CATALOGUE

The following bulletins comprise the Catalogue of The University of Texas at Austin:

PART II College of Pharmacy
PART III College of Business Administration
PART IV College of Engineering
PART V General Information
PART VII Graduate School
PART VIII School of Law
PART IX College of Humanities
PART X College of Fine Arts
PART XI School of Communication
PART XII College of Natural Sciences
PART XIII College of Education
PART XIV College of Social and Behavioral Sciences
PART XV School of Architecture
PART XVI Division of General and Comparative Studies

GENERAL PURPOSE OF THE CATALOGUE

The Catalogue Parts of The University of Texas at Austin are intended as a general information, to record the work of the biennium about to close (see Part V), and to make announcements for the ensuing period specified in such case.

As to the courses to be offered the following Long Sessions, the Catalogue contains only a preliminary announcement and is superseded by the Class Schedule, printed each semester.

The Catalogue contains the official regulations. Except as to degree requirements, these regulations are not valid beyond the period specified on the first page.

Statement on Equal Educational Opportunity

With respect to the admission and education of students, with respect to the availability of student loans, grants, scholarships, and job opportunities, with respect to the employment and promotion of teaching and nonteaching personnel, with respect to the student and faculty activities conducted on premises owned or occupied by the University, and with respect to student and faculty housing situated on premises owned or occupied by the University, The University of Texas at Austin shall not discriminate either in favor of or against any person on account of his or her race, creed, color, or national origin.

The University of Texas at Austin
Austin, Texas
Part XII: College of Natural Sciences

Degree Requirements, General

A total of 120 semester hours is required for the B.A. degree, Plan I. This total may include credits received by examination and a maximum of sixteen hours of coursework on a Pass-Fail basis. All students graduated in Plan I must complete the requirements for a departmental major and must complete at least thirty-six hours in residence within the classroom at The University of Texas at Austin. These thirty-six hours must include at least eighteen hours in the major. The completed degree program must include at least thirty-six semester hours in area division courses, of which eighteen semester hours must be in residence.

Degree Requirements, Specific

Specific requirements for the B.A. degree, Plan I, are divided into four areas: A, B, C, and D. With the Dean’s approval, interdepartmental courses, courses offered by other schools and colleges at The University of Texas at Austin, University Courses, and credit by examination may be used to meet these requirements. Such courses may not be used to meet the requirements of special programs of departmental majors without the approval of the program director or the departmental chairman. A course taken to meet the requirements of one area cannot also be used to satisfy the requirements of another area. No courses in areas may be taken on a Pass-Fail basis.

A. Prescribed Work

Area A

English: (a) English 306, 307, and either 310, 312L, 312M, 314K, 317, or 318M.
(b) English 306, 308, and either 312L, 312M, or 314K.

Foreign Language: Students continuing a study of the language for which they present two high-school admission units must pass four semesters in the new language, including the beginning course. Students who have no foreign language in high school must take the beginning course in a language without degree credit to remove their language deficiency, then satisfy the equivalent of three semesters beyond that course in the same language to fulfill their foreign language requirement.

The foreign language requirement is the attainment of a certain proficiency rather than the completion of a specified number of hours; any of these required semesters may be fulfilled by credit by examination. Students may accelerate their progress at any point in the sequence by means of credit by examination.

A student may not receive degree credit for two entrance units in a foreign language and Course 406 in that same language. A single foreign language and presented under Group C of the entrance requirement is not accepted in this restriction.

A student who has received credit for prior work in Latin, either in high school or college, should consult the Chairman of the Department of Classics, who will designate the Latin course for which he should enroll.

In order to achieve proficiency in a foreign language as rapidly as possible, all students are urged to take advantage of the intensive foreign language study program. Detailed information about this program may be obtained from the co-ordinator of the appropriate language department. Courses toward fulfillment of the foreign language requirement must be "language" courses; e.g., literature in translation courses will not count.

Area B

Eighteen semester hours, distributed among at least four of the subareas listed below, for meeting the legislative degree requirement of six semester hours each in American government and American history, only three semester hours of which may be by examination in each subject may be used. None of these courses, including those to satisfy the government and history requirement, can be taken on a Pass-Fail basis.

