common. They are classified as one of the major areas of study. They regularly use mathematical ideas in their compositions. The purpose is to show many links between mathematics and other disciplines. It will be assumed, as the course progresses, that the student has taken *Prerequisite:* Not recommended. Scientific Investigation of the Natural World (1 unit — Wilson).

**116 Discrete Mathematics.** A selection of topics from the social sciences and elsewhere, with a focus on graph algorithms, matrices, linear programming, and other mathematical topics. (Not offered 2005–06)

**117 Probability & Statistics.** An introduction to probability techniques, random variables and distribution functions. Includes statistical tests with examples drawn from various fields. (Not offered after any other college-level statistics course.) *Prerequisite:* No credit after BY220/EC200. (Meets the Natural World requirement.) 1 unit

**125 Pre-Calculus & Calculus.** The same as 126. (Fulfills or prepares for 126.) *Prerequisite:* Consent of instructor. *Critical Perspectives:* Scientific Investigation of the Natural World. (McDougall, Melara).

**126 Calculus 1.** Differential and integral calculus with applications. Students normally begin the course with a review of trigonometry. *Critical Perspectives:* Scientific Investigation of the Natural World. (Kosek, Laison, Melara, Tinsley).

**127 Calculus 1 & 2 Review.** A review of calculus techniques, some applications and some problems. Intended for students who have had a pre-calculus course. Fulfills all requirements met by 128; no credit if taken after 128. (Instructor and 1yr of high school calculus.)

**128 Calculus 2.** Techniques of integration, infinite series. (No credit if taken after 126.) *Critical Perspectives:* Scientific Investigation of the Natural World. (Erickson, Kosek, McDougall, Siddoway).

**155 Independent Study.** *Prerequisite:* Consent of instructor.

The program for elementary school teachers is appropriate for all general teaching positions in elementary schools. The secondary school teaching program is appropriate for teaching art, English, French, German, Latin, mathematics, music, science, social studies, or Spanish in middle/junior high school and senior high school. Information about the program for prospective teachers is available through the education department ([www.ColoradoCollege.edu/Dept/ED](http://www.ColoradoCollege.edu/Dept/ED)).

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**Block 4: Mathematical Explorations: The Heart of Mathematics.** This course is about the beauty of mathematics; about its interconnected network of intriguing ideas; about perceiving the world in a new way; about the quest for pattern, symmetry and order; about seeking understanding and grace; about guessing and making mistakes; about stopping and thinking; about being active rather than passive; about reading carefully; and about having fun. *Prerequisite:* Not recommended for Math majors. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 1 unit — Laison.

**Block 6: Mathematical Explorations: The Mathematics of the Calendar.** Cultures throughout human history have designed many different calendars, in efforts to synchronize years (one revolution of the earth about the sun), days (one rotation of the earth on its axis) and months (one cycle of the phases of the moon). This course will look at the history of this problem, and examine the Gregorian, Mayan and Roman calendars, among many others. While doing this, students will encounter some fun and interesting mathematics. *Prerequisite:* Not recommended for Math majors. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 1 unit — Anderson.

**Block 7: Mathematical Explorations: The Mathematics of Music.** Mathematics and music are disciplines with much in common — from Ancient Greek times when music was classified as one of the mathematical arts, to the present day when composers regularly use mathematical ideas (set theory, magic squares, fractals, block designs) in their compositions. The purpose of this introductory course is to explore some of the many links between mathematics and music. No previous knowledge of either would be assumed, as the course is partly designed to introduce both subject areas. *Prerequisite:* Not recommended for Math majors. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) (Also listed as Music 228.) 1 unit — Wilson.

**116 Discrete Mathematics.** A selection of mathematical topics that have broad applications in the social sciences and elsewhere, with an emphasis on mathematical modeling. Graph theory, graph algorithms, matrices, linear programming, and game theory. Not recommended for mathematics majors. (Not offered 2005–06.) 1 unit.

