Williams

SOPHOMORE YEAR: Especially able sophomores may register during the second term of sophomore year in honors courses ordinarily open only to juniors and seniors.

Sophomores of high achievement may also be given permission to register in upper class courses. This applies particularly to students who have taken advanced courses as freshmen. Eligibility is judged on an individual basis, and permission is obtained from the appropriate department at the time of registration.

JUNIOR AND SENIOR YEARS: A central feature of the Williams curriculum is the honors program (page 50) which provides an opportunity for students of superior initiative and ability to exercise originality and responsibility as scholars.

Another opportunity for advanced work available to students *enrolled in the honors program* is known as independent study. When a particularly able honors 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 to undertake a semester, or more, of independent study with a specially assigned member of the faculty. Arrangements for independent study are made with the appropriate department at the time of registration.

OPPORTUNITIES IN THE CREATIVE ARTS

Williams College recognizes the varied needs of both the disciplines which form part of the college's curriculum and of the students enrolled within its programs. Certain disciplines, especially those concerned with the creative arts, can benefit from an increased use of independent projects for its students, even for those who may not be honors students in the college-at-large. These projects normally do not form a part of the usual classroom program within that discipline. In addition, these independent projects realize more fruitfully the potential of the individual talent of the student and will guide the student in the growth of that talent and interest. All of these things the college desires to foster. It is generally conceded that an exclusively classroom oriented approach to the arts is unsatisfactory; it must be fortified by practical experience within that discipline.

The architect and humanitarian, Walter Gropius, in his Convocation Address at Williams College on September 22, 1963 stated:

> This unintegrated society of ours needs participation in the arts as an essential counterpart to technology..., for art develops

intuition....In our era of expediency and mechanization, the predominant educational aim ought to be to call forth creative habits; vocational skill should be a by-product only, a matter of course. The student's mind...will become increasingly inventive when he is guided not only by intellectual studies but also by practical experiments in forming, building, constructing things to come, a program of 'search' rather than 're-search'.

Qualified students at Williams are encouraged to make use of special electives in the creative arts in addition to the normal courses and extra-curricular activities within these fields. These special electives in the creative arts, listed with the course announcements under Art, Drama, English (Creative Writing), and Music, have been formulated by the various departments and disciplines for those who demonstrated talents and interests which the college hopes the individual student will wish to develop. Students should confer with the appropriate faculty member before registering for these courses.

Attention is directed to the Hubbard Hutchinson Memorial Fellowship for graduate study described on page 40.

REQUIREMENTS FOR THE BACHELOR OF ARTS DEGREE

Required Number of Courses

Twenty year courses, or the equivalent in semester courses, are required for the degree. The senior major course counts as two one-year courses.

Residence Requirement

A minimum of two years of residence is required for the degree.

Foreign Language Requirement

All Williams students are required to fulfill a minimum language requirement in one of two ways: (1) by achieving a satisfactory score on the College Entrance Examination Board Language Achievement Test, or (2) by passing

a 103-104 course in Greek, Latin, German, Russian, French, Italian, Spanish, or the 105-106 course in Spanish at Williams.

Distribution Requirement

Two one-year courses, or their equivalent in semester courses, must be completed in each of the following three divisions by the end of the sophomore year:

DIVISION I. *Languages and the Arts*

Art	German	Public Speaking
Comparative Literature	Greek	Russian
Drama	Italian	Spanish
English	Latin	
French	Music	

DIVISION II. *Social Studies*

Anthropology	History	Psychology
Classical Civilization	Philosophy	Religion
Economics	Political Science	

DIVISION III. *Science and Mathematics*

Astronomy	Chemistry	Mathematics
Biology	Geology	Physics

Ordinarily a freshman elects at least one course from each of the three divisions.

The Major

Juniors are required to choose a major field of concentration. The selection is normally made at the time of registration in the spring of the sophomore year. But qualified students may request permission to register provisionally in a major at the end of their freshman year.

General Structure

The program of the major normally consists of:

(1) Three or four one-year courses* in the major subject, taken in a prescribed sequence and culminating in the double-credit senior course. These are known as *sequence courses*.