Legislative requirement (six hours each):

1. American government
2. American history

Three hours each from any two of the subareas listed below:

1. Anthropology
2. Economics
3. Geography
4. Linguistics
5. Psychology
6. Sociology

Area C

Three semester hours, with no more than nine in any one department, from seven areas as listed below.

Areas courses at the level of Mathematics 301, 301E or their equivalent, cannot be counted toward the Area C requirement or toward the total hours required for the degree if taken September, 1972, or later.

A minimum of three semester hours in courses in history of science and philosophy of science may be used to fulfill Area C requirements. Such courses will have a minimum prerequisite of six hours of biological or physical sciences.

These semester hours may include courses listed in two or more departments which may be used as a course in only one department in fulfilling requirements under Area C.

1. Astronomy
2. Botany
3. Biology
4. Chemistry

Course taken to satisfy Area B requirements cannot also be used to satisfy requirements in this area.
Degrees, Programs, and Requirements in the College

Requirements in Order of Work

Each student is required to register for the beginning course in English in his first long-session semester at the University, unless he has received credit by transfer or by examination. If he does not pass the course, he should repeat it in a succeeding long-session semester until a satisfactory grade is received.

In general, it is desirable that a student register for a foreign language course in his first long-session semester and continue the foreign language sequence until the requirement is complete. A freshman may not begin two first-semester language courses; neither may a freshman register for more than eight semester days in one department per semester.

Each regularly enrolled student shall have completed fifteen semester hours of required courses by the end of his first long session (or two long-session semesters in residence), thirty semester hours by the end of the second, and forty-five semester hours by the end of the third, counting credits and exemptions earned by transfer by examination. If this number of hours is not successfully passed at the end of the specified periods, the student must register for a minimum of nine semester hours of required courses in each long-session semester in residence until the deficiency is removed.

If there is a conflict between these requirements and orderly progress in the student's major course program, or if he is not ready to declare his major, he may be advised by the Dean upon recommendation of the departmental chairman or the program supervisor in the student's major field. Major course program is designed to mean all work, in any department, necessary to the program.

C. Special Concentrations

Within the general requirements for the degree of Bachelor of Arts and the requirements of the student's major department or subject, a student may also acquire a concentration in one of several special programs (see the catalogue in the Division of General and Comparative Studies). These programs are approved by the Division of General and Comparative Studies, under the direction of the Dean.

D. Majors

Major Requirement: The B.A. Plan I degree requires the completion of all requirements for one major, as specified in the catalogue of the College of Humanities, the College of Natural Sciences, the College of Social and Behavioral Sciences, and the Division of General and Comparative Studies.

These majors are:

- College of Humanities: Classics, Czech, English, French, German, Greek, Hebrew, Italian, Latin, Oriental and African Languages and Literatures, Philosophy, Portuguese, Russian, Scandinavian, and Spanish.
- College of Natural Sciences: Astronomy, Biochemistry, Biology, Botany, Chemistry, Computer Sciences, Geology, Meteorology, Mathematics, Physics, and Zoology.
Part XII: College of Natural Sciences

BIOLGY

The biology degree program is offered by the Division of Biological Sciences. Students electing this degree program shall have completed at least 32 semester hours from Biology 302, 303, 304, 205 and 206 (or their equivalents). Two years in biological sciences with laboratory, one of which must be upper-division required and all programs of this major must be approved by the student's major.

Major: Twenty-four additional semester hours of biology (Botany, Microbiology, and Zoology) with the following requirements: (a) At least twelve semester hours must be in upper-division courses; (b) at least one course must be taken in each department; (c) of the twenty-four semester hours offered for the major, one course from an approved list must be selected from each of the following majors: (1) Cellular or molecular biology, (2) genetics or evolutionary organismal or environmental biology, (4) physiological or developmental biology. Each course taken at The University of Texas at Austin and counted as satisfying the major requirement must be passed with a grade of at least C.

Minor: General chemistry and organic chemistry (Chemistry 610 and 611L or 110L [or 810], or 618 and 118K and 118L [or 818] or their equivalents), at least six semester hours of mathematics, or six semester hours of computer sciences, or six semester hours of physics (Physics 305K, 302L, 406M, 407 or 307 or their equivalents).

BOTANY

Major: Botany 420, 421, 423, 374 or 478, 419 or 462, Zoology 325 and additional courses in botany only one of which may be Botany 377.

Minor: Twelve semester hours of chemistry including Chemistry 310 or 410K (or 810A).

