

COLLEGE OF Basic Sciences

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The College of Basic Sciences offers preparation for careers in biochemistry, biological sciences, chemistry, computer science, geology and geophysics, microbiology, and physics and astronomy. Students are also provided with strong academic backgrounds for professional study in medicine, dentistry, pharmacy, and many other careers that require in-depth study of science.

The departments within the college, the various curricula, and the degrees that may be earned are shown in the following chart. These curricula provide broad general education as well as knowledge of the structure of science. Students in the college may also choose curricula that provide premedical or predoctoral preparation, including curricula in biochemistry, biological sciences, chemistry with a preprofessional concentration, computer science with a life sciences concentration, and physics with a medical physics concentration. Classroom and laboratory study may be supplemented by contact with active research programs.

The Department of Computer Science offers work leading to the bachelor's and doctoral degrees in computer science and is a participating department in the University's graduate program leading to the Master of Science in Systems Science degree. The other departments of the college offer work leading to the bachelor's, master's, and doctoral degrees.

For specific information concerning undergraduate degree programs, refer to the curricula offered by the departments on the following pages. Detailed information about graduate degree programs may be obtained from the *Graduate Bulletin*.

ADMISSION REQUIREMENTS

Students who contemplate entering this college should give special attention to the mathematics and science courses they select and should consult a representative of the department they plan to enter prior to completing their initial registration.

Students will be admitted to the college when they:

- have earned 24 or more semester hours of credit in courses numbered 1000 or above;
- have maintained a grade point average of at least 2.00 on both LSU and overall averages;
- have passed all courses in mathematics and science with grades of "C" or better or received special approval of the dean of the college;
- have passed ENGL 1001 or the equivalent with a grade of "C" or better;
- have earned credit in either MATH 1022, 1023, 1550 or 1551 with a grade of "C" or better.
- Entry into any of the three majors (biochemistry, biological sciences, and microbiology) in the Department of Biological Sciences requires earned credit in BIOL 1201 and 1202; CHEM 1201; and MATH 1550.

- Entry into any of the three secondary education concentrations (biological sciences, chemistry, or physics) requires a 2.50 gpa and passing scores on the PRAXIS I assessments or minimum ACT composite of 22 or minimum SAT composite of 1030.

Transfer students from other accredited colleges or universities will be permitted to enter the college when they: (1) present, by means of an official transcript, evidence that they have met the current admission requirements of the University and the senior college; and (2) receive approval of the dean of the college.

Students who, after initial enrollment in this college, wish to obtain credits from colleges or universities other than LSU and who plan to offer such credits toward their degree requirements must obtain prior approval from the dean on a specific-course basis.

STUDENT RESPONSIBILITY

Students in this college bear final responsibility for selection of their academic programs and adherence to all published regulations and requirements of the college and the University. Each student must see his or her counselor in the college office for a final degree checkout during the semester *prior to* the semester in which the degree is to be awarded.

CORRESPONDENCE, EXTENSION, AND INTERSESSION CREDIT

Correspondence and extension credit may be accepted toward meeting degree requirements only with approval of the dean of the college and may not exceed a total of 12 hours.

Students in the College of Basic Sciences may not register for more than three semester hours of credit during Intersession without approval of the dean.

Students in residence may take courses by correspondence only in exceptional cases (e.g., conflicts between single sections of required courses) and with specific approval of the dean of the college.

Students may not be enrolled in correspondence course work the semester they intend to graduate.

DEGREE REQUIREMENTS OF THE COLLEGE

The college offers the bachelor's degree in several curricula designed to give students a thorough education in a particular scientific discipline. In addition, a core of material representing a broad exposure to the human cultural heritage is an integral part of the curricula in the college. That core consists of the following course work.

English • Twelve semester hours including ENGL 1001 and 2000 and six hours chosen from English courses on the general education

COLLEGE OF BASIC SCIENCES • UNDERGRADUATE DEGREES

Departments	Curricula	Degrees
Biological Sciences	Biochemistry	Bachelor of Science
	Biological Sciences	
	Microbiology	
Chemistry		
Chemistry	Chemistry	Bachelor of Science in Geology
Computer Science	Computer Science	
Geology & Geophysics	Geology	
Physics & Astronomy	Physics	Bachelor of Science

humanities list or Honors 2002, 2004, 2012, 2013, 2202, 2204, 3001, 3003.

Mathematics • A minimum of five semester hours of calculus (Mathematics 1550). Some curricula require additional credits in mathematics. Degree credit will not be allowed for mathematics courses numbered below 1550.

Foreign Language • Students may satisfy the college foreign language requirement by passing eight to 10 semester hours in a single foreign language. Ordinarily, courses numbered 1001 and 1002, or 1101 and 1102, or 1001 and 2051 are chosen. For example, students choosing Russian will take RUSS 1001 and 1002 (10 semester hours), but students choosing French will take FREN 1001 and 1002 (8 semester hours) and the additional two semester hours will be added to free electives.

International students whose native language is not English and who did not attend an English-speaking high school may satisfy the foreign language requirement as follows:

- As shown above (in a language other than the student's native language); or
- By passing nine hours in his or her native language in courses that may be taken for credit by native speakers of the language; or
- By taking nine semester hours of English and/or speech (CMST) above the minimum requirements in the curriculum for the BS degree. The courses must be pre-approved by the dean and must be taken at LSU. At least three hours must be at the 2000 level or above.

Sciences • Fourteen hours including two semesters of study in the biological sciences, and a year-course in a physical science. Either the biological or physical sciences must include laboratory credits. Courses selected to meet this requirement must be chosen from courses offered by departments in the College of Basic Sciences.

Social Sciences and Humanities • Fifteen semester hours in most curricula of the college. These hours are in addition to the English and foreign language requirements described above. Nine to 12 hours of the required social

sciences/humanities courses must be chosen from the list of general education courses in the following way: three hours in the arts, three hours in the humanities (depending on the curriculum), and six hours in the social sciences.

Following is a listing of the more important academic policies of the college offered to guide students toward degrees.

