

History of the College

principle in the nineteenth century, Williams did not need to rescue itself with the general education principle in the twentieth century.

During its long history much of the life and tone of the College was shaped by students. While the same influence continues, the competitive pressure for admissions since World War II has allowed for a new and significant degree of selectivity on the part of the College. Among the consequences of this change has been a quickening of the intellectual life of the College and a reconsideration of traditions and emphases no longer considered appropriate for an institution of liberal learning.

Among the first traditions to go was compulsory religious exercises, abandoned in 1962 after a hundred years of gradual but steady erosion. Voluntary worship in the form of ecumenical chapel services and the activities of student religious organizations carry on another long tradition. In response to the concern of undergraduate leaders and the faculty and in recognition of the failure of Greek Letter Fraternities to fulfill adequately objectives consistent with college purpose, the Trustees in 1962 took the first of a series of actions that replaced fraternities with a residential house system. Williams became, as a result, a much more open community. The decision to become coeducational and the admission of women to Williams as degree candidates in 1970 has reinforced the spirit of equality and freedom conducive to a climate of learning.

In this atmosphere of change and heightened purpose the curriculum underwent appropriate transformations, as a careful comparative study of the yearly catalogues readily shows, leading to the present 4-1-4 curriculum and a more flexible and wide-ranging schedule and program both on and beyond the campus. In spite of change, however, the guiding spirit of the College has not wavered from the statement expressed by Mark Hopkins in his inaugural address of 1836: "We are to regard the mind, not as a block of iron to be laid upon the anvil and hammered into any shape, nor as a block of marble in which we are to find the statue by removing the rubbish, nor as a receptacle into which knowledge may be poured, but as a flame that is to be fed, as an active being that must be strengthened to think and to feel—and to dare, to do, and to suffer."

1984-1985 Graduation Requirements: Williams

THE CURRICULUM

Williams College offers a course of study leading to the degree of Bachelor of Arts. The course requirements prescribe both the number of courses to be completed and the minimum grade level to be achieved; the curriculum also requires that each student explore several fields of knowledge and concentrate in one. The full requirements for the degree include meeting the minimum academic standards stated below, residence at the College, fulfillment of the distribution requirement, completion of a major, and completion of the physical education requirement.

The academic year is divided into two regular semesters and a Winter Study Program. The student takes four courses in each semester and during January pursues a single program of study on a pass-fail basis.

The Winter Study Program which began in 1967 is intended to provide students and faculty with a dramatically different educational experience in the January term. The differences are in the nature of the courses, the nature of the learning experience, and the change of educational pace and format from the fall and spring semesters. These differences apply to the faculty and students in several ways: faculty can try out courses with new subjects and techniques that might, if successful, be used later in the regular terms; they can explore subjects not amenable to inclusion in regular courses; and they can investigate fields outside their usual areas of expertise. In their academic work which is graded *Pass*, *Perfunctory Pass*, or *Fail*, students can explore new fields at low risk, concentrate on one subject that requires a great deal of time, develop individual research projects, or work in a different milieu (as interns, for example, or on trips outside Williamstown). In addition, Winter Study offers students an opportunity for more independence and initiative in a less formal setting, more opportunity to participate in cultural events, and an occasion to get to know one another better.

Freshmen select one course from among a group of interdisciplinary seminars devoted to the study of influential ideas and systems, great works of art, or major historical events, and designed to illustrate the spirit of liberal learning. Sophomores and juniors select one subject of study, chosen from the list of January course offerings or elected as a project of independent study, either on or off campus, in cooperation with an instructor. Seniors are encouraged to elect a project in their major or program of concentration.

REQUIREMENTS FOR THE BACHELOR OF ARTS DEGREE

Academic Requirement

To be eligible for the Bachelor of Arts degree a student must pass 32 semester courses and receive grades of C minus or higher in at least 19 of those semester courses, pass four Winter Study Projects (unless excused from one by the Committee on Academic Standing), attain an average of C minus in the major field, and complete eight quarters of physical education.

