

CATALOGUE

The following bulletins comprise the Catalogue of the University:

- PART II *College of Pharmacy*
- PART III *College of Business Administration*
- PART IV *College of Engineering*
- PART V *General Information, Main University*
- PART VI *College of Arts and Sciences*
- PART VII *Graduate School*
- PART VIII *School of Law*
- PART IX *Medical Branch**
- PART X *College of Fine Arts*
- PART XI *School of Communication*
- PART XII *Dental Branch†*
- PART XIII *College of Education*
- PART XIV *The Southwestern Medical School‡*
- PART XV *School of Architecture*
- PART XVI *School of Nursing§*

GENERAL PURPOSE OF THE CATALOGUE

The Catalogue Parts of the Main University are intended to give general information, to record the work of the biennium about to close (except Part V), and to make announcements for the ensuing period specified in each case.

As to the courses to be offered the following Long Sessions, the Catalogue contains only a preliminary announcement and is superseded by the *Final Announcement of Courses*, printed each semester.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 cover page.

* Part IX, catalogue of the Medical Branch, is distributed by the office of the Dean of the Medical Branch, Galveston.

† Part XII, catalogue of the Dental Branch, is distributed by the office of the Dean of the Dental Branch, Houston.

‡ Part XIV, catalogue of the Southwestern Medical School, is distributed by the office of the Dean of the Southwestern Medical School, Dallas.

§ Part XVI, catalogue of the School of Nursing, is distributed by the office of the Dean of the School of Nursing, Galveston.

CATALOGUE NUMBER: PART VI

College of ARTS AND SCIENCES

1963-1964 and 1964-1965

WITH ANNOUNCEMENTS FOR

1965-1966 and 1966-1967



THE UNIVERSITY OF TEXAS
AUSTIN, TEXAS

Dept. Math-
ematics

1. Bachelor of Arts

Plan I: Majors in the various fields of Arts and Sciences, with minors in suitable fields.

Plan II: A liberal arts program for students with high scholastic standing in high school.

2. Bachelor of Science in Architectural Studies

3. Bachelor of Science in Chemistry

4. Bachelor of Science in Geology

5. Bachelor of Science in Home Economics

Option I: For home-making.

Options II-VII: For professional training.

6. Bachelor of Science in Medical Technology

7. Bachelor of Science in Physics

STUDENT RESPONSIBILITY

The student is held responsible for knowing degree requirements and enrolling for courses that fit into his degree program. He is likewise held responsible for knowing the University regulations in regard to the standard of work required for continuance in the University, involving scholastic probation and enforced withdrawal. If he needs information beyond that in this catalogue and the General Information bulletin, he should consult the Office of the Associate Dean of the College of Arts and Sciences.

For a complete list of requirements for a particular degree, the student should combine the general Requirements given below with the Prescribed Work and Special Requirements listed under the specific degree for which he is applying.

GENERAL REQUIREMENTS FOR DEGREES

1. No degree will be conferred except on dates publicly announced.
2. To receive a degree a student must be in residence at the Main University for at least two long-session semesters, or the equivalent period of residence, and must complete in residence at least thirty semester hours in courses offered in the College of Arts and Sciences counting toward the degree.
3. At least twenty-four of the last thirty semester hours offered for credit for an undergraduate degree must be taken in the Main University but not necessarily in residence. In the case of the degrees of Bachelor of Science in Medical Technology, and Bachelor of Science in Architectural Studies, this rule applies to the academic work.
4. No credit earned by correspondence instruction from The University of Texas or elsewhere and no credit earned by enrollment at another college or university while the student is currently enrolled for residence work at The University of Texas will be counted toward a degree in the College of Arts and Sciences unless specifically approved in advance by the Dean of the College of Arts and Sciences, or his representative. Not more than 30 per cent of the semester

hours required for any degree offered in the College of Arts and Sciences may be done by correspondence.

5. No second bachelor's degree will be conferred until the candidate has completed at least twenty-four semester hours in addition to those counted toward the bachelor's degree which requires the higher number of semester hours of credit. However, since the major subject is not shown on the diploma, it is not possible for a student to receive a second Bachelor of Arts degree from The University of Texas.

6. Seniors will not be approved for their degree unless they have complied with the regulations regarding required health and physical education. See the General Information bulletin.

7. An Air Force or Army Reserve Officers Training Corps student who elects the basic and/or advanced program in air science or military science will not be approved for graduation until his Government contract is completed, unless such student is released from the ROTC. (See the section describing the Air Force and Army Reserve Officers Training Corps in the General Information bulletin.)

8. Nine semester hours of air science, military science, or naval science courses may be counted for degree credit only as free nonadvanced electives by those students who complete twenty-four semester hours of such ROTC courses (see p. 42 of this catalogue).