- All students must complete a program of study established by the department concerned and approved by the faculty and the dean of the college.
- No curriculum in the college requires less than 120 semester hours; some curricula require more. Students in all degree programs of the college must earn at least 24 of the last 30 semester hours offered toward their degrees as registrants in the College of Basic Sciences at LSU. The University requires that all candidates for the bachelor's degree must fulfill a minimum residence requirement of two semesters (or four summer terms) and must earn at least 25 percent of the total number of hours required for the degree at this University.
- Students in all degree programs of the college must earn in residence on the LSU campus (Baton Rouge) at least 18 of the hours offered toward their degrees in courses offered by departments in the College of Basic Sciences. In all degree programs, at least nine of these 18 hours must be in courses numbered above 3000 and offered by the department administering the major program. Students majoring in the Biological Sciences Department must have nine semester hours in courses numbered above 3000 in their major. Research courses cannot be used in the residence requirement of nine hours numbered above 3000. A maximum of three semester hours in research courses may be used in the 18-hour residence requirement. Courses used to satisfy all residence requirements must be passed with a grade of "C" or better.
- Correspondence courses and courses in which credit was earned through credit examination may not be used to satisfy the

college residence requirement.

- The following courses must be passed with a grade of "C" or better: (1) all required science, computer science, and mathematics courses; (2) all restricted, second discipline, and advanced sciences electives; and (3) English 1001 and 2000. If a student makes a "D" or "F" in a course requiring a "C," the course must be taken and not dropped the next semester the student is in residence and the course is offered.
- Nonparticipation courses in kinesiology may be taken for elective credit. A maximum of three semester hours will be allowed in kinesiology participation (activity) courses. Twelve semester hours of ROTC may be allowed for degree credit, with no more than six of the twelve semester hours in courses numbered below 3000. However, the sum of basic (1000-2000 level) ROTC course credits and kinesiology activity course credits allowed toward the degree may not exceed six semester hours.
- Students are expected to make reasonable and satisfactory progress in a degree program. Consequently, sequential scheduling of courses in the major field is necessary, and required courses in English and mathematics must be scheduled each semester until they are satisfactorily passed. If necessary, a required course may be dropped *once*, but normally, *not* a second time.
- Application for the bachelor's degree must be made in writing and approved by the dean of the college during the semester *prior* to the semester in which the degree is to be awarded.

MINOR FIELD REQUIREMENTS (OPTIONAL)

A student in the College of Basic Sciences may earn a minor in a second field under the following conditions:

- The minor must include at least 17 semester hours of course work, of which at least six semester hours must be taken on this campus and at least three of the six hours

- must be at the 3000 or 4000 level.
- Each course used in the minor must be passed with a grade of “C” or better.
- Courses used for the minor may not be taken on a pass/fail basis.
- All minors must be approved by the dean.

The department offering the minor may impose additional requirements; the specific requirements of the department must be stated in the catalog.

Students in other colleges who wish to obtain a minor in one of the departments of the College of Basic Sciences must meet the same requirements listed above.

COLLEGE PROBATION

A student in the College of Basic Sciences who fails to earn a 2.00 semester average in a regular semester or a summer term will be placed on college probation. In addition, students who fail to meet the college academic requirements noted in the section on degree requirements, or who enter the college with deficiencies may be placed on college probation. At the discretion of the dean, a student who is on college probation and fails to meet the academic requirements, including earning a 2.00 or better semester average, may be declared ineligible to continue in the college. A student on college probation who does earn a 2.00 or better semester gpa, who remediates course deficiencies, and who makes satisfactory progress in the degree program will be removed from college probation.

PREMEDICAL AND PRE-DENTAL COUNSELING

Counselors are available to help students with applications to medical and dental schools. This application process begins one and one-half years prior to professional school entry. Information regarding the Premedical/Predental Program at LSU and the professional school application process is available at the following Web site: <http://science.lsu.edu/premedical.htm>.

The College of Basic Sciences sponsors a Premedical/Predental Review Committee that provides letters of evaluation for LSU students applying to professional schools. Students wishing to use the services of the LSU Premedical/Predental Review Committee must: (1) have a minimum 3.0 overall and science gpa, (2) have been enrolled at LSU-Baton Rouge as a full time student for the two semesters preceding the committee review, (3) attend mandatory informational meetings, and (4) meet all registration deadlines.

Further information about the committee procedures and requirements may be obtained in the Dean's Office, 338 Choppin Hall.

TEACHER PREPARATION PROGRAM FOR GRADES 6-12

The departments of Biological Sciences, Chemistry, and Physics & Astronomy offer undergraduate degree programs with an area of concentration in secondary education (middle school and high school). Students in the program may receive a BS in biological sciences, chemistry, or physics and qualify for teacher certification. The curricula have been developed cooperatively with faculty in the

College of Education and include courses taught jointly by faculty in the College of Basic Sciences and the College of Education. Students completing these degree programs and meeting any additional requirements of the Louisiana Department of Education will be eligible for certification in the state of Louisiana as teachers in grades 6-12.

Admission to any secondary education concentration requires a minimum gpa of 2.50 and passing scores on the PRAXIS I assessments or minimum ACT composite of 22 or minimum SAT composite of 1030. Students who might have an interest in middle and high school teaching should choose to take EDCI 2001 as one of their general education social sciences courses in the freshman or sophomore year. Details of the programs and requirements for admission, continuation, graduation and certification can be obtained from Student Services counselors in the College of Basic Sciences. The curriculum for each eligible major is listed in the departmental sections of this catalog as a secondary education concentration. Students are required to achieve passing scores on the PRAXIS I assessment or minimum composite of 22 or minimum SAT composite of 1030 and have a 2.50 earned LSU and cumulative gpa prior to enrollment in 3000-level EDCI courses. They should take the required PRAXIS II assessments during the last semester of course work *prior* to student teaching. They must pass all required sections of the PRAXIS II Series and they must earn at least a “C” grade in all academic content (major), education courses, and any course work so specified by the Louisiana Board of Elementary and Secondary Education prior to graduation.

A second option for students interested in middle/high school science teaching is to pursue a traditional bachelor's degree in science and then complete a master's degree in the LSU College of Education. The master's degree program (Holmes Program) begins in June and requires 15 months of course work and classroom experience leading to both the master's degree and teaching certification. Information about the program and potential scholarship assistance is available through the College of Education, Office of Student Services.

EARNING TWO DEGREES, OR ONE DEGREE WITH TWO MAJORS

With the dean's approval, a student may be enrolled in two bachelor's degree programs concurrently and thereby either earn two degrees, or earn one degree with two majors listed on the transcript, provided all requirements are completed as of the same commencement.