Residence Requirement

Students who enter Williams as freshmen must spend a minimum of six semes-

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The Curriculum

ters in residence at Williams. Students transferring to Williams from another institution must spend a minimum of four semesters in residence at Williams, and those entering as sophomores are expected to spend six semesters in residence. Students are considered to be in residence if they are taking a program of study under the direction of the Williams College Faculty. Students must be in residence for both semesters of their final year.

The degree requirements must be completed within eight semesters, including any semesters for which a student receives credit while not in residence at Williams. Thus, semesters spent away on exchange programs with other colleges or on junior year abroad and semesters made up of Advanced Placement courses (if the student wishes to accelerate and the Committee on Academic Standing approves) count toward this total.

Distribution Requirement

For the purposes of the Distribution Requirement, the departments of the College are grouped into three divisions: Division I, Languages and the Arts; Division II, Social Studies; and Division III, Science and Mathematics. Each student must complete at least two graded semester courses in each division by the end of the junior year.

Courses which fulfill the distribution requirement in Division I are designed to help students become better able to respond to the arts sensitively and intelligently by learning the language, whether verbal, visual or musical, of a significant field of artistic expression. Students learn how to develop the capacity for critical discussion, to increase awareness of the esthetic and moral issues raised by works of art, and to grow in self-awareness and creativity.

Courses which fulfill the Division II requirement consider the institutions and social structures that human beings have created, whether knowingly or unknowingly, and which in turn markedly affect their lives. These courses are intended to help the students recognize, analyze and evaluate these human structures in order that they may better understand themselves and the social world in which they live.

Courses which fulfill the Division III requirement are intended to provide some of the factual and methodological knowledge needed to be an informed citizen in a world deeply influenced by scientific thought and technological accomplishment, and to cultivate skill in exact and quantitative reasoning.

DIVISION I. Languages and the Arts

Afro-American Studies	French	Literature in Translation
Art	German	Music
Classics	Greek	Russian
Comparative Literature	History of Ideas	Spanish
English	Latin	Theatre

DIVISION II. Social Studies

African and Middle Eastern Studies	Environmental Studies	Psychology
	History	Religion

Williams

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The Curriculum

Afro-American Studies
American Studies
Anthropology
Asian Studies
Economics

History of Ideas
History of Science
Philosophy
Political Economy
Political Science

Russian, Soviet and East European Studies
Science and Technology Studies
Sociology
Women's Studies

DIVISION III. Science and Mathematics

Astronomy
Biology
Chemistry
Computer Sciences

Geology
History of Science
(specified course)

Mathematical Sciences
Physics
Psychology
(specified courses)

Major Requirement

The Major Requirement is designed to assure that all Williams undergraduates will have the experience of disciplined and cumulative study, carried on over an extended period of time, in some important field of intellectual inquiry. Juniors are required to declare a major field of concentration; the actual selection of a major is normally made at the time of registration in the spring of the sophomore year.

Major Fields

Majors are offered in the following fields:

American Studies
Anthropology
Art
Astronomy and Physics
Biology
Chemistry
Classics (Greek, Latin)
Computer Science
Economics
English
Geology
German
History

Mathematical Sciences
Music
Philosophy
Physics
*Political Economy
Political Science
Psychology
Religion
Romance Languages
French
Spanish
Russian
Sociology
Theatre

*Offered jointly by the Departments of Economics and Political Science

General Structure

1) A student ordinarily must elect at least nine semester courses in his or her major field. A particular major may also require an additional course and/or one Winter Study Project during the junior or senior year.

A student may also fulfill the minimum requirements for a major by taking eight semester courses in the major field and two semester courses, approved by a major advisor, in associated fields. In interdepartmental majors, such as Political Economy, a larger number of courses may be required.