Additional electives from anthropology, chemistry, geography, geology, archaeology, studies, mathematics, microbiology, physics, or zoology are recommended.

CHEMISTRY

Not less than eight semester hours of mathematics, including not less than five semester hours of differential and integral calculus, and Physics 401 and 402 required of all students majoring in chemistry.

Major: Chemistry 301, 302, 204, 610 and 110K and 110L (or 810), or 618 and 118K and 118L (or 818), 353, 153K, 394 (or 354L), 345, 455, 478K.

Minor: Twelve semester hours of botany and/or zoology, geology, mathematics, microbiology, or physics; or, with written consent of the departmental adviser and approval of the Dean, twelve semester hours in a subject offered at or below College of Natural Sciences.

COMPUTER SCIENCES

Major: Mathematics 308 and 311, and eighteen semester hours of upper-division computer sciences courses, including Computer Sciences 327 and 337 and five semester hours of numerical mathematics (normally Computer Sciences 34 is the most advanced 368K or 369L are also acceptable). A grade of C or better required in each upper-division course offered for the major requirements. One Computer Sciences 370 course may be counted toward the major requirement.

GEOLGY

GEOLOGICAL SCIENCES

Geology must make a grade of at least C in each semester of each course required in fulfillment of the requirements for the degree.

Major: Geology 301 or 303, 404, 416K, 416L, 416M, 420K, 321, 422K, 428, 429, or equivalent courses to make a total of thirty semester hours.

Minor: Twelve semester hours of which six must be upper-division, in any one of the following disciplines: Anthropology, astronomy, any biological science, history, administration, Computers science, chemistry, education, engineering, geology, mathematics, physics. Other disciplines may be chosen with written approval of the Chairman of the Department of Geological Sciences.

HOME ECONOMICS

Home Economics: Thirty semester hours of home economics, of which at least fifteen must be upper-division. No more than fifteen hours of lower-division courses may be counted toward the degree.

MATHEMATICS

Major: A minimum of thirty-two semester hours of mathematics, including Advanced Mathematics 308 or the equivalent, 311, 665A, 372K, and at least nine additional upper-division hours of mathematics. The courses 308A, 308B, 311, 665A, and 372K must each be passed with a minimum grade of C. Each student should consult his advisor for help in choosing courses consistent with his educational goals.

MICROBIOLOGY

Six semester hours of organic chemistry, at least six semester hours of mathematics, and eight semester hours of physics are required for all students majoring in microbiology.

Minor: Three semester hours of biology and twenty-four semester hours of mathematics, including Microbiology 362. At least sixteen hours of microbiology must be upper-division courses.

PHYSICS

All students majoring in physics must take Chemistry 301, 302, and 204.

Major: Fifteen semester hours of upper-division physics.

Minor: Twelve semester hours of mathematics of which six must be upper-division and include three semester hours of differential equations.

ZOOLOGY

Six semester hours of upper-division mathematics beyond Mathematics 305G (may be Pass-Fail) are required of all students majoring in zoology.
Part XII: College of Natural Sciences

2. Curriculum and Instruction 332S, 667S, 370S, 371; Educational Psychology 332S.


4. In order to meet the minimum general education requirements for undergraduate degrees, the student who enters the University with an admitted deficiency of two units in foreign language must choose three semester hours elective from the area of the basic courses: Accounting, drawing, foreign language, logic, mathematics, statistics, music theory.

Option VI: Interior Design

1. Art 305 and three semester hours of upper-division European art or architectural history. (See "Course Numbers" in the General Information Bulletin.)
2. Six semester hours of chemistry or physics; six semester hours of biology or Zoology 311K and 316K.
3. Drawing 208 and three semester hours from Architecture 301 or Art 302 or 302.
4. Choice of Art 301K, 302K, 302L; or Architecture 411D, 417D.
5. Speech 319 and three semester hours from advertising, business law, marketing.
6. Six semester hours of economics, psychology, and/or sociology.

8. In order to meet the minimum general education requirements for undergraduate degrees, the student who enters the University with an admitted deficiency of two units in foreign language must choose one semester hour elective from the area of the basic courses: Accounting, drawing, foreign language, logic, mathematics, statistics, music theory, unless Architecture 411D is taken.