A student may earn one degree, with two majors listed on the transcript, by completing the residence and academic requirements for each major and the degree program to which it belongs. The student may earn two degrees by, in addition, earning 30 hours more than required for the degree that requires the fewer number of hours.

If the two programs are in different colleges, then the student must be accepted for admission to both colleges and must adhere to the regulations of both colleges. The student must declare a home college, where registration will be initiated and permanent files maintained, and must maintain contact

with the second college to ensure that satisfactory progress is being made toward the requirements of its degree program.

PASS-FAIL OPTION

Students in the College of Basic Sciences may register for courses in the college on a pass-fail basis under the following conditions:

- Only students with a 2.50 average or better may participate.
- Only *free elective* courses may be taken on a pass-fail basis. Required courses, restricted electives, and courses germane to the major and the career for which the student is preparing may not be taken on a pass-fail basis. Registration for a course on a pass-fail basis will not be permitted until the required work in the same area has been satisfactorily completed. A student *may not* take courses offered by the Honors College on a pass-fail basis.
- Eligible students may take one course per semester up to a total of 12 hours toward the degree on a pass-fail basis.
- A student must have permission (by signatures on a petition form) from the dean of this college, the instructor of the course, and the student's department chair.
- Pass-fail registration must be completed before the final day for adding courses.

Students from other colleges who wish to register for courses in this college on a pass-fail basis will present a petition form to the dean of the college. If the petition is approved, the student will then present the form to the instructor concerned for the appropriate action.

Courses offered by the College of Basic Sciences that are required in a student's curriculum or are normally considered important in preparation for the student's career will not be approved on a pass-fail basis.

PHI BETA KAPPA

Seniors and juniors with gpa of at least 3.60 and 3.90, respectively, are considered for membership in Phi Beta Kappa, the oldest scholastic honor society in the United States. Excellence in a variety of intellectual disciplines, rather than proficiency in a single field of study, is the major criterion for election.

The academic record should include satisfactory completion of the general education requirement, including two courses in English or American literature or literature in a foreign language (if not the major field); six-hour sequences in both a life science and a physical science, with an additional two hours of related laboratory work in one of these fields; upper division courses (3000 level or above) in at least two different humanities or social sciences outside the major; and electives that show a commitment to a liberal education.

Sophomores and juniors with high gpas should consult with Phi Beta Kappa officers or college counselors for more specific information. Specific requirements are described on the Phi Beta Kappa Web site www.lsu.edu/student_organizations/phiбетakappa/.

PHI KAPPA PHI

Founded in 1897 at the University of Maine, Phi Kappa Phi is the nation's oldest, largest, and most selective honor society for all academic disciplines. Its chapters are on nearly 300 campuses in the United States, Puerto Rico, and the Philippines. Each year, approximately 30,000 members are initiated. Some of the organization's more notable members include former President Jimmy Carter, writer John Grisham, NASA astronaut Wendy Lawrence, and Netscape founder James Barksdale. The LSU chapter was founded in 1930 as the 43rd chapter in the nation.

The mission of Phi Kappa Phi is to recognize and promote academic excellence in all fields of higher education and to engage the community of scholars in service to others. Phi Kappa Phi is unique because it recognizes superior scholarship in *all academic fields*, rather than restricting membership to a limited field. Juniors in the top 7.5 percent and seniors and graduate students in the top 10 percent of their classes may be invited to become members of Phi Kappa Phi. New LSU Phi Kappa Phi members are initiated and honored in the spring semester each year and wear identifying ribbons on their academic gowns at commencement exercises. Additional information about the Society may be found at www.phikappaphi.org.

COOPERATIVE EDUCATION PROGRAM

Please see the section "Cooperative Education" in the "Student Life and Academic Services" section of this catalog.

DEPARTMENTS AND CURRICULA

DEPARTMENT OF BIOLOGICAL SCIENCES

CHAIR • Newcomer, *Professor*
ASSOCIATE CHAIR • Moore, *Professor*
ASSOCIATE CHAIR • Bruch, *Associate Professor*
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BOYD PROFESSORS • Blackwell

BOYD PROFESSOR EMERITA • Tucker

PROFESSORS EMERITI • Braymer, Chang, Dietz, Fischer, Kent, J. M. Larkin, W. Lee, Meier, Shih, Socolofsky, Silverman, Weidner, Woodring, Younathan

PROFESSORS • Batzer, Battista, Blackwell, Bricker, K. Brown, Caprio, Carman, Fleege, Foltz, Hafner, Hand, Homberger, Keel, King, Laine, Lynn, Moore, J. Moroney, Newcomer, Platt, Siebenaller, Stephens, Stickle, Urbatsch, Williamson

ASSOCIATE PROFESSORS • Achberger, Bartlett, Bruch, Cronin, DiMario, Ding, Donze, Gayda, Gleason, Grove, Harms, Hellberg, Kim, J. C. Larkin, LiCata, Longstreth, Pettis, Rainey, Waldrop, Wischusen, Zhou

ASSISTANT PROFESSORS • Aboul-cla, Carstens, Christner, Doerfler, Eberhard (*Research*), Engel, Galvez, Hale-Donze, Hart, Kato, Y. Lee, Luo, Menze (*Research*), Pakhomova (*Research*), Pruffer, Stevens, Svoboda, Whitehead, Yu

INSTRUCTORS • Brininstool, D. Brown, Farrar, Garretson, Gregg, Hawkins, Hrinkevich, Jolissaint, McCoy, N. Minor, P. Moroney, Pollock, Pomarico, Reiland, Sullivan, Telles, Thompson
ADJUNCT FACULTY • Austin, Brumfield, Burris, Carlton, Cooper, Dagg, Finelli, Fitzsimons, Gimble, Guala, Hales, Henk, Kousoulas, LaRock, Mendelssohn, Mynatt, Prowell, Remsen, K. Robertson, Smith, Soper, Wilson, Ye

The Department of Biological Sciences offers a comprehensive background in biology for teacher preparation, graduate studies, and for professional programs in medicine, dentistry, pharmacy, and veterinary medicine. The department offers bachelor of science degrees in biochemistry, biological sciences and microbiology. All degrees require a core of departmental courses that include BIOL 1201, 1202, 1208, 1209, 2051, 2153, and either 4087 or 4093 and 4094. In addition, all students are required to take 20-25 hours of electives from courses numbered 3000 and above in biological sciences that include two courses with laboratories and at least one course from three of four departmental groupings (described below). Students seeking the bachelor of science degree in biological sciences may fulfill the requirement for 20 hours of electives with courses from all areas of the department while students seeking the biochemistry and microbiology degrees take courses specific to those degrees. All students in the department may earn a maximum of six hours of BIOL 3999. A maximum of three hours of BIOL 3999 may be taken as advanced biochemistry, biological sciences, or microbiology electives. BIOL 3999 may not be used as a laboratory course. Students may earn more than one degree in the department but biological science courses numbered 3000 and above (excluding the core biochemistry courses) may only be applied to one degree. Majors in the department are ineligible for the departmental minor.