**117 Probability & Statistics.** An introduction to the ideas of probability, including counting techniques, random variables and distributions. Elementary parametric and non-parametric statistical tests with examples drawn from the social sciences and life sciences. (No credit if taken after any other college-level statistics course.) Not recommended for mathematics majors. *Prerequisite:* No credit after BY220/EC200. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 1 unit — Bredin, Brown, Laison, Melara, Tinsley.

**125 Pre-Calculus & Calculus.** The same calculus as 126 together with materials from algebra, trigonometry, analytic geometry and the study of functions. Intended solely for students not sufficiently prepared for 126. (Fulfills one unit of the divisional requirement in the natural sciences.) *Prerequisite:* Consent of instructor and (equals 1 unit N, 1 unit Outside). (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 2 units — McDougall, Melara.

**126 Calculus 1.** Differential and integral calculus of algebraic and transcendental functions and applications. Students normally begin the calculus sequence with this course. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 1 unit — Erickson, Kosek, Laison, Melara, Tinsley.

**127 Calculus 1 & 2 Review.** A review of the differential and integral calculus of one variable, including techniques, some applications and an introduction to infinite series. This course is intended for students who have had a previous two-semester course in calculus covering basic techniques of both differentiation and integration, and wish to review this material. This course fulfills all requirements met by 128; no credit given if taken after 128. *Prerequisite:* Consent of instructor and 1yr of high school calculus. (Not offered 2005–06.) 1 unit.

**128 Calculus 2.** Techniques of integration, applications of the definite integral, differential equations, infinite series. (No credit if taken after 127.) *Prerequisite:* 125 or 126. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 1 unit — Brown, Erickson, Kosek, McDougall, Siddoway.

**155 Independent Study.** *Prerequisite:* Consent of instructor. (Not offered 2005–06.) 1 unit.

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**161 Mathematics in a Cultural Context.** *Prerequisite:* FYE Course. 1st Years Only. (Not offered 2005-06.) 2 units.

**203 Calculus 3.** Vectors in two and three dimensions, and the calculus of functions of several variables. *Prerequisite:* 128. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 1 unit — Erickson, Kosek, Siddoway.

**217 Probability and Statistical Modeling.** Introduction to probability distribution theory and statistical inference. Descriptive methods for building models with emphasis on linear regression models including variance and covariance. Analysis of model fit and discussion of modern robust techniques. (This course is an appropriate first course in statistics for students with stronger mathematical backgrounds.) *Prerequisite:* 117 or 126. (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) 1 unit — Janke.

**218 Analysis of Environmental Data.** This course will focus on the fundamentals of exploratory data analysis, hypothesis testing, and experimental design in the ecological, environmental, and the earth sciences. Topics will include theory and practice of project design, data distribution and description, the central limit theorem, characterization of uncertainty, correlation, univariate hypothesis testing, and multivariate analyses (ANOVA, linear regression). Students will complete a final project using environmental data collected in the field and analyzed using statistical computer software. *Prerequisite:* 126 or 125 or 127 or equivalent (Calculus I). (Meets the Critical Perspectives: Scientific Investigation of the Natural World requirement.) (Also listed as Environmental Science 228.) 1 unit — McDougall.

**220 Linear Algebra.** Matrix algebra and Gaussian elimination. The geometry of vectors in  $R^2$ ,  $R^3$  and  $R^n$ . Vector spaces and linear transformation. Introduction to orthogonal geometry and eigenvalue problems. *Prerequisite:* 203. 1 unit — Laison, Siddoway.

**227 Mathematical Software.** An introduction to one of the major mathematical software packages such as Mathematica or Matlab. Investigation of symbolic computation, numerical algorithms, and graphics as used in these programs. Students may take the course more than once to learn additional software packages, but they may take it a maximum of two times for credit. (May be taught either in the extended format or as a January Half-Block.) *Prerequisite:* 128. 1/2 unit — McDougall.