9. No more than twelve semester hours of Bible may be counted toward a degree.

10. Each degree program is arranged in the sequence best calculated to insure orderly progression of the student's college work. A first-semester freshman, if registering for twelve semester hours or more, must include a minimum of nine semester hours of courses (comprising no fewer than three courses) specified under "Prescribed Work" in one of the plans for a degree in the College of Arts and Sciences (for Plan I, items 1 through 6). Likewise, he must include a minimum of nine semester hours of such courses in each long-session semester until he has accumulated forty-eight semester hours of credit. Transfer students with less than forty-eight semester hours of credit are also bound by this regulation. At the Dean's discretion, adjustment may be made when exceptional circumstances exist or when a student has gained credit through advanced placement examination or when the student is enrolling for less than twelve semester hours of credit in a long-session semester.

Applying for a Degree

11. To apply for a bachelor's degree, the applicant must request a Degree Card through the Registrar's Office before March 1 of his junior year. This card consists in part of a photostatic copy of the applicant's record, which is prepared in the Registrar's Office at a nominal cost to the student. The photostat and the degree card application are forwarded to the Dean's Office, where a degree card is prepared. The student is then notified of the courses he lacks and the requirements he must satisfy to receive his degree. Avoidance of errors is the main purpose of the Degree Card; but the student himself is expected (1) to remember that graduation is attained by fulfilling the requirements for a particular degree in one catalogue under which he is entitled to graduate and (2) to register in ac-

cordance with the requirements of that catalogue. *He finally registers entirely at his own risk.*

12. A candidate for a degree must (1) register in the University in the College of Arts and Sciences in the long-session semester or in the summer session in which he is to receive the degree and (2) file with the Dean a Diploma Name Card, preferably at registration in his last semester but not later than one month before the closing date of the semester or summer session in which the degree is to be granted. No degree will be conferred unless the Diploma Name Card has been properly filed with the Dean.

13. It is urged that each candidate attend the Commencement at which his degree is to be conferred.

Graduation under a Particular Catalogue

14. To receive a degree in the College of Arts and Sciences, a student must fulfill all requirements for that degree as set forth in a catalogue under which he is entitled to graduate. A student may always choose to graduate under the current catalogue. A student may graduate under the catalogue in force the year he enrolls in the Main University or that governing any subsequent year in which he is registered in the College of Arts and Sciences. If he registers in the Main University for the first time during a summer session, he may choose to graduate under the catalogue governing the preceding long session or the one for the next long session.

A student who completes by March 1 of any year at least twelve semester hours in extension classes or correspondence work, or both, from The University of Texas which count toward his degree, may choose to graduate under the catalogue applying to that year.

All of these provisions are subject to the limitation that all requirements for a degree in the College of Arts and Sciences must be completed within six years of the date of the catalogue chosen. If a student leaves school to enter military service in a period of emergency, the six-year period is exclusive of his time spent in the service.

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF ARTS

PLAN I

This degree program offers to the student an opportunity for combining a broad cultural education with an emphasis in fields of a major and two minors.

A. Prescribed Work

1. Twelve semester hours of English (English 601 or 601Q, and six semester hours of sophomore English).

2. Six semester hours of mathematics, or Greek 506 and 507, or two semesters of Latin other than Latin 506. Latin 210 may not be counted for this purpose. (A student who begins Latin in the University should take Latin 506, 507, and three semester hours of sophomore Latin.) Some majors do not permit this substitution. See requirements under "C. Majors and Minors." A student who offers courses in

one of the classical languages in satisfaction of this requirement may not offer the same courses toward the satisfaction of Requirement 3.

3. Foreign language: The foreign language requirement is the attainment of a certain proficiency rather than the completion of a specified number of hours. Completion of courses 406 and 407 or 506 and 507 in a foreign language and six semester hours of work beyond that level in the language, generally course 312K and 312L (or 612), or such portion thereof as may be required by the score on the language classification test, meets the requirement. A student offering Latin must take at least six hours of Latin above the level of 507, regardless of the score on the language classification test. 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. A student who chooses a major in the Latin American Institute must take Spanish or Portuguese (see the bulletin of the Institute of Latin American Studies). For the special foreign language requirement for the Eastern European Studies program, see "Eastern European Studies" under "C. Majors and Minors."

If a Romance or Germanic or Slavonic language is used in meeting this requirement, any student with a knowledge of the language, however acquired, may absolve the requirement by passing with a grade of at least *B* the final examination in the highest course called for by the requirement. Application for such a final examination must be made to the chairman of the appropriate language department before a regularly scheduled period of final examinations. A student who, with departmental permission, enrolls without the prerequisite for the most advanced course required may absolve his language requirement by passing this course.

If a student who has taken language at another college believes he is entitled to a standing more advanced than that shown by the University's evaluation of transfer credits, he may request a language classification test to determine whether he may go beyond the level at which he has been placed; or, if he believes he has achieved the proficiency required for the degree, he may request an advanced standing examination in the last course required for the degree.