An undergraduate minor in *biological sciences* is available to students majoring in curricula outside the Department of Biological Sciences. Required courses are BIOL 1201, 1202, 1208, 1209, 2051, 2153, 4087, and at least three more hours of biological sciences in a course at the 3000-level (excluding BIOL 3999) or above (total of 23 hours).

Admission into the Department of Biological Sciences

In addition to admission to the College of Basic Sciences, entry into any of the three majors (biochemistry, biological sciences, and microbiology) in the Department of Biological Sciences requires earned credit in BIOL 1201 and 1202; CHEM 1201; and MATH 1550.

CURRICULUM IN BIOCHEMISTRY

TOTAL SEM. HRS. • 125

FRESHMAN YEAR	SEM. HRS.
Biological Sciences 1201, 1202, 1208, 1209	8
Chemistry 1201, 1202, 1212	8
English 1001	3
Mathematics 1550, 1552	9
General education arts course	3
	<hr/> 31

SOPHOMORE YEAR	SEM. HRS.
Biological Sciences 2051, 2153	8
Chemistry 2001, 2261, 2262, 2364	10
Physics 2001, 2002, 2108, 2109	8
English 2000	3
General education social science course	3
	<hr/> 32

JUNIOR YEAR	SEM. HRS.
Biological Sciences 4001, 4093, 4094	9
Approved biochemistry elective	6
Foreign language courses	8-10
Six hrs. chosen from 2000-level or above English or Honors courses from the general education humanities list	6
Approved electives	3-1
	<hr/> 32

SENIOR YEAR	SEM. HRS.
Biological Sciences 4385	3
Approved biochemistry electives	9
General education social sciences course (sophomore level or above)	3
Social science/humanities courses	6
Approved electives	9
	<hr/> 30

Approved biochemistry electives must come from the following list, must include at least one laboratory course, and must include at least one course from both Group 1 and Group 3 and two courses from Group 2:

- Group 1: BIOL 4596; CHEM 4150, 4160, 4552, 4561, 4562, 4563, 4564, 4570, 4572
- Group 2: BIOL 3060, 3090, 3156, 4110, 4132, 4158, 4159, 4160, 4177, 4246, 4400, 4450, 4753
- Group 3: Ecology and Evolution course or Organismal Diversity course (courses in this group are listed as areas three and four at the end of the curriculum in Biological Sciences)

BIOL 3999 can also be taken as a biochemistry elective but does not count as a laboratory course.

CURRICULUM IN BIOLOGICAL SCIENCES

TOTAL SEM. HRS. • 125

FRESHMAN YEAR	SEM. HRS.
Biological Sciences 1201, 1202, 1208, 1209	8
Chemistry 1201, 1202, 1212	8
English 1001	3
Mathematics 1550, 1552 or EXST 2201	9
General education arts course	3
	<hr/> 31

SOPHOMORE YEAR	SEM. HRS.
Biological Sciences 2051, 2153	8
Chemistry 2261, 2262, 2364	8
Six hrs. chosen from 2000-level or above English or Honors courses from the general education humanities list	6
Foreign language courses	8-10
English 2000	3
Approved electives	2-0
	<hr/> 35

JUNIOR YEAR	SEM. HRS.
Biological Sciences 4087 or 4093 and 4094	4-6
Approved biological sciences electives	6-9
Physics 2001, 2002, 2108, 2109	8
General education social sciences courses (sophomore level or above)	6
Approved electives	5-0
	<hr/> 29

SENIOR YEAR	SEM. HRS.
Approved biological sciences electives.	11-14
Social sciences/humanities courses.	6
Approved electives.	13-10
	<u>30</u>

Approved biological sciences electives (20 hrs. required) are BIOL courses numbered 3000 and higher and must include two courses with laboratories (excluding independent research BIOL 3999). Further, biological sciences electives must include at least one course from three of the following areas: 1) *molecular and cellular biology*: BIOL 3090, 3116, 4001, 4104, 4123, 4124, 4127, 4132, 4159, 4177, 4190, 4246, 4385, 4400, 4596, 4753; 2) *physiology, anatomy, and development*: BIOL 3060, 3152, 3156, 4110, 4155, 4158, 4160, 4200, 4444; 3) *ecology and evolution*: BIOL 3040, 4015, 4084, 4090, 4253, 4262, 4600; 4) *organismal diversity*: BIOL 4020, 4041, 4053, 4054, 4084, 4105, 4125, 4126, 4141, 4142, 4145, 4146, 4154, 4162, 4163, 4600, 4653.

Areas of Concentration

◆ Marine Biology (18-19 hrs.)

Students may obtain an area of concentration in Marine Biology by meeting the requirements of the biological sciences degree, incorporating the following courses into their program of study.

Required courses (18-19 hrs.) OCS 1005; BIOL 4262; BIOL 4090, or 4145 or 4154; and 8-9 hrs chosen from BIOL 3040, 3999, 4020, 4090, 4145, 4154, 4155, 4253, 4254, 4263, 4308, 4600 and 4653

◆ Secondary Education (47 hrs.)

Students may obtain an area of concentration in Secondary Education by meeting the requirements of the biological sciences degree, incorporating the following courses into their program of study. This concentration require 23 hrs. of BIOL courses numbered 3000 and higher.

