

College of Liberal Arts and Sciences

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Dean

PURPOSE

Like all major research universities, Arizona State University provides the means for undergraduates to acquire a liberal education, an education that broadens students' understanding in the major areas of human knowledge while providing students with in-depth knowledge in their chosen areas of focus.

While the professional schools and colleges can and do provide for important dimensions of a liberal education, the central academic setting for accomplishing this basic university purpose is the College of Liberal Arts and Sciences (CLAS). The college provides a particularly rich and varied set of opportunities for students to gain the kind of liberal education that helps to prepare them for a lifetime of continued learning and application of knowledge in a diverse and ever-changing world.

As a consequence of the wide range of subjects CLAS offers in the humanities, the natural sciences and mathematics, and the social and behavioral sciences, instruction is provided in a number of core areas for undergraduate students from all of the other colleges. Students with majors in business, education, engineering, nursing, and other professional colleges rely on CLAS for basic foundation courses. CLAS also offers the majority of courses meeting the General Studies requirement.

CLAS initiated and continues to participate actively with the University Honors College. It also offers advising to undergraduates who are working out their undergraduate programs or are planning for graduate studies.

Most of the university faculty's engagement in the discovery and creation of knowledge and its dissemination occurs in CLAS. As an integral part of this activity, CLAS offers a wide range of graduate training programs leading to a master's or doctoral degree. For graduate degree application information, consult the *Graduate Catalog* and contact either the Graduate College or the academic unit in which the degree of interest would be earned, the latter in order to receive detailed information on particular degree requirements.

ORGANIZATION

CLAS consists of 22 academic departments, several interdisciplinary programs, six centers, and several research

institutes and laboratories. The college offers 33 programs leading to a bachelor's degree, 27 programs leading to a master's degree, 18 programs leading to a doctoral degree, and interdisciplinary graduate programs in cooperation with other colleges.

ADMISSION

Any entering ASU student who has met the minimum university entrance requirements can be admitted to CLAS. Students with fewer than 50 earned hours of credit can, if they wish, be admitted as "no preference" students. Students with 50 or more hours must declare a major to be accepted into the college.

Any student with a cumulative GPA of at least 2.00 who is currently registered in good standing in another college at ASU and who wishes to major in a subject offered by CLAS and to follow a program of study in the major may transfer into the college. The student transfers by making application and being initially advised in the Office for Academic Programs, SS 111. Students admitted from other ASU colleges are under mandatory advising during the first semester and must take courses leading directly to a degree in CLAS. Failure to follow mandated advice on course selection can result in enrollment and registration problems, including cancellation and holds.

Transfer Students. The university standards for evaluation of transfer credit are listed on pages 50–51. Transfer students are urged to contact the relevant academic department or the Office for Academic Programs, SS 111, to ensure a smooth transition to CLAS. Students who have transferred courses from institutions other than Arizona community colleges must have their transcripts evaluated by an advisor in SS 111. Students who have attended only Arizona community colleges have evaluations performed in the department of the major.

Courses transferred from two-year (community) colleges are accepted as lower-division credit only. Students are urged to choose their community college courses carefully, in view of the fact that a minimum of 50 semester hours of work taken at the university must be upper-division credit (see page 51).

“Undecided” or “Undeclared” Majors. Students in CLAS are not required to select a major upon entering the college as freshmen or at any time thereafter until the semester in which 60 semester hours are earned. Until such “no preference” students have chosen a major, they are advised through the University Academic Advising Center, in the Undergraduate Academic Services building. It is important to consult an academic advisor before any enrollment activity. Before or during the semester in which they earn 60 semester hours, students must select their major and transfer into the appropriate department. *Note:* Students who wish to enter a program of study that has a rigidly structured curriculum should be aware that delay in choosing a major could result in added time and cost in the completion of requirements.

ADVISING

All students are urged to seek advising in the appropriate college unit before registration. Students must follow the calendar published in the *Schedule of Classes* for each semester for information regarding enrollment, adding/dropping classes, and withdrawals.

Regular Advising. All students are strongly urged to seek advising in the appropriate college unit before registration.

Advising Locations. CLAS students should seek routine advising in the following locations:

| Student | Advising Location |
|--|--|
| Declared majors | Department of major |
| No preference No-preference, pre-law | University Academic Advising Center, Undergraduate Academic Services building (602/965-4464) |
| No preference, pre-medical | MCL 110B (602/965-2365) |

The Office for Academic Programs, located in SS 111, is the central resource center for academic information in the college. Requests from students, departmental advisors, and faculty for clarification of rules, procedures, and

Advising for Preprofessional Programs

| Professional Field | Office Where Advisor Is Located |
|-----------------------------------|--|
| Dentistry ^{1, 2} | Pre-Health Professions, MCL 110B |
| Foreign service | Department of chosen major |
| Health physics | Pre-Health Professions, MCL 110B |
| Law | Office for Academic Programs, SS 111 |
| Medicine ¹ | Pre-Health Professions, MCL 110B |
| Ministry | Department of Religious Studies, LL B605 |
| Occupational therapy ¹ | Pre-Health Professions, MCL 110B |
| Optometry ^{1, 2} | Pre-Health Professions, MCL 110B |
| Osteopathy ¹ | Pre-Health Professions, MCL 110B |
| Pharmacy ¹ | Pre-Health Professions, MCL 110B |
| Physical therapy ¹ | Pre-Health Professions, MCL 110B |
| Podiatry ^{1, 2} | Pre-Health Professions, MCL 110B |

¹ Students preparing for a career in these areas should register in the Pre-Health Professions office, 602/965-2365.
² No school in Arizona offers a program in dentistry, optometry, or podiatry. Students interested in pursuing these professions should confer with the pre-health professions advisor concerning out-of-state schools where they may complete their training.

advising needs of the college and university should be directed to that office.

Mandatory Advising. The following categories of Liberal Arts and Sciences students *must* receive advising and *must* be cleared on the Mandatory Advising Computer System (MACS) before their classes may be scheduled:

1. students in their first semester at ASU;
2. students on probation;
3. students with less than a 2.00 cumulative GPA;
4. students who have admissions deficiencies;
5. other students with “special admissions” status; and
6. students who have been disqualified (these students are allowed to attend ASU summer sessions only and must be advised in the Office for Academic Programs, SS 111).

Students in the above mandatory advising categories should consult an advisor in the appropriate location listed in the previous section. Students with admission deficiencies are carefully monitored to ensure that they take courses that eliminate their deficiencies. The University Academic Advising Center assists in this monitoring of students with declared majors during situations where the departmental ad-

vising load is too heavy to permit effective departmental supervision.

Advising for Preprofessional Programs. Special advising is available for students planning to enter the fields listed in the “Advising for Preprofessional Programs” table. The professional programs shown in the table are not majors in themselves; that is, there are no majors called “pre-medical,” “pre-law,” etc. In each program, the student must eventually select an established major in CLAS or in one of the other colleges.

DEGREES

Majors. Programs leading to the B.A. and B.S. degrees are offered by CLAS, with majors in the subjects listed in the “CLAS Degrees, Majors, and Concentrations” table, pages 104-106. Each major is administered by the academic department indicated.

Double Majors. The College of Liberal Arts and Sciences provides an opportunity for students to major in two disciplines and to earn a degree that reflects both. A dual degree is possible only when both disciplines are offered as majors in CLAS. Students interested in pursuing a double major are encouraged to contact the Office for Academic Programs, SS 111.

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 71-94. For graduation requirements, see pages 66-70. Omnibus courses are offered that are not listed in the catalog; see pages 44-45.

CLAS Degrees, Majors, and Concentrations

| Major | Degree | Administered by |
|---|-------------------------|---|
| Baccalaureate Degrees | | |
| Anthropology | B.A. | Department of Anthropology |
| Emphasis: Latin American studies | | |
| Asian Languages (Chinese/Japanese) | B.A. | Department of Languages and Literatures |
| Biology | B.S. | Departments of Botany and Zoology |
| Botany | B.S. | Department of Botany |
| Concentrations: plant biochemistry and molecular biology, systematics and ecology, urban horticulture | | |
| Chemistry | B.A. | Department of Chemistry and Biochemistry |
| Chemistry | B.S. | Department of Chemistry and Biochemistry |
| Emphasis: biochemistry | | |
| Chicana and Chicano Studies | B.A. | Office of Chicana and Chicano Studies |
| Clinical Laboratory Sciences | B.S. | Department of Microbiology |
| Computer Science | B.S. ¹ | Department of Computer Science and Engineering |
| Economics | B.A., B.S. ² | Department of Economics |
| Emphasis: Latin American studies | | |
| English | B.A. | Department of English |
| Exercise Science/Physical Education | B.S. | Department of Exercise Science and Physical Education |
| Concentrations: exercise and sport studies, exercise and wellness | | |
| Family Resources and Human Development | B.A., B.S. | Department of Family Resources and Human Development |
| Concentrations: family resources and human development in business, family studies/child development, human nutrition—dietetics | | |
| French | B.A. | Department of Languages and Literatures |
| Geography | B.A., B.S. | Department of Geography |
| Emphases: Asian studies, Latin American studies, meteorology-climatology, urban studies | | |
| Geology | B.S. | Department of Geology |
| German | B.A. | Department of Languages and Literatures |
| History | B.A., B.S. | Department of History |
| Emphases: Asian studies, Latin American studies | | |
| Humanities | B.A. | Interdisciplinary Humanities Program |
| Interdisciplinary Studies | B.A., B.S. | College of Liberal Arts and Sciences |
| Italian | B.A. | Department of Languages and Literatures |
| Mathematics | B.A. | Department of Mathematics |
| Mathematics | B.S. | Department of Mathematics |
| Options: applied mathematics, computational mathematics, general mathematics, pure mathematics, statistics and probability | | |
| Microbiology | B.S. | Department of Microbiology |
| Philosophy | B.A. | Department of Philosophy |
| Physics | B.S. | Department of Physics and Astronomy |
| Emphasis: astronomy | | |
| Options: I, II | | |
| Political Science | B.A., B.S. | Department of Political Science |
| Emphases: Asian studies, Latin American studies | | |
| Psychology | B.A., B.S. | Department of Psychology |

¹ The Department of Computer Science and Engineering is located administratively in the College of Engineering and Applied Sciences. The B.S. degree in Computer Science is offered by both CLAS and the College of Engineering and Applied Sciences. Requirements differ according to college (see page 127 and pages 297–300).

² The Department of Economics is located administratively in the College of Business. The baccalaureate degree in Economics is offered by both CLAS and the College of Business. Requirements differ according to college (see pages 127–128 and pages 235–236).

³ This program is administered by the Graduate College. See the “Graduate College” section of this catalog.

| Major | Degree | Administered by |
|---|---------------------|---|
| Religious Studies Emphases: Asian studies, Jewish studies, Latin American studies, Russian and East European studies, Southeast Asian studies, women's studies | B.A. | Department of Religious Studies |
| Russian | B.A. | Department of Languages and Literatures |
| Sociology Emphasis: public safety | B.A. | Department of Sociology |
| Spanish Emphases: Latin American studies, Mexican American studies | B.A. | Department of Languages and Literatures |
| Speech and Hearing Science | B.S. | Department of Speech and Hearing Science |
| Wildlife Conservation Biology Options: aquatic, terrestrial | B.S. | Department of Zoology |
| Women's Studies | B.A., B.S. | Women's Studies Program |
| Zoology | B.S. | Department of Zoology |
| Graduate Degrees | | |
| Anthropology Concentrations: archaeology, bioarchaeology, linguistics, museum studies, physical anthropology, social-cultural anthropology | M.A. | Department of Anthropology |
| Anthropology Concentrations: archaeology, physical anthropology, social-cultural anthropology | Ph.D. | Department of Anthropology |
| Biological Sciences | M.S. | Departments of Botany, Microbiology, and Zoology |
| Botany Concentrations: ecology, photosynthesis | M.S., Ph.D. | Department of Botany |
| Chemistry Concentrations: analytical chemistry, biochemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, solid state chemistry | M.S., Ph.D. | Department of Chemistry and Biochemistry |
| Communication Disorders | M.S. | Department of Speech and Hearing Science |
| Creative Writing | M.F.A. ³ | Creative Writing Committee |
| English Concentrations: comparative literature, English linguistics, literature and language, rhetoric and composition | M.A. | Department of English |
| English | Ph.D. | Department of English |
| Exercise Science Concentrations: biomechanics, motor behavior/sport psychology, physiology of exercise | Ph.D. ³ | Committee on Exercise Science |
| Exercise Science/Physical Education | M.S. | Department of Exercise Science and Physical Education |
| Family Resources and Human Development Concentrations: family studies, general family resources and human development | M.S. | Department of Family Resources and Human Development |
| Family Science | Ph.D. | Department of Family Resources and Human Development |
| French Concentrations: comparative literature, language and culture, literature | M.A. | Department of Languages and Literatures |

