

## Degrees and Courses of Study

Vassar College offers a balanced course of study leading to the degree of Bachelor of Arts. To permit flexibility, it offers also an opportunity for a four-year program leading to a combined Bachelor of Arts and Master of Arts or Science degree in a limited number of specified areas. It encourages students to pursue the degree through the development of a coherent program of study which recognizes, as much as possible, individual needs.

### Requirements for the Degree of Bachelor of Arts

#### Units

Each candidate for the Bachelor of Arts degree is required to complete 34 units of work, equivalent to the standard of 120 semester hours recognized by the Board of Regents of the University of the State of New York. The system of units is threefold:

- a) the single unit, a course for one semester
- b) the half unit, equivalent to one-half of a semester course taken over an entire semester or for a half semester only
- c) the double unit, consisting of a year sequence of semester courses or the equivalent of two semester courses in one term

#### Freshman Course, Quantitative Course, and Foreign Language Requirements

All graduates must comply with the Freshman Course requirement, the Quantitative Course requirement, and the foreign language proficiency requirement as described on page 43.

#### Residence

Four years of full time enrollment is the usual length of time expected for the baccalaureate degree. However, students may be permitted to spend a longer or shorter time. The fact that many students will benefit from a break in the four-year sequence is acknowledged and reflected in the residence requirement. While students are expected to make orderly progress toward the degree, they are encouraged to move at the pace and in the fashion which suits their needs and those of their chosen program. Students who want to accelerate their degree program should consult with the Dean of Studies.

#### Residence Requirement

1. A student choosing a regular four-year program must spend at least three of those years in residence.
2. Students on a three-year program (accelerating students, those entering with a considerable number of prematriculation Advanced Placement credits, those transferring after one year at another college) would normally be expected to spend two and one-half years in residence. If special one-year off-campus programs—e.g., Junior Year Abroad or academic leave of absence—were deemed essential to their studies, the residence requirement would be reduced to two years in those cases by permission of the Committee on Leaves and Privileges.
3. Students entering Vassar as juniors must spend two years in residence and elect at least 17 units—the minimum amount of Vassar work required of transfer students for a Vassar baccalaureate degree.
4. Any special permissions relating to the residence requirement (academic leaves of absence, acceleration) must be sought individually from the Committee on Leaves and Privileges by February 15 of the previous academic year.

5. All students in senior years in

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#### Freshman Cour

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#### Quantitative Co

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#### Foreign Language

Recognizing the un foreign languages, th tion in French, Ger students may learn Instructional Langu Swedish.

- Latin American Studies Senior Seminar** (1)  
Required of all senior majors. Sponsoring department, instructor, and agenda will vary from year to year, but will display a multidisciplinary character through selection of materials and possible use of guest seminar leaders from other participating departments. For 1994/95: History/Latin American Studies 389b. "Resistance, Persistence, Negotiation: Varieties of the Indian Experience in Latin America." (See History 389b.)
- [Political Science 257. Race, Class, and Politics in the Caribbean]** (1)
- Political Science 263a. International Inequality: The Politics of North-South Relations** (1)
- Political Science 353a. Seminar in Domination and Cultural Resistance** (1)
- Political Science 368b. Seminar in Third World Development Politics** (1)
- Portuguese. First, Second and Third Year of Spoken Language** (1)  
(See Self-Instructional Language Program description.)

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## Mathematics

**Professors:** John Feroe, John McCleary, Charles I. Steinhorn; **Associate Professor:** Peter C. Pappas (Chair); **Assistant Professors:** Benjamin A. Lotto, Edith N. Starr.

Requirements for Concentration: 140/141 (or 145 or permission of the department to enroll in 224), 9 units above the 100 level plus 301, including 224/225, 326, 361, and 355. Reading courses are not counted among the required units. Work used to satisfy major requirements may not be taken NRO after declaration of the major.

Senior Year Requirements: At least 1 unit each semester of 300-level work in addition to 301. This requirement may be satisfied by 399 if the student has already completed 6 units of 300-level work in regular classes.

Recommendations: Majors are strongly urged to elect at least 2 units in applications of mathematics to other fields. A reading knowledge of French, German, or Russian is advised for those contemplating graduate study.

Sequence of Courses for Concentration: Students will normally elect 140/141, 224/225, but freshmen eligible for Advanced Placement should confer with the department. Election of advanced courses should be made in consultation with a departmental adviser.