The Curriculum

2) A prescribed sequence of courses, supplemented by parallel courses, and ending in a senior major course, is required in some major fields. Other majors ask the student to plan a sequence of elective courses, including advanced work building on elementary courses in the field, and ending in a one or two semester faculty-organized course or project in the senior year. All fields of concentration provide a system of counseling to help students plan programs reflecting individual interests as well as disciplined and cumulative patterns of inquiry.

Courses in many major programs require prerequisite courses in related areas. A full description of the detailed structure of each major is found under the heading of that major in the section, "Courses of Instruction."

Contract Major

A limited number of contract majors is also permitted for specially qualified and dedicated students who wish to undertake coherent study of an interdisciplinary subject not covered by a regularly offered major. Since considerable time is required for approval of a contract major, interested students should begin to formulate their proposals early in the spring semester of the sophomore year. Procedures for arranging a contract major and for honors work in such a major are described in the section, "Courses of Instruction."

Double Major

A student with a strong interest in two regular majors may double major with the permission of each major department or program and the Committee on Academic Standing. Although a student may be granted permission to use a course from one department or program to fulfill a particular requirement in the other, the student nevertheless must take the minimum number of courses in each field without counting any course twice. A student may be a candidate for Honors in either or both of the majors, but a course for Honors in one major may not be used for an Honors course in the other.

Co-ordinate Programs

In addition to majoring in a field, a student may choose to concentrate elective courses on a single topic or area, such as African and Middle Eastern Studies; Afro-American Studies; Asian Studies; Comparative Literature; Environmental Studies; Russian, Soviet, and East European Studies; Science and Technology Studies; or Women's Studies. Descriptions of such possible co-ordinate programs appear under the appropriate heading in "Courses of Instruction." A student making such a choice often can waive certain prerequisites for courses in the program, and may be granted a reduction in the number of courses required to complete the major.

Physical Education Requirement

The Physical Education requirement provides students the opportunity of establishing and maintaining a general level of fitness and well-being; of developing abilities in carry-over activities; of discovering and extending their own physical capabilities; and of developing skills in activities with survival implications, such as swimming, life saving and water safety.

The Curriculum

A swim test is required of all freshmen at the start of the academic year. Students who fail to complete the test must pass a basic swim course given in the Physical Education program during the first quarter of the year.

Students must complete eight quarters of physical education by the end of the sophomore year unless excused by the Dean or the Director of Health. Extensions can be granted by the Dean of the College in consultation with the Physical Education Department to postpone completion until junior year.

Students must enroll in at least three different activities in fulfilling the requirement and at least two quarters must be devoted to one carry-over sport, as defined by the Physical Education Department. No more than four of the required eight units may be earned by participating in the marching band, by serving as team manager, or both.

ADDITIONAL CURRICULAR OPPORTUNITIES*Advanced Placement*

At the discretion of the appropriate departments, students presenting satisfactory scores in Advanced Placement examinations may be placed in advanced courses not regularly open to freshmen and/or they may receive course credit toward the degree. A.P. credit, if granted, can be used to satisfy the Distribution Requirement*; as a prerequisite; in partial fulfillment of the major requirement; and (if in two or more subjects) for acceleration. A.P. credit can not be used to reduce the normal course load of any semester nor to make up a deficiency incurred at Williams.

Independent Study

When a particularly able candidate wishes to pursue the study of a subject not covered by the normal course offering of the College, arrangements may be made for him or her to undertake courses of independent study under faculty supervision. Arrangements for independent study are made with the appropriate department at the time of registration, and must be approved by the Committee on Academic Standing.

Student Initiated Courses

A Student Initiated Course is one proposed and organized by students and involves common group responsibilities, such as reading and discussion. The instructor supervises syllabus, student participation, and performance. Usually, in such courses, the students carry a heavy burden of the leadership in proposing requirements, selecting material to be covered, and conducting discussions, as well as in conceiving the basic outline of the course. The instructor is responsible for evaluating and grading students.

- 1) Student Initiated Courses for the fall and spring semesters are designated by the numbers 487 and 488 respectively.
- 2) In order to provide for departmental planning, students should discuss plans for Student Initiated Courses in the coming year at the beginning of the previous spring semester.