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| Major | Degree | Administered by |
|--|--------------------|--|
| Geography | M.A., Ph.D. | Department of Geography |
| Geology | M.S., Ph.D. | Department of Geology |
| German | M.A. | Department of Languages and Literatures |
| Concentrations: comparative literature, language and culture, literature | | |
| History | M.A. | Department of History |
| Concentrations: Asian history, British history, European history, Latin American history, public history, U.S. history, U.S./Western history | | |
| History | Ph.D. | Department of History |
| Concentrations: Asian history, British history, European history, Latin American history, U.S. history | | |
| Humanities | M.A. ³ | Graduate Committee on Humanities |
| Mathematics | M.A., Ph.D. | Department of Mathematics |
| Microbiology | M.S., Ph.D. | Department of Microbiology |
| Molecular and Cellular Biology | M.S., Ph.D. | Interdisciplinary Committee on Molecular and Cellular Biology |
| Natural Science | M.N.S. | |
| Concentrations: | | |
| botany | | Department of Botany |
| chemistry | | Department of Chemistry and Biochemistry |
| geology | | Department of Geology |
| mathematics | | Department of Mathematics |
| microbiology | | Department of Microbiology |
| physics | | Department of Physics and Astronomy |
| zoology | | Department of Zoology |
| Philosophy | M.A. | Department of Philosophy |
| Physics | M.S., Ph.D. | Department of Physics and Astronomy |
| Political Science | M.A., Ph.D. | Department of Political Science |
| Concentrations: American politics, comparative politics, international relations, political theory | | |
| Psychology | Ph.D. | Department of Psychology |
| Concentrations: clinical psychology, developmental psychology, environmental psychology, experimental psychology, physiological psychology, social psychology | | |
| Religious Studies | M.A. | Department of Religious Studies |
| Science and Engineering of Materials | Ph.D. ³ | Committee on the Science and Engineering of Materials |
| Sociology | M.A., Ph.D. | Department of Sociology |
| Spanish | M.A. | Department of Languages and Literatures |
| Concentrations: comparative literature, language and culture, linguistics, literature | | |
| Spanish | Ph.D. | Department of Languages and Literatures |
| Speech and Hearing Science | Ph.D. ³ | Committee on Speech and Hearing Science |
| Concentrations: developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders | | |
| Statistics | M.S. ³ | Committee on Statistics |
| Teaching English as a Second Language | M.TESL | Department of English |
| Zoology ⁴ | M.S., Ph.D. | Department of Zoology |
| Concentration: ecology | | |

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² The Department of Economics is located administratively in the College of Business. The baccalaureate degree in Economics is offered by both CLAS and the College of Business. Requirements differ according to college (see pages 127–128 and pages 235–236).

³ This program is administered by the Graduate College. See the “Graduate College” section of this catalog.

⁴ The major has only one formalized concentration; other areas of study are available.

Minors. Although not required for graduation, special college-approved minors are available in most departments. Check department program descriptions for details. Minors offered by departments must have at least 18 hours of designated courses, including 12 hours of upper-division work. The college requires a grade of at least “C” in all upper-division courses in the minor. Some departments have stricter requirements. A minimum of six upper-division hours in the minor must be taken in residence at ASU Main.

University policies prohibit the “double-counting” of courses from the major in the minor. Specific questions concerning double-counting, as well as general questions about the approval processes for minors, should be taken up with an academic advisor in the department offering the minor or the Office for Academic Programs, SS 111.

| Minors | Pages |
|--|-------|
| Anthropology | 114 |
| Asian Languages (Chinese/Japanese) | 153 |
| Astronomy | 175 |
| Chemistry and Biochemistry | 123 |
| English | 129 |
| Exercise Science/Physical Education | 133 |
| Family Resources and Human Development | 136 |
| French | 153 |
| Geology | 143 |
| German | 153 |
| History | 145 |
| Italian | 153 |
| Mathematics | 164 |
| Microbiology | 168 |
| Philosophy | 173 |
| Physics | 176 |
| Political Science | 180 |
| Psychology | 183 |
| Religious Studies | 186 |
| Russian | 153 |
| Sociology | 188 |
| Spanish | 153 |
| Women’s Studies | 193 |
| Zoology | 195 |

DEGREE REQUIREMENTS

Credit Requirement. All candidates for graduation in the B.A. and B.S. degree curricula are required to complete

at least 120 semester hours, of which at least 50 hours must consist of upper-division courses. A minimum ASU cumulative GPA of 2.00 is required for graduation.

Course Load. The normal course load is 15–16 semester hours. First-semester freshmen and entering transfer students are not permitted to register for more than 18 semester hours in the initial semester. Other students who wish to register for more than 18 hours must have a GPA of at least 3.00 and must file a petition in the Office for Academic Programs, SS 111, before registration. Any petition for an overload in excess of 21 hours must be presented to the Standards Committee of the college.

Foreign Language Requirement.

CLAS requires knowledge of one foreign language equivalent to the completion of two years’ study at the college level. For purposes of meeting this requirement, American Sign Language is considered a foreign language. For more information, see page 154.

GRADUATION REQUIREMENTS

In addition to fulfilling college and major requirements, students must meet all university graduation requirements. For complete information, see pages 66–70.

GENERAL STUDIES REQUIREMENT

All students enrolled in a baccalaureate degree program must satisfy a university requirement of a minimum of 35 hours of approved course work in General Studies, as described on pages 71–74. General Studies courses are listed on pages 74–94, in the course descriptions, in the *Schedule of Classes*, and in the *Summer Sessions Bulletin*.

COLLEGE DEGREE REQUIREMENTS

CLAS degree requirements are more extensive than the General Studies requirement. Additional course work in the humanities, natural sciences and mathematics, and social and behavioral sciences is required. A well-planned program of study enables students to complete the General Studies require-

ment while fulfilling college degree requirements. Students are encouraged to consult with an academic advisor in planning a program to ensure that they meet all necessary requirements. It is also important to note that the college classification of the humanities, natural sciences and mathematics, and social and behavioral sciences is, in some courses, different from that used for General Studies.

To graduate from CLAS, a student must satisfy separate requirements of three kinds in addition to the General Studies requirement: *proficiency requirements* indicate a minimal level of competence in written communication, quantitative reasoning, and foreign language; *major requirements* involve concentrated course work in one field; and *distribution requirements* ensure that the student is exposed to disciplines outside the major field.

I. Proficiency Requirements. Each student is required to demonstrate proficiency in First-Year Composition, a foreign language, and mathematics.

Each student must demonstrate proficiency by completing the courses specified below with a grade of “C” or better in each course. Courses used to meet a proficiency requirement may not ordinarily be used to satisfy the distribution requirement; the two exceptions are specified under III.A and III.B.

- A. First-Year Composition
 1. ENG 101 and 102 or
 2. ENG 105 or
 3. ENG 107 and 108 for foreign students.
- B. Foreign Language
 1. completion of foreign language course work at the intermediate level (202 or equivalent; see Department of Languages and Literatures listings for these equivalencies) or
 2. a foreign language course at the 300 level or above taught in the foreign language and having 202 or equivalent as a prerequisite or

3. completion of secondary education at a school in which the language of instruction is not English or
 4. completion of SHS 275 American Sign Language IV.
- C. Mathematics
1. MAT 114 or
 2. MAT 117 or
 3. MAT 170 or
 4. any higher-level MAT course.

II. Major Requirements. Each student is required to select a major from among the fields of study offered by CLAS. The requirements for completion of the major are described under departmental listings.

- A. The major department may require up to 45 semester hours of course work. The minimum is 30 hours. A maximum of 18 additional hours may be required in related courses and prerequisites. No more than 63 semester hours of course work may be required to complete the major, related courses, and prerequisites. Some departments require calculus-level mathematics; up to five of these semester hours may be excluded from the 63-hour maximum because they satisfy the mathematics proficiency requirement. A minimum of 12 upper-division hours in the major must be taken in residence at ASU Main.
- B. No credit is granted toward fulfilling major or minor requirements in any upper-division course in that subject field unless the grade in that course is at least a "C." In CLAS, the assignment of a grade of "Y" indicates a level of performance that would have resulted in a grade of at least "C" had the normal grading scheme been used.

C. Major fields of study are classified into the following three divisions:

1. Humanities
 - Asian Languages (Chinese/Japanese)
 - English
 - French
 - German
 - Humanities
 - Italian
 - Philosophy
 - Religious Studies
 - Russian
 - Spanish
2. Natural Sciences and Mathematics
 - Biology
 - Botany
 - Chemistry
 - Clinical Laboratory Sciences
 - Computer Science
 - Geology
 - Mathematics
 - Microbiology
 - Physics
 - Wildlife Conservation Biology
 - Zoology
3. Social and Behavioral Sciences
 - Anthropology
 - Chicana and Chicano Studies*
 - Economics
 - Exercise Science/Physical Education*
 - Family Resources and Human Development*
 - Geography
 - History
 - Political Science
 - Psychology
 - Sociology
 - Speech and Hearing Science*
 - Women's Studies*

III. Distribution Requirements. The purpose of the distribution requirement is to ensure that the student is introduced to disciplines outside the division of the major. A list of major fields and their respective divisions is given under II.C.

Unless the major field carries an asterisk in II.C, students are considered to have fulfilled the distribution requirements in the division of the major.

Students majoring in Chicana and Chicano Studies, Exercise Science/Physical Education, Family Resources and Human Development, Speech and Hearing Science, and Women's Studies must satisfy distribution requirements in social and behavioral sciences as well as in the other two divisions.

Students majoring in Anthropology, Geography, and Psychology may not use ASM courses in the case of Anthropology majors, GPH courses in the case of Geography majors, or PSY courses in the case of Psychology majors to satisfy the natural sciences and mathematics requirements.

- A. Humanities (15 semester hours). Each student is required to complete five courses of at least three semester hours each. Course prefixes are identified in the following section.

At least three of the five courses must be taken in one or more of the following CLAS units: the Departments of English, Languages and Literatures, Philosophy, and Religious Studies, and the Interdisciplinary Humanities Program. At least two of these three courses must be at the 300 level or above.

Note: Literature or "civilization" courses (300 level or above) taught in a foreign language may be used to satisfy the humanities distribution requirement, even if they are also used to demonstrate foreign language proficiency (see I.B).

Course prefixes for the humanities distribution requirement:

*Students majoring in these fields must satisfy the distribution requirements in all three divisions.

1. ENG (Department of English; any literature course, including ENG 200 and 218)
 2. CHI, FLA, FRE, GER, GRK, HEB, IDN, ITA, JPN, LAT, POR, RUS, SPA, THA (Department of Languages and Literatures: FLA 150 or any literature or “civilization” course at the 300 level or above)
 3. HUM (Interdisciplinary Humanities Program)
 4. PHL, HPS (Department of Philosophy)
 5. REL (Department of Religious Studies)
 6. CSH (Chicana and Chicano Studies)
 7. APH (College of Architecture and Environmental Design)
 8. ARS, DAH, MHL, MUS, THE (College of Fine Arts)
- B. Natural sciences and mathematics (14 semester hours)
1. Part A (eight semester hours). Two courses (either lecture courses with included laboratories or lecture courses with appropriate accompanying laboratories) to be taken in the Departments of Botany, Chemistry and Biochemistry, Geography (GPH 111 and 212 if taken with 214), Geology, Microbiology, Physics and Astronomy, or Zoology. Laboratories need to meet for at least 30 hours per semester. See departmental listings.
 2. Part B (six semester hours). Two courses to be taken from the Departments of Anthropology (ASM only), Botany, Chemistry and Biochemistry, Computer Science and Engineering, Geography (GPH only), Geology, Mathematics, Microbiology, Physics and Astronomy, Psychology (PSY only), or Zoology. See departmental listings. Students who complete Part A using courses from only one department may not use courses from that department in Part B. Biology courses are considered to be from both the Departments of Botany and Zoology for the purposes of this restriction.
Note: Only mathematics courses for which MAT 117 or a higher-level mathematics course is a prerequisite may be used to satisfy natural sciences and mathematics distribution requirements. Mathematics courses for which MAT 117 is a prerequisite may be used to satisfy distribution requirements in natural sciences and mathematics, even if they were also used to demonstrate mathematics proficiency.
- C. Social and behavioral sciences (15 semester hours). Each student is required to complete five courses of at least three semester hours each.
Courses used to fulfill the social and behavioral sciences distribution requirement must be taken from no fewer than two but no more than three departments.
At least two courses must be at the 300 level or above.
Course prefixes for the social and behavioral sciences distribution requirement:
1. ASB (Department of Anthropology)
 2. CSS (Chicana and Chicano Studies)
 3. ECN (Department of Economics, College of Business)
 4. GCU (Department of Geography)
 5. HIS (Department of History)
 6. PGS (Department of Psychology)
 7. POS (Department of Political Science)
 8. SOC (Department of Sociology)
 9. WST (Women’s Studies Program, only WST 100 or 300 but not both)
- IV. **General Electives.** Most CLAS majors can meet all of the above requirements with fewer than the 120 hours of credit required for graduation. The remainder of their hours are general electives that may be selected from any of the departments of CLAS and from the offerings of the other colleges.
- Program of Study.** The program of study, which is required by university regulations during the semester in which an undergraduate earns the 87th hour, must be filed and approved at least two weeks before the preregistration period for the subsequent semester. Students are expected to follow the approved program of study or to receive early college approval for proposed changes to the program of study. Students should contact the Office for Academic Programs, SS 111, regarding college graduation rules and deadlines. Deadlines for filing a program of study after enrolling in the 87th hour are March 1 and October 1 of each year. Students with 87 hours must have a college-approved program of study before registering for the next semester.

