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Consider the impact of Purdue University on your world!

Some of you are Purdue students, poised on the launch pad of your adult life. Others, high school students still trying to zero in on your career path and life mission. Consider looking at your future through the expansive and engaging field of vision Purdue offers in this increasingly global and technologically advanced world.

**Telescopic View of Purdue**

- Founded in 1869 as Indiana’s land-grant university and named for benefactor John Purdue
- Ranks 22nd among the nation’s public universities and 61st among all universities by *U.S. News & World Report* (2009)
- Among the largest universities in the United States with a state system-wide enrollment of more than 74,300 at four campuses and 10 Technology Statewide locations throughout Indiana; about 39,700 at the main campus in West Lafayette
- Ranks 9th in *SmartMoney* magazine’s “pay-back” survey, quantifying the long-term value of a college education — or earnings compared to tuition investment (2009)
- Included in The Princeton Review 100 “best value” ranking for offering a high-quality education at a reasonable price (2009)
- Named among the top 20 by The Princeton Review in a variety of campus-life categories, including best athletics, best college newspaper, and best campus food (2009)

**Discover the World at Purdue**

- A world of choices: 200 majors
- Highly touted programs and graduates in the STEM disciplines (science, technology, engineering, math) and business, liberal arts, and agriculture; several interdisciplinary options
- Culturally diverse campus, with students from more than 125 countries and all 50 states
- Typically ranks No. 1 or No. 2 in international student enrollment among public institutions in the United States
- First university to have its own airport (1930); also the first university to establish a department of computer science (1962)
- Community service experiences available in 175 courses; Engineering Projects in Community Service (EPICS) founded at Purdue, now a popular program nationally
- Incredible research opportunities for students to learn from, and work with, world-renowned faculty in Discovery Park’s enviable interdisciplinary centers and laboratory facilities in nanotechnology, biosciences, information technology, alternative fuels, and the study of learning
- Study Abroad programs in 45 countries
- Number of recognized student organizations: 850
- Member of the Big Ten Conference, noted for both academic excellence and competitive athletic programs
- Nationally recognized career preparation track via Professional Practice (co-op and internship) programs
- Some 700 companies recruit on campus, valuing the work ethic of Purdue’s new graduates and alumni who have earned a degree that is respected around the world
- Median salary for graduates three years after graduation of $51,400; median salary 15 years after graduation of $90,500 (data from *SmartMoney* ranking, classes of 2005 and 1993)
- Living alumni network of 410,000 world-wide

**Proven World Leader**

- To date, 22 alumni chosen for space flight — headlined by Neil Armstrong and Gene Cernan, the first and last humans on the moon
- Two Purdue professors in three years received the World Food Prize, considered the Nobel Prize of Agriculture: Philip Nelson (2007) and Gebisa Ejeta (2009); Nelson developed aseptic storage and distribution of processed fruits and vegetables, and Ejeta’s research increased sorghum production, which is one of the world’s main cereal grains
- Early work by Purdue researchers led to the first successful transmission of a black-and-white television picture
- Purdue graduate Carol Morgan Pottenger, rear admiral in the U.S. Navy, is one of the first women selected for sea duty and the first woman to lead a combat strike group
• Boilermakers Len Dawson, Bob Griese, Hank Stram, and Rod Woodson are all enshrined in the Pro Football Hall of Fame
• Brian Lamb, who started public-affairs channel C-SPAN 30 years ago, is an alumnus
• Don Thompson, president of McDonald’s Corp. USA, has a Purdue engineering degree
• More Forbes 800 corporate chief executive officers hold an undergraduate degree from Purdue than from any other public university
• Aviation pioneer Amelia Earhart was a career counselor to women students on campus; gift funds from the Purdue Research Foundation made possible the purchase of Earhart’s “Flying Laboratory” used for her ill-fated around-the-world flight attempt
• Basketball coaching legend John Wooden, an Indiana native, led Purdue to the 1932 National Championship
• Orville Redenbacher, “the Popcorn King,” was a Purdue graduate
• Purdue has graduated more women engineers than any other university, and one in 50 engineers in the United States is Purdue-trained

Academic programs at Purdue are organized within colleges and schools. A brief description of each college and school follows, but we encourage you to visit the Purdue Web site — www.purdue.edu. Plan to spend some time discovering Purdue. You’ll find, in the online details, information about the University’s academic programs and courses. We appreciate your interest and welcome your questions. You’re invited to campus for the “real” Boilermaker experience. You’ll see a galaxy of opportunities before you — paths similar to many Boilermakers whose impact has taken them to great heights around the world … and high above it!

**College of Consumer and Family Sciences**

The college, one of the largest and highest ranked of its kind in the nation, prepares men and women for careers related to the needs of families and consumers. Students can choose a Bachelor of Science degree program from 13 majors in the areas of family studies and child development, consumer sciences and consumer business, hospitality and tourism, nutrition, health and fitness, and education. The Department of Hospitality and Tourism Management also offers an associate degree program. See www.cfs.purdue.edu.