Option VII: Child Development

1. Eighteen semester hours in education, including Curriculum and Instruction 667K and Educational Psychology 371; and nine semester hours from Curriculum and Instruction 632K, 371, Educational Psychology 332E, Special Education 332.
2. Six semester hours of chemistry or physics; six semester hours of biology or Zoology 311K and 316K.
3. Three semester hours of sociology or cultural anthropology; six semester hours of psychology with at least three being upper-division.
5. Three semester hours of mathematics or computer sciences.

* Prerequisite for Curriculum and Instruction 607K: A grade-point average of at least 2.0 on all courses undertaken at The University of Texas at Austin.
approved courses offered in the College of Business Administration may be substituted for economics. The science requirement may be fulfilled by approved courses in the College of Engineering. Additional courses that may be of interest to mathematics majors are offered by various departments in these colleges.

First Year: Mathematics 808; six semester hours of English; Courses 406 and 407 in a foreign language; three semester hours from requirement 5 above; two semester hours from requirement 6 above; three semester hours of electives.

Second Year: Mathematics 311 and six additional semester hours of mathematics; six semester hours of English; third semester of foreign language; five semester hours of American history; ten semester hours of electives. (Campus Sciences 404G is recommended.)

Third Year: Mathematics 665a and nine additional semester hours of upper-division mathematics (probability is recommended); eight semester hours of science from requirement 6 above; six semester hours of American government; six semester hours of upper-division electives.

Fourth Year: Mathematics 373K and nine additional semester hours of upper-division mathematics; three semester hours from requirement 7 above; two semester hours of non-science upper-division electives; six semester hours of additional electives; five semester hours of additional electives.

BACHELOR OF SCIENCE IN MEDICAL TECHNOLOGY

This degree is designed to enable the student preparing for medical technology simultaneously to earn the Bachelor of Science degree within the usual four-year period and to complete the technical training required for certification by the Registry of Medical Technologists. The purpose of this degree is to meet the increasing demands of the medical sciences for technologists with a high level of science background and a greater degree of technical competence than that which can be attained by satisfying the minimum Registry requirements.

A. Prescribed Work

1. Nine semester hours of English including English 306.
2. Courses 406 and 407 in a foreign language (or such portion thereof as will be required by the score on the language test). Beginning foreign language will not count toward the 100 hours if it duplicates the language used by the entrance requirement or if the student has a foreign language entrance deficiency.
3. Six semester hours of American history.
4. Six semester hours of mathematics.
5. Six semester hours chosen from the following: Psychology 301 (recommended), Anthropology 302, classical civilization (except literature in translation), economics, or sociology.
6. Three semester hours chosen from the following: Technical writing, creative writing, English literature (one of these three is recommended), architecture, art, drama, linguistics, a literature course in a foreign language, music, or speech.
7. One course chosen from the following: Computer Science 404G, Mathematics 365G, 808a, Statistics 310, or Zoology 350. (Computer Science 404G is recommended.)
8. Biology 302 and 303 or the equivalent.

B. Special Requirements

The student must make a grade-point average of at least 2.0 on the courses at The University of Texas at Austin which are required and counted toward the degree.

C. Order and Choice of Work

The student should consult with the faculty adviser each semester regarding the order and choice of work. Students should complete the requirements both for general chemistry (Chemistry 301, 302, and 204) and for biology (Biology 302 at 303) during the first year, since these courses are prerequisite for courses in the second year. Organic chemistry (Chemistry 310 and 311 or 310 and 311B or 311K and 311L or 810 and 311K and 311L or 818B) should be completed as soon as possible, since it is prerequisite for Microbiology 249 and Chemistry 249.

None of the work prescribed for the fourth year of this curriculum can be used toward the minimum residence requirement.

BACHELOR OF SCIENCE IN PHYSICS

A. Prescribed Work

1. Nine semester hours of English including English 306 (or the equivalent).
2. Twenty-four semester hours of mathematics.
3. Eight semester hours of chemistry approved by the Department of Physics.
4. Five semester hours of geological or biological science, including laboratory.
Part XII: College of Natural Sciences

354M. Structure and Function of Marine Animals.—May count as junior only one of the following courses: Marine Studies 354M, 352.3, 352.4. 354M. Comparative physiology of selected marine animals (fishes and invertebrates); adaptive mechanisms and relationships of environments. Prerequisite: Upper-division standing in zoology and consent of instructor. Laboratory fee. (Prior to 1975–1976, given as Marine Studies 352.7)

