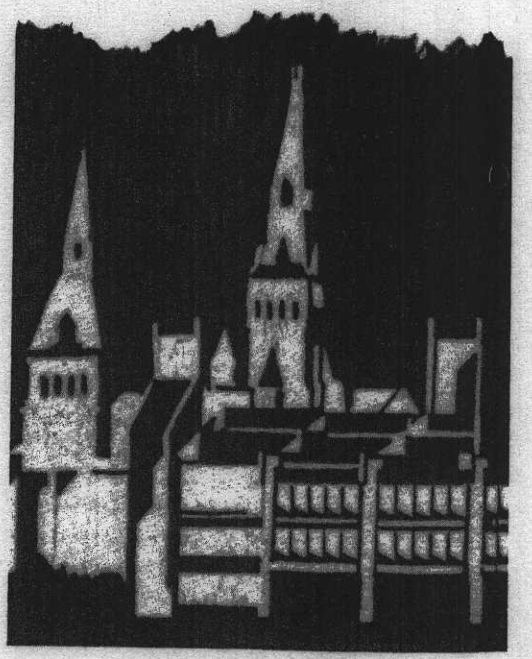

GEORGETOWN UNIVERSITY BULLETIN

UNDERGRADUATE SCHOOLS

1975-1976

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Georgetown 1975-76

COLLEGE OF ARTS AND SCIENCES

ROYDEN B. DAVIS, S.J.	*Dean*
RICHARD H. SULLIVAN	*Associate Dean*
HUBERT J. CLOKE	*Assistant Dean*
H. ROSALIND COWIE	*Assistant Dean*
ANNE D. SULLIVAN	*Assistant to the Dean*

HISTORY

The College of Arts and Sciences of Georgetown University, the oldest Catholic College in the United States, was founded in 1789 by John Carroll, Archbishop of Baltimore. A progressive citizen of his time, he firmly believed in the principles of the United States Constitution. He made it clear that the new college was to be open to students of every religious persuasion.

On March 1, 1815, President James Madison signed the act of Congress which chartered the College of Georgetown. In 1844 it was incorporated by another Congressional act. During the years of the Civil War, Georgetown students fought for the North and South. Later the colors blue and gray were adopted by the College to signify the reunited nation and the sons of Georgetown who had served on both sides in its civil war.

From its founding to the present day the graduates of Georgetown College have taken their places in the forefront of almost every human endeavor. They serve as educators, public servants and statesmen; they work in business, law, medicine and research.

Today, proud of its tradition and heritage, Georgetown, through all its graduates, seeks to serve the communities and the world in which it lives.

OBJECTIVES

The College of Arts and Sciences exists to provide a liberal education for young men and women who will be called to intellectual, moral and professional leadership, and to foster in them a life-long commitment to the quest for truth.

As a Jesuit College, it draws upon a dynamic tradition of education, characterized by an optimistic Christian humanism and committed to the assumption of responsibility and action. Accordingly, the College seeks to encourage the development of critical powers, respect for tradition and human reason, and an appreciation of life and all its endeavors. It promotes not only the intellectual disciplines but also the search for personal values and convictions that will enable its graduates, throughout their lives, to continue redefining and maturing their thought, and also to continue pursuing the integration of their activities, values and relations with others.

In light of these aims, the College has developed a diversified academic program in which fundamental issues and ultimate values play an integral role. A high priority is placed on quality teaching and on developing a community of learning among its faculty, students and administrators.

DEGREE REQUIREMENTS

Candidates for a degree in the College of Arts and Sciences must complete the following graduation requirements:

(1) Minimum of 120 semester hours.
(2) Minimum of 38 semester courses.
(3) *General Education* requirements of 10 semester courses:

Literature	2 courses
Math/Science	2 courses
Social Science	2 courses
Theology	2 courses
Philosophy	2 courses

(4) Selection of a major field of concentration and completion of all requirements of the major as specified by the department.
(5) Comprehensive examination (or its equivalent) in the student's major field.
(6) A final cumulative academic averag a minimal 2.0

NOTE: For the purpose of computing thirty-eight course minimum, a science ure and accompanying lab is counted as ourse. The lab need not be taken in the s emester as the lecture to be counted in anner. A laboratory not related to a cc r any course worth less than three cr ill be computed as half a course.