**College of Education**

The state-accredited and nationally ranked and accredited College of Education prepares outstanding teachers, instructional leaders, administrators, school counselors, counseling psychologists, curriculum specialists, teacher educators, and educational researchers for the essential roles they play in guiding the education of our youth. Through interdisciplinary instructional programs in teacher education, research in the educational process, and engagement with Indiana schools, College of Education graduates are well prepared for a rewarding career in education. The dedicated and experienced faculty members, some of whom are known internationally as experts in their fields, are respected leaders in a wide range of curriculum areas and are actively engaged in research. Together the students and faculty share a passion for learning, teaching, and changing the world. The college offers undergraduate and graduate degrees in a variety of disciplines. In addition to the teacher education programs offered by the College of Education, teacher preparation programs also are offered through other colleges and schools across campus. See www.education.purdue.edu.

**College of Engineering**

The College of Engineering is internationally known for the quality and scope of its programs. Students launch their careers with a common first-year program in the School of Engineering Education. Once they have completed that program, they choose from undergraduate curricula in aeronautics and astronautics, agricultural, biological, biomedical, chemical, civil, computer, construction engineering and management, electrical, industrial, interdisciplinary, materials, mechanical, or nuclear engineering. Every school within engineering offers graduate degree programs. See www.engineering.purdue.edu.

**College of Agriculture**

Among the nation’s highest ranked and most prestigious institutions, the college offers excellent teaching, research, extension, and international programs. More than 40 programs of study prepare life scientists, engineers, business representatives, producers, information specialists, and resource managers for professional careers in the world’s food and natural resource systems. See www.ag.purdue.edu/oap.
School of Health Sciences

The school offers a variety of human health-related study areas. Undergraduate programs include environmental health science, general health sciences, medical laboratory science (medical technology), occupational health science (industrial hygiene), and radiological health science (health physics). The general health sciences major requires the selection of a concentration area in pre-medical, pre-dental, pre-occupational therapy, pre-physical therapy, pre-chiropractic, pre-optometry, pre-physician’s assistant, or public health. Students completing these programs are prepared to enter the health-related job market or apply to the professional or graduate program of their choosing. At the graduate level, programs of study include health physics, medical physics, occupational and environmental health sciences, radiation biology, and toxicology. See www.healthsciences.purdue.edu.

College of Liberal Arts

The college offers essentially all of the traditional disciplines of the humanities, social and behavioral sciences, and creative arts. Majors and minors are available in the departments of anthropology, audiology and speech sciences, communication, English, foreign languages and literatures, health and kinesiology, history, philosophy, political science, psychological sciences, and sociology; and in the School of Visual and Performing Arts. Students can prepare themselves in more than 50 majors, including 16 undergraduate interdisciplinary programs. See www.cla.purdue.edu.

Krannert School of Management

Degree programs include accounting, management, industrial management, and economics. Accounting and management programs focus on finance, marketing, operations, human resources, and strategic planning. The industrial management program combines management and technical education with a manufacturing management, engineering, or science minor. The accounting program combines a management background with extensive education in accounting principles and practices. All programs include coursework in the arts, humanities, and international and cross-cultural aspects of modern business. See www.krannert.purdue.edu.

School of Nursing

The School of Nursing prepares students from diverse backgrounds for careers as professional nurses. The nationally accredited undergraduate program prepares a student for licensure as a registered nurse (R.N.). A diverse mix of liberal arts, science, and nursing courses gives students a scientific, multidisciplinary education. Small clinical classes give students practical experience in health assessment, maternal child care, mental health, acute care, and community health nursing. This program admits nursing majors at the freshman year and offers early, hands-on clinical courses. The R.N.-to-B.S. program allows registered nurses to complete their baccalaureate requirements. The Second Degree Baccalaureate Program allows students who hold a degree in another field to pursue a B.S. in Nursing. The master’s degree program prepares pediatric nurse practitioners and adult nurse practitioners, and offers a post-master’s oncology certification. A graduate nursing consortium with the Purdue Schools of Nursing at Calumet and Fort Wayne offers various specializations. The Doctor of Nursing Practice (D.N.P.) delivers a post-baccalaureate to practice doctoral curriculum. See www.nursing.purdue.edu.

School of Pharmacy and Pharmaceutical Sciences

The school offers an accredited professional program leading to the Doctor of Pharmacy degree. This program combines a basic and applied science background as well as clinical experience allowing students to function as licensed pharmacists to provide pharmaceutical care. The prepharmacy curriculum can be taken either through Purdue’s prepharmacy program or at another institution. It typically takes a minimum of two to three years of academic study to meet the pre-pharmacy course requirements. The school also has a four-year, non-licensure-eligible B.S. in Pharmaceutical Sciences degree designed for entry-level pharmaceutical industry positions or as a foundation for advanced education. See www.pharmacy.purdue.edu.

College of Science

Actuarial science, biological sciences, chemistry, computer science, earth and atmospheric sciences, mathematics, physics, statistics, math and science secondary school teaching, and interdis-
disciplinary science programs prepare students for immediate careers or advanced study. Premedical, pre-dental, and pre-veterinary options; a Professional Practice Program; study abroad; and honors programs are available. Students may pursue official minors in other areas outside their major. Enrollment in sciences while deciding on a major in any field is encouraged. A highly qualified faculty, state-of-the-art facilities, and ongoing research keep teaching up to date. See www.science.purdue.edu.