*Beginning in the 1986-87 academic year, A.P. credit will no longer be able to be used to satisfy distribution requirements.

MATHEMATICAL SCIENCES (Div. III)

Departmental Staff for 1985-86

Chair, Professor ROBERT M. KOZELKA
Acting Chair, Professor Guilford L. Spencer

Professors: GRABOIS, V. HILL, KOZELKA†, SPENCER. Associate Professor: BRUCE. Assistant Professors: ADAMS, O. BEAVER, BERGSTRAND, LENHART, LEVINE*, SCRAGG, SILVA. Lecturer: L. E. WRIGHT. Visiting lecturer: FARRELL.

MAJOR PROGRAM

Sequence Courses

Mathematics 108	Multivariable Calculus
Computer Science 135	Introduction to Computer Science
Mathematics 151	Discrete Mathematics
Mathematics 211	Linear Algebra
Mathematics 301	Real Analysis
Mathematics 311	Abstract Algebra I
Mathematics 401	Senior Major Course

Elective courses and projects

Three one-semester courses from among mathematics courses numbered 240 or above, of which at least one must form, with a sequence course or with another elective, an appropriate year sequence approved by the department. Two courses in computer science, of which one must be numbered 330 or above, may be substituted for one of the elective courses in mathematics.

Satisfactory participation by senior majors in the Senior Colloquium.

It is recommended but not required that one Winter Study Project offered by the department for majors be taken during the junior or senior year.

Variations in the sequence courses, adapting the program within the general course requirements to special needs and interests of the individual student, may be arranged in consultation with the department.

Students interested in attending graduate school or pursuing a career in mathematics are urged to take more upper division mathematics and computer science courses beyond those required for a minimum major.

THE DEGREE WITH HONORS IN MATHEMATICAL SCIENCES

The degree with Honors in Mathematics is awarded to a student who has demonstrated outstanding intellectual achievement in a program of study which extends beyond the requirements of the regular major. The principal consideration in recommending a student for the degree with Honors will be: Mastery of core material and skills, breadth and, particularly depth of knowledge beyond the core material, ability to pursue independent study of mathematics, originality in methods of investigation and, where appropriate, creativity in research.

Prospective Honors students are urged to consult with their departmental adviser at the time of registration in the spring of the sophomore or at the beginning of the junior year to arrange a program of study that could lead to the degree with Honors. Such a program normally comprises coordinated study involving a regular course, and independent study, undertaken during a regular semester and a Winter Study period. The study culminates in a significant piece of written work and an oral exposition. A major paper of an expository nature, original research, successful completion of appropriate examinations of the Society of Actuaries or a major computer project are examples of acceptable culminating written work.

If the program chosen consists of two independent study courses and one WSP independent study, the culminating written work should be a formal bound thesis.

Formal admission to candidacy is based on promising performance in the first two of the three units of study in the Honors program. Recommendations for the degree with Honors will be made for outstanding performance in the three Honors courses. Highest honors will be recommended for students who have displayed exceptional ability, achievement or originality.

ADVANCED PLACEMENT

The Mathematical Sciences Department attempts to place each student who elects a mathematics course in that course best suited to the student's preparation and goals. A freshman enrolling in Williams College is asked to complete a questionnaire with the help of the student's secondary school mathematics teacher, indicating the mathematical material covered by the student and the level of sophistication of the student's previous mathematical experience. The student is placed in the appropriate mathematics course determined by the results of the questionnaire, the results of the Advanced Placement Examination (AB or BC) if the student took one, and any additional available information. A student who receives a 4 or 5 on the BC examination and elects to continue the calculus is ordinarily placed in Mathematics 108 with credit given for Mathematics 107. A student who receives a 3 on the BC examination or a high grade on the AB examination and whose high school training indicates adequate preparation will receive credit for Mathematics 107 if he or she elects Mathematics 108 and completes it with a grade of C- or better. In any event students registering for mathematics courses are urged to consult with members of the department concerning appropriate courses and placement. The department reserves the right to place students at that point in the calculus sequence which is appropriate to their previous preparation.