354N. Physical Oceanography.—Same as Meteorology 376. Only one of the following courses may be counted: Marine Studies 354N, 352.10, 382.11, 384N. An introduction to the physical properties of sea water and the physical processes in the ocean, including energy exchanges, wave and tidal motions, and the general circulation. Prerequisite: Calculus and a course in physics. Laboratory fee. (Prior to 1975–1976, given as Marine Studies 352.10)

354P. Marine Meteorology.—May count as junior only one of the following courses: Marine Studies 354P, 352.11, 382.11, 384P. An introduction to the general structure of the marine atmosphere, air-sea interaction and meso-scale components of the general circulation. Prerequisite: Calculus and a course in meteorology. (Prior to 1975–1976, given as Marine Studies 352.11)

Graduate Courses

680. Research in Marine Studies.


383. Topics in Marine Studies.

384. Marine Invertebrates.

384E. Marine Microbial Ecology.

384F. Marine Geology.

384G. Biology of the Microalgae.

384K. Ecology of Fishes.

384L. Marine Chemistry.

384M. Structure and Function of Marine Animals.

384N. Physical Oceanography.

384P. Marine Meteorology.


690. General Marine Studies.

191. Seminar in Marine Studies.

Mathematics

DEPARTMENT OF MATHEMATICS

PROFESSOR BLEDSOE, CHAIRMAN

PROFESSORS EMERITUS: CRAIG, ETTLINGER, LUBKEN, MOORE, NANCE, PRUSS; PROFESSORS BEMBERG, BLEDSOE, CAMERON, CHARNER, CHURCH, EDMONSON, GARDNER, GEIL, GILLHAM, GREENWOOD, GREY, GUY, JOHN, LACEY, LORENTZ, OLSON, OSBORNE, SCHUMACHER, YOUNG; VISITING PROFESSORS BING, ROTA, SCHROEDER, SHIBA;

ASSISTANT PROFESSOR EMERITUS: WEISS; ASSOCIATE PROFESSORS ARMANDARIZ, BESS, BENTON, BICHTEL, CALD, CARRY, DANIEL, DOLLARD, DURKIN, EATON, GILBERT, GROSSENFELD, SHAW, SHERWOOD, THOMAS, VICK, WALSTON; VISITING ASSOCIATE PROFESSORS BEIBLICH, BRESS, RALLIS; ASSISTANT PROFESSORS ALEXANDER, BEAN, BENSON, CHAO, CHESTER, DIETRICH, FISHER, FRIEDMAN, GERTH, HALL, HAMER, HURT, JARROBINO, JOSHI, KROWN, LEHT, McADAM, PIGLEY, PLEDGER, POND, RUSSELL, SMITH, SPOHLEN, SPEISER, STARBIRD, WHITE, WOJASZENK, WILK.

Lower-Division Courses

All students should consult an advisor before registering for Mathematics 908. The advisor will determine on the basis of the student's background and CEEB aptitude Level I Achievement Test results whether the student should proceed for grades only by Mathematics 305G. Students may take an examination for credit in Mathematics 305G.

77. Introduction to Mathematics.—May not be included in the major requirements for the Bachelor of Arts or Bachelor of Science degrees with a major in mathematics. May be repeated for credit when the topics vary. May be used to satisfy the Area C requirements for the Bachelor of Arts degree under Plan I or mathematics requirement for the Bachelor of Science degree under Plan II. Intended primarily for general liberal arts students. Designed to enable students to study and experience the nature and techniques of mathematics. Topics include history and development of mathematical sciences, axiomatic mathematics, models and applications.

81. Mathematics for Business and Economics.—Only one of the following may count: Mathematics 603b, 808, 608E, 808E, 613, 613E. May not be included in a major requirement for the Bachelor of Arts or Bachelor of Science degrees in mathematics. First semester: Logic, sets, permutations, combinations, probability, relations, functions, inequalities, introduction to linear programs. Second semester: Linear programming, functions, analytic geometry, calculus of elementary functions. Either half may be taken for independent study. Prerequisite: For Mathematics 603b, 803a or consent of instructor. Three hours a week for two semesters.

82. Mathematics of Investment.—May not be included in the major requirements for the Bachelor of Arts or Bachelor of Science degrees with a major in mathematics. Simple and compound interest, equivalent rates, equivalent values, annuities, amortization, sinking funds, bonds, depreciation.