College of Technology

The eight departments and 23 concentrations in the College of Technology prepare students to meet the technological needs of business, industry, and government. Technology students begin taking courses in their majors as early as their freshman year. Courses and other opportunities allow students to experience a variety of hands-on, real-world applications. The college awards associate’s, bachelor’s, and graduate degrees. See www.purdue.edu/technology.

School of Veterinary Medicine

This professional school has assumed a leading position nationally and internationally in educating the veterinary medical team. The school is fully accredited and is one of only 28 in the United States that grant the Doctor of Veterinary Medicine (D.V.M.) degree. The Veterinary Technology Program is accredited by the American Veterinary Medical Association (AVMA) and awards Associate of Science and Bachelor of Science degrees. The Associate of Science degree is also offered via distance learning. The Veterinary Technology Program at Purdue is one of only three AVMA-accredited programs administered by a school of veterinary medicine. See www.vet.purdue.edu.

The Graduate School

The Graduate School oversees more than 70 programs of graduate study and research that lead to advanced degrees. Purdue graduate students engage in relevant coursework and cutting-edge research that lead to master’s and doctoral degrees in agriculture, consumer and family sciences, education, engineering, health sciences, liberal arts, management, nursing, pharmacy, science, technology, veterinary medicine, and a variety of exciting interdisciplinary programs. The Graduate School also offers several graduate-level, academic credit certificate programs and combined (undergraduate/graduate) degree programs. For details about the Graduate School at Purdue, visit www.gradschool.purdue.edu.

College of Science

Organization and Purpose

Science — the effort to observe, understand, and utilize the laws of nature — is an ancient discipline. Today, science is more exciting than ever because of the speed with which new insights are obtained and often applied to vital human problems, such as population growth, disease, pollution, energy shortages, and food production.

The College of Science at Purdue University offers many undergraduate and graduate programs that will prepare you for a variety of careers. Scientists are encouraged by society to pursue new avenues of research, either as individuals or as part of great research teams employing many scientists. They are needed to design computers and computer programs, locate and analyze natural resources, help find ways to protect our environment, and apply research findings to industrial and human problems. Scientists are needed as teachers at all levels of education. They are sought as administrators for governmental organizations using other scientists or engineers and as salespeople and managers by companies with science-based products.

Undergraduate education in the sciences is considered excellent background for graduate study in medicine (including veterinary medicine), dentistry, business administration, law, and areas of the social sciences where quantitative methods are important. The College of Science also is very interested in helping students whose goal is not a career in science but a general education with emphasis on the scientific aspects of our society.

The College of Science at Purdue is an excellent place to acquire an education in science. Its seven instructional departments give you the chance to increase your knowledge of science
by interacting with first-rate scientists who also are gifted teachers and by working with modern equipment in well-designed laboratory experiments. The departments also have honors programs if you are qualified and fine libraries that allow you to pursue, in depth, subjects in which you have an interest. You also may choose to pursue a minor in an area of the College of Science or in other areas of the university.

Choosing a Major

Science today is a collection of specializations — and that can be confusing to students who know they want to study science but who aren’t ready to commit themselves to a particular subdivision of the field. The undergraduate plans of study in the College of Science reflect the many specializations within science, but there also are opportunities for students to get a broad education in one or more of the sciences.

An important concern will be deciding between the main divisions of science study at Purdue — the life and physical sciences or the mathematical and computational sciences. If you are not sure what specific science to choose as a major, start in the subject you like best and sample other sciences as a first-year student. The first-year programs in the seven departments of the school are similar enough that switching from one science major to another is usually simple, if you decide your initial choice is not best for you.

Decisions about options offered within each department need not be made until at least your sophomore year, and often not until your junior year. Many students obtain a broad science education as undergraduates and delay specialization until graduate school.

If you have a specific interdisciplinary career objective in mind, you might consider one of the options suggested under the Interdisciplinary Science Program or plan to supplement your major courses with those offered by other schools or colleges of the University.

Choosing a major is not always easy, but help is available. Science academic advisors and faculty members will be happy to provide information and guidance.

Scholarships

The College of Science grants scholarships based on academic merit to highly qualified applicants each year. During recent years, more than $400,000 in scholarship money has been distributed annually by the College of Science to outstanding students. Top students will receive invitations to apply for scholarships; however, scholarship applications are open to all students pursuing a science major.

For beginning students, successful applicants typically will be among the top 10 percent of their high school class, have strong grades in high school math and science courses, and have outstanding standardized test scores (greater than 1350 on the combined SAT exams, or 32 on the ACT exams) as well as outstanding participation in math and science competitions, high school activities, and honors. Continuing students who compete successfully for scholarships usually have at least a 3.5/4.0 overall GPA in addition to a strong record in leadership, community service, and research.

For further information, contact the Scholarship Coordinator, College of Science, Mathematical Sciences Building or visit the college scholarship Web site at www.science.purdue.edu/prospective_students/scholarships. For information about other types of financial assistance, see page 18.

Professional Practice Program

The College of Science Professional Practice Program (formerly Cooperative Education Program) gives science students the opportunity to alternate periods of supervised professional employment with periods of University coursework while studying for their bachelor’s degrees.