4. Twelve semester hours in the natural sciences, including (a) six semester hours in a laboratory course in physical science (chemistry or physics) or Physics 609; and (b) Biology 607 or Geology 601 or Zoology 311K and 316K. Special departmental requirements will be found under "C. Majors and Minors."

5. Six semester hours of American government (Government 610).

6. Six semester hours of United States history.

7. The requirements set down below under "C. Majors and Minors."

8. Thirty-six semester hours of advanced courses. (See "Course numbers" in the General Information bulletin.) Not more than twelve of the thirty-six semester hours of advanced courses of this requirement may be taken outside of the College of Arts and Sciences.

For a student who chooses a major in Latin American Studies, eighteen of these thirty-six semester hours of advanced courses must be from Latin American content courses.

9. At least eighteen semester hours of advanced courses, including six se-

semester hours of advanced courses in the major subject must be completed in residence at the Main University.

10. Enough courses to make a total of 120 semester hours. At least twelve semester hours of elective work must be taken in subjects outside the major and minor fields. ("Field" is to be interpreted as referring to broad areas such as natural sciences, social sciences, and foreign languages. In cases of doubt about the proper interpretation, the student or the faculty adviser should consult the Office of the Associate Dean.)

Not more than thirty-six semester hours may be counted in one subject; not more than twelve semester hours in work offered by the Association of Religious Teachers, or their equivalent done elsewhere; not more than twenty-four semester hours in any one of the following semiprofessional or professional subjects or more than thirty semester hours in any combination of them: home economics, architecture, business administration, education, engineering, fine arts, journalism, law, library science, radio-television-film, speech, air science, military science, naval science, pharmacy.

B. Special Requirements

1. The student must make (a) an average of at least one point per semester hour on the courses taken at the University which are required and counted toward the degree, and (b) an average of at least one point per semester hour on the courses taken at the University and counted as the major subject. In addition, majors in English must make a grade of at least *C* in each English course taken at the University and counted as satisfying the major requirement, and majors in geology must make a grade of at least *C* in each semester of each course presented in fulfillment of the requirements for the degree. (See "C. Majors and Minors" below.) An *A* grade on a semester hour counts as 3 points; a *B*, as 2 points; a *C*, as 1 point; a *D* and an *F*, as 0.

2. The student must, not later than three weeks before the end of the semester or summer session in which he expects to take his degree, show such ability to write clear and correct English as to satisfy the Committee on Students' Use of English. To promote the habitual use of clear and correct English, the written work (theses, reports, quizzes, examination papers, etc.) of every student in all his courses is subject to inspection by the Committee. It is the duty of each member of the teaching staff to require that his students shall be careful in their use of English, to give due weight to the students' use of English in making up of grades and to report promptly to the Committee, submitting the evidence, any student whose use of English is seriously defective. If any student be found deficient, the Committee will prescribe for him such work as in its judgment is proper, and this work must be done to the satisfaction of the Committee before the student can obtain his degree.

C. Majors and Minors

The first two years of work in the College of Arts and Sciences prescribe many courses which are basic to all degrees within the College. For this reason it is possible for a student to choose his major as late as the beginning of his junior

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Degrees

year. An earlier choice is preferable, if the student is confident of his preference. Undetermined majors will register with an undetermined majors committee, and members of this committee will be available for consultation to help the student make his eventual choice. Other students are expected to be advised at registration by their major department. The Testing and Counseling Center will arrange for tests that will help the student discover areas of his greatest ability.

The student will note that it is possible to arrange his minors and electives so as to take in effect two majors. Such an arrangement is especially desirable for those who wish to teach two subjects. However, since the major subject is not shown on the diploma, it is not possible for a student to receive a second Bachelor of Arts degree from The University of Texas.

Courses in architecture, business administration, education, engineering, fine arts, journalism, law, library science, pharmacy, radio-television-film, speech, air science, military science, and naval science do not count as majors in the College of Arts and Sciences and may not count as minors except as specified below. A student who chooses fine arts as a first minor will elect or will conform to one of the four programs offered by the College of Fine Arts for minors as follows: For art: Art 305; three hours chosen from the following: 301K, 302K, 363M; six hours of advanced courses chosen from the following: 360K, 360L, 360M, 361M, 362, 362K, 362L, 362M, 366, 367, 378K. For drama: Six hours from the following courses: Drama 301K, 301L, 312K, 312L, 314 (provided 312K or 312L is not taken), 418 (may be taken only once); six hours from the following: 320K, 320L, 360K, 360L (on advice of instructor), 313K, 366, 367. For music: Option 1: Music 302L or 303L, 313L, 330K; three hours of advanced literature chosen from the following: 335, 370, 371, 372, 375, 376, 377, 379K. Option 2: Music 605; six hours of advanced applied music chosen from Courses 420 and 460. For fine arts (general): Philosophy 373 (may not be counted as fine arts by philosophy majors); six hours chosen from the following: Art 305, Drama 314, Music 302L or 303L; three hours (six hours for philosophy majors) chosen from the following: Art 360K or any art history course listed under the minor in art, Drama 367, Music 330K or any senior course in music literature (philosophy majors may take six hours).