Required courses: EDCI 2001, 3001, 3002, 4003, 4004, 4005; BIOL 3001, 3002, 4003, 4004, and 17 hrs. chosen from the approved biological sciences electives numbered 3000 and higher

CURRICULUM IN MICROBIOLOGY

TOTAL SEM. HRS. • 125

FRESHMAN YEAR	SEM. HRS.
Biological Sciences 1201, 1202, 1208, 1209	8
Chemistry 1201, 1202, 1212.	8
English 1001.	3
Mathematics 1550, 1552 or EXST 2201.	9
General education arts course.	<u>3</u>
	31

SOPHOMORE YEAR	SEM. HRS.
Biological Sciences 2051, 2153.	8
Chemistry 2261, 2262.	6
Three hrs. chosen from English or Honors courses at the 2000-level and above from general education humanities list.	3
English 2000.	3
Foreign language courses.	8-10
Approved electives.	<u>2-0</u>
	30

JUNIOR YEAR	SEM. HRS.
Biological Sciences 3116, 4110.	6
Chemistry 2001, 2364.	4
Physics 2001, 2002, 2108, 2109.	8
Three hours chosen from English or Honors courses at 2000 level and above from general education humanities list.	3
Approved microbiology electives.	4
General education social sciences course (sophomore level or above).	3
Approved electives.	<u>3</u>
	31

SENIOR YEAR	SEM. HRS.
Biological Sciences 4246, 4125 or 4256.	6
Biological Sciences 4087 or 4093 and 4094.	4-6
Approved microbiology electives.	6
Social sciences/humanities courses.	6
General education social sciences course.	3
Approved electives.	<u>8-6</u>
	33

Approved microbiology electives must come from the following list and must include two laboratory courses: BIOL 3090, 3999 (3), 4053, 4054, 4084, 4090, 4105, 4106, 4123, 4124, 4125, 4126, 4127, 4132, 4162, 4163, 4190, 4200, 4256, 4400.

DEPARTMENT OF CHEMISTRY

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BOYD PROFESSOR EMERITI • Good, McGlynn, Pryor
CHANCELLOR EMERITUS • Wharton
PROFESSORS EMERITI • Baddley, Berg, Carpenter, Cartledge, Day, Fischer, Gale, Kestner, Koenig, R. Nauman, Newkome, Robinson, Runnels, Selbin, Traynham, Wharton, Williams
PROFESSORS • Butler, Daly, Dellinger, Hales, Hall, Hammer, Marzilli, Maverick, McCarley, Murray, Poliakoff, Russo, Smith, Soper, Stanley, Vicente
ASSOCIATE PROFESSORS • Chan, Crowe, Gilman, Hopkins, Spivak, Taylor, Watkins
ASSISTANT PROFESSORS • Chen, R. Cook, Cueto (*Research*), Gamo, Lomnicki (*Research*), Macnaughton, Nesterov, Tolocka, Zhang
INSTRUCTORS • Allen, E. Cook, Dávila, Hogan, Kolniak, McMasters, T. Nauman, Rupnik
ADJUNCT FACULTY • Bricker, Dooley, Laine, LiCata, McGuire, Negulescu, Sprunger, Thibodeaux

Students obtain a thorough working knowledge of the fundamentals of chemistry, supplemented by study in physics, mathematics, and other sciences. The curriculum is further enriched by the requirement of a broad basic background in the social sciences and humanities. The department offers special lecture and laboratory courses for its majors.

Chemistry majors must select one of nine areas of concentration, preferably in their sophomore year. Undecided majors and those who are considering chemistry as a possible major are strongly encouraged to take CHEM 1002 in their second semester. This course will alert them to the various career opportunities in chemistry in time to make an appropriate decision. The different concentrations can be grouped according to whether or not they prepare the student for an *active career in chemistry* or for *another profession*, such as medicine, dentistry, or veterinary medicine.

Active Careers in Chemistry • These concentrations are recommended for students who seek a professional career in chemistry or plan to pursue graduate studies in chemistry or a closely related field. The areas of concentration listed in this section are certified by the American Chemical Society. Students successfully completing those concentrations will receive a certificate upon graduation. The *biological chemistry* concentration strengthens the student's knowledge of the chemistry and structure of living systems. The *chemical physics* concentration emphasizes understanding chemical systems based on fundamental physical, mathematical, and theoretical principles. The *chemistry* concentration provides a broad background in chemistry. It is recommended to students who desire a career in chemistry but do not yet know which branch of chemistry best suits them. The *environmental chemistry* concentration is recommended for preparation as a chemical professional or for entrance to graduate study in chemistry, but with an environmental emphasis. The *materials* concentration makes the connection between chemistry and a wide range of practical materials used to fabricate electronic, optical, and other devices. The *polymer* concentration is designed for students with career objectives in the science of synthetic or biological macromolecules, including plastics.

The *secondary education* concentration leads to certification as a chemistry teacher in grades seven through 12.

Chemistry for Other Professions • The *preprofessional* concentration is designed primarily for students who will apply for graduate education in another profession, such as medicine, dentistry, or veterinary medicine. The *chemistry and a second discipline* concentration allows students to develop their interests and abilities in other disciplines outside of chemistry, whether or not graduate education is contemplated. Students may choose second disciplines such as computer science, geology, engineering, business administration, history, foreign languages, political science, and others.

Undergraduate Minor in Chemistry • Requirements are a minimum of 20 semester hours of chemistry, including at least two laboratory courses and at least three semester hours at the 3000 or 4000 level, but excluding CHEM 3900.

CURRICULUM IN CHEMISTRY

TOTAL SEM. HRS. • 128

*With the dean's approval, CHEM 1202, 1212 may be substituted for CHEM 1422, 1431; CHEM 2002 may be substituted for CHEM 2003; and CHEM 2261, 2262, and 2364 may be substituted for CHEM 2461, 2462, and 2463.

**The biological chemistry, pre-professional, and secondary education concentrations also require Biological Sciences 1208 and 1209 laboratories.

FRESHMAN YEAR	SEM. HRS.
Biological Sciences 1201 and 1202**	6-8
Chemistry 1201 or 1421; 1422; 1431*	8
English 1001	3
General education arts course	3
Mathematics 1550, 1552	9
Approved electives or area requirements	3-1
	32

SOPHOMORE YEAR	SEM. HRS.
Chemistry 2001, 2003, 2461, 2462, 2463*	12
Computer science programming course	3
English 2000	3
Physics 2101, 2102, 2108, 2109	8
Approved electives or area requirements	6
	32

JUNIOR YEAR	SEM. HRS.
Chemistry 3491, 3492, 3493	9
Six hrs. chosen from 2000-level or above English or Honors courses from the general education humanities list	6
Foreign languages courses	8-10
General education social sciences courses (one course at the sophomore level or above)	6
Approved electives or area requirements	5-3
	34

SENIOR YEAR	SEM. HRS.
Approved social sciences/humanities courses	6
Approved electives or area requirements	24
	30

Areas of Concentration

◆ Biological Chemistry (28 hrs.)