If you choose to participate in Professional Practice, it may take longer to earn your degree, but you will receive several important benefits. Based on past experience of students in Professional Practice Programs, you can expect that (1) your earnings from your employment will be enough to pay a substantial portion of your remaining years of employment/studies, and (2) you will gain valuable professional experience in your scientific field — giving you a feeling for the career you select, making your coursework more relevant, and increasing your value as a future employee.
As a professional practice student, you will attend Purdue for about two academic years before your first work experience. After that, you will alternate periods of academic study with periods of work experience. The actual study-work schedule depends on your major and professional practice employer.

Your professional practice employer will have been approved by the University and will have agreed to give you a meaningful work experience related to your scientific interests. Normally, you will work for the same employer throughout your baccalaureate program and be given increasing responsibility with each work period.

Each department in the College of Science determines its own eligibility requirements for participation and has a departmental coordinator of the program. (Departmental requirements are given in the departmental sections of this catalog.) The departmental coordinator counsels students in the program and has information about available jobs.

You must apply to the coordinator in your department to be accepted into the professional practice program. If you are an interdisciplinary science student, apply to the coordinator in the department of your major science concentration or to the College of Science professional practice coordinator. If you are interested in the program, you should contact the departmental coordinator as early as possible to facilitate job placement and to assure your eligibility.

The University, through a professional practice coordinator, supervises you and your employer during work periods. After each work period, you must write a comprehensive report about your work experience. When they graduate, students who complete at least four work periods receive a certificate indicating that they have completed the Professional Practice Program.

While employed as a professional practice student, you must register for noncredit departmental courses numbered 091, 092, 093, 094, or 095 and pay the special University fee for program registration.

**Teacher Education Program**

Purdue University offers programs that prepare students for teaching in early childhood, middle childhood (elementary education), early adolescence (junior high/middle school), adolescence/young adulthood (secondary), and exceptional needs (special education). Program standards, curricula, and licensure are in accord with regulations promulgated by the Indiana Department of Education and authorized by the National Council for Accreditation of Teacher Education (NCATE). Descriptions of performance-based programs may vary by content areas. Official performance-based program guidelines are available via the College of Education Teacher Education Web site at www.teach.purdue.edu/licensure. Students seeking additional clarification and guidance should consult with an academic advisor.

A person who already holds a bachelor’s degree may wish to complete a teacher education program as an “undergraduate or graduate for licensing only” student. If this option is chosen and a second baccalaureate degree is not desired, please contact the Office of Professional Preparation and Licensure for a transcript evaluation. Eligibility requirements do apply.

**Title II Reporting Requirements.** Purdue University is in compliance with Title II reporting requirements. Please visit www.education.purdue.edu/title2 to obtain complete details. If you are unable to access this Web site, please contact the Office of Professional Preparation and Licensure at Beering Hall of Liberal Arts and Education, Room 3229; 100 N. University Street; West Lafayette, IN 47907-2098 for a copy of the report.

**Teacher Education Requirements**

The following information outlines the assessment of students completing a teacher education program at Purdue University. For the most current information, visit www.education.purdue.edu/oppl/program.html. The candidate must:

- Attend the Office of Professional Preparation and Licensure Teacher Education Orientation during Block I or CDFS 10000;
- Submit the Application/Signature Form to the licensure office;
- Complete Gates A, B, and C (an application is not required for Gate B or C);
• Complete Gate D licensure requirements;
• Apply for the State of Indiana license through the Office of Professional Preparation and Licensure upon successful completion of the program and other possible state requirements such as the cardiopulmonary resuscitation (CPR) certificate.

Required Criteria and Suggested Time Line

Remain flexible. The length of time to complete the Teacher Education Program is determined by academic progress and career planning. Additional time may be necessary if you are:
- a) changing your degree objective or transferring,
- b) overcoming a GPA below the required teacher education program standard,
- c) pursuing an additional major or licensure area, or
- d) encountering other unknown needs or circumstances.

Before the First Semester:
1. Admission to Purdue University.
2. Admission to the respective academic college, i.e., Agriculture, Consumer and Family Sciences, Education, Liberal Arts, Science, or Technology.
3. Assignment to and guidance by an academic advisor.
Consult with your academic advisor regularly to ensure that the required criteria are met and coursework is successfully completed in the sequence authorized by the Purdue University Teacher Education Council.