Students interested in majoring in either mathematics or computer science should be aware that Mathematics 108 and 151 may be taken in either order. Mathematics 151 is a required course in both majors, as is Computer Science 135. *First semester freshmen are not allowed to enroll in computer science courses.* Therefore, although Mathematics 108 may seem to be a natural progression from a secondary school course in calculus, it may be worthwhile to consider electing Mathematics 151 in the first semester. Again, consultation with members of the department is recommended.

GENERAL REMARKS

Divisional Requirements

All courses listed may be used to satisfy this requirement unless otherwise indicated.

Alternate year courses

Courses numbered 241, 242, 302, 306, 313, 314, 315, 324, 325, 330, 331, 351, 352, 360, 371, 373, 375, 381, 432 and 434 are each normally offered once every two years. All other courses are normally offered every year.

Course Numbering

Courses numbered 200 and above are normally open to all students meeting the prerequisites. Students with questions about the level at which courses are conducted are invited to consult members of the department.

Course Descriptions

Descriptions of the courses in computer science are under that heading. More detailed information on *all* of the offerings in the Department is available in the *Informal Guide to Courses in Mathematical Sciences* that can be obtained at the departmental office.

Courses open on a pass/fail basis

Students taking a mathematics course on a pass/fail basis must meet all the requirements set for students taking the course on a graded basis.

With the permission of the department, any course offered by the department may be taken on a pass/fail basis. Permission will not be given to mathematics majors to meet any of the requirements of the major or honors degree on this basis. However, with the permission of the department, courses taken in the department beyond those requirements may be taken on a pass/fail basis.

Graduate School Requirements

There are an increasing number of graduate and professional schools that require mathematics as a prerequisite to admission or to attaining their degree. Students interested in graduate or professional training in business, medicine, economics or psychology are advised to find out the requirements in those fields early in their college careers.

[MATH 105 Mathematical Modeling (Not offered 1985-86.)

Many real-world problems can be "modeled" using only elementary algebra and geometry. Some of the problems examined are: the elusive map coloring conjecture (finally established in 1976), the "instant insanity" puzzle, sanitation truck routing and elementary economic decision making. One of the results of this study is an understanding of elementary graph theory, game theory and other combinatorial techniques involved in this non-calculus type of mathematical thinking.

Credit will not ordinarily be given for this course to students who have previously received credit for Mathematics 108 or equivalent.

Hour

[MATH 106 Introduction to Linear Algebra (Not offered 1985-86.)

An introduction to linear algebra recommended for students interested in the social sciences. Topics include matrices, vectors, transformations, linear equations, determinants and linear programming.

Credit will not ordinarily be given for this course to students who have previously received credit for Mathematics 108 or equivalent.

Hour

MATH 107(F,S) Introduction to Calculus

Functions, graphs, continuity. Derivatives and applications. Area and integration. Exponential, logarithmic and trigonometric functions.

Prerequisite, Quantitative Studies 100 (or demonstrating basic proficiency in diagnostic test—see Quantitative Studies).

NOTE: Students who have had less than one full year of calculus in high school should enroll in the sections which meet four times a week.

Hours 107(F)

First semester: ADAMS, O. BEAVER, FARRELL, SPENCER

107(S)

Second semester: ADAMS, BERGSTRAND

MATH 108(F,S) Multivariable Calculus

Continuation of Mathematics 107. Techniques of integration; Taylor expansions; vector and analytic geometry in two and three dimensions; partial derivatives, multiple integrals.

Prerequisite, Mathematics 107 or equivalent.

Hours 108(F)

First Semester: BERGSTRAND, FARRELL, LEVINE

108(S)

Second semester: FARRELL, SPENCER

Computer Science 131 Computers and Society (Same as History of Science)

(See Computer Science, and for complete description, see under History of Science 131.)