Any course taken to meet the requirements under "A. Prescribed Work" counts also toward satisfying the major and minor requirements, unless otherwise specified below.

At least eighteen semester hours of advanced courses, including six semester hours of advanced courses in the major, must be completed in residence at the Main University.

In general, the major and minor requirements are as follows:

Major: Twenty-four semester hours in one of the subjects listed below, of which at least twelve must be in advanced courses. **No freshman course may be counted in fulfillment of the major requirement unless specifically authorized by the major department.**

Minors as listed under the major subject:

First Minor: Twelve semester hours in a field closely related to the major.

Second Minor: Six semester hours in another field supporting the major.

AMERICAN STUDIES

The program must include:

semester hour minor in international studies for the usual departmental first and second minor requirements.

The minor must include International Studies 360 and five other courses from a grouping of courses prescribed by the Committee on International Studies. No courses counted toward the minor may be in the student's major department, and no more than two courses may be in the same department. The foreign language requirements are those of the major department.

LATIN

Major: For those beginning Latin in college, thirty semester hours of Latin, as follows: 506, 507, 311, 312, 623, 224, and 665. For those entering with credits in Latin, twenty-six semester hours of Latin above the freshman level. Such students should consult the Chairman of the Department of Classics for the courses required.

First Minor: Twelve semester hours, of which six must be advanced, in any one of the following: Greek, another foreign language, English, classical civilization, fine arts, ancient history, philosophy.

Second Minor: Six hours of advanced courses in a subject listed above which is not offered as the first minor.

LATIN AMERICAN STUDIES

Major: Twenty-four semester hours in one of the following: anthropology, economics, geography, government, history, Spanish. Eighteen of these twenty-four semester hours must be in advanced courses, including at least twelve hours in Latin American content courses.

No freshman course may be counted in fulfillment of the major requirement except the following: Anthropology 301, 302; Economics 302, 303; Geography 301K, 303K; History 604, 609.

Minor: Twelve semester hours in one of the fields listed above which was not chosen as the major, or twelve semester hours in either business administration or education. At least six of these twelve semester hours must be in Latin American content courses, and the other hours must be in Latin American related courses.

For information concerning Latin American content courses and related courses see the bulletin of the Institute of Latin American Studies.

LINGUISTICS

Major: Twenty-four semester hours including (1) English 318M or German 328, or the equivalent; (2) Linguistics 344K; (3) six semester hours above the level of Course 312L in a foreign language other than the minor; (4) Linguistics 370K and 370L; (5) English 360K or 364K or German 369 or Spanish 367K or the equivalent; (6) English 364L or 364M or Greek 665a or 665b or Latin 665a or 665b or Spanish 373. (Note the prerequisites for these senior courses.)

First Minor: Twelve semester hours of a foreign language not offered in the major or second minor; or twelve semester hours of advanced English; or twelve semester hours of mathematics, including Mathematics 304K and 305K;

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or twelve semester hours of philosophy, including Philosophy 332 and 344; or twelve semester hours of speech, including six hours selected from Speech 311K, 313K, 323K, 337, 341; or with the approval of the Chairman of the Linguistics Program, twelve semester hours of any other subject not offered in the major or second minor.

Second Minor: Linguistics 672, or Portuguese 372 and 374.

MATHEMATICS

Major: Twenty-four semester hours of mathematics above freshman rank, of which at least twelve must be in advanced courses. M

Minor: Twelve semester hours of at least sophomore rank in a second subject offered in the Colleges of Arts and Sciences, Business Administration (excluding Office Administration 304 and 305), Education, or Engineering.

MICROBIOLOGY

Major: Biology 607 and twenty-four semester hours of microbiology above freshman rank, of which at least twelve must be in advanced courses.

First Minor: Fifteen semester hours of chemistry, including organic chemistry and quantitative analysis.

Second Minor: Six semester hours of physics.

MIDDLE EASTERN STUDIES

A student may enter the Middle Eastern program only with the consent of the Chairman of the Committee on Middle Eastern Studies and will plan his schedule with an adviser to whom he will be assigned by the Chairman. A student in the program must satisfy the requirements of a *major* department, and complete a Middle Eastern concentration including International Studies 360 and seven other courses from a grouping of courses prescribed by the Committee on Middle Eastern Studies. Courses required for the concentration may also count toward major, minor, and elective requirements.