Requirements for Passing through Gate A
(A Teacher Education Program Application/Signature Form is required. See #7.)
1. Complete required courses for Gate A, with no grade lower than a “C”:
   - Most program areas—Block I (EDCI 20500, EDCI 28500)
   - Early Childhood Education—CDFS 21000
2. Maintain a minimum overall GPA as established by the program area.
3. Maintain a professional education GPA of 3.0/4.0 with no grade lower than a “C” and no Incomplete (“I”) for any professional education course. Courses include EDCI, EDPS, and EDST courses, in addition to courses designated by a program area as professional education courses.
4. Maintain a minimum content/major GPA as established by the program area.
5. Meet satisfactory assessment of the initial portfolio as defined by faculty. Early Childhood Education (ECE) majors, see Unit Assessment Component Chart for ECE.
6. Meet Praxis I: Pre-Professional Skills Tests (PPST) or Computerized PPST with the following scores:
   - Reading: 176 or above
   - Writing: 172 or above
   - Mathematics: 175 or above
All scores must be officially submitted by the Educational Testing Service to Purdue University; code RA #1631 or WLAF as a score recipient. For more details, please refer to the Teacher Education Program Testing Information sheets available in the Office of Professional Preparation and Licensure; Beering Hall, Room 3229; 100 N. University Street; West Lafayette, IN 47907-2098.
7. Submit a completed and signed teacher education Application/Signature Form to the Office of Professional Preparation and Licensure if all of the above requirements have been met or will be met by the end of the semester (or summer session if enrolled in summer classes). The application may be marked to hold for current semester grades or test score reports. See application for due dates. A student must be enrolled in the college that houses the teacher education major in order to apply for Gate A.
The student’s signature on the Signature Form acknowledges that s/he will read the teacher education information on this Web site, referring to it regularly in order to remain informed of standards and responsibilities to the Teacher Education Program process. The signature also confirms understanding of the following:
- Limited Criminal History Reports may be required throughout the Teacher Education Program for field experiences, and a report will be required for licensing.
- Purdue University will check Zachary’s Law Registry periodically.
- The Indiana Department of Education will review misdemeanor/felony convictions at the time of licensing.
- Consent to release personal information and Social Security number to the State of Indiana and other state/federal departments of education as well as provide a signed and valid CPR certificate.
8. Receive written notification of status through Gate A from the Office of Professional Preparation and Licensure.

9. If denied admission, reapplication is required.

**Student Teaching Application Workshop Information.** If you plan to student teach during the fall semester, you must apply in October of the preceding academic year. If you plan to student teach during the spring semester, you must apply in November of the preceding academic year. You must visit the Office of Field Experiences (OFE) to sign up for an Application Workshop to receive a pass code in order to complete the online Student Teaching Application on the Internet.

*Note:* For student teaching information, see the Office of Field Experiences (OFE) Web site at www.education.purdue.edu/fieldexp or e-mail fieldexp@purdue.edu. This application serves as a “letter of intent” and does not imply automatic placement, as a student must successfully complete Gates A, B, and C requirements before student teaching.

**Requirements for Passing through Gate B**

Requirements for Passing through Gate B must be met in order to continue in the program, including eligibility for study abroad block courses. (No Teacher Education Program application is required for Gate B, although a Student Teacher Application must be submitted. See “Note” below.)

1. Complete required courses for Gate B, with no grade lower than a “C”;
   - Most program areas—Block II (EDPS 23500, EDPS 26500)
   - Early Childhood Education—CDFS 21300 (grade of “B”), CDFS 31000, CDFS 31800, and EDPS 26000 or 26500
   - Special Education—Block II (EDPS 23500, EDPS 26500), EDPS 27000, and EDPS 46000
2. Maintain a minimum overall GPA as established by the program area.
3. Maintain a professional education GPA of 3.0/4.0 with no grade lower than a “C” and no Incomplete (“I”) for any professional education course. Courses include EDCI, EDPS, and EDST courses, in addition to courses designated by a program area as professional education courses.

4. Maintain a minimum content/major GPA as determined by the program area.
5. Meet satisfactory assessment of the beginning portfolio as defined by faculty. Early Childhood Education (ECE) majors, see Unit Assessment Component Chart for ECE.
6. Request a Limited Criminal History Report if required for field experiences throughout the Teacher Education Program. The Zachary’s Law Registry also will be checked periodically.
7. Failure to meet or comply with the above requirements will result in removal from methods courses.
8. Receive written notification of status through Gate B from the Office of Professional Preparation and Licensure.

*Note:* For student teaching information, see the Office of Field Experiences (OFE) Web site at www.education.purdue.edu/fieldexp or e-mail fieldexp@purdue.edu. A student must pass through Gates A and B before submitting the Student Teaching Application form to OFE. This application serves as a “letter of intent” and does not imply automatic placement.

**Requirements for Passing through Gate C**

(No Teacher Education Program application is required.)

1. Complete required courses for Gate C, with no grade lower than a “C”;
   - Most program areas—Specific methods courses
   - Early Childhood Education—CDFS 40500, CDFS 40600, and CDFS 40800 with grades of “B”
   - Elementary Education—Block III (EDCI 36100 and EDCI 36200), Block IV (EDCI 36300 and EDCI 37000), and Block V (EDCI 36400, EDCI 36500, and EDPS 43000)
2. Pass Praxis II: Subject Assessments/Specialty Area Tests required by the Indiana Department of Education for licensing. For information on required tests and passing scores, please consult the Teacher Education Program Testing Information sheets and the Educational Testing Service Web site at www.ets.org/praxis.

*Note:* Praxis II must be passed before being allowed to student teach. Praxis II tests are only offered seven times a year and must be registered for in advance.
3. Maintain a minimum overall GPA as established by each program area.

4. Maintain a professional education GPA of 3.0/4.0 with no grade lower than a “C” and no Incomplete (“I”) for any professional education course. Courses include EDCI, EDPS, and EDST courses in addition to courses designated by a program area as professional education courses. All professional education coursework should be completed prior to student teaching.