**228 Mathematical Problem Solving Seminar.** Students will meet regularly during the semester, in order to learn problem solving techniques as applied to interesting mathematical problems, often drawn from the national William Lowell Putnam competition, or the COMAP Mathematical Modeling Contest. Students may take the course more than once, but at most two times for credit (in different years). *Prerequisite:* 128 or consent of instructor. 1/2 unit — Brown, Siddoway.

**240 Topics in Mathematics.** Special topics in mathematics not offered on a regular basis.

**Block 7: Mathematical Modeling.** This course will introduce key concepts in the use of mathematics to model real-world phenomena. We will cover the ideas of model formulation, dimensional analysis, sensitivity analysis, and parameter estimation. The models we study will be drawn from biology, physics, chemistry, and economics. We will use computer simulations in addition to pencil-and-paper analysis. This class is appropriate for anyone thinking about majoring in mathematics, or curious about what math can tell us about the real world. *Prerequisite:* 126 or equivalent. 1 unit — Brown.

**251 Number Theory.** A careful study of major topics in elementary number theory, including divisibility, factorization, prime numbers, perfect numbers, congruences, Diophantine equations and primitive roots. *Prerequisite:* 203 or (128 and CP222). 1 unit — Anderson, Bredin, Erickson, Tinsley.

**255 Independent Study.** *Prerequisite:* Consent of instructor. 1 unit — Tinsley.

**256 Mathematical Models in Biology.** An introduction to selected quantitative models drawn from areas of biology such as ecology, genetics and physiology. For each model, the course includes an investigation of the mathematical methods, an evaluation of the model, and some elementary simulation techniques. *Prerequisite:* 126 and one college biology course. (Not offered 2005-06.) 1 unit.

**300 Geometry.** Some current topics in advanced and modern geometry. Topics drawn from linear geometry, affine, inversive and projective geometries, foundations and axiomatics, transformation groups, geometry of complex numbers. (Offered alternate years.) *Prerequisite:* 251. 1 unit — Erickson.

**311 Vector Analysis.** Vector functions, the properties of three-dimensional differential equations. *Prerequisite:* 203.

**312 Fourier Analysis.** The theory of polynomials. Applications to the theory of theoretical mathematics. *Prerequisite:* 203.

**313 Probability.** Probability spaces, expectation, distribution functions. *Prerequisite:* 203.

**315 Differential Equations.** An active approach to problems. Review of first order differential systems of equations, and existence and uniqueness theorems.

**318 Numerical Analysis.** The study of algorithms for finding solutions of differential equations, and numerical methods. *Prerequisite:* Consent of instructor or 203.

**321 Abstract Algebra I.** An introductory course in group theory. *Prerequisite:* 220 and 251. 1 unit —

**322 Abstract Algebra II.** Continuation of 321.

**325 Graph Theory.** A study of graphs and optimization and proofs. (Offered alternate years.) 1 unit.

**340 Topics in Mathematics.** Special topics in mathematics not offered 2005-06.) 1 unit.

**345 Research in Mathematics.** An independent investigation with a faculty member of a field of the faculty member's own research as an extended format course for 1/2 unit.

**351 History of Mathematics.** A study of the development and the role of mathematics in different cultures. (Offered in alternate years.)

**355 Independent Study.** *Prerequisite:* Consent of instructor.

**375 Mathematical Analysis I.** An introduction to sequences and series; topology of the real line; compactness. *Prerequisite:* 220 and 251. 1 unit.

**376 Mathematical Analysis II.** Continuation of 375. Integrals, culminating in an introduction to multiple integrals and of vector-valued functions. 1 unit.

**399 Seminar in Mathematics.** A semester-long study of mathematical journals, or problems selected by the instructor. Students will be responsible for a total of one unit of credit. .5 unit — Anderson.

**400 Topology.** An introduction to the study of compactness, connectedness, and continuous functions. (Offered alternate years.)

**410 Complex Analysis.** The calculus of functions of a complex variable, integration, power-series, residue theory and conformal mappings. *Prerequisite:* Consent of instructor or 375. 1 unit.