PPLICATION FOR THE DEGREE

Degrees are awarded three times a ye: May, September and December. Se must file an application for the degree a College Dean's Office. The last day to fi May degree is February 1st; for a Sep er degree, August 1st; for a Decembe gree, November 1st. Failure to apply fc degree may necessitate the postponeme graduation.

Diplomas are distributed at C nencement in May. Those students graduate in September and December part in the Commencement Exercises in or if they prefer, diplomas can be mai their homes in June.

At the beginning of senior year, stu are requested to fill out an "Inforn Sheet" in the College Dean's Office. form supplies information about career and extra-curricular activities during c It is helpful in preparing letters of recor dation.

GENERAL EDUCATION REQUIREMENTS

The general education requirements dinarily fulfilled in the student's Fre and Sophomore years. It is possible t plete virtually all the requirements year.

Out of the normal course load courses in Freshman year, the stude choose no more than two courses in a discipline; this regulation holds for omore year also. In addition, the stude not take two courses in the same disci the same semester during the first two

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(6) A final cumulative academic average of a minimal 2.0

NOTE: For the purpose of computing the thirty-eight course minimum, a science lecture and accompanying lab is counted as one course. The lab need not be taken in the same semester as the lecture to be counted in this manner. A laboratory not related to a course or any course worth less than three credits will be computed as half a course.

APPLICATION FOR THE DEGREE

Degrees are awarded three times a year: in May, September and December. Seniors must file an application for the degree at the College Dean's Office. The last day to file for a May degree is February 1st; for a September degree, August 1st; for a December degree, November 1st. Failure to apply for the degree may necessitate the postponement of graduation.

Diplomas are distributed at Commencement in May. Those students who graduate in September and December take part in the Commencement Exercises in May; or if they prefer, diplomas can be mailed to their homes in June.

At the beginning of senior year, students are requested to fill out an "Information Sheet" in the College Dean's Office. This form supplies information about career plans and extra-curricular activities during college. It is helpful in preparing letters of recommendation.

GENERAL EDUCATION REQUIREMENTS

The general education requirements are ordinarily fulfilled in the student's Freshman and Sophomore years. It is possible to complete virtually all the requirements in one year.

Out of the normal course load of ten courses in Freshman year, the student may choose no more than two courses in any one discipline; this regulation holds for Sophomore year also. In addition, the student may not take two courses in the same discipline in the same semester during the first two years.

Literature

The literature requirement is normally fulfilled by English. Freshmen take a placement test during Freshman Orientation. On the basis of the testing, some students may be admitted to Honors English courses. Other students may be required to complete an additional course in writing. Most students, however, select two courses from the large number of Freshman offerings.

For students of exceptional language ability, the literature requirement may be fulfilled in a foreign language.

Social Science

A full year at the introductory level in one of the following fields satisfies the social science requirement: Economics, Government, History, Psychology, or Sociology.

Math/Science

The math/science requirement may be satisfied in any one of three ways: (1) a one-semester math course and a one-semester science course; (2) two one-semester science courses; (3) a full year sequence of Statistics with Calculus (031, 032), Calculus and Analytic Geometry (057-035, 036), Introductory Biology (023-003, 004), General Chemistry (023-003, 004), or General Physics (081-003, 004).

Philosophy and Theology

Georgetown, with its commitment to the Jesuit tradition, believes that modern men and women should consider reflectively their relationship to the world, their fellow man, and God. All students take a year of Philosophy and a year of Theology.

In Philosophy, Introduction to Philosophy and one elective are required. The Problem of God course or Introduction to Biblical Literature plus one elective are required for Theology.

Language

While there is no general language requirement for College students, some departments do require proficiency through the inter-

mediate level. Language requirements are noted under each major listing below. Language placement tests are available during Freshman Orientation. Students who pass at the advanced level are exempt from the requirement.

If language is not required, elective courses are selected by the student with the help of his or her adviser.

MAJOR CONCENTRATIONS

In the College of Arts and Sciences, the following major fields of concentration lead to a *Bachelor of Arts* degree:

American Studies	History
Classics	Modern Languages
Economics	Philosophy
English	Sociology
Fine Arts	Theology
Government	Interdisciplinary Studies

The following major fields lead to a *Bachelor of Science* degree:

Biology	Physics
Chemistry	Psychology
Mathematics	

At preregistration in the Spring before the end of the Sophomore year, students following a Bachelor of Arts curriculum are obliged to declare formally their major elective field for the ensuing two years. Although every attempt will be made to honor the student's first choice of a major, admission to a particular major shall be by permission of the Department concerned and ultimately of the Dean. Students following a Bachelor of Science curriculum in Biology, Physics, Mathematics, Chemistry or Psychology normally elect their program prior to registration in the Freshman year.