The program requires Arabic or Hebrew 406, 407, 312K, and 312L, or the equivalent in another Middle Eastern language. With special permission, an intensive course in a Middle Eastern language may be substituted for part of this requirement. An intensive language course will *not* satisfy any part of the basic foreign language requirement of the College of Arts and Sciences.

PHILOSOPHY

Major: Twenty-four semester hours of philosophy, including Philosophy 329K and 329L and nine additional hours of advanced courses, six of which must be of senior rank. Philosophy 301 may be counted toward the major.

First Minor: Twelve semester hours in a second social science (anthropology, economics, geography, government, history, psychology, or sociology) or in fine arts (see p. 49); or, with written consent of the departmental chairman and approval of the Dean, twelve semester hours in another subject.

Second Minor: Six semester hours in a third social science; or, with written con-

394. *Studies in Historical and Comparative Linguistics.*
395. *Conference Course in Linguistics.*
698. *Thesis.*
699. *Dissertation.*

DEPARTMENT OF MATHEMATICS

PROFESSOR GUY, Chairman

PROFESSOR EMERITUS Cleveland; PROFESSORS Craig, Edmondson, Ettlinger, Greenwood, Gregory, Guy, Moore, Schild, Schücking, Vandiver, Wall, Young; ASSOCIATE PROFESSORS Curtis, Goldstein, Kerr, Lubben, Osborn, Prouse, Sachs, Weaver; VISITING ASSOCIATE PROFESSORS Cheney, Penrose; ASSISTANT PROFESSORS Barnes, Cain, Durbin, Hurt, Innis, Kezlan, Kripke, Lacey, Lynch, Nance, Odell, Porter, Rockafellar, Scroggs, Walbesser, Walston, Yett.¹⁴

For Undergraduates

301. *College Algebra.*—Only one of the following may be counted: Mathematics 301, 301E, 301F.
301E. *College Algebra.*—Designed for engineers. Only one of the following may be counted: Mathematics 301E, 301, 301F.
301F. *College Algebra with Applications in Business and Economics.*—Only one of the following may be counted: Mathematics 301F, 301, 301E.
303. *Mathematics of Modern Business.*—Designed for business administration students. Prerequisite: Mathematics 301, 301E, or 301F.
304. *Plane Trigonometry.*—Mathematics 304 and 304E may not both be counted.
304E. *Trigonometry.*—Mathematics 304E and 304 may not both be counted. Designed for engineers.
204F. *Introduction to Computer Programming.*—May not be counted by students with credit for Mathematics 355. Introduction to computers; analysis of elementary problems and solutions on a computer using an automatic programming system such as Fortran or Algol. Prerequisite: Mathematics 301E or 301 or 301F, and 304E or 304. Two lectures a week.
304G. *Introduction to Computer Science.*—Mathematics 304G and 204F may not both be counted. Basic characteristics of computers, concepts and properties of algorithms, solution of computational problems using algorithms defined by procedure-oriented languages such as FORTRAN or ALGOL. Prerequisite:

¹⁴ This list, for the sessions of 1963-1964 and 1964-1965, includes all staff members of professional rank.

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Mathematics

Registration for Mathematics 613 or 613E. Mr. Young. (To be offered for the first time in 1965-1966.)

304K. *Number Analysis.*—Designed for students registered under Plan II for the Bachelor of Arts degree. Development of number concept, including angle numbers.

305. *Analytic Geometry.*—Only one of the following may be counted: Mathematics 305, 305E, 305K. Prerequisite: Trigonometry.

305E. *Analytic Geometry.*—Designed for engineers. Only one of the following may be counted: Mathematics 305E, 305, 305K. Prerequisite: Mathematics 301E or 301 or 301F and 304E or 304.

305K. *Number Analysis and Analytic Geometry.*—Only one of the following may be counted: Mathematics 305K, 305, 305E. Prerequisite: One of the following: Mathematics 301, 301E, 304, 304K.

608E. *Calculus with Analytic Geometry.*—May not be counted by students with credit for Mathematics 305E and 613Ea or the equivalent. Prerequisite: Mathematics 301E or 301 or 301F, and 304E or 304. Six lectures a week for one semester.

808E. *Calculus with Analytic Geometry.*—Registration limited to students with departmental approval. May not be counted by students with credit for Mathematics 305E and 613E or the equivalent. Differential calculus and integral calculus of polynomials; analytic geometry. Prerequisite: Mathematics 301E or 301 or 301F, and 304E or 304. Four lectures a week for two semesters. (Given for the first time in 1964-1965.)

309. *Solid Geometry.*—An extension of classical Euclidean geometry to three dimensions. Lines and planes, polyhedra, cylinders, cones, spheres, etc. Prerequisite: A high-school course in plane geometry.

310K. *First Course in Theory of Numbers.*—May count as advanced hours if preceded by twelve hours of mathematics. Interrelationship of integers; linear forms; quadratic reciprocity. Prerequisite: Six hours of mathematics, including college algebra. Mr. Osborn.