Prospective majors in mathematics are strongly advised to complete Math 140/141 or Math 145 by the end of the freshman year and Math 224/225 by the end of the sophomore year. In any case, the first sequence must be completed by the end of the sophomore year in order to declare the major and Math 224/225 must be completed by the end of the junior year.

Advisers: The department.

### Correlate Sequence in Mathematics

Students majoring in other programs may complement their study by electing a correlate sequence in mathematics. Course selection should be made in consultation with the department and the major adviser to ensure exposure to the mathematics most useful to the field of concentration.

Requirements for the correlate sequence: 140/141 (or 145 or permission of the department to enroll in 224), 4 graded units above the 100 level including 224/225 and 1 unit at the 300 level.

#### Please note:

Students receiving 1 unit of Advanced Placement credit based on either the AB or BC Mathematics Advanced Placement Examination or the calculus credit examination administered by the Department of Mathematics may not be granted credit for Math 115 or 140. Students with credit from the AB Mathematics Advanced Placement Examination are encouraged to enroll in Math 145. Students with credit from the BC Mathematics Advanced Placement Examination or outstanding performance in the calculus credit examination are encouraged to enroll in Math 224.

### I. Introductory

**114a-115b. Pre-Calculus and Introduction to Calculus** (½,1)  
This sequence is designed for students who wish to take Mathematics 115, Introduction to Calculus, but whose mathematical background is deficient. Students with three years of high school mathematics should begin with Mathe-

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On the satisfactory completion of Mathematics 115, the student receives  $\frac{1}{2}$  unit of credit for Mathematics 114.

Not open to students with AP credit in mathematics or students who have completed Mathematics 115 or 140.

Prerequisite: high school mathematics. Advice of the department should be sought before registering for this course.

### 115b/116a.

#### 115b. Introduction to Calculus

(1) A short course intended for students not majoring in mathematics or the physical sciences who need a working knowledge of calculus. The course emphasizes techniques and applications with relatively little attention to the rigorous foundations. The department.

Not open to those who have had 140.

Prerequisite: at least three years of high school mathematics.

Three 50-minute periods; one 50-minute problem session.

#### 116a. Topics in Calculus

(1) A continuation of 115. Topics may include: matrix methods, use of differentiation and integration, differential equations, and partial differentiation. Emphasis is on techniques and applications. The department.

Not open to those who have had 141.

Prerequisite: 115 or equivalent.

#### [117b. Excursions in Mathematics]

(1) An investigation of several problems in mathematics aimed at developing an appreciation of the spirit of mathematics. The department.

Alternate years: not offered in 1994/95.

#### [119a. Non-Euclidean Geometry]

(1) The consequences of dropping the parallel postulate from Euclid's axioms of geometry. Philosophical implications, historical perspective, and real-world applications with careful development of the theory. Mr. McCleary.

Prerequisite: one year of high school geometry.

Alternate years: will be offered in 1995/96.

#### 140a/141b. Calculus with Discrete Mathematics

(1) Topics from the calculus of one variable, discrete mathematics and probability are combined to reflect their common features, and are applied to a variety of disciplines. Topics include: limits, continuity, derivatives, applications of derivatives, transcendental functions, the definite integral, applications of definite integrals, approximation methods, difference and differential equations, combinatorial methods, discrete and continuous probability. The department.

Not open to those who have had Math 115.

Prerequisite: a minimum of three years of high school mathematics, preferably including trigonometry.

Three 50-minute periods; one 50-minute problem session.

#### 145a. Topics in Calculus and Discrete Mathematics

(1) Materials from Math 140/141 presented in one semester for students with previous experience with calculus. Topics in discrete mathematics and second semester calculus are fully developed and topics in first semester calculus are reviewed. The department.

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## II. Intermediate

Prerequisite for all intermediate courses: 116, 141, 145 or equivalent, unless otherwise indicated.

#### 210a. Discrete Mathematics

(1) Mathematical induction, elements of set theory and logic, permutations and combinations, relations, topics in graph theory, generating functions, recurrence relations, Boolean algebras. Ms. Starr.

#### [215b. Methods of Mathematical Modeling]

(1) A survey of mathematical models with emphasis on how they arise in a given problem; topics chosen from linear, integer and dynamic programming, game theory, decision theory, queuing theory, combinatorial methods, and graph theory. Probabilistic and differential techniques developed as needed. Instructor to be announced.

Alternate years: not offered in 1994/95.

#### 224a and b. Linear Algebra

(1) The theory of higher dimensional space. Topics include: geometric properties of  $n$ -space, matrices and linear equations, vector spaces, linear mappings, determinants. The department.