The major program includes the required courses as specified in the curricula. The student must receive departmental approval for all courses in his major field. At the end of the Senior year, each candidate for a degree must pass a comprehensive examination (or its equivalent) in his major field. This comprehensive may be written or oral, or both depending on the department.

The major department may require the student to take a maximum of 12 courses, including basic courses in that major. The student, in turn, may elect a maximum of 14 courses in his major. *It is expected that a science major in Junior and Senior years will elect one non-science course per semester.*

MINOR CONCENTRATIONS

Minor areas of concentration (minors) are permitted, but not required, in the College of Arts & Sciences. The following areas are available for minor concentrations:

Biology	History
Chemistry	Mathematics
Classics	Modern Languages
Computer Science	Philosophy
Economics	Physics
English	Psychology
Fine Arts	Sociology
Government	Theology

Minor areas of concentration should be declared in Junior year; in order to complete requirements for a minor, the student must take the majority of credits in the minor field at Georgetown. Minor requirements are listed under departmental entries.

When a student has declared a double major, a minor is not permitted. Double minors also are not approved.

PREPARATION FOR GRADUATE AND PROFESSIONAL SCHOOLS

A large proportion of the graduates of the College each year go on to graduate and professional schools. The College attempts, through its curricula, programs, and advising system, to give its students strong preparation for graduate work.

Pre-Legal

Georgetown has a long tradition of preparing students to enter the legal profession. The Law Center itself, located near the U.S. Capitol, has grown to national prominence. While there is no "pre-law" curriculum, students preparing for law school should co
trate on courses which require analytic
ng and clear written expression.
Most students who plan to go to law s
ajor in one of the humanities or soci
ces. However, the flexibility of the C
rriculum gives students in any major
portunity to elect courses in areas
ay serve as a background for law. Stu
ho think they may be interested in a
reer should elect such courses as
onstitutional History, Accounting,
riminology. The Associate Dean's
aintains a small but current libra
formation to help those applying t
hools.

Pre-Medical and Pre-Dental

Georgetown offers a number of pro
hich prepare students to enter medi
ntal school. In each of these the st
ust take the following basic pre-me
re-dental courses (a full year of each):

- Mathematics (Calculus)
- General Chemistry
- Organic Chemistry
- Introductory Biology
- Elementary Physics

The B.S. programs with majors in Bi
Chemistry, Mathematics, Physics, and
ology include all or some of the
ourses. The remaining courses on the li
aken as electives to round out the pre-
al/pre-dental requirements. The B.S.
Medical/Pre-Dental programs with maj
Biology, Chemistry, and Physics are
cience programs, and offer more tha
inimum of natural science courses re
for medical school admission.
The A.B. Pre-Medical/Pre-Dental
grams permit a student to major in one
humanities or social sciences, and at the
ime to fulfill the minimum science re
ents for medical or dental school. Fi
cience courses may be taken as electi
e option of the student in consultatio
is or her adviser. The proximity of th
ge to the Georgetown Medical-Dental
r and the Kennedy Institute of Bioeth
ows the student to be exposed t

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cate before the opening of the Fall term with the chairman of the Department. They should present a transcript of their record, and a description or syllabus of the course which they have taken. Such students, if approved in advance by the Department of History, will be allowed to substitute an elective course offered by the Department to the extent that classroom space permits.

History majors are required to complete History 003, 004 and at least eight semester courses in history electives (courses numbered 100 or above) chosen with the approval of the Department. The Department strongly recommends that students planning to major in History take two semester courses in History, and an additional social science course or courses (e.g., Economics 001, 002 and/or Government 001, 002) during their Sophomore year. History majors are also required to demonstrate foreign language proficiency (intermediate level).

The History majors must report to the History Department for selection of a Departmental Adviser before the end of Sophomore year.

The oral comprehensive examination is based upon 24 hours of elective courses, and is administered near the end of the Senior year.

Eighteen hours of History courses are required for a History minor.

HISTORY HONORS. Admission to the History Honors Program should be requested through written application to the chairman of the Department. Students who are accepted into this program will plan their studies with the Director of Honors Studies in History.