310L. *First Course in Theory of Numbers.*—May count as advanced hours if preceded by twelve hours of mathematics. Selected topics of elementary number theory, with additional work on topics such as a quadratic reciprocity, simple Diophantine equations, and rings of residue classes. Prerequisite: Six hours of mathematics including college algebra. Mr. Vandiver, Mr. Weaver.

312. *Advanced Plane and Solid Analytic Geometry.*—Prerequisite: Mathematics 305 or 305E. Mrs. Porter.

613. *Calculus.*—Mathematics 613 and 613E may not both be counted. Counts as three advanced hours if preceded by nine hours of mathematics, or as six advanced hours if preceded by twelve hours of mathematics. Prerequisite: Analytic geometry, or college courses in trigonometry and algebra completed with

grades of at least *B* and registration for analytic geometry. Three lectures a week for two semesters.

613E. *Calculus*.—Designed for engineers. Mathematics 613E and 613 may not both be counted. May count as three advanced hours if preceded by nine hours of mathematics, or as six advanced hours if preceded by eleven hours of mathematics. Prerequisite: Analytic geometry, or college courses in trigonometry and algebra completed with a grade of at least *B* and registration for analytic geometry. Three lectures a week for two semesters.

314E. *Calculus with Analytic Geometry*.—Continuation of Mathematics 608E. Only one of the following may be counted: Mathematics 314E, 613b, 613Eb. May count as advanced hours if preceded by eleven hours of mathematics. Prerequisite: Mathematics 608E or the equivalent.

315. *Theory of Equations*.—May count as advanced hours if preceded by eleven hours of mathematics. Prerequisite: Analytic geometry.

316. *Elementary Mathematical Statistics*.—Graphical presentation, frequency functions, distribution functions, averages, variance, standard deviation, curve-fitting, and related topics. Prerequisite: Six hours of mathematics.

318E. *Advanced Calculus with Applications*.—May count as advanced hours if preceded by eleven hours of mathematics. Mathematics 318E and 325 may not both be counted. Prerequisite: Mathematics 314E or the equivalent.

319E. *Differential Equations with Applications*.—May count as advanced hours if preceded by eleven hours of mathematics. Mathematics 319E and 326 may not both be counted. Prerequisite: Mathematics 314E or the equivalent.

Any of the following junior courses in mathematics may count as senior courses if preceded by six hours of advanced mathematics.

620K. *Mathematics of Astronomy*.—Prerequisite: Six hours of calculus and junior standing. Three lectures a week for two semesters. Mr. Prouse.

321K. *Advanced Calculus*.—Designed to develop ability to understand and solve problems. Approximations, limits, functions, derivatives, and integrals. Prerequisite: Six hours of calculus.

321L. *Advanced Calculus*.—Continuation of Mathematics 321K. Functions defined by integrals, expansions for functions, multiple integrals, applications. Prerequisite: Mathematics 321K.

322K. *Differential Equations and Applications*.—Prerequisite: Six hours of calculus.

322L. *Differential Equations and Applications*.—Prerequisite: Mathematics 322K.

624. *Introduction to the Foundations of Analysis*.—Prerequisite: Six hours of calculus and consent of instructor. Three lectures a week for two semesters. Mr. Moore.

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325. *Advanced Calculus with Engineering Applications*.—Mathematics 325 and 318E may not both be counted. Prerequisite: Six hours of calculus.

326. *Differential Equations with Engineering Applications*.—Mathematics 326 and 319E may not both be counted. Prerequisite: Six hours of calculus.

330K. *Advanced Analytic Geometry of the Euclidean and Projective Planes*.—Analytical methods of homogeneous and line co-ordinates as applied to the real and complex domains of metric and projective geometries of the plane and space. Prerequisite: Six hours of calculus.

333K. *Teaching Problems in Arithmetic and Algebra*.—Basic ideas and the method of presentation of these concepts in the grades and high school. Prerequisite: Twelve hours of mathematics. Mr. Ettlinger.

333L. *Teaching Problems in Geometry*.—Basic ideas of plane and solid geometry; ruler and compass constructions; representation of space objects by plane projection; use of these ideas in teaching plane and solid geometry. Prerequisite: Twelve hours of mathematics. Mr. Ettlinger.

340. *Interpolation and Graphical Methods*.—Nomographic charts, empirical formulae, operation with symbols, interpolation both direct and indirect, approximate or numerical integration. Prerequisite: Three hours of advanced calculus or Actuarial Science 219 (or Mathematics 219) and six hours of calculus. Mr. Greenwood.

340L. *Matrices and Matrix Calculations*.—Continuation of Mathematics 340, with emphasis on matrix methods of calculation. Prerequisite: Mathematics 355 or twelve hours of advanced mathematics. Mr. Greenwood, Mr. Odell.