Computer Science 133(F,S) Introduction to Programming

(See under Computer Science for full description.)

Computer Science 135(F,S) Introduction to Computer Science

(See under Computer Science for full description.)

MATH 140 Calculus and Statistics

Elementary probability models, including continuous models derived from calculus considerations. Theory of statistical inference by integration and normal curve properties. The relationship between estimation and tests of hypotheses. Elementary bivariate probability: discrete and continuous random variables.

Prerequisite, Mathematics 107.

Not open for major credit to junior or senior mathematical sciences majors.

Hour

O. BEAVER

MATH 151(F,S) Discrete Mathematics

As a complement to the calculus, which is the study of continuous processes, this course focuses on the discrete: finite sets and their interrelations and applications. Topics will include set theoretic ideas, counting, logic, recursion, lattices, abstract graphs, boolean algebras.

Prerequisite, Mathematics 107.

Hours 151(F)

151(S)

First semester: BRUCE

Second semester: BERGSTRAND, GRABOIS

MATH 210 Applied Mathematics for Scientists (Same as Physics 210)

(See under Physics for full description.)

MATH 211(F,S) Linear Algebra

Geometric vectors, linear equations, vector spaces, linear independence and bases. Linear transformations, matrices and determinants. Inner products.

Prerequisite, Mathematics 108 or 151.

Hour 211(F)

211(S)

First semester: ADAMS

Second semester: O. BEAVER

Computer Science 235(F,S) Principles of Computer Science

(See under Computer Science for full description.)

Computer Science 236 Computer Organization

(See under Computer Science for full description.)

[MATH 241 Intermediate Statistics (Not offered 1985-86.)

Tests of statistical hypotheses, with emphasis on small-sample tests from normal populations: t-test, chi-square. Contingency tables and other nonparametric tests. Applications directed towards the behavioral sciences.

Prerequisite, Mathematics 140.

Hour

[MATH 242 Random Processes (Not offered 1985-86.)

The study of probability situations which change over time. Some of the classical probabilistic models which have been used in psychology, biology, economics and transportation: queueing theory, birth and death processes, waiting times, Markov chains.

Prerequisite, Mathematics 108 or 140.

Hour

MATH 301 Real Analysis

The real and complex number systems. Elementary topology of the real line and plane. Functions of a single variable: limits, continuity, differentiability, the Riemann and Riemann-Stieltjes integrals. Sequences, series and uniform convergence.

Elementary topology of metric spaces and functions on metric spaces with emphasis on \mathbb{R}^n .

Prerequisites, Mathematics 211 and 151.

Hour

O. BEAVER

MATH 302 Complex Analysis (Will not be offered 1986-87.)

Analytic functions: Cauchy-Riemann equations, Cauchy's integral theorem and its consequences, Taylor series and Laurent series. Applications, including some of the following: calculus of residues, conformal mapping, harmonic functions and boundary value problems.

Prerequisite, Mathematics 301.

Hour

SILVA

[MATH 306 Differential Equations (Not offered 1985-86.)

An introductory study of both ordinary and partial differential equations. Existence, uniqueness, properties of solutions, as well as consideration of methods of solution.

Prerequisite, Mathematics 301.

Hour

MATH 311 Abstract Algebra I

Groups: normal subgroup, factor group, homomorphism, isomorphism.

Rings: ideal, quotient ring, polynomials, integral domain.

Fields: algebraic and transcendental extensions, introduction to Galois Theory.

Prerequisites, Mathematics 151 and 211.

Hour

BERGSTRAND

[MATH 313 Elementary Number Theory (Not offered 1985-86.)

Divisibility properties of the integers; prime and composite numbers. Congruence modulo n ; solutions of linear and quadratic congruences and of some Diophantine equations. The distribution of primes. Problems in additive arithmetic and discussion of some famous unsolved problems.

Prerequisite, Mathematics 211.

Hour

[MATH 314 Abstract Algebra II (Not offered 1985-86.)