Required Courses

General education courses
2 Intermediate language
2 Modern History (044-003, 004)
8 History electives

MATHEMATICS

For a major in Mathematics the candidate is required to complete the following courses: Calculus and Analytic Geometry (Math. 035 through 038), General Physics (Physics 015, 016), Linear Algebra (Math. 202), Modern Algebra I (Math. 203) and Advanced Calculus (Math. 231-232). The student is also required to complete at least four semesters of electives offered in the Department, at the level of 200 or above. Of these, at least two must be in Mathematics proper; the other two may be in Computer Science. A student majoring in Mathematics therefore has the option of concentrating either in Mathematics proper or in Computer Science.

For a minor in Mathematics, the candidate must complete the four-semester sequence of Calculus and Analytic Geometry, and two semesters of upper division courses in Mathematics proper.

For a minor in Computer Science the student is required to take Introduction to Computers (Math. 071) or its equivalent, Calculus and Analytic Geometry III (Math. 037) or Vectors and Matrices (Math. 004), and four semester courses in Computer Science at the 200 level.

Required Courses

General education courses
2 General Physics
4 Calculus and Analytic Geometry
1 Linear Algebra
1 Modern Algebra
2 Advanced Calculus
4 Mathematics electives

MODERN LANGUAGES

The Department of Modern Languages offers a major in French, German and Spanish. In addition to a full year of the advanced level of the language the major field consists of six courses of foreign language electives chosen with the approval of the Department.

Students interested in a modern language major should also give thought to majoring in their chosen language in the School of Languages and Linguistics.

Required Courses

General education courses
French
Normal sequence assuming Intermediate French taken during Freshman year:
Sophomore year: 203-204.
Junior year: 211-212 and 249-250.
Senior year: choice of two of following three 214; 263-264; 271-272.
Qualified advanced undergraduates may take series courses as electives with adviser's appro

German
2 Advanced German
6 German electives

Spanish
2 Advanced Spanish
6 Spanish electives

PHILOSOPHY

All students in the College of Arts and ences are required to take two courses in losophy, one in Freshman year and on Sophomore year. These required course Introduction to Philosophy and an ele from the range of Intermediate Courses.

Those who elect Philosophy as a majo required to take an additional eight sem courses of Philosophy electives. In cases, graduate courses in Philosophy are available to satisfy this requirement. M are expected to work closely with the De ment's Director of Undergraduate Studi with another member of the Departme formulating their program. Students tending to continue their philosophical st on the graduate level are strongly urg take at least two courses both in the histo philosophy and in the main philosop fields. The Department is very receptive terdisciplinary programs of study whe these can be worked out. A student desiri concentrate in Philosophy, either as a r or in the context of an interdisciplinary gram, should submit a proposed progra studies to the Departmental Committe Undergraduate Majors for approval.

Majors in Philosophy are further req to take a special seminar in their Senior (Philosophical Integration). Successful pletion of this seminar, which carries academic credits, satisfies the comprehe amination requirement of the Colle Arts and Sciences.

For a minor in Philosophy, a student quired to complete 18 credits: two ge

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MATHEMATICS
057—

PROFESSORS:
Lagnese (Chairman), Stokes, Weinstein (Emeritus)

PROFESSOR OF COMPUTER SCIENCE:
Maisel

ASSOCIATE PROFESSORS:
Bobo, Datko, Teller

ASSISTANT PROFESSORS:
Benke, Orcutt, Rosier, Sandefur, Sullivan, Vogt

ASSISTANT PROFESSORS OF COMPUTER SCIENCE:
Gnugnoli, Tucker

INSTRUCTORS:
Bradley, Chambers, Loatman

001. Introduction to College Mathematics (3)
This course is designed to assist students whose high school mathematics background is insufficient for the standard Freshman mathematics courses. Topics include algebraic operations, factoring, exponents and logarithms; polynomials, rational functions, the exponential, log and trigonometric functions; graphing. Fall and Spring.

003. Introduction to Calculus (3)
This course is a terminal course for non-science students. Its contents are the concepts of the integral and the derivative; application of differentiation to study properties of polynomials and rational functions; antiderivatives and integrals of polynomials; derivatives and antiderivatives of exponential, logarithmic and trigonometric functions. Prerequisite: Two years of High School algebra or Math 001. Fall and Spring.

004. Vectors and Matrices with Applications (3)
This course provides an introduction to the language and methods of matrix algebra for students in the social sciences, physical sciences, and business administration. Topics covered include: Matrix operations, inverse matrices, determinants and applications to linear equations; basic probability; Markov chains and multiple regression; linear inequalities and linear programming. Prerequisite: Two years of High School algebra or Math 001. Spring only.