645. *Probability*.—May count as business administration. Principles underlying statistical inference, including probability distributions, chance variables, conditional probabilities, and expected values. Prerequisite: Six hours of calculus. Three lectures a week for two semesters.

355. *High-Speed Computer Programming*.—Characteristics of high-speed computers; logical flow diagrams; programming using machine language; compilers; automatic programming. Students solve problems using the Computation Center facilities. Prerequisite: Mathematics 613 or 613E. Mr. Gregory, Mr. Osborn, Mr. Scroggs, Mr. Walston.

For Undergraduates and Graduates

360K. *Topics in Modern Mathematics*.—May be repeated for credit. Designed especially for high-school mathematics teachers. Prerequisite: Six hours of college mathematics; or a valid teacher's certificate in science, two years of teaching experience, and consent of instructor. Mr. Edmondson, Mr. Guy.

360L. *Topics in Modern Mathematics*.—May be repeated for credit. Designed especially for high-school mathematics teachers. Prerequisite: Mathematics 360K. Mr. Edmondson, Mr. Guy.

360M, 360N. *Modern Topics in Elementary Mathematics*.—Selected topics in mathematical analysis, with emphasis on the development of basic concepts in mathematical thinking needed for the elementary teacher. Prerequisite: Six hours of advanced courses, or junior standing, and consent of instructor. Mrs. Barnes, Mr. Walbesser.

360P. *Celestial Mechanics*.—Prerequisite: Mathematics 325 and 326. Mr. Prouse.

361. *Theory of Functions of a Complex Variable*.—Prerequisite: Mathematics 325 and 326, or the equivalent. Mr. Hurt, Mr. Nance, Mr. Walston.

361K. *Introduction to Analysis*.—Prerequisite: Mathematics 361 or the equivalent. Mr. Curtis, Mr. Scroggs.

662. *Analytical Mechanics*.—Prerequisite: Six hours of advanced mathematics, including three hours of advanced calculus or differential equations. Three lectures a week for two semesters.

362K. *Probability and Statistics*.—Designed for engineering and science students. Prerequisite: Six hours of advanced mathematics, including Mathematics 325 or 321K or the equivalent. Mr. Greenwood, Mr. Odell.

362L. *Probability and Statistics*.—Designed for engineering and science students. Prerequisite: Mathematics 362K. Mr. Greenwood, Mr. Odell.

363. *Linear Operators*.—Linear operators and their properties; construction of operators with specified properties; applications; smoothing data, outputs of physical systems, etc. Prerequisite: Mathematics 321L or 322L, or senior standing and consent of instructor. Mr. Wall.

364K. *Vector and Tensor Analysis*.—Prerequisite: Mathematics 321L, or 322L, or 325 and 326, or the equivalent. Mr. Craig, Mr. Hurt.

364L. *Vector and Tensor Analysis*.—Prerequisite: Mathematics 364K. Mr. Craig, Mr. Hurt.

366. *Difference Methods*.—Ordinary and divided differences, interpolation, smoothing, and related topics. Prerequisite: Mathematics 321L, or senior standing and consent of instructor.

366K. *Nonlinear Differential Equations and Applications*.—May be repeated for credit. Theory of oscillations, linear and nonlinear; relaxation oscillations. Many examples from engineering and physics. Prerequisite: Mathematics 322L, or 325 and 326, or the equivalent. Mr. Yett.

667. *Introduction to Modern Projective Geometry*.—Prerequisite: Six hours of advanced mathematics. Three lectures a week for two semesters. Mr. Lubben.

368K. *Numerical Analysis*.—Mathematics 368K and 668a may not both be counted. Basic numerical methods for function evaluation, root-finding, interpolation, numerical quadrature, and ordinary differential equations; illustrative examples solved using high speed computing equipment of the Computation Center.

Prerequisite: Twelve hours of advanced mathematics, including Mathematics 355, 325, and 326; or nine hours of advanced mathematics, including Mathematics 355, and registration for 325 and 326. Mr. Goldstein, Mr. Gregory, Mr. Scroggs, Mr. Young.

368L. *Numerical Analysis*.—Mathematics 368L and 668b may not both be counted. Basic numerical methods for function evaluation, root-finding, interpolation, numerical quadrature, and ordinary differential equations; illustrative examples solved using high speed computing equipment of the Computation Center. Prerequisite: Twelve hours of advanced mathematics.

669. *Mathematical Analysis for Advanced Physical Chemistry*.—Prerequisite: Mathematics 322L, or 325 and 326, or the equivalent. Three lectures a week for two semesters. Mr. Prouse.

371K. *Topics in Modern Algebra*.—Prerequisite: Six hours of advanced mathematics. Mr. Lubben.

371L. *Topics in Modern Algebra*.—Prerequisite: Six hours of advanced mathematics. Mr. Lubben.