5. Maintain a minimum content/major GPA as established by each program area. Most, if not all, content courses should be completed before student teaching.

6. Meet satisfactory assessment of the developing portfolio as defined by faculty.

7. Receive written notification of status through Gate C from the Office of Professional Preparation and Licensure.

8. Successful completion of requirements through Gate C of the Teacher Education Program allows the Office of Professional Preparation and Licensure to authorize the student to enter the student teaching semester. For information regarding student teaching placement, please see the Office of Field Experiences (OFE) Web site at www.education.purdue.edu/fieldexp or e-mail fieldexp@purdue.edu.

9. Student Teaching Information. To be eligible to student teach, a candidate must have applied and been admitted to the Teacher Education Program and have passed through Gate C. For information regarding student teaching placement, please see the Office of Field Experiences (OFE) Web site at www.education.purdue.edu/fieldexp or e-mail fieldexp@purdue.edu. For more information regarding student teaching, please see the Office of Field Experiences (OFE) Web site at www.education.purdue.edu/fieldexp or e-mail fieldexp@purdue.edu.

10. Request a Limited Criminal History Report if required for field experiences. The Zachary’s Law Registry also will be checked periodically.

11. Begin job search through the Center for Career Opportunities at www.cco.purdue.edu/student.

Requirements for Passing through Gate D

(License application is required. See #9.)

1. Student teach.
   • Professional education courses, including methods courses, must be successfully completed before student teaching.
   • You may student teach only after passing through Gate C.
   • A grade of “C” or above must be earned in EDCI/EDPS 49600, 49800, 49900, or CDFS 45000 Supervised Teaching.

Note: For more information regarding student teaching, please see the Office of Field Experiences (OFE) Web site at www.education.purdue.edu/fieldexp or e-mail fieldexp@purdue.edu.

2. Maintain a minimum overall GPA as established by each program area.

3. Maintain a professional education GPA of 3.0/4.0 with no grade lower than a “C” and no Incomplete (“I”) for any professional education course. Courses include EDCI, EDPS, and EDST courses, in addition to courses designated by a program area as professional education courses.

4. Maintain a minimum content/major GPA as established by each program area.

5. Meet satisfactory assessment of the proficient portfolio as defined by faculty.

6. Continue to meet all criteria for passing through Gates A, B, and C.

7. Request a Limited Criminal History Report for licensure. The Zachary’s Law Registry also will be checked periodically.

8. Receive degree. Recommendation for licensure is contingent upon the posting of the degree on the transcript. All encumbrances must be paid.

9. Apply for an Indiana Teaching License, even if leaving the State of Indiana. For more details, consult the Indiana Licensure instruction packet provided by the Office of Professional Preparation and Licensure at the Student Teacher Orientation. The online license application may be submitted two months prior to the last day of required courses. Purdue University will make a recommendation for licensing upon completion of all licensure requirements.

Note: The following questions will be asked by the Indiana Department of Education Division of Professional Standards on the license application:

• Have you ever had a credential, certificate, or license to teach denied, revoked, or suspended in Indiana or in any other state?
• Have you ever been convicted of a felony?
• Have you been convicted of a misdemeanor other than minor traffic violations since January 15, 1994?
If a conviction of a misdemeanor or felony (including a suspended sentence) is documented, the applicant will be required to submit a written explanation and copies of court records with the license application. The Indiana Department of Education is solely responsible for the review of and response to misdemeanor or felony convictions.

10. Apply for licensure in other states, if desired. Contact the licensing office in the particular state and request application materials. Consult the National Association of State Directors of Teacher Education and Certification at www.nasdtec.org/jurisdictions.tpl for Web sites, addresses, and telephone numbers.

Note: For additional licensing, apply for renewal or submit a request for an evaluation through the Office of Professional Preparation and Licensure if coursework is to be completed through Purdue University.

Admissions

Admissions Inquiries and Procedures

The information that follows is a basic overview of the undergraduate admission process. For the most current information regarding admission procedures, deadlines, and criteria, visit www.admissions.purdue.edu or contact the Office of Admissions; Purdue University; Schleman Hall; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; admissions@purdue.edu; (765) 494-1776. Prospective students also are encouraged to visit the Web site to sign up for the Office of Admissions contact list to receive mail and e-mail from Purdue.

Application Deadlines

High school students are strongly encouraged to apply for admission very early in their senior year, and some programs have specific deadlines. There also are specific deadlines for transfer students. Current application and scholarship deadlines are posted on the undergraduate admissions Web site.

Freshman Admissions Criteria

Applications are reviewed on an individual and holistic basis. First and foremost, applicants must be prepared academically for the rigors of college and the academic demands of the major to which they are seeking admission. In its review of each applicant, Purdue considers the following factors: high school coursework, grades, strength of curriculum, academic trends, class rank, core and overall grade point average, SAT or ACT test score, personal statement, personal background and experiences, and space availability in the intended major.

Transfer Admissions Criteria

College students who want to transfer must have completed minimums of 12 to 24 semester credit hours of college-level coursework prior to enrollment at Purdue. Minimum credit-hour requirements will vary based on each student’s high school and/or college academic credentials. Criteria for transfer admission vary widely based on the major to which the student is applying. All programs have minimum GPA requirements, and some have college coursework prerequisites. The Office of Admissions Web site has the most current information about admission criteria and processes as well as about transferring credit.