SPECIAL CREDIT OPTIONS

Pass/Fail Grade Option. The pass/fail grade option is intended to broaden the education of Liberal Arts and Sciences undergraduates by encouraging them to take advanced courses outside their specialization. A mark of “P” contributes to the student’s earned hours but does not affect the GPA. A failing grade is computed into the GPA.

Only CLAS students with at least 60 semester hours may take courses under the pass/fail option. The option may be used under the following conditions:

1. enrollment for pass/fail needs the approval of the instructor and the college;
2. enrollment under this option must be indicated during registration and may not be changed after the late registration period; and

3. a maximum of 12 hours taken for pass/fail may be counted toward graduation.

Students may not enroll under the pass/fail option in the following courses:

1. those taken to satisfy the foreign language or English First-Year Composition requirements;
2. those in the student's major or minor or certificate program;
3. those counted toward or required to supplement the major;
4. those counted as 499 Independent Study;
5. those taken for honors credits; or
6. those counted toward satisfying the proficiency and distribution requirements of the college or the General Studies requirement.

The above option is not available to CLAS students for courses offered by other colleges except for courses in economics offered by the College of Business.

Audit Grade Option. A student may choose to audit a course, in which case the student attends regularly scheduled class sessions but no credit is earned. The student should obtain the instructor's approval before registering for the course. For more information, see "Grading System," pages 59–63. *Note:* This grade option may not be changed after the late registration period.

Correspondence Study. Study by correspondence is not a normal part of a degree program; special circumstances must exist for a resident student to take correspondence courses. Any enrollment in correspondence courses must have the prior approval of the college.

ACADEMIC STANDARDS

The standards for GPA and the terms of probation, disqualification, reinstatement, and appeal are identical to those of the university as set forth on pages 63–64, except that the disqualified student in CLAS is suspended for at least two regular semesters at the university. Students on probation normally have one semester in which to remove their probation. Students with cumulative GPAs of less than 2.00 who leave the university for a semester or more are not automatically readmitted. Such students, as well as all disqualified stu-

dents, should contact the Office for Academic Programs, SS 111, regarding procedures and guidance for reinstatement and returning to good standing. By following recommendations and meeting established standards for summer school work or course work at other institutions, the possibility of successful reinstatement is enhanced.

Academic discipline is one of the functions of the Office for Academic Programs, SS 111. All students having academic difficulties of any kind should contact this office. Also available in this office is information on policies and procedures of the college on academic honesty, student grievances with respect to grades, and various petitions regarding college standards and graduation requirements.

Academic honesty is expected of all students in all examinations, papers, academic transactions, and records. The possible sanctions include, but are not limited to, appropriate grade penalties, loss of registration privileges, disqualification, and dismissal.

STUDENT RESPONSIBILITIES

Any student enrolling in courses offered by CLAS is expected to follow the rules and deadlines specified in the *General Catalog* and the current *Schedule of Classes*. Students are urged to meet with their departmental academic advisors before registration. Students with additional questions or problems are also urged to meet with advisors in the Office for Academic Programs, SS 111, regarding the academic rules of the college and the university.

SPECIAL PROGRAMS

University Honors College. CLAS works closely with the University Honors College, which affords qualified undergraduates opportunities for enhanced educational experiences. For a complete description of the University Honors College requirements and opportunities, see pages 99–101.

Interdisciplinary Studies. An Interdisciplinary Studies major leading to the B.A. or B.S. degree provides students of outstanding ability in the humanities, natural sciences and mathematics, and social and behavioral sciences opportunities to pursue courses of studies that cut across departmental boundaries and focus on specific topics or problem ar-

eas. Completion of 32 semester hours at ASU with a GPA of at least 3.25 and three letters of recommendation from ASU faculty members are required for admission. For more information about degree requirements, contact the Office for Academic Programs, SS 111.

Washington Semester Program. Students have a variety of opportunities for practicum and internship experiences that enable them to meld classroom learning with practical application. Among the several individual departmental programs that provide internships for majors, the Department of Political Science is the ASU sponsor of the Washington Semester Program. The program provides students a one-semester opportunity to study in Washington, D.C., through any one of several programs sponsored by the American University. The program is available to outstanding juniors or seniors and requires careful planning with an academic advisor early in the student's career. For more information, call the Department of Political Science, 602/965–6551.

Military Officer Training. The Departments of Aerospace Studies and Military Science offer programs leading to commissions in the armed forces, but they do not offer majors or minors. For further information, see the appropriate department descriptions in this catalog.

Certificate Programs and Areas of Emphasis

Eight certificates are available from units in CLAS, as shown in the "Certificates" table. Areas of emphasis are also available in some of the same areas and in Latin American Studies and are indicated in the "Baccalaureate Degrees" portion of the "CLAS Degrees, Majors, and Concentrations" table, pages 104–106. The certificate programs and areas of emphasis are described below.

Asian Studies. An Asian Studies certificate is offered through the Center for Asian Studies.

Students must complete two years (20 semester hours) of an Asian language plus 30 additional hours of Asian-area studies courses selected from core Asian studies courses or courses with a significant focus on Asia chosen in consultation with the Center

for Asian Studies advisor. Students whose native language is an Asian language or who have otherwise mastered an Asian language may elect to take four additional Asian studies courses in place of the elementary and intermediate language classes. Language requirements may be selected from Chinese, Indonesian, Japanese, Thai, and Vietnamese.

An East Asian Studies certificate is also available. Students must complete two years (20 semester hours) of Chinese or Japanese plus 30 additional semester hours of East Asian area studies courses; these courses must be selected from the core East Asian curriculum or must be courses with a significant focus on East Asia chosen in consultation with the Center for Asian Studies director. Note that students whose native language is Chinese or Japanese or who have otherwise mastered these languages may elect to take four additional East Asian studies courses in place of the elementary and intermediate language courses.

The center houses a comprehensive library and is involved in student and faculty exchange programs with several Asian universities as well as serving as a liaison with various Asian organizations.

For more information, contact the Center for Asian Studies, WHALL 109, 602/965-7184.

Health Physics. The curriculum of health physics involves work in CLAS and the College of Engineering and Applied Sciences. The purpose of the concentration is to serve undergraduate students who wish to prepare themselves for careers in health physics. To qualify for professional status, a health physicist needs a B.S. degree in one of the physical or life sciences and a group of specialized courses in physics, mathematics, chemistry, engineering, and biology or zoology.

A Certificate of Concentration in Health Physics is awarded for the successful completion of a B.S. degree in a physical or life science that follows a prescribed program. Inquiries about the program should be addressed to the Pre-Health Professions Office, MCL 110B, 602/965-2365, where academic advising is available.

Certificates

| Certificate Program | Administered by |
|--|---|
| Asian Studies certificate* | Center for Asian Studies |
| East Asian Studies certificate | Center for Asian Studies |
| Health Physics, Certificate of Concentration in | Pre-Health Professions Office |
| Jewish Studies,* Certificate of Concentration in | Jewish Studies Committee |
| Russian and East European Studies,* Certificate in | Russian and East European Consortium |
| Southeast Asian Studies, Certificate in | Program for Southeast Asian Studies |
| Translation, Certificate in | Department of Languages and Literatures |
| Women's Studies,* Certificate of Concentration in | Women's Studies Program |

* Emphases are also available in these certificate programs and are indicated in the "Baccalaureate Degrees" portion of the "CLAS Degrees, Majors, and Concentrations" table, pages 104-106.

Jewish Studies. The Jewish studies program is designed with the following goals in mind:

1. to examine the history and culture of the Jews;
2. to provide a model for interdisciplinary teaching and research;
3. to generate and facilitate research on Judaica;
4. to provide the community with programs, courses, and research furthering the understanding of Judaica; and
5. to stand as an example of the university's commitment to a program of meaningful ethnic studies on a firm academic base.

The Certificate of Concentration in Jewish Studies may be combined with a major in any college. For information about the program, refer to the Department of History or the Department of Religious Studies or the chair of the Jewish Studies Committee listed in the current *Schedule of Classes*.

Latin American Studies. The Latin American area studies program is designed to give students an understanding of public affairs, culture, and national trends in Latin American nations and is offered as a combined degree program in cooperation with the Departments of Anthropology, Economics, Geography, History, Languages

and Literatures, and Political Science and the College of Business. In this program, the students major in one of the cooperating departments, completing the degree requirements of that particular discipline. At least 30 upper-division semester hours of the total program must be in Latin American content courses, 15 hours in the major, and 15 hours in other disciplines. A reading knowledge of Spanish or Portuguese is required. Fulfillment of requirements is recognized on the transcript by a bachelor's degree in "(major)—Latin American Studies."

For more information, consult the Center for Latin American Studies, SS 213, 602/965-5127.

Russian and East European Studies. Any undergraduate major can earn a Certificate in Russian and East European Studies by successfully completing one of the following two options.

Option one requires three years of Russian or two years of Russian and one year of another East European language and 30 upper-division semester hours in Russian and/or East European course work. *Option two* requires two years of Russian and 36 upper-division hours in Russian and/or East European course work. Fulfillment of these requirements is recognized on the transcript by a bachelor's degree in "(Discipline)—Russian/East European Studies."

For more information, call the coordinator of the Russian and East European Consortium in the Department of History at 602/965-5778.

Southeast Asian Studies. A Certificate in Southeast Asian Studies is awarded to any undergraduate student who elects an interdisciplinary focus in Southeast Asian studies while completing degree requirements in any discipline or professional program. The certificate program offers two options: (1) an area studies specialization emphasizing courses in the social sciences and humanities and requiring one year of Indonesian, Thai, or Vietnamese and (2) a language specialization requiring a two-year sequence in a Southeast Asian language and a proportional number of area studies courses.

Students wishing to study a Southeast Asian language other than those offered on campus may transfer credits earned at the Southeast Asian Studies Summer Institute, a consortium for intensive language and area studies, or at other accredited programs. Qualified students may request placement testing on other national languages of the region, administered in accordance with the national American Council of Teachers in Foreign Languages (ACTFL) guidelines.

The ASU curriculum includes

1. language instruction in Indonesian, Thai, or Vietnamese;
2. ASB/GCU/HIS/POS/REL 240 Introduction to Southeast Asia (3);
3. HIS 308 Modern Southeast Asian History (3);
4. electives in the social sciences and humanities on the history, geogra-

phy, culture, politics, and religion of the region; and

5. a culminating capstone seminar in which the students share multidisciplinary approaches to the region and integrate knowledge of Southeast Asia with their respective disciplinary orientations.

Courses counting toward the Certificate in Southeast Asian Studies fulfill requirements for undergraduate majors and General Studies in the social and behavioral sciences, humanities, literacy, and global and historical awareness areas. A two-year sequence in Southeast Asian language study meets the foreign language requirement for undergraduates in CLAS.

The Program for Southeast Asian Studies is a federally funded National Resource Center for Southeast Asia. For more information, contact the Program for Southeast Asian Studies, LL C32, 602/965-4232.

Translation. See page 154 for information about the Certificate in Translation.