Students completing this concentration will receive American Chemical Society certification.

Sophomore Year • MATH 2065, 2085 or 2090 (3-4 sem. hrs.)

Junior Year • BIOL 2051 or 2153 (4 sem. hrs.)
Senior Year • CHEM 3900 in an approved biological chemistry project or BIOL 3999 including a comprehensive written report filed with the Department of Chemistry's Undergraduate Office; CHEM 4552, 4553, 4564, and 4570 or 4571; BIOL 4093, 4094, 4385 (21 sem. hrs.)

This concentration also requires BIOL 1208 and 1209 to be taken in the freshman year.

◆ Chemical Physics (29 hrs.)

Students completing this concentration will receive American Chemical Society certification.

Sophomore Year • MATH 2057, and 2065, 2085 or 2090 (6-7 sem. hrs.)

Junior Year • 3 hrs. of Physics electives
Senior Year • CHEM 3900 in an approved physical chemistry research project, 4552,

4553, and 4570 or 4571; BIOL 4087 or 4093 and 4094; 3 hours of chemistry electives; 3 hrs. of physics electives (20-22 sem. hrs.)
Physics electives: PHYS 2221, 2231, 2411, 4123, 4125, 4141, 4142, 4251, 4261
Chemistry electives: CHEM 4581, 4594, 4596, 4597

◆ Chemistry (25 hrs.)

Recommended for preparation as a chemical professional or for entrance to graduate study in chemistry. Students completing this concentration will receive American Chemical Society certification.

Sophomore Year • MATH 2065, 2085 or 2090 (3-4 sem. hrs.)

Junior Year • BIOL 4087 or 4093 and 4094 (4-6 sem. hrs.)

Senior Year • CHEM 3900 in an approved chemistry project, 4552, 4553, 4564, and 4570 or 4571; 6 sem. hrs of chemistry electives (18 sem. hrs.)

Chemistry electives: CHEM 3900 (additional hrs.), 4010, 4011, 4160, 4561, 4562, 4563, 4570 or 4571, 4572, 4581, 4594, 4597

◆ Chemistry and a Second Discipline (24 hrs.)

In addition to CHEM 3900, 4552, 4553, and 4570 or 4571, an approved second discipline concentration consists of at least 15 sem. hrs. of electives in one area outside the Department of Chemistry. In general, the area courses are to form a coherent sequence. This does not mean that all courses must be from the same department, but that there must be a logical plan for education in depth. When possible, students should take the same courses required for a major in the same area. There should be at least three courses numbered 3000 or above. Courses should be taken from no more than two departments. Selection of the concentration should be completed and approved by the department and dean's office by the end of the sophomore year.

◆ Environmental Chemistry (24 hrs.)

Students completing this concentration will receive American Chemical Society certification.

Sophomore Year • MATH 2057 (3 sem. hrs.)

Junior Year • BIOL 4087 or 4093 and 4094 (4-6 sem. hrs.)

Senior Year • CHEM 3900 in an approved environmental chemistry project, 4150, 4552, 4553, 4570 or 4571; and 6 hrs. chosen from environmental electives (17 sem. hrs.)

Environmental Electives: EVEG 4135, ENVS 4500, 4477, OCS 4040, 4165

◆ Materials (29 hrs.)

Students completing this concentration will receive American Chemical Society certification.

Sophomore Year • MATH 2065, 2085 or 2090; ME 2733 (6-7 sem. hrs.)

Junior Year • BIOL 4087 or 4093 and 4094 (4-6 sem. hrs.)

Senior Year • CHEM 3900 in an approved area of materials research project; 4010, 4552, 4553, 4564, 4570 or 4571; ME 3701, 4723 (20 sem. hrs.)

◆ Polymers (24 hrs.)

Students completing this concentration will receive American Chemical Society certification.

Sophomore Year • MATH 2065, 2085 or 2090 (3-4 sem. hrs.)

Junior Year • BIOL 4087 or 4093 and 4094 (4-6 sem. hrs.)

Senior Year • CHEM 3900 in an approved polymer research project, 4010, 4011, 4552, 4553, 4564, and 4570 or 4571 (17 sem. hrs.)

◆ Pre-professional Chemistry (24 hrs.)

Sophomore Year • 3 hrs. from preprofessional electives

Junior Year • BIOL 4093 (3 sem. hrs.)

Senior Year • CHEM 4552, 4553, and 4570 or 4571; BIOL 4094, 4385, 5 hours from preprofessional electives (18 sem. hrs.)

Pre-professional Electives: BIOL 2051, 2153, 3156, 3152 or 4160; CHEM 3900 or BIOL 3999 in an approved project

This concentration also requires BIOL 1208 and 1209 to be taken in the freshman year.

◆ Secondary Education

Students may obtain an area of concentration in secondary education leading to certification as a teacher in grades seven through 12 by meeting the requirements of the chemistry degree and incorporating the following courses in their program of study. In addition, the student should include EDCI 2001 as one of the social science courses offered for degree. Students should plan their curriculum so that the second semester of the senior year can accommodate 15 hrs. that are required to be taken concurrently (EDCI, 4004, 4005, CHEM 4004).

Junior Year • CHEM 3001, 3002, and EDCI 3001, 3002 (8 sem. hrs.)

Senior Year • BIOL 4087, CHEM 4570 or 4571; 3 hrs. CHEM electives; CHEM 4003, 4004, and EDCI 4003, 4004, 4005 (29 hrs.)

Chemistry electives: CHEM 4010, 4011, 4150, 4160, 4552, 4553, 4561, 4562, 4563, 4564, 4570 or 4571, 4581, 4594, 4597

DEPARTMENT OF COMPUTER SCIENCE

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ASSISTANT PROFESSORS • Baumgartner, Busch, Karki, Kosar, Park, Shah, Ullmer, Wilson
INSTRUCTORS • Blanks, Brenner, Douglas, Duncan, Edgeworth, Guillott
VISITING FACULTY • Branton

The undergraduate computer science curriculum is structured around basic courses in computer science and mathematics. The curriculum is designed to allow a flexible plan of study via the mandatory selection of one of three concentrations: *networking, software*

engineering, and computer science and a second discipline. A concentration should be declared at the beginning of the sophomore year. If the second discipline concentration is selected, an approval form must be completed and approved by the department and the dean's office.