Early Registration — STAR

Student Access, Transition and Success Programs (SATS) invites you to campus for one day of early registration during the summer before your first semester as a new student. Summer Transition, Advising, and Registration (STAR) is a day set aside for you to meet with your academic counselor and register for first-semester classes. The University will mail you a fee statement.
Student Orientation and Support Programs

Student Access, Transition and Success Programs (SATS) is responsible for the coordination of initiatives that help you prepare for, transition into, and succeed as a student in Purdue University’s academically rigorous environment.

SATS, a division of the Office of Enrollment Management, offers several programs to help beginning and transfer students adjust to Purdue. Boiler Gold Rush is organized for new, beginning students and transfer students, and it includes a variety of activities designed to help you make a smooth transition into Purdue. Students who begin their studies at other times of the year also have the opportunity to participate in orientation. Invitations to those different programs are mailed to you at the appropriate times.

SATS programs include Summer Transition, Advising, and Registration (STAR); Common Reading; Learning Communities; Orientation Programs (such as Boiler Gold Rush and Welcome Programs); Parent and Family Programs; the Purdue Promise program; and the West Central Indiana Regional Twenty-first Century Scholars site. For more information on any of these programs, please visit www.purdue.edu/sats, e-mail sats@purdue.edu, or phone (765) 494-9328. The SATS address is Stewart Center, Room G77A; 128 Memorial Mall Drive; West Lafayette, IN 47907.

International Students

If you are an applicant from another country, your application and supporting documents will be evaluated by the staff in the Office of International Students and Scholars. You will be admitted on the basis of credentials certifying the completion of preparatory studies comparable to requirements for United States citizens applying at the same entry level. Guidelines for determining admissibility are specified in the “Admissions Criteria” section of this publication. English translations must accompany transcripts and other credentials. You also must submit satisfactory evidence of your ability to comprehend English as shown by a TOEFL (Test of English as a Foreign Language) score of at least 550 (213 computer-based score, 79 Internet-based score). The minimum score for First-Year Engineering applicants is 567 (233 computer-based score, 88 Internet-based score).

You must furnish sufficient evidence of adequate financial support for your studies at Purdue.

The Office of International Students and Scholars will assist you in entering the United States and the University. The office also will provide other services such as orientation programs, immigration advising, and personal and cross-cultural counseling. See the Web site at www.iss.purdue.edu.

Military Training

Reserve Officers’ Training Corps (ROTC) is available for all men and women who are full-time students. You can pursue military courses in conjunction with the academic curriculum and receive academic credits. If you complete the program, you will receive a commission as an officer in the Army, Navy, Marine Corps, or Air Force. You do not incur a commitment until you are accepted into the program and enroll in the third-year course or accept an ROTC scholarship. Scholarships that assist with tuition, incidental fees, and textbooks are available through all four services. A monthly allowance is available for students who sign a contract. Additional information is available in the College of Liberal Arts catalog, or you can contact any of the military departments directly. All ROTC offices are located in the Armory.

Proof of Immunization

Indiana state law requires proof of immunization for the following vaccine-preventable diseases as condition of enrollment on residential campuses of state universities: measles, mumps, rubella, diphtheria, and tetanus. In addition, international students must provide documentation that they have been tested for tuberculosis after arriving in the United States. Information regarding compliance will be forwarded to all admitted students.

Purdue Across Indiana

The Purdue academic system extends across the state with academic programs at four system campuses and several College of Technology locations.
System Campuses
Admission to these system campuses is administered by the admissions department at each campus. These campuses include:
- Indiana University-Purdue University Indianapolis (IUPUI) — Indianapolis, Indiana
- Indiana University-Purdue University Fort Wayne (IPFW) — Fort Wayne, Indiana
- Purdue North Central — Westville, Indiana
- Purdue Calumet — Hammond, Indiana

College of Technology Statewide
Admission to College of Technology Statewide locations is administered by the Office of Admissions at Purdue’s West Lafayette campus. College of Technology Statewide locations include:
- Anderson
- Columbus
- Greensburg
- Indianapolis
- Kokomo
- Lafayette
- New Albany
- Richmond
- South Bend
- Vincennes

For more information about The Purdue System-wide campuses and College of Technology Statewide locations, visit www.purdue.edu and click on “Purdue Across Indiana.”

Nondiscrimination Policy Statement
Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Executive Memorandum No. D-1 which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.

Any questions or concerns regarding the Nondiscrimination Policy Statement shall be referred to the Vice President for Ethics and Compliance for final determination.
Expenses

The cost of attending Purdue University varies, depending on a variety of factors, including where a student chooses to live; travel expenses; food costs; enrollment in a special program; date of entry; the college or school in which you are enrolled; etc. Basic minimum costs for the two-semester 2009–10 school year on the West Lafayette campus are shown in the following table. Some academic programs may have additional fees. Contact the department if you have questions.

Full-time students are charged a general service fee, a technology fee, and a repair and rehabilitation fee. The general service fee provides students with access to a variety of services and privileges such as access to the Recreational Sports Center and the Boilermaker Aquatic Center for recreational sports activities. It also allows deep-discount ticket prices for most Convocations-sponsored events and for Intercollegiate Athletics contests with presentation of a student ID card.