Women's Studies. The curriculum of women's studies involves courses from colleges throughout the university. The program is designed with the following goals in mind:

1. to examine the central issues of the quality and shape of women's lives;
2. to provide a model for interdisciplinary teaching and research;
3. to generate and facilitate research on women's experience;
4. to provide the university and the community with programs, courses, and research that acknowledge and expand the potential of women; and

5. to stand as a visible example of the university's commitment to change in the status of women.

A Certificate of Concentration in Women's Studies is awarded for the successful completion of WST 100 (or 300) and 498 and an additional 15 semester hours from the list of approved women's studies courses, only six hours of which may also be applied toward the student's major.

Inquiries about the program should be addressed to the Women's Studies Program, SS 104, 602/965-2358, where the current list of approved courses is available.

GENERAL INFORMATION

Research Centers. To expand educational horizons and to enrich the curriculum, CLAS maintains the following research centers:

Arizona Center for Medieval and Renaissance Studies
 Cancer Research Institute
 Center for Asian Studies
 Center for Latin American Studies
 Center for Meteorite Studies
 Center for Solid State Science
 Center for the Study of Early Events in Photosynthesis
 Hispanic Research Center

See the *Graduate Catalog* for a description of these research centers.

LIBERAL ARTS AND SCIENCES

LIA 390 The Use of Research Libraries. (3) F, S
 Interdisciplinary resources and services of libraries, particularly this university's, with emphasis on research, information literacy, and applied critical thinking skills. Lecture, discussion, site visits. *General Studies: L1.*

Department of Aerospace Studies

Air Force ROTC

Col. Ronald J. Perkins

Chair

(MAIN 340) 602/965-3181

PROFESSOR

PERKINS

ASSISTANT PROFESSORS

HALL, RIZZA, WARDEN

Purpose. The Department of Aerospace Studies curriculum consists of the general military course and history for freshmen and sophomores (AES 101, 102, 201, 202) and the professional officer course for juniors and seniors (AES 301, 302, 401, 402).

General Qualifications. A man or woman entering the Air Force Reserve Officers' Training Corps (AFROTC) must be the following:

1. a citizen of the United States (non-citizens may enroll but must obtain citizenship before commissioning);
2. of sound physical condition; and
3. at least 17 years of age for scholarship appointment or admittance to the Professional Officer Course (POC).

Additionally, scholarship recipients must be able to fulfill commissioning requirements by age 25. If designated for flying training, the student must be able to complete all commissioning requirements before age 26 and a half; persons in other categories must be able to complete all commissioning requirements before age 30.

Four-Year Program (GMC and POC). A formal application is not required for students entering the four-year program. A student may enter the program by simply registering for one of the general military course (GMC) classes at the same time and in the same manner as other courses. GMC students receive two semester hours for each AES 100 and 200 class completed for a total of eight semester hours.

GMC students not on AFROTC scholarship incur no military obligation. Each candidate for commissioning must pass an Air Force aptitude test and a physical examination and be selected by a board of Air Force officers. If selected, the student then enrolls in the POC the last two years of the AFROTC curriculum. Students attend a four-week field training course at an Air Force base normally between the sophomore and junior years. Upon successful completion of the POC and the college requirements for a degree, the student is commissioned in the U.S. Air Force as a second lieutenant. The new officer then enters active duty or may be granted an educational delay to pursue graduate work.

Two-Year Program (POC). The basic requirement for entry into the two-year program is that the student have two academic years of college work remaining, either at the undergraduate or graduate level. Applicants seeking enrollment in the two-year program must pass an Air Force aptitude and medical examination and be selected by a board of Air Force officers. After successfully completing a six-week field training course at an Air Force base, the applicant may enroll in the professional officer course in the AFROTC program. Upon completion of the POC and the college requirements for a degree, the student is commissioned.

Qualifications. The following requirements must be met for admittance to the POC:

1. The four-year student must successfully complete the general military course and the four-week field training course.
2. The two-year applicant must complete a six-week field training course.
3. All students must pass the Air Force Officer Qualifying Test (AFOQT).
4. All students must pass the Air Force physical examination.
5. All students must maintain the minimum GPA required by the college.
6. All students must meet the physical fitness requirements.

Pay and Allowances. POC members in their junior and senior years receive \$150.00 per month for a maximum of 20 months of POC attendance. Students are also paid to attend field training. In addition, uniforms, housing, and meals are provided during field training at no cost to the student. Students are reimbursed for travel to and from field training.

Scholarships. AFROTC offers scholarships annually to outstanding young men and women on a nationwide competitive basis. Scholarships cover college tuition for nonresident students and provide an allowance for books, fees, supplies and equipment, and a monthly tax-free allowance of \$150.00. Scholarships are available on a four- and two-year basis. To qualify for the four-year scholarship, a student must be a U.S. citizen and submit an application before December 1 of the senior year in high school. Interested students should consult their high school counselors or call AFROTC at ASU for application forms to be submitted to

HQ AFROTC
MAXWELL AFB
AL 36112-6663

Students enrolled in AFROTC at ASU are eligible for two-year scholarships. Those students interested must apply through the Department of Aerospace Studies. Consideration is given to academic grades, the score achieved on the AFOQT, and physical fitness. A board of officers considers an applicant's personality, character, and leadership potential.

AEROSPACE STUDIES

AES 101 U.S. Air Force Organization. (2) F Introduction to U.S. Air Force organization, mission, doctrine, offensive, and defensive.

102 Leadership Lab. (0) F Emphasis on common Air Force customs and courtesies, drill and ceremonies, health and physical fitness through group participation. Corequisite: AES 101.

103 Nature of U.S. Air Power. (2) S Background on strategic missile defense forces, general purpose, and aerospace support forces in national defense.

104 Leadership Lab. (0) S Continuation of AES 102 with more in-depth emphasis on learning the environment of an Air Force officer. Corequisite: AES 103.

201 Aerospace History to WWII. (2) F

Historical survey of events, trends, and policies leading to the emergence of air power through WW II.

202 Leadership Lab. (0) F

Application of advanced drill and ceremonies, issuing commands, knowing flag etiquette, and developing directing and evaluating skills to lead others. Corequisite: AES 201.

203 Aerospace History: WW II to Present.

(2) S

Aerospace power from WW II to the present, emphasizing the impact of limited war and technology on roles and missions.

204 Leadership Lab. (0) S

Continuation of AES 202 with an emphasis on preparation for field training. Corequisite: AES 203.

301 U.S. Air Force Communication Management and Leadership. (3) F

The individual as a manager in the Air Force. Covers motivational and behavioral processes, leadership, communication, and group dynamics. *General Studies: L2.*

302 Leadership Lab. (0) F

Advanced leadership experiences applying leadership and management principles to motivate and enhance the performance of other cadets. Corequisite: AES 301.

303 U.S. Air Force Management and Leadership. (3) S

Organizational and personal values, management of forces in change, organizational power, politics, managerial strategy, and tactics. *General Studies: L2.*

304 Leadership Lab. (0) S

Continuation of AES 302 with emphasis on planning the military activities of the cadet corps and applying advanced leadership methods. Corequisite: AES 303.

401 National Security Institutional Policy and Strategy. (3) F

Emphasis on the broad range of American civil-military relations; the political, economic, and social constraints on the national defense. *General Studies: L2.*

402 Leadership Lab. (0) F

Advanced leadership experience demonstrating learned skills in planning and controlling the military activities of the corps. Corequisite: AES 401.

403 Topical and Regional Security Issues.

(3) S

Formulation and implementation of U.S. defense policies; impact of technological and international developments in the overall defense policymaking processes.

404 Leadership Lab. (0) S

Continuation of AES 402 with an emphasis on preparation for transition from civilian to military life. Corequisite: AES 403.

- three hours each in linguistics, an ethnographic area course, and an archaeology or physical anthropology area course.

Three of the nine hours in related fields must be in statistics. Each student's program of study must be approved by the advisor in consultation with the student. At least 18 semester hours must be in upper-division courses. For details see the departmental brochure. See "Foreign Language Requirement and Placement," page 154.

Latin American Studies Emphasis.

Students majoring in Anthropology may elect to pursue a Latin American Studies emphasis, combining courses from the major with selected outside courses of wholly Latin American content. See "Latin American Studies," page 111, for more information.

Minor in Anthropology

The Anthropology minor requires 18 semester hours. Two courses, ASB 102 and ASM 101, are required. The other 12 hours must be in the upper division and represent at least two of the three subfields of anthropology. For more information, consult the department office.

SECONDARY EDUCATION—B.A.E.

Social Studies. The major teaching field consists of 63 semester hours, of which 30 hours must be in the anthropology courses required for the B.A. degree. Of the remaining hours, two groups of 15 hours are to be taken in related social sciences. Psychology or a single natural science may be used as one of the 15-hour fields. SED 480 is taken to provide the remaining three hours.

| | |
|--|----|
| SED 480 Special Methods of Teaching Social Studies | 3 |
| Anthropology | 30 |
| Social sciences..... | 15 |
| Social sciences, natural sciences, or psychology | 15 |
| Total | 63 |

The minor teaching field consists of 24 semester hours in anthropology. Courses ASB 102 and ASM 101 and two upper-division courses in each subfield (archaeology, physical anthropology, and social-cultural anthropology) are required.

Department of Anthropology

Barbara L. Stark
Chair

John K. Chance
Associate Chair
(ANTH A124) 602/965-6213

REGENTS' PROFESSOR
TURNER

PROFESSORS

BAHR, BRANDT, CARR, CHANCE, CLARK, COWGILL, EDER, KINTIGH, KOSS, MARTIN, MERBS, MORRIS, NASH, REDMAN, SCHOENWETTER, STARK, WILLIAMS

ASSOCIATE PROFESSORS

AGUILAR, ALVAREZ, BARTON, FALCONER, FIRESTONE, HEDLUND, HUDAK, MARZKE, M. NELSON, RICE, SPIELMANN

ASSISTANT PROFESSORS

HEGMON, B. NELSON, STEADMAN, WELSH

SENIOR LECTURER

WINKELMAN

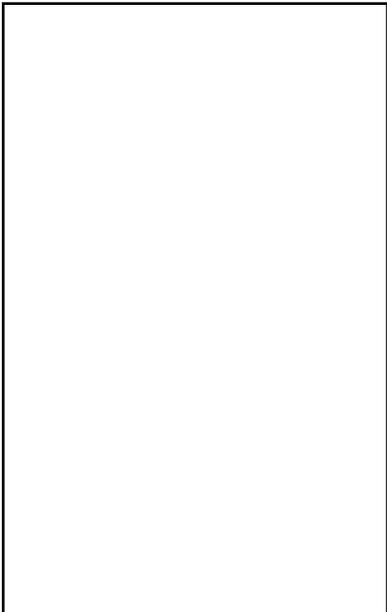
PROFESSORS EMERITI

DITTERT, GAINES, STEWART

ANTHROPOLOGY—B.A.

The program consists of 45 semester hours, of which 36 must be in anthropology and nine in related fields to be approved by the advisor in consultation with the student. Course requirements are distributed as follows:

- ASB 102 and ASM 101;
- six hours, including at least one course at the 300 level or above, in each of the following subfields: archaeology, physical anthropology, and social-cultural anthropology; and



GRADUATE PROGRAM

The Department of Anthropology offers programs leading to the M.A. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

ANTHROPOLOGY (ASM)

ASM 101 Human Origins and the Development of Culture. (3) F, S

Physical anthropology and archaeology. Evidence and processes of human evolution and of culture change. Primates. Fossil hominids and their tools. Race, variation, and heredity. Environment and human biology. Prehistoric culture and society. *General Studies: SB.*

241 Biology of Race. (3) F, S

Human variation and its interpretation in an evolutionary context.

301 Peopling of the World. (3) S

Course reviews all evidence for human dispersal during the last 100,000 years, origins of language, cultures, races, and beginnings of modern humans. Prerequisite: ASM 101. *General Studies: SB.*

338 Anthropological Field Session. (2–8) S

Anthropological field techniques, analysis of data, and preparation of field reports. May be repeated for credit. Prerequisite: instructor approval.

341 Human Osteology. (4) F

Osteology, human paleontology, and osteometry. Description and analysis of archaeological and contemporary human populations. 3 hours lecture, 3 hours lab. Prerequisite: ASM 101 or instructor approval.

342 Human Biological Variation. (4) S

Evolutionary interpretations of biological variation in living human populations, with emphasis on anthropological genetics and adaptation. Nutrition and disease and their relation to genetics and behavior. 3 hours lecture, 3 hours lab. Prerequisites: ASM 101 and MAT 106 (or equivalent) or instructor approval. *General Studies: S2.*

343 Primatology. (3) F

Evolution and adaptations of nonhuman primates, emphasizing social behavior. Includes material from fossil evidence and field and laboratory studies in behavior and biology. Prerequisite: ASM 101 or instructor approval.