005. Introduction to Statistics (3)
This course provides an introduction to descriptive methods; an elementary development of probability theory including sample spaces, random variables and their distributions, the binomial, normal and related distributions; and an introduction to statistical inference including random sampling, estimation of parameters, tests of hypotheses and simple regression and correlation. Prerequisite: Two years of High School algebra or Math 001. Fall and Spring.

031, 032. Statistics with Calculus (4, 4)
Topics are finite probability: finite probability spaces, random variables, probability distributions. Calculus: limits, derivatives, integrals, exponential and logarithmic functions, graphing and computation. Continuous probability: general probability spaces, random variables, distribution and density functions, the normal distribution. Statistics: sampling, estimation and testing, regression and curve fitting, and correlation. Prerequisite: Two years of High School algebra or Math 001.

035, 036. Calculus and Analytic Geometry I, II (4, 4)
This is a fundamental and in-depth study of differential and integral calculus of functions of one variable. Included is the study of sequences and infinite series.

037, 038. Calculus and Analytic Geometry III, IV (4, 4)
This course is a natural sequel to Math 035, 036. It includes a study of vectors and matrices in n-dimensions with applications to multivariate calculus, such as: inner products and cross products, vector functions, the Jacobian matrix, curves and surfaces, Lagrange multipliers, change of variables, line integrals and surface integrals, the divergence theorem. Stokes' theorem.

202. Linear Algebra (3)
Basic properties of finite dimensional vector spaces and linear operators. Topics include: systems of equations, vector spaces, linear transformations, matrices, determinants, inner product spaces, canonical representations of operators. Fall only.

203. Modern Algebra I (3)
Basic algebraic structures and their homomorphisms: groups (including permutation groups, finitely-generated Abelian groups, Sylow theory) and rings (including unique factorization domains, polynomial rings). Prerequisite: Math. 202. Spring only.

204. Modern Algebra II (3)
More basic algebraic structures and their homomorphisms: modules and algebras; Galois theory with its applications to constructions by straightedge and compass and to the solvability of polynomial equations. Prerequisite: Math. 203. Not offered in 1975-76.

211. Number Theory (3)
Basic properties of the integers: divisibility, prime numbers, unique factorization. Congruences and

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quadratic residues: Legendre's and Jacobi's symbol, law of quadratic reciprocity. Number theoretic functions: Euler's function, Möbius; function. Other topics will be chosen from among distribution of primes, sums of squares representations, Riemann's zeta function. Not offered in 1975-76.

212. Numerical Analysis (3)
Development of methods for solving numerical problems on digital computers. Problems discussed include solution of systems of linear equations and nonlinear equations, interpolation, numerical integration, and solution of ordinary differential equations. Work will include solving practical problems using the computer. Not offered in 1975-76.

215. Differential Geometry (3)
The analytic representation of curves and a discussion of arc length and the formulae of Frenet which determine the intrinsic properties of space curves. The theory of surfaces, particularly their representation by curvilinear coordinates; this includes the equations of Gauss-Weingartern and the fundamental theorem of surface theory which states that a surface is uniquely determined by its first and second fundamental forms. The geometry of surfaces which is developed through a study of geodesics. Special topics of interest such as isometric and geodesic mappings, minimal and ruled surfaces. Not offered in 1975-76.

231, 232. Advanced Calculus (3, 3)
Construction of the fields of real and complex numbers. Notions of metric spaces, compactness, with applications in the study of functions. Sequences and series of functions. The Riemann-Stieltjes integral. Topics in the theory of functions of several variables.

233, 234. Probability Theory and Statistics (3, 3)
Probability theory: probability spaces, random variables and their distributions, multivariate distributions, the normal and related distributions, and the central limit theorem. Statistical inference: point and interval estimation, hypothesis testing, chi-square tests, general linear models, linear regression and analysis of variance.

235. Fourier Series (3)
The expansion of a function in Fourier series. Orthogonality. Mean and pointwise convergences. Summation methods. Application to boundary value problems of mathematical physics. Not offered in 1975-76.

236. Introduction to Complex Variables and Applications (3)
Complex numbers. Analytic functions including exponential, logarithmic and trigonometric functions of a complex variable. Geometric and mapping properties of analytic functions. Contour integration, Cauchy's theorem, the Cauchy integral formula. Power series representations. Residues and poles. Conformal mapping and applications as time permits. Not offered in 1975-76.