*This list, for the sessions of 1973–1974 and 1974–1975, includes all staff members of professional rank.
Part XII: College of Natural Sciences

305G. Elementary Functions and Co-ordinate Geometry.—May not be counted by students with credit for Mathematics 304 or 304E. Only one of the following may be included in the major requirement for the Bachelor of Arts or Bachelor of Science degree with a major in mathematics: Mathematics 305G, 304, 305, 305E. Study of elementary functions, their graphs and applications including polynomial, rational, and algebraic functions, exponential, logarithmic, and hyperbolic functions.

308B. Calculus I and II.—Only one of the following may be counted: Mathematics, 308, 603B, 608E, 808E, 613, 613E. Introduction to the theory and applications of differential and integral calculus, including functions of several variables. Topics will include the real numbers, functions, analytic geometry, limits, derivatives, mean value theorems, fundamental theorem of calculus, derivative techniques, areas, volumes, moments, arc lengths, problems involving maxima and minima, functions of several variables, series, parametric and polar coordinates. Certain sections are designated as intended primarily for well-prepared students of mathematics and mathematically oriented sciences who wish to investigate more carefully the foundations of calculus. Either half may be taken for independent credit. Prerequisite: For 308A, four years of high school mathematics and satisfactory score on the CEEB Mathematics Level I Achievement Test, or Mathematics 305G; for 308B, Mathematics 308A with a grade of at least C, or consent of instructor. Three lectures and two discussion sessions a week for two semesters.

311. Linear Algebra and Matrix Theory.—Linear equations and matrices, linear mapping, determinants, quadratic forms. Prerequisite: Mathematics 311 or consent of instructor.

315K. Elementary Set Theory and Logic.—Naive set theory, relation and functions, equivalent sets, cardinal arithmetic, induction, introduction to symbolic logic, and other related topics. Prerequisite: Mathematics 308.

316. Elementary Statistical Methods.—May not be included in the major requirement for the Bachelor of Arts or Bachelor of Science degrees with a major in mathematics. Graphical presentation, frequency functions, distribution functions, averages, standard deviation, variance, curve-fitting, and related topics.

316K. Modern Topics in Elementary Mathematics I.—Mathematics 316K or 360M may not both be counted. May count as an upper-division course toward the degree of Bachelor of Science in Elementary Education. Selected topics in mathematical analysis, with emphasis on the development of basic concepts of mathematical thinking needed for elementary teachers. Prerequisite: Consent of elementary education advisor or mathematics education advisor.

316L. Modern Topics in Elementary Mathematics II.—Mathematics 316L or 360N may not both be counted. May count as an upper-division course toward the degree of Bachelor of Science in Elementary Education. Selected topics in mathematics, with emphasis on the development of basic concepts of mathematical thinking needed for elementary teachers. Prerequisite: Mathematics 316K.

317. Advanced Calculus for Applications I.—Only one of the following may be counted: Mathematics 427K, 318L, 319E, 326. Infinite series, ordinary and partial differential equations. Prerequisite: Mathematics 308. Four lectures a week for one semester.

318L. Advanced Calculus for Applications II.—Matrices, elements of vector analysis and calculus of functions of several variables, including gradient, divergence, and curl of a vector field, multiple integrals and chain rules, length of arc, line and surface integrals, Green's theorems in the plane and space, vector analysis. Prerequisite: Mathematics 308 or the equivalent. Four lectures a week for one semester.

319E. First Course in the Theory of Numbers.—Properties of the integers, divisibility, linear and quadratic forms, prime numbers, congruences and residues, quadratic reciprocity, number theoretic functions. Prerequisite: Eleven hours of mathematics and upper-division standing or consent of instructor.

321. Structure of Modern Geometry.—Basic ideas of plane and solid geometry; ruler and compass constructions; representation of space objects by plane projections; use of these ideas in teaching plane and solid geometry. Prerequisite: Mathematics 343K, or upper-division standing and consent of instructor.

322. Matrices and Matrix Calculations.—Techniques of matrix calculation. Prerequisite: Mathematics 308 or the equivalent.

323. Introduction to Algebraic Structures.—Elementary properties of groups and rings, including symmetric groups, properties of the integers, polynomial rings, elementary field theory. Prerequisite: Mathematics 311 or consent of instructor.