**417 Mathematical Statistics.** Brief introduction to Bayesian statistical inference, including decision theory. (Offered alternate years.) 1 unit.

The program for elementary school teachers is appropriate for all general positions in elementary schools. The secondary school teaching program is for teaching art, English, French, German, Latin, mathematics, music, science, or Spanish in middle/junior high school and senior high school. About the program for prospective teachers is available through the department (www.ColoradoCollege.edu/Dept/ED).

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**311 Vector Analysis.** Vector functions, divergence and curl. Green's and Stoke's theorems, and the properties of three-dimensional curves and surfaces. Related topics from linear algebra and differential equations. *Prerequisite:* 203. (Also listed as Physics 311.) 1 unit — Whitten.

**312 Fourier Analysis.** The theory of Fourier series, the Fourier transform, and orthogonal polynomials. Applications to the classical partial differential equations of physics and to theoretical mathematics. *Prerequisite:* 220 or 311. (Also listed as Physics 312.) 1 unit — Kosek.

**313 Probability.** Probability spaces, discrete and continuous random variables, independence, expectation, distribution functions. *Prerequisite:* 203. 1 unit — Brown.

**315 Differential Equations.** An active study of differential equations arising from classical scientific problems. Review of first order equations, series solutions, oscillation theory, special functions, systems of equations, and existence and uniqueness theorems. *Prerequisite:* 203. 1 unit — Melara.

**318 Numerical Analysis.** The study of numerical approximation techniques and their errors. Investigation of algorithms for finding roots of functions, values of derivatives and integrals, solutions of differential equations, and various matrix solutions. (Offered alternate years.) *Prerequisite:* Consent of instructor or 203 and 221. 1 unit — Melara.

**321 Abstract Algebra I.** An introduction to the abstract algebraic properties of groups, rings and fields. *Prerequisite:* 220 and 251. 1 unit — Tinsley.

**322 Abstract Algebra II.** Continuation of 321. *Prerequisite:* 321. 1 unit — Anderson.

**325 Graph Theory.** A study of graphs as finite mathematical structures. Emphasis on algorithms, optimization and proofs. (Offered alternate years.) *Prerequisite:* 220 and 251. (Not offered 2005-06.) 1 unit.

**340 Topics in Mathematics.** Special topics in mathematics not offered on a regular basis. (Not offered 2005-06.) 1 unit.

**345 Research in Mathematics.** An introduction to the nature of mathematical research. Investigation with a faculty member of current mathematical problems, usually chosen from the field of the faculty member's own research. (Offered in alternate years. May be offered some years as an extended format course for 1/2 unit.) *Prerequisite:* Consent of instructor. 1 unit — Laison.

**351 History of Mathematics.** A study of selected developments in the history of mathematics, and the role of mathematics in different cultures and at different times. The course often uses original sources. (Offered in alternate years.) *Prerequisite:* 251. (Not offered 2005-06.) 1 unit.

**355 Independent Study.** *Prerequisite:* Consent of instructor. (Not offered 2005-06.) 1 unit.

**375 Mathematical Analysis I.** An introduction to the theoretical basis for the calculus. Sequences and series; topology of the real line; metric spaces; definitions of limit, continuity, compactness. *Prerequisite:* 220 and 251. 1 unit — Brown.

**376 Mathematical Analysis II.** Continuation of 375. A rigorous treatment of derivatives and integrals, culminating in an introduction to continuity and differentiation of functions of several variables and of vector-valued functions. *Prerequisite:* 375. 1 unit — McDougall.

**399 Seminar in Mathematics.** A semester-long study based on articles in current mathematical journals, or problems selected by the instructor. Topics will be chosen on the basis of interest and accessibility. Students will be responsible for presenting some of the material. May be repeated for a total of one unit of credit. .5 unit — Anderson.