Continuation of Mathematics 311. Field theory: algebraic and transcendental extensions, automorphism, finite field, Galois Theory. Other topics chosen from advanced linear algebra, Lie Algebra Theory or representations and characters.

Prerequisite, Mathematics 311.

Hour

MATH 315(S) Groups and Characters (Will not be offered 1986-87.)

Group theory with emphasis on topics having applications in the physical sciences and with greater attention to examples than to proofs. Symmetry groups, group structure, representations and characters over the real and complex fields, space groups (chemistry), matrix groups (physics).

Prerequisite, Mathematics 211.

Hour

V. HILL

MATH 324 Topology (Will not be offered 1986-87.)

General spaces and the notions of continuity, connectedness, compactness. Metric spaces. Introduction to homology and homotopy.

Prerequisite, Mathematics 301.

Hour

ADAMS

MATH 325 Topics in Geometry (Will not be offered 1986-87.)

Selected topics from projective geometry, geometric algebra, non-Euclidean geometry, Hilbert's axiomatic development of Euclidean geometry.

Prerequisite, Mathematics 211.

Hour

V. HILL

MATH 330 Numerical Analysis

Solution of non-linear equations and linear systems, interpolation and approximation, numerical differentiation and integration, with attention to error analysis and efficiency of algorithms.

Prerequisites, Mathematics 211 and Computer Science 135.

Hour

SPENCER

[Computer Science 331 Programming Languages (Not offered 1985-86.)]

(See under Computer Science for full description.)

[MATH 351 Decision Theory (Not offered 1985-86.)

Mathematical rules for and consequences of making decisions under various conditions: certainty, risk (known probabilities of outcomes), uncertainty (unspecified probabilities of outcomes). Linear programming and game theory, principally in matrix form, as examples of the first situation; duality between them. Utility theory of von Neumann as an example of the second; quantification of non-numeric prospects. Prior probabilities as an example of the third; how to modify guesses on the basis of data. Emphasis on discrete problems.

Prerequisite, Mathematics 211.

Hour

[MATH 352 Combinatorics (Not offered 1985-86.)

A study of the properties and characterizations of configuration of points and lines. Graphs, trees, criteria for planarity and map coloring will be considered, as well as applications in the physical and social sciences. The theory will be developed with an emphasis on independent work and problem solving.

Prerequisite, permission of the instructor.

Hour

Computer Science 355 Algorithms

(See under Computer Science for full description.)

MATH 360 Mathematical Logic (Will not be offered 1986-87.)

Propositional predicate logic. Investigations of the correspondence between mathematical truth and provability. Soundness completeness and compactness theorems. Introduction to Gödel incompleteness and its philosophical consequences. Discussion of automated theorem proving and applications to artificial intelligence.

Prerequisite, Mathematics 151 or 202.

Hour

BRUCE

Computer Science 371 Computer Graphics (Will not be offered 1986-87.)

(See under Computer Science for full description.)

Computer Science 373 Artificial Intelligence (Will not be offered 1986-87.)

(See under Computer Science for full description.)

[Computer Science 375 Data Base Systems (Not offered 1985-86.)]

(See under Computer Science for full description.)

[MATH 381(S) History of Mathematics (Not offered 1985-86.)

A survey of the development of mathematical thought from ancient times to the present, with some consideration of its place in political, social and intellectual history. Assigned problem studies will explore historical methods of solution, famous mathematical questions, the work of individual mathematicians and the rise of various branches of mathematics.

Prerequisite, Mathematics 211.

Hour

V. HILL]

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Mathematical Sciences, Medieval Studies

MATH 397, 398, 497, 498 Reading

Directed independent reading in Mathematics.
Prerequisite, permission of the department.

MATH 401 Senior Major Course

The purpose of the course is to emphasize the unity and power of mathematics by studying in depth a particular area of mathematics. The content will be chosen to draw as widely as possible upon the backgrounds of the participants and to illustrate a variety of applications. The exact topics to be covered will be decided by consultation among staff and students.

Required of senior Mathematical Sciences majors.