324. A Survey of Numerical Techniques.—Mathematics 348 and Computer Sciences 348 may not both be counted. Meets with Computer Sciences 348. May not be counted in fulfilling the major requirements for a master's degree in mathematics. Emphasizes the derivations and applications of numerical techniques most frequently used by scientists and engineers; interpolation; approximation; numerical differentiation and integration; differential equations; zeros of functions; stability of linear systems; material supplemented by problems to be solved on a high-speed digital computer. Prerequisite: Mathematics 308 or consent of instructor; Computer Sciences 404G (or 304G). Laboratory fee, $4.

325. Topics in Modern Mathematics I.—May be repeated for credit when topics vary. Designed especially for high-school mathematics teachers. May not be counted in fulfilling the major requirements for a bachelor's or master's degree in mathematics. Prerequisite: Six hours of college mathematics; or a valid teacher's certificate in science, two years of teaching experience, and consent of instructor.

326. Topics in Modern Mathematics II.—May be repeated for credit. Designed especially for high-school mathematics teachers. May not be counted in fulfilling the major requirements for a bachelor's or master's degree in mathematics. Prerequisite: Mathematics 360K.
360R. Topics in Mathematics for Advanced Business Administration and Economics.—May be repeated for credit when the topics vary. May not be counted fulfilling the major requirements for a bachelor's or master's degree in mathematics. Prerequisite: Six hours of college mathematics, upper-division status, and consent of instructor.

361. Theory of Functions of a Complex Variable.—Elementary theory and applications of analytic functions, series, contour integration, and conformal mappings. Prerequisite: Mathematics 427K or 665a, or upper-division standing and consent of instructor.

362K. Probability I.—An introductory course in the mathematical theory of probability; this course is fundamental to further work in probability and statistics. Prerequisite: Mathematics 609.

362L. Probability II.—Continuation of Mathematics 362K. Prerequisite: Mathematics 362K.

362M. Introduction to Stochastic Processes.—Introduction to Markov chains, birth and death processes, and other topics. Prerequisite: Mathematics 609 or equivalent. (Not yet given.)

364K. Vector and Tensor Analysis I.—Invariance, vector algebra and calculus, integral theorems, general co-ordinates, introductory differential geometry, tensor analysis, applications. Prerequisite: Mathematics 427K or 427L.

364L. Vector and Tensor Analysis II.—Continuation of Mathematics 364K with emphasis on tensor and exterior analysis, Riemannian geometry, and invariance. Prerequisite: Mathematics 364K.

365. Introduction to Analysis.—An introduction to basic concepts and techniques in analysis. The first semester bridges the gap between elementary calculus (808) and more advanced courses in analysis, primarily by putting the elementary calculus of functions of one real variable on a rigorous foundation. Topics include axioms for the real numbers, elementary topology of the line, limits, continuity and differentiability, the intermediate value theorem, and the mean value theorem, the Riemann integral, and the fundamental theorem of calculus for continuous function on a closed interval. The second semester, which is a continuation of the first, includes topics in functions of several variables. Either may be taken for independent credit. Prerequisite: For 665a, Mathematics 808 or 311, or consent of instructor; for 665b, Mathematics 665a. Three lectures a week for two semesters.

367K. Topology I.—An introduction to topology, including sets, functions, cardinal numbers, and the topology of metric spaces. Prerequisite: Mathematics 311 or consent of instructor.

367L. Topology II.—Various topics in topology, primarily of a geometrical nature. Prerequisite: Mathematics 367K or consent of instructor. (Not yet given.)

368K. Introduction to Numerical Analysis.—Mathematics 368K and Computer Sciences 368K may not both be counted. Meets with Computer Sciences 368K. A basic mathematical treatment of numerical methods; interpolation and approximation; numerical differentiation and integration; solution of ordinary differential equations; zeros of functions; material supplemented by problems to be solved on a high-speed digital computer. Prerequisite: Mathematics 427K and Computer Sciences 494G or consent of instructor. Laboratory required.

369L. Introduction to Numerical Linear Algebra.—Mathematics 369L and Computer Sciences 369L may not both be counted. Meets with Computer Sciences 369L. A survey of computational methods in linear algebra; direct solution of linear systems; norms and condition numbers, the linear least squares problem; eigenvalues and eigenvectors; material supplemented by problems to be solved on a high-speed digital computer. Prerequisite: Mathematics 340L and Computer Sciences 494G or consent of instructor. Mathematics 311 is also recommended.