**400 Topology.** An introduction to the study of point-set topology. Examples of topological spaces; compactness, connectedness, and continuity; separation axioms. Additional topics chosen from algebraic or geometric topology. (Offered alternate years.) *Prerequisite:* 375. 1 unit — Anderson.

**410 Complex Analysis.** The calculus of functions of a complex variable. Differentiation, contour integration, power-series, residue theory and applications, conformal mapping and applications. *Prerequisite:* Consent of instructor or 375. 1 unit — Kosek.

**417 Mathematical Statistics.** Brief introduction of probability, descriptive statistics, classical and Bayesian statistical inference, including point and interval estimation, hypothesis tests and decision theory. (Offered alternate years.) *Prerequisite:* Consent of instructor or 313. (Not offered 2005-06.) 1 unit.

The program for elementary school teachers is appropriate for all positions in elementary schools. The secondary school teaching program for teaching art, English, French, German, Latin, mathematics, music studies, or Spanish in middle/junior high school and senior high schools about the program for prospective teachers is available through department ([www.ColoradoCollege.edu/Dept/ED](http://www.ColoradoCollege.edu/Dept/ED)).

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**440 Topics in Mathematics.** Given on demand for a group of students interested in a topic not included in the regular curriculum. (Not offered 2005–06.) 1 unit.

**455 Independent Study.** (Not offered 2005–06.) 1 unit.

## Mathematical Economics

[www.ColoradoCollege.edu/Dept/EC/](http://www.ColoradoCollege.edu/Dept/EC/)

**Advisors —** Professors BREDIN (Mathematics), FENN (Economics), STINESPRING (Economics)

**THE MAJOR:**

The mathematical economics major provides strong training for students pursuing private sector careers in investment banking, forecasting, applied mathematics, or finance, as well as graduate work in economics, operations research, and financial engineering. Students majoring in mathematical economics must successfully complete no fewer than 15 units of listed courses in mathematics (MA) and economics (EC), including a senior thesis. To solidify basic problem solving skills, all majors must initially take a common set of required courses in economic theory, calculus, linear algebra, and/or differential equations. Depending on individual course prerequisites, majors may then directly fulfill the elective requirement which undertakes a more advanced treatment of mathematical economics, and complete a sequence of courses that provide exposure to the statistical modeling of data.

Students desiring to major in mathematical economics are required to pass the following prerequisites prior to admission into the major: EC 150 (or 151 and 152), MA 126, and MA 128. In addition to those courses, all majors must complete MA203, MA220 or 315, EC207, EC209, MA217, EC408, EC392, and EC496, plus one approved MA elective course and one approved EC elective course. A list of approved electives may be obtained from either department or from the economics department Web site. Distinction in Mathematical Economics is awarded by action of the departments to up to the top 20 percent of graduating majors based on their GPA within the major, with the provision that they have also received an A in Senior Thesis.

## Music

[www.ColoradoCollege.edu/Dept/MU/](http://www.ColoradoCollege.edu/Dept/MU/)

Professors AGEE (Associate Chair), M. GRACE (Chair), LEVINE, SCOTT; Associate Professor BEN-AMOTS; Instructor BHATTACHARJYA; Professor Emeritus GAMER, JENKINS, JUHAS; Artist-in-Residence S. GRACE; Lecturers D. ANDERSON, D. BRINK, LASMAWAN; Instructors APPLGATE, A. BRINK, COOPER, DOUMBIA, DUTRA-SILVEIRA, EKBERG, ERB, HANSEN, HEAD, INOUE, JENSEN, JORGENSEN, KNIGHT, MARTIN, MATZKE, D. MILLER, MURRAY, NAGEM, PENNINGTON, REED, SHELTON, STEVENS, TESKE, VAN HOY, VIEIRA, T. WILSON; Part-time Artist-in-Residence ROWLAND; Chamber Ensemble Instructors DA VINCI QUARTET; Visiting Professors SCHORMANN, WHITE, R. WILSON

**THE MAJOR:**

All students who wish to major in music must complete the core curriculum, consisting of the following eight block courses: 391, 392, 393, 411, 412 (Western and comparative music theory; 393 must be completed before the end of the junior year); 315, 316 (music history), and 301 or 399 (creative component/music since 1945). Students must also complete four other elective block courses from the department offerings, three of which must be from the 200-level or above, are also required.