344 Fossil Hominids. (3) N

Ancient African, Asian, and European human and primate skeletal, dental, and cultural remains. Human biological, behavioral, and cultural evolution. Prerequisite: ASM 101 or instructor approval. *General Studies: H.*

345 Disease and Human Evolution. (3) F

Interaction of people and pathogens from prehistoric times to the present, with emphasis on disease as an agent of genetic selection. Prerequisite: ASM 101 or instructor approval.

346 Human Origins. (3) S

Humanity's place in nature; fossils; historic and recent concepts of human races; influence of culture on human evolution.

348 Social Issues in Human Genetics. (3) S

Moral and social implications of developments in genetic science, particularly as they affect

reproduction, medicine, and evolution. *General Studies: SB.*

365 Laboratory Methods in Archaeology. (4) N

Techniques of artifact analysis. Basic archaeological research techniques; methods of report writing. May be repeated for credit for total of 8 hours. Prerequisite: ASM 101 or instructor approval.

435 Archaeological Pollen Analysis. (3) F

Theory, methodology, and practice of pollen analytic techniques. Compares uses in botany, geology, and archaeology. 2 hours lecture, 3 hours lab, possible field trips. Prerequisite: instructor approval.

450 Bioarchaeology. (3) S

Surveys archaeological and physical anthropological methods and theories for evaluating skeletal and burial remains to reconstruct biocultural adaptation and lifeways. Prerequisite: ASM 101 or instructor approval.

452 Dental Anthropology. (4) F

Human and primate dental morphology, growth, evolution, and genetics. Within- and between-group variation. Dental pathology and behavioral-cultural-dietary factors. 3 hours lecture, 3 hours lab. Prerequisite: instructor approval. *General Studies: S2.*

454 Comparative Primate Anatomy. (4) S

Functional anatomy of the cranial, dental, and locomotor apparatus of primates, including humans, emphasizing the relation of morphology to behavior and environment. Lectures, lab, dissections, demonstrations. 3 hours lecture, 3 hours lab. Prerequisite: instructor approval.

455 Primate Behavior Laboratory. (3) N

Instruction and practice in methods of observation and analysis of primate behavior. Discussion of the relationship between class work on captive animals and field techniques for studying free-ranging groups. Directed readings, 6 hours lab. Prerequisites: ASM 343; instructor approval. *General Studies: L2.*

465 Quantification and Analysis for Anthropologists. (3) S

Statistical, quantitative, and geometric strategies for envisioning and exploring archaeological, physical anthropological, bioarchaeological, and sociocultural data. Univariate and multivariate methods. Prerequisites: introductory statistical course; instructor approval.

472 Archaeological Ceramics. (3) N

Analysis and identification of pottery wares, types, and varieties. Systems for ceramic classification and cultural interpretation. 2 hours lecture, 3 hours lab. Prerequisite: instructor approval.

548 Geoarchaeology. (3) F

Geologic context relevant to archaeological research. Topics include sediments, deposition environments, soils, anthropogenic and biogenic deposits, and Quaternary chronology. Prerequisite: instructor approval.

555 Advanced Human Osteology. (3) N

Laboratory and field techniques in dealing with the human skeleton. Emphasis on preparation, identification, radiography, sectioning, microscopy, and data processing. 1 hour lecture, 6 hours lab. Prerequisite: ASM 341 or instructor approval.

565 Quantitative Archaeology. (3) S

Formal methods of structuring, codifying, and analyzing data for archaeological problems. Designing research to yield data amenable to productive analysis.

566 Advanced Topics in Quantitative Archaeology. (3) F

Archaeological issues associated with quantitative analysis, e.g., Bayesian and Monte Carlo approaches, simulation, diversity. May be repeated for credit. Prerequisite: ASM 565 or instructor approval.

573 Lithic Analysis. (3) N

Analysis and interpretation of chipped stone artifacts. Focus on both techniques and underlying concepts and their application to real collections. Prerequisite: instructor approval.

591 Seminar. (3) N

Selected topics in archaeology and physical anthropology.

- (a) Bioarchaeology
- (b) Evolution and Culture
Cross-listed as ASB 591.
- (c) Interdepartmental Seminar
Cross-listed as ASB 591.
- (d) Physical Anthropology
- (e) Primates and Behavior

ANTHROPOLOGY (ASB)

ASB 102 Introduction to Cultural and Social Anthropology. (3) F, S

Principles of cultural and social anthropology, with illustrative materials from a variety of cultures. The nature of culture. Social, political, and economic systems; religion, aesthetics, and language. *General Studies: SB, G.*

202 Ethnic Relations in the United States. (3) F, S

Processes of intercultural relations; systems approach to history of U.S. interethnic relations; psychocultural analysis of contemporary U.S. ethnic relations. *General Studies: C/H.*

210 Sex, Marriage, and Evolution. (3) F

Examination of the sexual nature and behavior of humans from both a biological and an anthropological point of view.

211 Women in Other Cultures. (3) N

Cross-cultural analysis of the economic, social, political, and religious factors that affect women's status in traditional and modern societies. *General Studies: G.*

222 Buried Cities and Lost Tribes: Our Human Heritage. (3) S

Archaeology through its most important discoveries: human origins, Pompeii, King Tut, the Holy Land, Southwest Indians, and methods of field archaeology. *General Studies: HU.*

231 Archaeological Field Methods. (4) S

Excavation of archaeological sites and recording and interpretation of data. Includes local field experience. 2 hours lecture, 8 hours lab. Prerequisite: ASM 101 or instructor approval. *General Studies: S2.*

240 Introduction to Southeast Asia. (3) F

An interdisciplinary introduction to the cultures, religions, political systems, geography, and history of Southeast Asia. Cross-listed as GCU 240/HIS 240/POS 240/REL 240. *General Studies: G.*

- 242 Asian American Experiences: An Anthropological Perspective.** (3) F
The historical and contemporary experiences of Asian Americans in terms of the anthropological concepts of culture, ethnicity, and adaptation. *General Studies: L1, C.*
- 250 Anthropology Topics.** (3) S
Covers five areas of anthropological inquiry. Emphasizes library research, critical analysis, and communication skills relevant to upper-division anthropology course work. Prerequisites: ASB 102; ASM 101 or equivalent; completion of the First-Year Composition requirement. *General Studies: L1.*
- 302 Ethnographic Field Study in Mexico.** (3) SS
Fieldwork study of cultural adaptation, Mexican culture, United States-Mexican cultural conflict, ethnographic research methods, and local culture. Lecture, discussion, field research. Pre- or corequisite: SPA 101 or equivalent.
- 311 Principles of Social Anthropology.** (3) S
Comparative analysis of domestic groups and economic and political organizations in primitive and peasant societies. *General Studies: SB.*
- 314 Comparative Religion.** (3) F, S
Origins, elements, forms, and symbolism of religion; a comparative survey of religious beliefs and ceremonies; the place of religion in the total culture. Prerequisite: ASB 102 or instructor approval.
- 319 The North American Indian.** (3) A
Archaeology, ethnology, and linguistic relationship of the Indians of North America. Does not include Middle America. Prerequisite: ASB 102 or instructor approval.
- 320 Indians of Arizona.** (3) F
The traditional cultures and the development and nature of contemporary political, economic, and educational conditions among Arizona Indians.
- 321 Indians of the Southwest.** (3) S
Cultures of the contemporary Indians of the Southwestern United States and their historic antecedents. Prerequisite: ASB 102 or instructor approval. *General Studies: L2/SB, C/H.*
- 322 Indians of Mesoamerica.** (3) S
Historic tribes and folk cultures. Prerequisite: ASB 102 or instructor approval. *General Studies: SB, G.*
- 323 Indians of Latin America.** (3) F
Indigenous cultures of the Amazon, the Andean region, Central America, and southern Mexico. Lecture, discussion. Prerequisite: ASB 102 or instructor approval.
- 324 Peoples of the Pacific.** (3) N
Peoples and cultures of Oceania focusing particularly on societies of Melanesia, Micronesia, and Polynesia. Prerequisite: ASB 102 or instructor approval. *General Studies: G.*
- 325 Peoples of Southeast Asia.** (3) F
A cultural-ecological perspective on the peoples of mainland and insular Southeast Asia. Subsistence modes, social organization, and the impact of modernization. Prerequisite: ASB 102 or instructor approval. *General Studies: G.*
- 330 Principles of Archaeology.** (3) F, S
Methods and theories for reconstructing and explaining the lifeways of prehistoric peoples. Prerequisite: 3 hours of archaeology. *General Studies: SB.*
- 333 New World Prehistory.** (3) F
The variety of archaeological patterns encountered in the Western Hemisphere. Covers the period from the appearance of humans in the New World to European contact; covers the area from Alaska to Tierra del Fuego. Prerequisite: completion of the First-Year Composition requirement. Pre- or corequisite: 1 upper-division ASU course. *General Studies: L2/SB.*
- 334 Arctic Anthropology.** (3) S
Past and present Aleut-Eskimo prehistory, origins, physical features, adaptations, variation, and culture, with comparisons of Asian Arctic populations. Prerequisite: instructor approval. *General Studies: G.*
- 335 Southwestern Anthropology.** (3) N
Past cultures in the Southwest and their relation to present peoples using archaeological, ethnological, and linguistic evidences. Environmental and resource utilization from earliest times to the present. *General Studies: SB, C/H.*
- 337 Pre-Hispanic Civilization of Middle America.** (3) S
Preconquest cultures and civilizations of Mexico. The Aztecs, Mayas, and their predecessors. Prerequisite: ASM 101 or instructor approval. *General Studies: H.*
- 338 Archaeology of North America.** (3) N
Origin, spread, and development of the prehistoric Indians of North America up to the historic tribes. Does not include the Southwest. Prerequisite: ASM 101 or instructor approval.
- 350 Anthropology and Art.** (3) A
Art forms of people in relationship to their social and cultural setting. Prerequisite: ASB 102 or instructor approval.
- 351 Psychological Anthropology.** (3) S
Approaches to the interrelations between the personality system and the sociocultural environment. Prerequisite: ASB 102 or instructor approval. *General Studies: SB.*
- 353 Death and Dying in Cross-Cultural Perspective.** (3) S
Humanistic and scientific study of aging, sickness, dying, death, funerals, and grief and their philosophy and ecology in non-Western and Western cultures. *General Studies: HU/SB, G.*
- 355 Shamanism, Healing and Consciousness.** (3) S
World views, practices, and roles of shamans and traditional and contemporary healers; explanatory biopsychological models of consciousness. *General Studies: HU/SB.*
- 361 Old World Prehistory I.** (3) F
Biosocial evolution in the Pleistocene, emphasizing technological achievements and the relationship between technology and environment in western Europe, sub-Saharan Africa. Prerequisite: ASM 101 or instructor approval. *General Studies: H.*
- 362 Old World Prehistory II.** (3) S
Transition from hunting and collecting societies to domestication economies; establishment of settled village life, emphasizing the Near East, Egypt, Southwest Europe. Prerequisite: ASM 101 or instructor approval. *General Studies: H.*
- 383 Linguistic Theory: Phonetics and Phonology.** (4) F
Basic articulatory phonetics and contemporary theories of the sound system of language. 3 hours lecture, 1 hour lab. *General Studies: SB.*
- 400 Cultural Factors in International Business.** (3) S
Anthropological perspectives on international business relations; applied principles of cross-cultural communication and management; regional approaches to culture and business. Cross-listed as IBS 400. *General Studies: G.*
- 411 Kinship and Social Organization.** (3) S
Meanings and uses of concepts referring to kinship, consanguinity, affinity, descent, alliance, and residence in the context of a survey of the varieties of social groups, marriage, rules, and kinship terminological systems. Prerequisite: 6 hours of anthropology or instructor approval.
- 412 History of Anthropology.** (3) F
Historical treatment of the development of the culture concept and its expression in the chief theoretical trends in anthropology between 1860 and 1950. Prerequisite: ASB 102 or instructor approval. *General Studies: L2/SB.*
- 416 Economic Anthropology.** (3) F
Economic behavior and the economy in pre-industrial societies; description and classification of exchange systems; relations between production, exchange systems, and other societal subsystems. Prerequisite: ASB 102 or instructor approval. *General Studies: L2/SB.*
- 417 Political Anthropology.** (3) A
Comparative examination of the forms and processes of political organization and activity in primitive, peasant, and complex societies. Prerequisite: ASB 102 or instructor approval.
- 426 Historical Archaeology.** (3) N
Principles, techniques, and important sites. Use of ethnohistory, laboratory techniques, and artifact analysis. Discussion of value to historical understanding. Prerequisite: 1 course in archaeology or instructor approval.
- 462 Medical Anthropology: Culture and Health.** (3) F '96
Role of culture in health, illness, and curing; health status, provider relations, and indigenous healing practices in United States ethnic groups. Lecture, discussion. *General Studies: C.*
- 471 Introduction to Museums.** (3) F
History, philosophy, and current status of museums. Exploration of collecting, preservation, exhibition, education, and research activities in different types of museums. Prerequisites: ASB 102 and ASM 101 or instructor approval.
- 480 Introduction to Linguistics.** (3) F
Descriptive and historical linguistics. Survey of theories of human language, emphasizing synchronic linguistics. *General Studies: SB.*
- 481 Language and Culture.** (3) S
Application of linguistic theories and findings to nonlinguistic aspects of culture; language change; psycholinguistics. Prerequisite: ASB 102 or instructor approval. *General Studies: SB.*
- 483 Sociolinguistics and the Ethnography of Communication.** (3) N
Relationships between linguistic and social categories; functional analysis of language use, maintenance, and diversity; interaction between verbal and nonverbal communication. Prerequisites: ASB 480 and ENG 213 (or FLA 400) or instructor approval. *General Studies: SB.*
- 529 Culture and Political Economy.** (3) N
Origin and spread of Western capitalism and its impact on non-Western societies. Ethnographic and historical case studies are utilized. Prerequisite: graduate standing.