406B. Mathematical Analysis for Advanced Physical Chemistry.—Either half may be taken for independent credit. The mathematics of thermodynamics, quan- tum mechanics, and statistical mechanics. Topics include ordinary differential equations and special functions, partial differential equations, matrix algebra, and numerical calculations. Prerequisite: Mathematics 427K and 427L. Three hours a week for two semesters.

408K. Differential Equations I.—Discussion of existence, uniqueness, and qualitative properties of solutions; methods for representation of solutions. Prerequisite: Mathematics 427K or 665a or consent of instructor.

408L. Differential Equations II.—Topics in differential equations. Prerequisite: Mathematics 570K or consent of instructor.

411. Fourier Series and Boundary Value Problems.—Discussion of differential equations of mathematical physics and representation of solutions by Green's functions and eigenfunction expansions. Prerequisite: Mathematics 427K or 427L.

412K. Algebraic Structures I.—A study of groups, rings, and fields, including the theory of finite groups, isomorphism theorems, polynomial rings, and principal ideal domains. Prerequisite: Mathematics 311.

412L. Algebraic Structures II.—Topics from vector spaces and modules, including direct sum decompositions, dual spaces, canonical forms, and multilinear algebra. Prerequisite: Mathematics 373K.

414K. Fourier and Laplace Transforms.—Operational properties and applications of Laplace transforms, some properties of Fourier transforms. Prerequisite: Mathematics 427K.

414L. Fourier and Laplace Transforms.—Continuation of Mathematics 414K. Introduction to other integral transforms such as Hankel, Laguerre, Mellin, Z, etc. Prerequisite: Mathematics 374.
Part XII: College of Natural Sciences

375. Conference Course.—May be repeated for credit. Prerequisite: Upper division standing in mathematics and consent of instructor.

676. Methods of Applied Mathematics.—May be repeated for credit when topics vary. A unified treatment of various methods of applied mathematics with discussion of linear spaces, spectral theory of operators, Green's functions, and elementary theory of distributions; the precise contents will depend on the interest of the instructor. Prerequisite: Mathematics 427K and 427L, or 565S. Three lectures a week for two semesters.


378L. Introduction to Decision Theory.—Topics in estimation and hypothesis testing, and an introduction to game theory from the decision theoretic viewpoint. Prerequisite: Mathematics 362K. (Not yet given.)

378M. Statistical Methods.—Analysis of variance, factorial experiments, and regression analysis; emphasis on applications. Prerequisite: Upper division standing, an introductory statistics course, and consent of instructor. (Given for the first time in 1974–1975.)

379K. Functions of Several Variables.—Line integrals, differentiable functions on Euclidean spaces, calculus of alternating forms, Stokes' theorem, Green's theorem. Prerequisite: Mathematics 665A.

379L. Introduction to Differential Geometry.—Differential geometry of curves and surfaces, tensor analysis, smooth manifolds. Prerequisite: Mathematics 379K. (Given for the first time in 1973–1974.)

Graduate Courses

680C. Algebra.
681C. Real and Abstract Analysis.
681D. Complex Analysis.
682C. General Topology.
682D. Algebraic Topology.
682E. Differential Geometry.
684D. Mathematical Statistics.
684E. Analysis of Variance and Design of Experiments.

PHYSICAL SCIENCE

Lower-Division Courses

38. Introductory Physical Science I: Mechanics and Temperature.—Only one of the following may be counted without prior approval of the department: Physical Science 304, 3021, 403K, 403L, 609D, 527A. Inquiry laboratory approach to basic concepts of motion and of objects. Designed for students with some prior preparation in mathematics and physics. Four hours of integrated laboratory and lecture a week for one semester. Laboratory fee, $2.

39. Introductory Physical Science II: Substances, Heat, Electricity.—Only one of the following may be counted without prior approval of the department: Physical Science 304, 3021, 403K, 403L, 609D, 527B. Inquiry laboratory approach to classification of substances by chemical and physical means, current and heat electricity. Mathematics 305 or the equivalent recommended in parallel. Prerequisite: Physical Science 303. Four hours of integrated laboratory plus lecture a week for one semester. Laboratory fee, $2.