In addition, all music majors must complete at least one unit of private performance study, participate in an ensemble directed by the department for four semesters (one of these must be a world music ensemble, such as Balinese Gamelan or African Drumming, taken before or during 393). Majors must satisfy the piano proficiency requirement (all major and minor scales, one Bach two-part invention or the first movement of a classical sonatina, one Chopin prelude, and one 20th-century work of at least intermediate difficulty) no later than the beginning of the junior year, or take four semesters of piano lessons at Colorado College. Majors must also demonstrate knowledge of a music notation software system, either through examination, an independent study block, or by taking 200. Music majors who plan to satisfy state teaching certification requirements should consult with their advisors as early as possible in their college career.

Music majors may request permission to receive departmental honors at graduation from full-time faculty members of the music department. Honors in performance in departmental courses, then judgment whether honors will be awarded. Honors performances by faculty and student ensembles and distinguished visiting artists. Music major may receive honors for the semester following departmental work, and honors in performance and literature.

**THE MINOR:**

To fulfill requirements for a music minor, a minimum of six and one-half units of music courses, including ethnomusicology (such as 104, 221, 222, and a subsequent course in the theory sequence), and "In Western Culture," may be counted toward the minor. Music 200 per semester in the semesters following departmental work, and honors in performance and literature.

Students wishing to declare a music minor should contact the registrar to be signed by the music department.

### Theoretical

**104/FE104 World Music.** Surveys the music vocabulary and listening skills through a study of ethnomusicology between music and culture through ethnomusicology instrumental performance techniques through ethnomusicology requirement for the music department. (Meets the Social Science Distinction requirement.) (Not counted toward the minor.)

**150 Music in Western Culture.** For the non-music major. Cultural influences on music from antiquity to the present examined in terms of its stylistic characteristics and the society. Selected genres, composers and listening sessions. Special attention will be given to each period. (Meets the Critical Perspectives requirement.)

**199 Pre-Theory.** A course designed to develop through written and aural exercises and analysis basic theory involving melody, rhythm, and recognition of rhythm and meter, key signature, connection of basic triads and chords; basic theory to assist students planning to take Theory I-IV. (Meets the musician's basic materials and skills.) (1 unit — Bhattacharjya, D. Brink)

**200 Music @ the Computer.** Introduction to the computer in orchestration and musical arrangement, with an emphasis on the computer lab will explore a range of multimedia, and the Internet. Students will explore new combinations of sound and rhythm in digital music. Students will print, playback and record digital music. (1 unit — Ben-Amots)

**201 American Music: From Plymouth Rock to the Present.** From the colonial era to present. Both popular and classical music given a special attention given to the social and cultural context. Emergence of innovative U.S. musical traditions: the foundations for the subsequent school of jazz, Ives, Copland, and others, the avant garde of Stravinsky and Schoenberg, and rock during the 1950s, 60s, and 70s. Finally, contemporary living composers. No musical background is required.

passing grade on the appropriate state license examination, student degree and are recommended to the state of Colorado for licensure. The program for elementary school teachers is appropriate for positions in elementary schools. The secondary school teaching positions in elementary schools, French, German, Latin, mathematics, studies, or Spanish in middle/junior high school and senior high school. Those students who have one unit or less to complete units (in both all-college and the major requirements) may receive credit for a diploma. (www.ColoradoCollege.edu/Dept/ED.)

other institutions will be granted as much equivalent credit as possible by the registrar's office. must complete 32 units of credit to qualify for a Colorado degree. Those students who have one unit or less to complete units (in both all-college and the major requirements) may receive credit for a diploma. (www.ColoradoCollege.edu/Dept/ED.)