Prerequisite, permission of the department.

Hour

SPENCER

Computer Science 431 Theory of Computation

(See under Computer Science for full description.)

Computer Science 432 Operating Systems (Will not be offered 1986-87.)

(See under Computer Science for full description.)

[Computer Science 434 Compiler Design (Not offered 1985-86.)]

(See under Computer Science for full description.)

MATH W30 Senior Project

Normally to be taken by candidates for honors in Mathematics other than by thesis route.

MATH 493-W31-494 Senior Honors Thesis

Senior Colloquium

Required of senior majors in the mathematics route. Meets every week for one hour both fall and spring.

Hour

MEMBERS OF THE DEPARTMENT

MEDIEVAL STUDIES

Williams offers no formal program in Medieval Studies, but students interested in the subject should note the following individual course offerings that pertain to it.
(See respective departmental listings for the full description.)

- Art 236 Early Medieval Art
- Art 336 Romanesque and Gothic Art (Deleted 1985-86.)
- Art 342 Renaissance Art in Italy
- English 303 Introduction to Old English
- English 304 Dante
- English 305 Chaucer
- English 307 Arthurian Literature
- German 201 German Greats 1740-1848
- German 302 Literature of the High Middle Ages
- History 204 The Making of Europe: 300-1300
- History 347 The Renaissance (ca 1350-1520)
- History 361 Western Political Thought in Transition (Deleted 1985-86.)
- History of Ideas/Art 247 Art and Science in the Renaissance (Deleted 1985-86.)

Medieval Studies, Music

- Music 209 Medieval and Renaissance Music
- Music 301 Music in History I
- Religion 202 Christian Tradition
- Romance Languages 302 Introduction to Romance Linguistics
- Spanish 304 Spanish Literature of the Middle Ages and Renaissance

COURSES OF RELATED INTEREST

(See respective departmental listings for full description.)

- Art 343 Italian Art: 1500-1600
- Classics 101, 102 Classical Literature
- Classics 104 Greek Mythology
- English 301 The Middle Ages to the Enlightenment
- English 313 Renaissance Love Stories
- English 314 Renaissance Drama
- English 315 Milton and the Bible
- English 317 Elizabeth and the Elizabethans
- History 216 Greek History
- History 218 Roman History
- History 309 Catholic, Protestant, Puritan in the Age of Reformation (Deleted 1985-86.)
- History 323 Tudor and Stuart England, 1485-1714
- History of Ideas 101 The Greek Idea of Human Excellence (Deleted 1985-86.)
- Mathematics 381 History of Mathematics
- Philosophy 202 Greek Philosophy
- Political Science 231 Ancient and Medieval Political Philosophy
- Religion 203 Moses, Jesus, Muhammad
- Religion 204 The New Testament
- Religion 230 The Many Forms of Jesus

MUSIC (Div. I)

Departmental Staff for 1985-86

Chair, Professor DOUGLAS B. MOORE

Professors: D. MOORE, ROBERTS, SHAINMAN. Visiting Professor, SUDERBURG. Assistant Professor: ENNIS-DWYER. Visiting Associate Professor: KAZADIŞ. Lecturer: HEGYI.

MAJOR PROGRAM

Sequence courses

- Music 103-104 Music Theory and Musicianship I
- Music 201-202 Music Theory and Musicianship II
- Music 301, 302 Music in History I (Medieval and Renaissance Music) and Music in History II (independent study and advanced work as part of one of the other "period" courses: Music in the Baroque Era or Music in the Classic Era or Music in the Romantic Era.)
- Music 401 Senior Seminar in Music

Parallel courses

An additional year course or two semester courses in Music. The student is especially encouraged to enroll in those courses which will develop his critical skills in analysis and creative work in music, including independent study with one or more members of the faculty (See descriptions for Music 203, 204, 303, 325, 326, 425, 426.) *It is required that music majors participate in departmental performance groups for four semesters or more. The student must petition to meet the requirements in an alternative way.*