*Two one-semester courses are considered to be the equivalent of a one-year course.

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(2) One or two additional one-year courses. One or both of these courses may be specifically prescribed by the major department. Most departments permit some choice among alternatives, including, in appropriate cases, courses in subjects related to the major. Since these additional courses are taken along with the sequence courses they are called *parallel courses*.

The courses required by many departmental major programs require prerequisite courses in related departments. A description of the detailed structure of each major precedes the list of courses in each department under "Courses of Instruction".

Major Fields

Majors are offered in the following fields:

*American Civilization	Mathematics
Art	Music
Biology	Philosophy
Chemistry	Physics
Classics	**Political Economy
Greek	Political Science
Latin	Psychology
Economics	Religion
English	Romanic Languages
Geology	French
German	Spanish
History	Russian

Senior Major Course

A central feature of the major at Williams is the double-credit course taken in senior year. This course differs in two respects from other courses in the College. Since it is taken only by majors, the students share a common body of knowledge derived from their earlier sequence courses; and since it counts as two courses, it provides opportunity for coordinating earlier work and for writing papers which correlate various aspects of what they have learned.

Major Examination

The student's overall understanding of his major subject is tested by a comprehensive examination on the major, taken at the end of his senior year. The double-credit senior course, providing special opportunities for correlation

*Offered by the Department of History.
**Offered jointly by the Departments of Economics and Political Science.

- 45 -

The Curriculum

tion and review, and the major examination thus work together to insu
that the Williams graduate has not merely received passing grades in
number of separate courses, but has organized and assimilated what he h
learned.

Provisional Registration in Departmental Major in Sophomore Year

Early concentration in a major field of interest is open to students havi
well-formulated educational objectives. Students may request permissi
at the end of their freshman year to register provisionally as majors with
partments of their choice. This permission carries the privilege of registeri
for as much as four semesters of course work in the same department duri
sophomore year. Permission for provisional registration is obtained fro
the chairman of the appropriate department at the time of registration
sophomore year.

The Junior Year Abroad

Qualified students may apply for any one of several arrangements
spending the junior year abroad. A student may study in Europe, Afri
Asia or Latin America under programs arranged with his adviser a
approval of the chairman of his major department and of the Dean and t
Academic Standing Committee. A student who wishes to avail himself of t
opportunity must have a good academic record and competence in t
language of the country in which he plans to study. In general two years
study of the language at the college level are necessary to provide adequa
preparation.

Corrective Composition

It should be noted that Williams does not require a year's course in Engl
Composition, since most entering freshmen have received training in t
fundamentals of mechanics (spelling, punctuation, grammar, and senter
structure) before coming to college. If any freshman shows that he nee
further drill, he is assigned to Corrective Composition, a program of no
credit remedial work in which the student meets once a week with a memb
of the English department and concentrates on his special deficienci
Most courses involve a good deal of formal writing, and close check is ke
on the development of the student's powers of expression. Furthermo
any student who demonstrates the need for this instruction may be assign
to Corrective Composition at any time during his college career by a
member of the faculty.

[H368   *European Intellectual History, 1870-1920 (Not offered 1965-66; to be offered 1966-67.)*

The study of significant ideas and intellectuals in the late nineteenth and early twentieth centuries with particular emphasis on the sense of intellectual crisis. Special consideration will be given to science, history, positivism, the study of society, and the attempts to comprehend the irrational.

Weekly discussion and independent research.

Honors course for juniors and seniors.   Prerequisite, History 101-102 *or* 103-104.

Hour   FG Wed.   BRAZILL]

American Civilization H354   American Literature of the Nineteen-Twenties (Offered 1965-66; not to be offered 1966-67.)

Honors course for juniors and seniors.   Prerequisite, English 101.

Hour   RS   MANSFIELD

[*American Civilization H355   Contemporary American Literature (Not offered 1965-66; to be offered 1966-67.)*

Honors course for juniors and seniors.   Prerequisite, English 101.