530 Ecological Anthropology. (3) A

Relations among the population dynamics, social organization, culture, and environment of human populations, with special emphasis on hunter-gatherers and extensive agriculturalists.

532 Graduate Field Anthropology. (2–8) S

Independent research on a specific anthropological problem to be selected by the student in consultation with the staff. May be repeated for credit. Prerequisites: ASM 338 or equivalent; instructor approval.

535 Public Archaeology. (4) N

Theoretical and practical applications of cultural resources legislation and policy. Legal and administrative requirements; conservation, development, and management of cultural resources; CRM research design formulation. Seminar, field work. Prerequisites: regular graduate student standing; 12 completed graduate hours in archaeology; instructor approval.

536 Ethnohistory of Mesoamerica. (3) N
Indigenous societies of southern Mexico and Guatemala at Spanish contact and their post-conquest transformation. Emphasis is on the Aztec Empire. Prerequisite: graduate standing.

537 Topics in Mesoamerican Archaeology. (3) N

Changing organization of pre-Columbian civilizations in Mesoamerica is explored through interpretive issues, such as regional analysis, chiefdoms, urbanism, and exchange. Prerequisite: instructor approval.

540 Method and Theory of Sociocultural Anthropology and Archaeology I. (3) F

Basic issues concerning concepts of social and ethnic groups, cultural and sociological theory, and the nature of anthropological research. Prerequisite: instructor approval.

541 Method and Theory of Social and Cultural Anthropology. (3) S

Continuation of ASB 540. Prerequisite: ASB 540 or instructor approval.

542 Method and Theory of Archaeology II. (3) S

Models of human evolution, culture change, and interpretation of hunter-gatherer and tribal societies, ceramic, lithic, and faunal materials. Prerequisite: instructor approval.

543 Method and Theory of Archaeology III. (3) F

Covers concepts of social complexity along with economy, demography, and social dynamics, followed by archaeological research design. Prerequisite: instructor approval.

544 Settlement Patterns. (3) N

Spatial arrangement of residences, activity sites, and communities over landscape. Emphasis on natural and cultural factors influencing settlement patterns. Prerequisite: instructor approval.

546 Pleistocene Prehistory. (3) F

Development of society and culture in the Old World during the Pleistocene epoch, emphasizing technological change through time and the relationship of people to their environment. Prerequisite: ASB 361 or equivalent.

547 Issues in Old World Domestication Economies. (3) S

Archaeological evidence for transitions in Old World subsistence economies from hunting and gathering to dependence on domesticated plants and animals. Prerequisite: ASB 362 or equivalent.

550 Economic Archaeology. (3) N

Prehistoric economies in hunter-gatherer, tribal, and complex societies. Subsistence strategies, craft production and specialization, and exchange covered. Prerequisite: instructor approval.

551 Prehistoric Diet. (3) N

Includes (1) a critical review of techniques for recovering dietary information and (2) theoretical models concerned with explaining diet and nutrition. Prerequisite: instructor approval.

555 Complex Societies. (3) S

Structural variations in hierarchically organized societies, along with origins, dynamics, and collapse, are examined. Seminar.

559 Archaeology and the Ideational Realm. (3) N

"Post-processual" and other views concerning relevance of mental phenomena for understanding sociocultural change. Various approaches to inferring prehistoric meanings.

563 Hunter-Gatherer Adaptations. (3) N

Evolution of prehistoric hunter-gatherer societies in the Old and New Worlds from the most ancient times through protohistoric chiefdoms. Prerequisite: instructor approval.

567 Southwestern Archaeology. (3) S

Broad coverage of Southwestern cultural developments focusing on current debates and rigorous use of archaeological data in making cultural inferences.

568 Intrasite Research Strategies. (3) F

Research issues within a single site context. Topics include quantitative spatial analysis, site definition, sampling, distributional analysis, and substantive interpretation.

571 Museum Principles. (3) F

History, philosophy, and current status of museums. Exploration of collecting, preservation, exhibition, education, and research activities in different types of museums. Prerequisites: ASB 102 and ASM 101 or instructor approval.

572 Museum Collection Management. (3) S

Principles and practices of acquisition, documentation, care, and use of museum collections; registration, cataloging, and preservation methods; legal and ethical issues. Prerequisite: ASB 571 or instructor approval.

573 Museum Administration. (3) S

Formal organization and management of museums; governance; personnel matters; fund raising and grantsmanship; legal and ethical issues. Prerequisite: ASB 571 or instructor approval.

574 Exhibition Planning and Design. (3) S

Exhibition philosophies and development; processes of planning, designing, staging, installing, evaluating, and disassembling temporary and long-term exhibits. Prerequisites: ASB 571 and 572 or instructor approval.

575 Computers and Museums. (3) F

Basics of museum computer application; hardware and software; fundamentals of database management; issues of research, collections management, and administration.

576 Museum Interpretation. (3) F

Processes of planning, implementing, documenting, and evaluating educational programs in museums for varied audiences—children, adults, and special interest groups. Lecture, discussion. Prerequisite: ASB 571.

577 Principles of Conservation. (3) S

Preservation of museum objects: nature of materials, environmental controls, and causes of degradation; recognizing problems, damage, and solutions; proper care of objects. Prerequisites: ASB 571 and 572 or instructor approval.

582 Linguistic Theory: Syntax. (3) N

Contemporary theories of the grammatical structure of languages. Prerequisite: ASB 480 or FLA 400 or instructor approval.

585 Linguistic Theory: Phonological Systems. (3) F

Origins and development of contemporary phonological systems with particular attention to non-Western languages. Prerequisite: ASB 480 or FLA 400 or instructor approval.

591 Seminar. (3) N

Selected topics in archaeology, linguistics, and social-cultural anthropology.

(a) Archaeological Ceramics

(b) Archaeology of North America

(c) Cultural Anthropology

(d) Culture and Personality

(e) Evolution and Culture
Cross-listed as ASM 591.

(f) Historical Archaeology

(g) Interdepartmental Seminar
Cross-listed as ASM 591.

(h) Linguistics

(i) Museum Studies

(j) Problems in Southwestern Archaeology

(k) Problems in Southwestern Ethnology

(l) Social Anthropology

Biological Sciences

The following curricula are offered jointly by the Departments of Botany and Zoology. Students who elect one of these programs are advised by a member of one of the two departments.

BIOLOGY—B.S.

The major in Biology is offered jointly by the Departments of Botany and Zoology. Students are advised by a member of either department. This major serves students desiring a broader program in the biological sciences than that provided by the more specialized majors in the degree programs of the individual departments.

The major consists of 43 hours and 20 hours in supplementary areas, plus a mathematics proficiency. The required major courses, totaling 31 hours, are as follows:

| | | | |
|-----|-----|--|---|
| BIO | 181 | General Biology <i>SI/S2</i> | 4 |
| BIO | 182 | General Biology <i>SI</i> | 4 |
| BIO | 320 | Fundamentals of Ecology..... | 3 |
| BIO | 340 | General Genetics | 4 |
| BOT | 300 | Survey of the Plant Kingdom <i>L2/S2</i> | 4 |
| BOT | 360 | Plant Physiology..... | 4 |
| | | or ZOL 360 Basic Physiology (4) | |
| MIC | 206 | Microbiology Laboratory <i>S2*</i> | 1 |
| MIC | 220 | Biology of Microorganisms .. | 3 |
| ZOL | 350 | Comparative Invertebrate Zoology | 4 |

*Both MIC 205 and 206 must be taken to secure *S2* credit.

The remaining 12 hours (upper-division) are to be selected so that the total major hours reflect a balance between the two departments. Required supplementary courses are as follows:

| | | | | |
|--|----------|---|-------|--------|
| CHM | 113 | General Chemistry <i>SI/S2</i> | 4 | |
| CHM | 115 | General Chemistry with Qualitative Analysis <i>SI/S2</i> | 5 | |
| Choose between the two combinations of organic chemistry courses below | | | | 4 or 8 |
| CHM | 231 | Elementary Organic Chemistry <i>SI/S2</i> ¹ (3) | | |
| CHM | 235 | Elementary Organic Chemistry Laboratory <i>SI/S2</i> ¹ (1) | | |
| or | | | | |
| CHM | 331, 332 | General Organic Chemistry (6) | | |
| CHM | 335, 336 | General Organic Chemistry Laboratory (2) | | |
| CSE | 181 | Applied Problem Solving with BASIC <i>N3</i> | 3 | |
| | | or CSE 183 Applied Problem Solving with FORTRAN <i>N3</i> (3) | | |
| MAT | 210 | Brief Calculus <i>NI</i> | 3 | |
| | | or any calculus | | |
| PHY | 101 | Introduction to Physics <i>SI/S2</i> | 4 | |
| | | or PHY 111, 112 General Physics <i>SI/S2</i> ² (6) | | |
| | | and PHY 113, 114 General Physics Laboratory <i>SI/S2</i> ² (2) | | |
| Total | | | 23-27 | |

¹ Both CHM 231 and 235 must be taken to secure *S1* or *S2* credit.

² Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure *S1* or *S2* credit.

SECONDARY EDUCATION— B.A.E.

Biological Sciences. Offered jointly by the Departments of Botany and Zoology, the major teaching field consists

of a minimum of 40 semester hours and at least 22 hours in supporting courses. Required major courses are as follows:

| | | | |
|-------|-----|---|----|
| BIO | 181 | General Biology <i>SI/S2</i> | 4 |
| BIO | 182 | General Biology <i>S2</i> | 4 |
| BIO | 320 | Fundamentals of Ecology..... | 3 |
| BIO | 340 | General Genetics | 4 |
| BIO | 445 | Organic Evolution | 3 |
| BOT | 300 | Survey of the Plant Kingdom <i>L2/S2</i> | 4 |
| | | or BOT 370 The Flora of Arizona (4) | |
| | | or ZOL 350 Comparative Invertebrate Zoology (4) | |
| | | or ZOL 370 Vertebrate Zoology (4) | |
| BOT | 360 | Plant Physiology..... | 4 |
| MIC | 206 | Microbiology Laboratory <i>S2*</i> | 1 |
| MIC | 220 | Biology of Microorganisms .. | 3 |
| ZOL | 360 | Basic Physiology | 4 |
| Total | | | 34 |

*Both MIC 205 and 206 must be taken to secure *S2* credit.

The remaining courses in the major (six hours minimum) should be selected to reflect a balance between ZOL and BOT courses. Required supporting courses are as follows:

| | | | |
|-------|-----|---|----|
| CHM | 113 | General Chemistry <i>SI/S2</i> | 4 |
| CHM | 115 | General Chemistry with Qualitative Analysis <i>SI/S2</i> | 5 |
| GLG | 102 | Introduction to Geology I Historical <i>S2</i> ¹ | 3 |
| | | or GLG 300 Geology of Arizona (3) | |
| HPS | 330 | History of Biology: Conflicts and Controversies <i>H</i> | 3 |
| | | or ZOL 316 History of Biology: Conflicts and Controversies <i>H</i> (3) | |
| MAT | 170 | Precalculus <i>NI</i> | 3 |
| PHY | 101 | Introduction to Physics <i>SI/S2</i> | 4 |
| | | or PHY 111, 112 General Physics <i>SI/S2</i> ² (6) | |
| | | and PHY 113, 114 General Physics Laboratory <i>SI/S2</i> ² (2) | |
| Total | | | 22 |

¹ Both GLG 102 and 104 must be taken to secure *S2* credit.

² Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure *S1* or *S2* credit.

BIO 480 is required in the professional education program.

The minor teaching field consists of 24 semester hours as follows: BIO 181, 182; 16 additional hours in BIO, BOT, MIC, and ZOL courses selected to re-

flect a balance across the disciplines and subdisciplines in biology. BIO 480 is required in addition to the 24 semester hours in biological sciences.

BIOLOGY

BIO 100 The Living World. (4) F, S, SS Principles of biology. Cannot be used for major credit in the biological sciences. 3 hours lecture, 3 hours lab. *General Studies: S1/S2.*

181 General Biology. (4) F, S, SS Biological concepts emphasizing fundamental principles and the interplay of structure and function at the molecular, cellular, organismal, and population levels of organization. 3 hours lecture, 3 hours lab. For majors in biological sciences and preprofessional students in health-related sciences. Secondary school chemistry strongly recommended. *General Studies: S1/S2.*

182 General Biology. (4) F, S, SS Continuation of BIO 181. Secondary school chemistry strongly recommended. Prerequisite: BIO 181. *General Studies: S2.*

217 Conservation Biology. (3) F The scientific and technical means for management, protection, maintenance, and restoration of biological resources on this planet. Prerequisite: 8 hours of biology.

218 Medical History. (1) F Brief survey of humankind's important inventions and discoveries in the art and science of medicine, illustrating interrelationships of medical ideas.

300 Natural History of Arizona. (3) F, S Plant and animal communities of Arizona. Cannot be used for major credit in the biological sciences. Prerequisite: junior standing.

301 Field Natural History. (1) F, S Organisms and their natural environment. 2 weekend field trips, field project. Cannot be used for major credit in the biological sciences. Pre- or corequisite: BIO 300.

310 Special Problems and Techniques. (1-3) F, S Qualified undergraduates may investigate a specific biological problem under the direction of a faculty member. May be repeated for a total of 6 semester hours. Prerequisites: formal conference with the instructor; approval of the problem by the instructor and department chair.

320 Fundamentals of Ecology. (3) F, S Organization, functioning, and development of ecological systems; energy flow; biogeochemical cycling; environmental relations; population dynamics. Prerequisite: BIO 182 or instructor approval.

321 Introductory Ecology Laboratory. (3) S Laboratory and field observations and experiments to test current concepts and theories in ecology. Lab. Pre- or corequisite: BIO 320. *General Studies: L2.*

330 Ecology and Conservation. (3) F Ecological and biological concepts of conservation used to understand ecological problems caused by humans. Cannot be used for major credit in the biological sciences. *General Studies: G.*

332 Cell Biology. (3) F Survey of major topics in cell biology, including structural, biochemical, and molecular aspects of cell function. Prerequisite: BIO 182.

340 General Genetics. (4) F, S, SS
Science of heredity and variation. 3 hours lecture, 1 hour recitation. Prerequisite: BIO 182.

343 Genetic Engineering and Society. (3) F
Introduction to genetic engineering, with emphasis on applications (gene therapy, DNA fingerprinting, bioremediation, transgenic animals and plants). Prerequisite: BIO 100 or 181 or equivalent.

360 Cancer and Heart Disease. (3) F
Incidence and mortality statistics for cancer and heart disease; host and environmental risk factors; diagnosis, treatment and prevention strategies. Cannot be counted toward a Zoology major. Prerequisites: 12 hours in life sciences; CHM 231 or equivalent; L1 course; or instructor approval. *General Studies: L2.*

361 Radiation and Life. (3) S
Benefits and risks of radiation exposure in society; medical applications, food irradiation, nuclear power, solar UV, population health effects. Cannot be counted toward a Zoology major. Prerequisites: 12 hours in life sciences; CHM 231 or equivalent; L1 course; or instructor approval. *General Studies: L2.*

410 Professional Values in Science. (2–3) A
Considers issues related to values in science such as collaboration, finances, legal issues, media, mentoring, ownership of ideas, scientific integrity. Discussion, student projects. Cross-listed as HPS 410.

415 Biometry. (4) F
Statistical methods applied to biological problems, design of experiments, estimation, significance, analysis of variance, regression, correlation, chi square, and bioassay; the use of computers. Does not satisfy laboratory requirements for the liberal arts general studies program. 3 hours lecture, 3 hours lab. Prerequisite: MAT 210 or equivalent. *General Studies: N2.*

420 Computer Applications in Biology. (3) F
Computer analysis techniques in biology, emphasizing data entry, management and analysis, and graphic portrayal. Employs mainframe and microcomputers. Prerequisites: BIO 182 and MAT 117 and 170 or instructor approval. *General Studies: N3.*

426 Limnology. (4) S
Structure and function of aquatic ecosystems, with emphasis on freshwater lakes and streams. 3 hours lecture, 3 hours lab or field trip. Prerequisite: BIO 320 or instructor approval. *General Studies: L2.*

428 Biogeography. (3) F
Environmental and historical processes determining distributional patterns of animals and plants, emphasizing terrestrial life. Prerequisites: BIO 182 or equivalent; junior standing. *General Studies: L2.*

430 Advanced Developmental Biology. (3) S
Current concepts and experimental methods involving differentiation and biosynthetic activities of cells and organisms, with examples from microorganisms, plants, and animals. Prerequisite: ZOL 330.

441 Cytogenetics. (3) F '97
Chromosomal basis of inheritance. Prerequisite: BIO 340.

442 Cytogenetics Laboratory. (2) F '97
Microscopic analysis of meiosis, mitosis, and aberrant cell division. 6 hours lab. Pre- or co-requisite: BIO 441.

445 Organic Evolution. (3) F
Processes of adaptive change and speciation in sexual populations. Prerequisite: BIO 340 or ZOL 241.

464 Photobiology. (3) F '96
Principles underlying the effects of light on growth, development, and behavior of plants, animals, and microorganisms. Prerequisites: CHM 231 or 331; 12 hours of courses in life sciences.

480 Methods of Teaching Biology. (3) S
Methods of instruction, experimentation, organization, and presentation of appropriate content in biology. Prerequisite: 20 hours in the biological sciences.

512 Transmission Electron Microscopy. (3) F
Theory, use, and methods of preparing biological materials for transmission electron microscopy. Materials fee. Lecture, lab. Prerequisite: instructor approval.

515 Scanning Electron Microscopy. (3) S
Theory, use, and methods of preparing biological materials for scanning electron microscopy. Materials fee. 2 hours lecture, 3 hours lab. Prerequisite: instructor approval.

520 Biology of the Desert. (2) N
Factors affecting plant and animal life in the desert regions and adaptations of the organisms to these factors. Prerequisite: 10 hours of biological sciences or instructor approval.

524 Ecosystems. (3) F '97
Structure and function of terrestrial and aquatic ecosystems, with emphasis on productivity, energetics, biogeochemical cycling, and systems integration. Prerequisite: BIO 320 or equivalent.

526 Quantitative Ecology. (3) N
Sampling strategies, spatial pattern analysis, species diversity, classification, and applications of multivariate techniques to ecology. 2 hours lecture, 3 hours lab. Prerequisites: BIO 415 or equivalent; a course in ecology.

529 Advanced Limnology. (3) N
Recent literature, developments, methods, and limnological theory; field and lab application to some particular topic in limnology. Prerequisite: BIO 426.

532 Advanced Cell Biology. (3) S
Applications of contemporary electron microscopic and biochemical/molecular techniques for studying eukaryotic cell functions. Mechanisms of intracellular protein trafficking. Prerequisites: BIO 332 or BOT 360 or ZOL 360 or equivalent; CHM 231 or 331 or equivalent.

535 Biomembranes. (3) N
Structure and function of biological membranes, emphasizing synthesis, fluidity, exocytosis, endocytosis, and cell responses to hormones and neurotransmitters. Prerequisites: BIO 332 or equivalent; CHM 231 or 331 or equivalent.

543 Molecular Genetics. (3) F
Nature and function of the gene; emphasis on the molecular basis of inheritance and gene expression in prokaryotes and eucaryotes. Prerequisites: BIO 340; a course in organic chemistry.

Department of Botany

J. Kenneth Hooper
Chair
(LS E218) 602/965-3414

PROFESSORS

ARONSON, BACKHAUS, KLOPATEK,
NASH, PINKAVA, SOMMERFELD,
TRELEASE, VERMAAS

ASSOCIATE PROFESSORS

CLARK, FRASCH, PIGG, ROBERSON,
STUTZ, SZAREK, TOWILL, WEBBER

ASSISTANT PROFESSORS

DAY, MARTIN

ACADEMIC PROFESSIONALS

BINGHAM, LANDRUM,
LOBRUTTO, SHARP

PROFESSORS EMERITI

CANRIGHT, PATTEN, SWAFFORD

BOTANY—B.S.

The Department of Botany provides a broad and flexible curriculum for students interested in the plant sciences. After a minimal number of core courses, a specific program can be designed with a concentration in plant biochemistry and molecular biology, systematics and ecology, or urban horticulture, depending on the student's specific interests and career goals. The program prepares students for positions in education, industry, and technical fields as well as advanced degree programs in the plant sciences.

The program of study consists of 63 hours in the major. All students are required to take the same 19 hours of courses from the core area. Courses within the three different areas of concentration account for 34 to 43 additional hours. The balance of the 63 hours is electives within the life sciences and related areas selected by the student through consultation with a faculty advisor.

The required courses totaling 19 semester hours for the botany core are as follows:

| | | | |
|-----|-----|------------------------------|---|
| BIO | 181 | General Biology S1/S2 | 4 |
| BIO | 182 | General Biology S2 | 4 |
| BIO | 320 | Fundamentals of Ecology..... | 3 |
| BOT | 350 | Plant Anatomy..... | 4 |
| BOT | 360 | Plant Physiology..... | 4 |

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 71–94. For graduation requirements, see pages 66–70. Omnibus courses are offered that are not listed in the catalog; see pages 44–45.

Systematics and Ecology. Additional required courses totaling 18–19 semester hours for this concentration are as follows:

| | | | |
|-----|-----|--|--------|
| BIO | 340 | General Genetics |4 |
| BOT | 370 | The Flora of Arizona |4 |
| BOT | 410 | Lichenology |3 |
| | | or BOT 434 General Mycology (3) or BOT 450 Phycology (4) | |
| BOT | 420 | Plant Ecology |4 |
| BOT | 499 | Independent Study |3 |

Required supplemental courses include the following:

| | | | |
|-----|-----|--|---------|
| CHM | 113 | General Chemistry <i>SI/S2</i> | 4 |
| CHM | 115 | General Chemistry with Qualitative Analysis <i>SI/S2</i> | 5 |

Choose between the two combinations of courses below.....7 or 8

CHM 231 Elementary Organic Chemistry *SI/S2** (3)

CHM 235 Elementary Organic Chemistry Laboratory *SI/S2** (1)

CHM 361 Principles of Biochemistry (3)

— or —

CHM 331, 332 General Organic Chemistry (6)

CHM 335, 336 General Organic Chemistry Laboratory (2)

*Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

Courses meeting the college numeracy requirement are as follows:

| | | | |
|-----|-----|--|---------|
| BIO | 415 | Biometry <i>N2</i> or BIO 420 Computer Applications in Biology <i>N3</i> (3) | 4 |
| MAT | 210 | Brief Calculus <i>NI</i> or any calculus | 3 |

Plant Biochemistry and Molecular Biology. Additional required courses totaling 13 semester hours for this concentration are as follows:

| | | | |
|-----|-----|------------------------------|--------|
| BIO | 332 | Cell Biology |3 |
| BIO | 340 | General Genetics |4 |
| BOT | 465 | Plant Growth and Development |3 |
| BOT | 499 | Independent Study |3 |

Required supplemental courses include the following:

| | | | |
|-----|----------|--|---------|
| CHM | 113 | General Chemistry <i>SI/S2</i> | 4 |
| CHM | 115 | General Chemistry with Qualitative Analysis <i>SI/S2</i> | 5 |
| CHM | 331, 332 | General Organic Chemistry |6 |
| CHM | 335, 336 | General Organic Chemistry Laboratory | ...2 |
| CHM | 361 | Principles of Biochemistry |3 |

| | | | |
|-----|-----|------------------------------------|--------|
| CHM | 367 | Elementary Biochemistry Laboratory |1 |
|-----|-----|------------------------------------|--------|

Courses meeting the college numeracy requirement are as follows:

| | | | |
|-----|-----|--|---------|
| BIO | 415 | Biometry <i>N2</i> or BIO 420 Computer Applications in Biology <i>N3</i> (3) | 4 |
| MAT | 210 | Brief Calculus <i>NI</i> or any calculus | 3 |

Urban Horticulture. Additional required courses totaling 22 semester hours for this concentration are as follows:

| | | | |
|-----|-----|---|---------|
| BOT | 231 | Horticultural Science <i>S2</i> | 4 |
| BOT | 380 | Landscape Plants |3 |
| BOT | 381 | Landscape Practices |3 |
| BOT | 382 | Urban Forestry |3 |
| BOT | 386 | Indoor Plants or BOT 388 Turf Management (3) or BOT 488 Greenhouse/Nursery Management (3) |3 |
| BOT | 485 | Plant Pathology <i>L2</i> | 3 |
| BOT | 499 | Independent Study |3 |

Required supplemental courses include those selected from one of the following three options:

1. industry track;
2. graduate school track, applied or field research; or
3. graduate school track, basic or laboratory research.