239, 240. Applied Analysis (3, 3)
Ordinary differential equations with emphasis on the linear theory including techniques of power series solutions; partial differential equations including a study of the classical equations of mathematical physics and the method of separation of variables; orthogonal expansion of functions including Fourier series and Legendre polynomials; complex analysis including Cauchy's integral formula, power series, poles and residues. Prerequisites: Math 035-038 or equivalent. Not offered in 1975-76.

251. Ordinary Differential Equations (3)
Basic theory of systems of linear equations. Methods of solution for systems with constant coefficients. Applications to electrical circuits. Stability theory of linear and non-linear systems, with applications to mechanics. Fall only.

252. Partial Differential Equations (3)
Topics will include: first order equations including Lagrange's method of studying quasi-linear equations, characteristic curves and their role in solving initial value problems; linear second order equations including formal methods of solving them; classification of second order systems and their reduction to normal form; the derivation and use of Green's formula for solving second order equations; boundary value problems for the Laplace equation and for Poisson's equation; the study of initial value and boundary value problems for the wave equation and the heat equation, particularly the technique of separation of variables. Spring only.

253. Mathematical Modeling (3)
This course will expose the student to a wide variety of applications of mathematics in the social, physical, and biological sciences. For each application, there will be a description of the application, a derivation of the mathematical model, an analysis of the model, either analytically, or computationally, and usually both, and an interpretation of the conclusions. Not offered in 1975-76.

254. Linear and Dynamic Programming with Economic Applications (3)
An introduction to two basic optimization techniques, linear programming and dynamic programming. The mathematical theory will be illustrated by applications to production and inventory

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problems, scheduling and network problems. Prerequisites: Math 035-037. Not offered in 1975-76.

Computer Science Courses

070. Introduction to Computers and Their Application (3)
Introduces the student to the computer and the way it is used. Topics discussed include the impact of computers on society, how computers work, applications of computers in business, management, the physical and social sciences and engineering and an overview of programming languages. Spring only.

071. Introduction to Computers with FORTRAN Programming (3)
Introduces the student to computer science as a discipline and to the techniques of algorithmic formulation and FORTRAN programming. Topics discussed include the representation of information on a computer, a survey of computers, programming languages and applications, algorithmic formulation, flow charting and the basic elements of FORTRAN programming. Operating systems and service programs are discussed as time permits.

212. Numerical Analysis (3)
Development of methods for solving numerical problems on digital computers. Problems discussed include solution of systems of linear equations and nonlinear equations, interpolation, numerical integration, and solution of ordinary differential equations. Work will include solving practical problems using the computer. Not offered in 1975-76.

271. Data Structures and PL/1 Programming (3)
Introduces the student to the basic concepts of data structures and implements these basic concepts using PL/1. Topics discussed include the structure and nature of PL/1, list processing internal storage hierarchies and string manipulation, string processing, data structures in formal language and grammars with computer applications. Prerequisites: Math 071 and either Math 004 or Math 037. Spring only.

272. Programming Languages (3)
Acquaints the student with the broad range of general and special purpose computer languages and the techniques for the useful application of these languages. Topics discussed include: PL/1 as a string and list processing language, special purpose list processing languages and their applications, special purpose string processing languages and their application, interactive and data processing languages, programming languages and their application. Prerequisite: Math 271. Fall only.

273. Computer Organization and Assembly Language Programming (3)
Introduces the student to the organization of present day computers, machine and assembly languages. Topics include computer statics such as internal organization, memory, addressing sequences and instruction formats and computer dynamics such as instruction/execution cycle, sequencing and branching. Arithmetic logic and data transfer. Other topics include assembly language programming, segmentation and linkage, relocatability, macros and comparative architecture. Prerequisite: Math 071 or equivalent. Fall only.

274. Operating Systems (3)
Acquaints the student with the nature and purposes of operating systems and the way these purposes are implemented. Topics discussed include: history of the development; types of systems; elements of operating systems: control and calling sequences, service modules, logic and control blocks; job and data management, and recovery and scheduling; utilities and loaders; spooling methods and components. Prerequisites: Math 271 and Math 273. Not offered in 1975-76.

277, 278. Undergraduate Seminar in Computer Science (3, 3)
This course is designed to permit the undergraduate to take part in directed research in computer science. Topics to be discussed will be dictated by the needs of the student. Prerequisites: Math 271 and 273 and Permission of the Instructor.