Hour   MANSFIELD]

H451-452   Senior Honors Thesis

ITALIAN (Div. I)

(For description of courses *see under* Romanic Languages)

LATIN (Div. I)

(For description of courses *see under* Classics)

M

MATHEMATICS (Div. III)

DEPARTMENTAL STAFF FOR 1964-65

Chairman, Professor G. L. SPENCER, II*

Acting Chairman, Professor H. W. OLIVER

Professor RICHMOND, Professor JORDAN, Professor OLIVER, Professor SPENCER*, Associate Professor KOZELKA, Assistant Professor FEEMAN, Assistant Professor GRABOIS, Mr. LEVITZ**.

COURSES OF INSTRUCTION 1965-66

MAJOR PROGRAM

Sequence courses

Mathematics 101	Introduction to the Calculus	} or Mathematics 103
Mathematics 102	Elementary Calculus	} Elements of Calculus
Mathematics 201	Linear Algebra	
Mathematics 202	Calculus of Several Variables	
Mathematics 301-302	Advanced Calculus	
Mathematics 401-402	Advanced Differential Equations	

Parallel courses

Mathematics 305-306   Introduction to Abstract Algebra

The departmental sequence gives the student an understanding of the principles and processes of the calculus and their applications to physical and geometric problems. Mathematics 305-306 must be taken as a parallel course. The major aims to develop the student's mathematical power and insight and to prepare him to appreciate the place of mathematics in the modern world.

THE DEGREE WITH HONORS IN MATHEMATICS

The candidate for this degree carries the departmental sequence and the parallel course. In most cases he will be expected to replace the sequence courses 301-302, 401-402 by 301, H302, H401-H402.

In addition the honors candidate must undertake one of the following alternatives:

(a) Two elective one-semester courses from among Mathematics 204 and the 300 and 400 non-sequence courses offered by the department.

(b) One or two years of independent work. This work culminates in a senior thesis. The department is prepared to direct work in actuarial mathematics, algebra, analysis, geometry, mathematical foundations, statistics and topology. While the thesis need not contribute to the existing knowledge of mathematics, it will require the exercise of individual initiative.

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*On sabbatical leave 1964-65

**Second semester 1964-65

101   Introduction to the Calculus

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

Freshman course.

Hours   A, B, J, K   MEMBERS OF THE DEPARTMENT

102   Elementary Calculus

Continuation of Mathematics 101.

Methods of integration.   Introduction to differential equations.   Infinite series with applications.

Should be elected by those who are likely to major in mathematics or physics.

Freshman course.   Prerequisite, Mathematics 101.

Hours   A, B, J, K   MEMBERS OF THE DEPARTMENT

103   Elements of Calculus

An intensive coverage of the content of first year calculus for students who have training in calculus but are not prepared to enter Mathematics 201.

Freshman course.

Hours   D, M   MEMBERS OF THE DEPARTMENT

104   Introduction to Statistical Inference

Elementary theory of sets with applications to probability problems.   Probability functions with emphasis on binomial and normal models.   Inferences from models: statistical estimation and tests of hypotheses.   Elementary bivariate analysis.

Designed for students with interests in the biological or social sciences.

Freshman course.   Prerequisite, Mathematics 101 *or* 103.

Hours   D, L, M   MEMBERS OF THE DEPARTMENT

105   Concepts in the Calculus

Intuitive introduction to the ideas of the calculus, including functions, graphs, derivatives, integrals, and applications.

Designed for students who do *not* intend to continue the study of Mathematics. Credit will not be given for both Mathematics 105 and Mathematics 101.

Freshman course.

Hours   C, L   MEMBERS OF THE DEPARTMENT

106   Elements of Modern Algebra

Introduction to elementary number theory and to basic concepts of modern algebra.

Designed for students who do *not* intend to continue the study of Mathematics.

Freshman course.

Hours   C, L   MEMBERS OF THE DEPARTMENT

201   Linear Algebra

Linear systems, vector spaces, matrices, determinants, and quadratic forms.

Sophomore course.   Prerequisite, Mathematics 102, 103, *or* 104.