Computer science students will not receive degree credit for the following courses: CSC 4602; ELRC 4006; EXST 2000, 2095, 2201, 3001, 4001; ISDS 2000, 2001, 3001, 3002; PSYC 2011, 4111; and SOCL 2201. Computer science students may not receive credit for both IE 3302 and ISDS 2000, or for both IE 4510 and ISDS 2001.

An undergraduate *minor in computer science* is available. Required courses are CSC 1253, 1254, 2259, 3102, 3501, and three hrs. of computer science electives 3000-level and above; and 4101 or 4103 (total of 21 hours).

CURRICULUM IN COMPUTER SCIENCE

TOTAL SEM. HRS. • 123

¹See college list of approved general education natural sciences courses.

²If a 10-hour foreign language sequence is taken, the extra two hours will be counted toward approved electives.

³Students who have completed the prerequisites may substitute MATH 3355 or EE 3140 or EXST 4050.

⁴The computer science senior elective (three semester hours) must be an approved 4000-level computer science course.

FRESHMAN YEAR	SEM. HRS.
Computer Science 1200, 1350, 1351.....	7
English 1001.....	3
English or Honors course at the 2000-level or above on the general education humanities list.....	3
Mathematics 1550, 1552.....	9
Biological or physical sciences sequence ¹ ..	6
General education humanities communication studies course.....	3
	<u>31</u>

SOPHOMORE YEAR	SEM. HRS.
Computer Science 2259, 3102, 3380.....	9
Computer science elective 2000-level or above or computer science area requirement.....	3
English or Honors course at the 2000-level or above on the general education humanities list.....	3
English 2000.....	3
Mathematics 2090.....	4
General education biological or physical sciences sequence with lab ¹	8
General education social sciences course.....	3
	<u>33</u>

JUNIOR YEAR	SEM. HRS.
Computer Science 2262, 3501, 4101.....	9
Computer science electives 3000-level or above or computer science area requirement.....	3
Foreign language courses ²	8
Industrial Engineering 3302 ³	3
General education social sciences course at the sophomore level or above.....	3
Approved elective or area requirements....	6
	<u>32</u>

SENIOR YEAR	SEM. HRS.
Computer science 4103, 4330.....	6
Computer science senior elective ⁴ or computer science area requirement.....	3
Approved electives or area requirements....	12
General education arts courses.....	3
Social sciences/humanities course.....	3
	<u>27</u>

Areas of Concentration

◆ Computer Science and Second Discipline (24 hrs.)

In addition to three credit hours each from a CSC 2000-level or above elective, a CSC 3000-level or above, and a CSC senior elective, an approved second discipline concentration consists of 15 sem. hrs. of electives in one area outside of the Department of Computer Science. All courses must be taken from a single department except when a university minor is obtained. Courses in the second area are to form a coherent sequence; where possible students should take courses required of a major in that department. Ordinarily, there should be at least two courses numbered 3000 or above. Courses chosen from Information Systems and Decision Sciences must be numbered ISDS 3100 or above. The approval form must be submitted no later than the sophomore year with the consent of the departmental advisor and the dean's office.

◆ Networking (18 hrs.)

Required courses (9 hrs.)—CSC 4304, 4501, 4601

Approved area electives (9 hrs.)—IE 4510; MATH 3355, 4023, 4024, 4025, 4153, 4171, 4325, 4470; other electives subject to approval

◆ Software Engineering (18 hrs.)

Required courses (9 hrs.)—CSC 2000-level or above area elective; CSC 4351, 4402

Approved area electives (9 hrs.)—CSC 4304, 4370, 4890; EE 4760; IE 4461; ISDS (max. of 6 hrs.) from 4110, 4111, 4112, 4113, 4114, 4125, 4141, 4501, 4502, 4511; other electives subject to approval

DEPARTMENT OF GEOLOGY & GEOPHYSICS

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ASSISTANT PROFESSORS • Blanford, Engel
ADJUNCT FACULTY • Bentley, Hesp, Karki, Nummedal, Roberts, Schiebout, White

The geology curriculum prepares undergraduates for graduate study in geology and geophysics and related fields and for a wide range of professional careers, including teaching, research, resource exploration and devel-

opment, and environmental management and remediation. The curriculum has two areas of concentration: *geology* and *environmental geology*.

All geology students follow the same basic curriculum during the first five semesters of study. Students during this time receive a firm foundation in mineralogy, petrology, structural geology, and sedimentology, as well as basic courses in biology, computer science, chemistry, physics, and mathematics. Emphasis is on fundamental geologic processes operating on and within the earth. Laboratory and field studies are integrated into the curriculum at all levels and include a six-week field geology course at the department's permanent field camp in the Colorado Front Range.

The curriculum is designed to leave much of the final three semesters of study relatively unstructured so that students, with the guidance and approval of the department, can develop a program of advanced course work most appropriate to their career objectives. Students selecting the *geology* area of concentration take, in addition to the first five semester group of courses, history of the biosphere, a basic course in either geophysics, geochemistry or tectonics, and six hours of geology electives. Students selecting the *environmental geology* area of concentration take physical hydrogeology, nine hours of approved environmental geology electives, and nine hours of approved electives in chemistry, mathematics, and other disciplines relevant to environmental problems. Both areas of concentration are designed to provide students with a sound foundation in basic geology and to prepare them for entry into a graduate program or directly into a professional career.

Graduate and undergraduate majors in geology must pay a \$35 field service fee each semester. Students not majoring in geology who schedule courses requiring field trip fees will be assessed a *pro rata* part of the amount above as determined by the department chair. Part-time students enrolled in seminar courses only and students registered for thesis or dissertation only are exempt from the fee. Additional information concerning fees for field geology courses is available from the Geology Field Camp Director, Department of Geology & Geophysics.

An undergraduate *minor in geology* is available (17 hrs.). Required courses are GEOL 1001, 1003, 1601, 1602. At least three of the additional hours must be taken at the 3000 or 4000 level (excluding GEOL 3909) and on this campus.

Honors courses offered are Geology 1002 and 1004.

CURRICULUM IN GEOLOGY

TOTAL SEM. HRS. • 123

* See area requirements.