372. *Fourier Series and Boundary Value Problems*.—A treatment of the boundary value problems connected with the important differential equations of mathematical physics. Prerequisite: Mathematics 322L, or 325 and 326, or the equivalent. Mr. Greenwood, Mr. Hurt, Mr. Nance.

373K. *Linear Algebra with Application*.—The fundamental operations with integers, discussion of primes, divisibility, and congruences; introduction to the study of modern algebra and number theory. Prerequisite: Six hours of advanced mathematics and a certain aptitude for abstract mathematical thinking. Mr. Edmondson, Mr. Kerr, Mr. Rockafellar, Mr. Scroggs, Mr. Weaver.

373L. *Introduction to Abstract Algebra and Number Theory*.—Prerequisite: Mathematics 373K. Mr. Edmondson, Mr. Kerr, Mr. Scroggs, Mr. Weaver.

374. *Fourier and Laplace Transforms*.—Prerequisite: Mathematics 322L, or 325 and 326, or the equivalent. Mr. Guy, Mr. Prouse.

374K. *Fourier and Laplace Transforms*.—Continues the development of the theory and applications of various integral transforms begun in Mathematics 374. Prerequisite: Mathematics 374. Mr. Guy.

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

676. *Functions of Several Real Variables*.—Introduction to the fundamental processes in mathematics needed for work in modern applied mathematics. Prerequisite: Mathematics 321L, or 322L, or 325 and 326, or the equivalent. Three lectures a week for two semesters. Mr. Guy.

678. *Mathematical Statistics*.—May count as business administration. Distribution functions, averages, curve-fitting methods, correlation, functions of chance.

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variables, applications to sampling problems. Prerequisite: Six hours of advanced mathematics. Three lectures a week for two semesters.

For Graduates

680. *Theory of Groups.*
380K. *Topological Groups.*
681K. *Topics in the Fundamentals of Advanced Calculus, including Vector Calculus.*
381L, 381M. *Applications of Tensor Analysis.*
381N, 681N. *Research in Tensor Analysis.*
382. *Mathematical Theory of Strategy.*
682K. *Foundations of Differential Equations with Applications.*
682L. *Abstract Algebra.*
683. *Theory of Functions of Real Variables.*
383K. *Continued Fractions and Applications.*
683P. *Topics in Teaching Problems in Mathematics.*
684. *Functions of a Complex Variable.*
384K. *Topics in Finite Mathematical Analysis.*
684M. *Infinite Processes.*
385. *Research and Conference Course.*
385K, 385L. *Mathematics of Continuous Media.*
686. *Functional Analysis.*
386K. *Advanced Numerical Analysis.*
387. *Group Theory of Differential Equations.*
387K, 387L. *Integral Transforms.*
688. *Foundations of Mathematics.*
388K. *Complex Analysis.*
388L. *Real Analysis.*
689, 689K. *Point Sets and Continuous Transformations.*
389N. *Theory of Sets.*
690, 690K. *Research in Point-Set Theory.*
391. *Research in Numerical Integration.*

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- 391L, 391M. *Potential Theory.*
692, 692M. *Partial Differential Equations.*
693. *Calculus of Variations.*
393K. *Selected Topics in Numerical Analysis.*
394K. *Relativity: The Special Theory.*
394L. *Relativity: The General Theory.*
394M. *Special Topics in Relativity Theory.*
695N. *Research in Partial Differential Equations.*
696. *Integral Equations.*
696K. *Research in Differential and Integral Equations.*
697L. *Continued Fractions.*
698. *Thesis.*
699. *Dissertation.*

DEPARTMENT OF MICROBIOLOGY

PROFESSOR WYSS, Chairman

PROFESSORS Foster, Lankford, Schuhardt, Wyss; ASSOCIATE PROFESSORS Lockart, Morrow, Storck; ASSISTANT PROFESSORS Hoare, Jurtshuk.¹⁵

As used in defining the prerequisites of courses listed under this department, the term "biological science" refers specifically to the following sciences only: bacteriology, biology, biochemistry, botany, microbiology, physiology, and zoology.

For Undergraduates

001. *Freshman Correlation Course for Medical Technology.*—Required of all medical technology students. Lectures arranged.

311. *Public Health and Hygiene.*—Only one of the following may be counted: Microbiology 311, 310, Bacteriology 310, 311. Designed to meet the requirements of the Basic Science Law. Prerequisite: Biology 607 and sophomore standing. Mr. Schuhardt.

312. *Fundamentals of Pathology.*—Microbiology 312 and Bacteriology 312 may not both be counted. May count as an advanced course if preceded by six hours of microbiology. Designed to meet the requirements of the Basic Science Law. A lecture and demonstration course covering the fundamental nature and causes of disease. Prerequisite: Registration for Microbiology 316 or 619a, and sophomore standing.

¹⁵ This list, for the sessions of 1963-1964 and 1964-1965, includes all staff members of professorial rank.