Industry Track

| | | | |
|-------|-----|---|---------|
| CHM | 101 | Introductory Chemistry <i>SI/S2</i> | 4 |
| CHM | 231 | Elementary Organic Chemistry <i>SI/S2*</i> |3 |
| CHM | 235 | Elementary Organic Chemistry Laboratory <i>SI/S2*</i> |1 |
| ERA | 325 | Soils |3 |
| ERA | 326 | Soils Laboratory |1 |
| Total | | |12 |

*Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

Graduate School Track, Applied or Field Research

| | | | |
|-------|-----|--|---------|
| CHM | 113 | General Chemistry <i>SI/S2</i> | 4 |
| CHM | 115 | General Chemistry with Qualitative Analysis <i>SI/S2</i> | 5 |
| CHM | 231 | Elementary Organic Chemistry <i>SI/S2*</i> |3 |
| CHM | 235 | Elementary Organic Chemistry Laboratory <i>SI/S2*</i> |1 |
| ERA | 325 | Soils |3 |
| ERA | 326 | Soils Laboratory |1 |
| Total | | |17 |

*Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

Graduate School Track, Basic or Laboratory Research

| | | | |
|-------|-----|--|---------|
| CHM | 113 | General Chemistry <i>SI/S2</i> | 4 |
| CHM | 115 | General Chemistry with Qualitative Analysis <i>SI/S2</i> | 5 |
| CHM | 331 | General Organic Chemistry | ...3 |
| CHM | 332 | General Organic Chemistry | ...3 |
| CHM | 335 | General Organic Chemistry Laboratory |1 |
| CHM | 336 | General Organic Chemistry Laboratory |1 |
| ERA | 325 | Soils |3 |
| ERA | 326 | Soils Laboratory |1 |
| Total | | |21 |

Courses meeting the college numeracy requirement are as follows:

| | | | |
|-----|-----|--|---------|
| BIO | 415 | Biometry <i>N2</i> or BIO 420 Computer Applications in Biology <i>N3</i> (3) or ERA 350 Applied Quantitative Methods (3) | 4 |
| MAT | 117 | College Algebra <i>NI</i> | 3 |
| MAT | 170 | Precalculus <i>NI</i> or MAT 210 Brief Calculus <i>NI</i> (3) | 3 |

GRADUATE PROGRAMS

The Department of Botany offers programs leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.). The faculty collaborate with the faculty in the Departments of Microbiology and Zoology in offering programs leading to the M.S. degree in Biological Sciences. The faculty also participate in programs leading to the Master of Natural Science degree when one of the concentrations is botany. Select faculty collaborate with the faculty in the Departments of Chemistry and Biochemistry, Microbiology, and Zoology in offering programs leading to the M.S. and Ph.D. degrees in Molecular and Cellular Biology. Other select faculty collaborate in the interdisciplinary concentration in ecology.

BOTANY

BOT 108 Plants and Society. (4) F, S, SS The study of plants in relation to human affairs. Emphasis on edible, medicinal, and commercially significant plants, how they live and grow, and how mankind has applied knowledge to manipulate them. Not for majors in the biological sciences. 3 hours lecture, 3 hours lab. *General Studies: S1/S2.*

231 Horticultural Science. (4) S Principles and practices of horticulture, emphasizing growth, development, and propagation of horticultural plants and environmental factors that affect these processes. 3 hours lecture, 3 hours lab. Prerequisite: BIO 182 or BOT 108. *General Studies: S2.*

- 300 Survey of the Plant Kingdom.** (4) F
Systematic and evolutionary survey of the plant kingdom, emphasizing diversity of gross and cellular structure, reproduction, life cycles, and habitat. 3 hours lecture, 3 hours lab. Prerequisite: BIO 100 or 182 or BOT 108 or equivalent. *General Studies: L2/S2.*
- 301 Economic Botany.** (3) F
Plants/plant products used by people throughout the world. Cultivation, processing, and uses in modern life (fibers, medicinals, beverages, perfumes, and foods). Prerequisite: BIO 182; BOT 108 or equivalent.
- 350 Plant Anatomy.** (4) F
Development and mature structure of tissues of vascular plants; patterns and modifications of the leaf, stem, root, and the flower. 3 hours lecture, 3 hours lab. Prerequisite: BIO 182 or equivalent.
- 360 Plant Physiology.** (4) S
Plant growth and development, nutrition, water relations, reproduction, metabolism, and photosynthesis. 3 hours lecture, 3 hours lab. Prerequisites: BIO 182 or equivalent; CHM 101 or 115 or 231.
- 370 The Flora of Arizona.** (4) S
Principles of taxonomy; identification of Arizona plants. 2 hours lecture, 6 hours lab. Prerequisite: BIO 182 or equivalent or instructor approval.
- 380 Landscape Plants.** (3) S
Identification, culture, and use of plants in urban landscapes. Prerequisite: BOT 231 or equivalent.
- 381 Landscape Practices.** (3) S '97
Installation, irrigation, and maintenance of amenity plants in urban landscape with an emphasis on integrated landscaping technologies. 2 hours lecture, 3 hours lab. Prerequisite: BOT 380 or equivalent.
- 382 Urban Forestry.** (3) F
The establishment, care, and maintenance of ornamental trees, shrubs, and vines. Prerequisite: BOT 231 or equivalent.
- 386 Indoor Plants.** (3) F '97
Identification, culture, and use of container-grown plants for interior environments. Prerequisite: BOT 231 or instructor approval.
- 410 Lichenology.** (3) S '97
Chemistry, ecology, physiology, and taxonomy of lichens. 2 hours lecture, 3 hours lab. Prerequisite: BIO 182 or equivalent.
- 420 Plant Ecology.** (4) S
Plants in relation to environments, emphasizing terrestrial population, community and ecosystem processes. 3 hours lecture, 3 hours lab or field trip, 1 weekend field trip. Prerequisite: BIO 320 or equivalent.
- 425 Plant Geography.** (3) N
Plant communities of the world and their interpretation, emphasizing North American plant associations. Prerequisite: BIO 182 or equivalent or instructor approval.
- 434 General Mycology.** (3) S
Fundamentals of fungal morphology and systematics with an introduction to fungal cell biology, growth and development, ecology, and economic significance. 2 hours lecture, 3 hours lab. Prerequisite: BIO 182 or MIC 206 or equivalent.
- 445 Morphology of the Vascular Plants.** (4) S '98
Comparative form and evolutionary trends in the major groups of vascular plants. 3 hours lecture, 3 hours lab. Prerequisite: BOT 300 or equivalent.
- 448 Palynology.** (3) S
Significance of fossil and extant pollen, spores, and other palynomorphs to systematics, evolution, ecology, and stratigraphy. 2 hours lecture, 1 hour lab. Prerequisite: instructor approval.
- 450 Phycology.** (4) S
The algae (both fresh water and marine forms), emphasizing field collection and identification of local representatives. Morphological, ecological, and economic aspects of the algae. 3 hours lecture, 3 hours lab. Prerequisite: BIO 182 or instructor approval.
- 461 Physiology of Lower Plants.** (3) N
Cellular physiology and biochemistry of algae and fungi; responses of these organisms to chemical and physical stimuli and their process of morphogenesis. Prerequisites: BIO 182 or equivalent; CHM 231.
- 465 Plant Growth and Development.** (3) S '97
Molecular basis of development, role of signal transduction pathways/gene regulation in control of organ formation, pollination, germination and growth. Prerequisites: BIO 182 or instructor approval.
- 475 Angiosperm Taxonomy.** (3) S '98
Principles underlying angiosperm phylogeny. 2 hours lecture, 3 hours lab. Prerequisite: BOT 370 or instructor approval.
- 480 Plants: Pleasures and Poisons.** (3) N
Poisonous, medicinal, and other drug plants. Plant products and their effects on humans; historical and modern perspectives. Prerequisites: BIO 100, 182; BOT 108 or equivalent; CHM 231 or equivalent.
- 485 Plant Pathology.** (3) F
Identification and control of biotic and abiotic factors that cause common disease problems to plants. Prerequisite: BOT 360. *General Studies: L2.*
- 488 Greenhouse/Nursery Management.** (3) F '96
Greenhouse structures, environment, and nursery operation. Includes irrigation, nutrition, and other principles relative to container-grown species. Prerequisites: BOT 381; ERS 225.
- 490 Paleobotany.** (4) S '97
A broad survey of plant life of the past, including the structure of plant fossils, their geologic ranges, geographic distribution, and paleo-environment. 3 hours lecture, 3 hours lab or field trip. Prerequisite: BIO 182 or equivalent.
- 510 Experimental Design.** (3) S '98
ANOVAS, 1-way classification of factorial and partially hierarchic designs; introductory multivariate statistics. 1 3-hour lecture at night. Prerequisite: BIO 415 or equivalent.
- 520 Plant Structural Adaptation.** (2–3) F '96
Adaptive traits of leaf size/unique growth form on energy transfer efficiency; stomatal architecture and water-use efficiency; applications of stable isotopes. Prerequisite: BIO 320 or BOT 350 or 360 or equivalent.
- 525 Plant Photosynthetic Adaptation.** (3) F '97
Evolution and ecology of C₄ and CAM; adaptive traits improving competitive ability in natural environments; comparative physiology of desert plants. Prerequisite: BOT 360 or instructor approval.
- 560 Plant Molecular Biology.** (2) S '98
Biochemistry and molecular biology of plant organelles, including protein targeting, plant viruses, and molecular designs for plant improvements. Prerequisite: instructor approval.
- 562 Plant Genetic Engineering.** (3) S '98
Plant transformation utilization of transgenic plants, transient gene expression assays, and applications of plant genetic engineering. Prerequisite: instructor approval.
- 563 Plant Genetic Engineering Laboratory.** (2) S '98
Plant transformation, utilization of transgenic plants, transient gene expression assays, and applications of plant genetic engineering. 6 hours lab. Prerequisite: instructor approval.
- 564 Plant Metabolism.** (3) N
General plant metabolism and typical plant products, emphasizing biosynthesis and functions of storage products, cell wall constituents, plant acids, pigments, hormones, and numerous secondary products. Prerequisite: BOT 360 or CHM 231 or instructor approval.
- 568 Molecular Mechanisms of Photosynthesis.** (3) S '98
Structure and function of photosynthetic complexes; mechanism of energy conversion in plants, bacteria and model systems. Cross-listed as CHM 568. Prerequisite: instructor approval.
- 570 Plant Secondary Chemistry.** (3) N
Biosynthesis and distribution of plant natural products within various plant taxa. 3 hours lecture. Prerequisite: CHM 332 or equivalent.
- 581 Plant Tissue and Cell Culture.** (3) N
Aseptic, clonal propagation of plants and in vitro culture of cells, tissues, and organs. 2 hours lecture, 3 hours lab. Prerequisite: BOT 360 or 381.
- 585 Diagnosis of Plant Problems.** (4) N
Principles and techniques for diagnosis of biotic and abiotic agents that cause problems in economic plants. 2 hours lecture, 2 3-hour labs. Prerequisite: BOT 485.
- 591 Seminar.** (1) F, S
Topics may be selected from the following:
(a) Algae/Fungi
(b) Biosystematics
(c) Ecology
(d) Horticulture
(e) Photosynthesis
(f) Plant Physiology