FRESHMAN YEAR	SEM. HRS.
Approved social science or humanities course.....	3
Chemistry 1201, 1202, 1212.....	8
Geology 1001, 1003, 1601, 1602.....	8
Mathematics 1550, 1552.....	9
English 1001.....	3
	<u>31</u>

SOPHOMORE YEAR	SEM. HRS.
Approved electives.....	3-4
Biological Sciences 1201, 1202.....	6
English 2000.....	3
English course chosen from general education humanities list or Honors list.....	3
Geology 2081.....	3
Geology 2061 (required for geology area of concentration or approved environmental area of concentration course).....	3
General education social sciences courses (one course must be at the sophomore level or above).....	6
Physics 1201 or 2101, and 1208 or 2108.....	5-4
	32

JUNIOR YEAR	SEM. HRS.
Approved electives.....	0-3
English courses chosen from general education humanities or Honors list.....	3
Foreign Language courses.....	10-8
General Education arts course.....	3
Geology 3032.....	3
Geology 3041.....	3
Geology 3071.....	3
Physics 1202 or 2102 or 2002, and 1209 or 2109.....	5-4
	30

SUMMER (FOLLOWING JUNIOR YEAR)	SEM. HRS.
Geology 3666.....	6
	6

SENIOR YEAR	SEM. HRS.
Area of concentration courses.....	9-18
Approved electives.....	15-6
	24

Areas of Concentration

◆ Environmental Geology

Required Courses (21 hrs.): GEOL 4182; approved environmental geology electives (9 hrs.); approved area electives (9 hrs.)

◆ Geology

Required Courses (12 hrs.): GEOL 2061; nine hours of 4000-level geology electives, of which at least one course must be chosen from GEOL 4064, 4066, 4068, 4081, 4083, 4085, or 4131

DEPARTMENT OF PHYSICS & ASTRONOMY

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ASSOCIATE PROFESSORS • Blackmon, Gaarde, Giaime, González, Lehner, Sajo, Sprunger, Stacy, Young
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ADJUNCT FACULTY • Allen, Bagayoko, Boyd, Ederer, Gibbons, Holmes, S. Johnson, Milburn, Poliakoff, Price, Rezzolla, Rosen, Saulson, M. Schaefer, Scheraga, Scully, Svoboda, Thomas, Ventrice, Wang, Weiss

An undergraduate *minor in physics* is available. Required courses are PHYS 1201, 1202, 1208, 1209, (or PHYS 2101, 2102, 2108, 2109); PHYS 2221; and at least three courses in physics above 2200 (excluding PHYS 2401, 2995, 4399, and 4991) of which at least three hours must be at the 4000 level, and/or astronomy above 4000 (excluding ASTR 4997), for a total of 20-22 hours.

Undergraduate students on this campus may choose to *minor in nuclear science*. The following conditions must be met:

- Approval from the Department of Physics & Astronomy
 - At least 15 credit hours in astronomy, nuclear science, medical physics and health physics, and physics courses, 12 of which must be taken from the following: MEDP 2051, 4111, 4331, 4332, 4351, 4995; NS 4570; and PHYS 2203, 2207, 4098, 4271
- The Department of Physics & Astronomy offers master's degrees for medical physics studies. For additional information, see the section, "Graduate School and Professional Programs" in this catalog.

CURRICULUM IN PHYSICS

TOTAL SEM. HRS. • 129

Students planning to enter graduate school are encouraged to select a modern foreign language.

FRESHMAN YEAR	SEM. HRS.
Three hrs. of English or Honors courses at the 2000-level or above chosen from the general education humanities list.....	3
Mathematics 1550, 1552.....	9
Physics 1201, 1202, 1208, 1209.....	10
English 1001.....	3
General education arts course.....	3
Approved electives or area requirements.....	3
	31

SOPHOMORE YEAR	SEM. HRS.
English 2000.....	3
Three hrs. of English or Honors courses at the 2000-level or above chosen from general education humanities list.....	3
Mathematics 2057.....	3
Physics 2203, 2207, 2221.....	7
Biological sciences 1001 and 1002 or 1201 and 1202.....	6
Computer science programming course.....	3
General education humanities course.....	3
Approved electives or area requirements.....	4
	32

JUNIOR YEAR	SEM. HRS.
Foreign language courses.....	8-10
Physics 2231, 2411, 4098, 4132.....	12
General education social sciences course.....	6
Approved electives or area requirements.....	8-6
	34

SENIOR YEAR	SEM. HRS.
Physics 4125.....	3
General education social sciences/humanities course.....	3
Approved electives or area requirements.....	26
	32

Areas of Concentration

◆ Astronomy

Required Courses (28 hrs.) • ASTR 1101, 1102, 4221, 4222, 4261; MATH 2090; PHYS 4123, 4135, 4141

◆ Medical Physics

Required Courses (34 hrs.) • CHEM 1201, 1202, 1212, 2060; * MATH 2090; BIOL 2160; MEDP 2051, 4111, 4331, 4332, 4351; KIN 2500.
* CHEM 2261 may be substituted for CHEM 2060.

◆ Physics

Required Courses (28 hrs.) • CHEM 1201, 1202; MATH 2090; PHYS 4123, 4141, 4142, 4399, and two physics electives (4000 level or above)—with permission, a 4000-level mathematics course may be substituted for one

◆ Physics and a Second Discipline

Required Courses (28 hrs.) • MATH 2090; at least 24 sem. hrs. from an approved discipline outside of the Department of Physics & Astronomy; any second area may be chosen with consent of the dean and department advisor. The approved area form must be submitted no later than the sophomore year.

◆ Secondary Education

Students may obtain an area of concentration in secondary education with an emphasis on secondary school teaching by meeting the requirements of the physics degree and incorporating the following courses in their program of study. In addition, the student should include EDCI 2001 as one of the general education social science courses offered for the degree. Some general education courses are taken in different years than in the standard curriculum. Students should plan their curriculum so that the second semester of the senior year can accommodate 15 hours that are required to be taken concurrently (EDCI 4004, 4005, and PHYS 4004). *PHYS 4004 substitutes for PHYS 4125 in the physics major curriculum. Two 4000-level physics electives (6 sem. hrs.) substitute for PHYS 4098 and 4132 in the physics major curriculum. Approved electives are five to seven hours for the major.*
Required courses (37 hrs.): PHYS 2401, 3001, 3002, 4003; EDCI 3001, 3002, 4003, 4004, 4005; MATH 2090; ASTR 1101, 1102 or CHEM 1201, 1202.