#### 225b. Multivariable Calculus

(1) Continuation of 224. Differential calculus of vector functions, implicit function theorem, extreme values, multiple integrals, vector field theory. The department.

Additional prerequisite: 224 or the equivalent.

#### 250b. Methods of Applied Mathematics

(1) Survey of techniques used in the physical sciences. Topics include: ordinary and partial differential equations, series representation of functions, integral transforms, Fourier series and integrals. Mr. Feroe.

#### 268a. Probability Models

(1) A presentation of commonly applied discrete and continuous probability distributions. The use of expectation, independence, conditional probability, and related statistical concepts. Mr. Lotto.

Alternate years: offered in 1994/95.

#### 271b. Introduction to Number Theory

(1) Topics include: divisibility, congruence, modular arithmetic, diophantine equations, number-theoretic functions, distribution of the prime numbers. Mr. Pappas.

#### [275b. Introduction to Numerical Methods]

(1) (Same as Computer Science 275) Error and its propagation. Numerical approximation, interpolation, differentiation, integration. Solution of algebraic equations, systems of linear equations.

Additional prerequisite: ability to program in one high-level language.

Alternate years: not offered in 1994/95.

#### 290. Field Work

( $\frac{1}{2}$  or 1)

**Reading Courses**

Prerequisite: 224 or equivalent, and permission of the instructor.

**297.01. Elementary Number Theory** (½)

The department.

**297.04. Non-Euclidean Geometry** (½)

Mr. McCleary.

**298. Independent Work** (½ or 1)

Election should be made in consultation with a departmental adviser.

**III. Advanced**

Prerequisite for all advanced courses: 225, unless otherwise indicated.

For students planning graduate study in mathematics, 365 and 375 are strongly recommended.

**301b. Senior Seminar** (½ or 1)

Areas of study and units of credit vary from year to year. Mr. Steinhorn.

Open only to seniors whose major is mathematics.

**326a. Real Analysis** (1)

A rigorous treatment of topics in the classical theory of functions of a real variable from the point of view of metric space topology; limits; continuity, sequences and series of functions, and the Riemann-Stieltjes integral. Mr. Feroe.

**327a. Advanced Topics in Real Analysis** (1)

Continuation of 326. Measure theory, the Lebesgue integral, Banach spaces of measurable functions. Mr. Lotto.

Prerequisite: 326.

**328b. Theory of Differential Equations** (1)

Existence and uniqueness theorems for ordinary differential equations; general theory and eigenvalue methods for first order linear systems. Mr. Feroe.

Prerequisite: 326 or permission of the instructor.

Alternate years: offered in 1994/95.

**[335b. Topics in Differential Geometry and Topology]** (1)

Aspects of the elementary geometry and topology of differentiable manifolds. Topics vary from year to year.

Prerequisite: 326.

Alternate years: not offered in 1994/95.

**[350a. Foundations of Mathematics]** (1)

An introduction to mathematical logic. Topics are drawn from computability theory, model theory, and set theory. Mathematical and philosophical implications also are discussed.

Prerequisite: 326 or 361.

Alternate years: not offered in 1994/95.

**355b. Topology** (1)

Introductory point-set and algebraic topology; topological spaces, including metric

**361a. Modern Algebra** (1)

The theory of groups and an introduction to ring theory. Topics in group theory include: isomorphism theorems, generators and relations, group actions, Sylow theorems, fundamental theorem of finite abelian groups. Mr. McCleary.

**362b. Advanced Topics in Modern Algebra** (1)

Continuation of 361. Rings and fields, with a particular emphasis on Galois theory. Mr. McCleary.

Prerequisite: 361.

**365b. Complex Analysis** (1)

Integration and differentiation in the complex plane. Topics include: holomorphic (differentiable) functions; power series as holomorphic functions; Taylor series and their singularities; complex integration and, in particular, Cauchy's theorem and its consequences; Laurent series. Mr. Lotto.

**375a. Advanced Linear Algebra** (1)

Further study in the theory of vector spaces and linear maps. Topics may include: scalar products and dual space; symmetric, hermitian and unitary operators; eigenvectors and eigenvalues; spectral theorems; canonical forms. Mr. Steinhorn.

**380b. Topics in Advanced Mathematics** (1)

Advanced study in such areas as real analysis and modern algebra, offered in response to demand. The department.

**399. Senior Independent Work** (½ or 1)

Election requires the approval of a departmental adviser and of the instructor who supervises the work.