Hours   B, G, J, M   MEMBERS OF THE DEPARTMENT

202   Calculus of Several Variables

Partial derivatives and differentials of vector functions, and applications.   Multiple integration.   Taylor series.

Sophomore course.   Prerequisite, Mathematics 201.

Hours   B, G, M   MEMBERS OF THE DEPARTMENT

204   Intermediate Statistical Inference

Tests of statistical hypotheses, with emphasis on small-sample tests from normal populations: t-test, F-test, chi-square.   Contingency tables and other non-parametric tests.   Introduction to utility theory.   Applications directed towards the behavioral sciences.

Sophomore course.   Prerequisite, Mathematics 104.

Hour   MN   KOZELKA

301-302   Advanced Calculus

Topics in convergence with applications to series, differentiation, and integration. Vectors, differential equations, partial differentiation, multiple integration.

Junior course.   Prerequisite, Mathematics 202.

Hours   301-F, L; 302-F   MEMBERS OF THE DEPARTMENT

[**304   Foundations of Mathematics** *(Not offered 1965-66.)*

A study of the fundamental concepts of mathematics.   The axiomatic method. Theory of sets.   The real number system.   Groups.   Philosophy of mathematics.

Junior course.   Prerequisite, Mathematics 202.

Hour   ]

305-306   Introduction to Abstract Algebra

Axiomatic development of the natural numbers, the integers, and the rational numbers.   Integral domains, fields, rings, groups, vector spaces, matrices, determinants, linear equations.

Non-majors may take the first semester of this course without the second.

Junior course.   Prerequisite, Mathematics 201.

Hour   B   GRABOIS

Williams 1965

[308 *(formerly 303)* *Elementary Number Theory* *(Not offered 1965-66.)*

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.

Junior course. Prerequisite, Mathematics 202.·

Hour D

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310 *Numerical Analysis*

Theory of finite differences, with applications in algebra and calculus. Methods of approximate solution of polynomial equations of high degree and linear systems of high dimension. Numerical differentiation, integration, and approximate solution of differential equations. Consideration of round-off error and stability criteria. Attention will be given to methods for handling large-scale computation using electronic digital computers.

Junior course. Prerequisite, Mathematics 202.

Hour QG

JORDAN

[312 *Theory of Games* *(Not offered 1965-66.)*

Mathematical definition of games: algebraic and geometric interpretation of strategies. The fundamental theorem concerning solutions. The duality theorem relating games and linear programming problems. Degenerate cases and other special problems.

Junior course. Prerequisite, Mathematics 201.

Hour

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401-402 *Advanced Differential Equations*

Theory of functions of a complex variable. Transform methods. Fourier series and orthogonal functions. Partial differential equations.

Senior course. Required course in the major. Single-credit course for non-mathematics majors. Double-credit course with supplementary meetings (*Hour* FR) for mathematics majors. Prerequisite, Mathematics 301-302.

RICHMOND

Hour JK

[407 *Differential Geometry* *(Not offered 1965-66.)*

Theory of curves and surfaces in Euclidean space with emphasis on local intrinsic geometry of surfaces. Introduction to problems in the global theory of surfaces.

Senior course. Prerequisite, Mathematics 301.

Hour DE

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409 *Topology*

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

Senior course. Prerequisite, Mathematics 301, 305.

Hour C

SPENCER

HONORS COURSES

H302 *Advanced Calculus*

A treatment of functions of several variables, differential equations and existence theory with attention to rigor.

Honors course for juniors and seniors. Prerequisite, Mathematics 301.

Hour L

H401-H402 *Advanced Differential Equations and Complex Variables*

Cauchy development of theory of functions of a complex variable.

Topics in the theory of Fourier series, orthogonal functions, and functional analysis with applications.

Senior honors course. Double-credit course with supplementary meetings (*Hour* FR) for mathematics majors. Single-credit course for non-mathematics majors. Prerequisite, Mathematics H302.

Hour JK

SPENCER, OLIVER

H451-452 *Senior Honors Thesis*