With payment of full fees, students have access to the Purdue Student Health Center that covers medical clinical office visits, nutrition consultations, health education services, and a limited number of sessions for psychological counseling. Additional fees are charged for lab, x-ray, urgent care, physical therapy, and other services.

The technology fee is used to enhance student access to the campus networks, computer laboratories, and electronic access to information and databases. Technology fee funds are used to equip classrooms with computer and video projection equipment.

The Repair and Rehabilitation fee is assessed to address maintenance funding for buildings and infrastructure on campus, and funds received from the fee will be dedicated to building and infrastructural needs. The establishment of the fee is a result of growing unfunded needs to address critical building and infrastructural upkeep.

Miscellaneous personal expenses include such items as clothing, transportation, telephone, newspapers and magazines, dry cleaning and laundry, entertainment, etc.

### 2009–10 Estimated Costs West Lafayette Campus
(Fall and Spring Semesters)

<table>
<thead>
<tr>
<th>Items</th>
<th>Indiana Resident</th>
<th>Nonresident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition/Fees</td>
<td>$8,638*†</td>
<td>$25,118*†</td>
</tr>
<tr>
<td>Room/Board</td>
<td>8,710</td>
<td>8,710</td>
</tr>
<tr>
<td>Books/Supplies</td>
<td>1,220</td>
<td>1,220</td>
</tr>
<tr>
<td>Travel</td>
<td>310</td>
<td>480</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1,760</td>
<td>1,760</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$20,638</strong></td>
<td><strong>$37,288</strong></td>
</tr>
</tbody>
</table>

* First-time students enrolled at the West Lafayette campus beginning in the Summer 2009 Session and thereafter pay these fees. Undergraduate, graduate, and professional students who were enrolled as degree-seeking students prior to the Summer 2009 Session may be eligible for lower fees based upon continuous enrollment. Please see the University Bursar’s Web site at www.purdue.edu/bursar for more information regarding rates.

† Your budget can vary, depending on your state of residence and the type of housing and academic program you select. Some programs have additional fees: Engineering, $1,000; Management, $1,274; Technology, $500; Flight, individual courses in the program have additional fees that can be reviewed at www.purdue.edu/bursar or by contacting the Department of Aviation Technology. International students pay an additional $60 per semester.

Rates and refund schedules are subject to change without published notice.
Refunding of Fees and Tuition

Registered students who find it necessary to cancel their registration before the beginning of classes, upon the recommendation of the registrar, will receive a 100 percent refund of all fees and tuition.

Non-Title IV Aid

Students who withdraw during the first six weeks of a semester, with the recommendation of the registrar, will receive a partial refund of the general service fee and tuition. More specifically, the percentage of refund is determined as follows:

Fall or Spring Semester
1. Withdrawal during the first or second week, 80 percent refund
2. Withdrawal during the third or fourth week, 60 percent refund
3. Withdrawal during the fifth or sixth week, 40 percent refund

No portion of the technology fees, repair and rehabilitation fees, or academic building facilities fee will be refunded once classes begin.

Title IV Aid

Once classes begin, refunds are prorated based on the date of withdrawal from class(es). Refunds are based on a diminishing scale through 60 percent of the semester. Refunds are calculated on all fees and tuition.

Summer Modules

Refunds for summer modules are proportionate on the same basis as semester refunds.

Financial Aid

To ensure that all students have an opportunity to obtain a college education regardless of their financial circumstances, Purdue University, through the Division of Financial Aid, administers a fourfold program of scholarships, grants, employment opportunities, and loans.

The Purdue University Division of Financial Aid administers federal, state, and University financial assistance programs. These programs require students to have a high school diploma or GED. Most types of aid also are based upon financial need and satisfactory academic progress. Students must submit a Free Application for Federal Student Aid (FAFSA) online at www.fafsa.ed.gov to be considered for all types of financial aid. Students should apply early for Purdue financial aid. Eligible FAFSAs submitted by March 1 will receive preference in the awarding of aid.

Families are welcome to visit the campus to discuss the types of available aid and the application procedure. Walk-in counselors are available from 9:00 a.m. to 5:00 p.m. on Monday, Tuesday, Wednesday, and Friday, and from 1:00 to 5:00 p.m. on Thursday. Telephone counselors are available from 8:00 a.m. to 5:00 p.m. Monday through Friday at (765) 494-0998. Computer access to student aid status is available at mypurdue.purdue.edu.

Resident Assistants

University Residences has a plan whereby graduate and undergraduate students who are at least 21 years of age can be hired as a resident assistant (RA). An RA devotes approximately 20 hours each week to his or her duties in this capacity, with most of the time scheduled during evenings and weekends. Compensation for an RA position includes reduced tuition, room and board, and a small stipend. Applications and additional information for those interested in becoming a resident assistant can be found at www.housing.purdue.edu.
Living Accommodations

University housing facilities and programs are available to all students based on Purdue’s policy of equal opportunity regardless of national origin, race, religion, color, or sexual orientation. It is the University’s desire and expectation that all others providing housing or services to Purdue students will do so in a manner consistent with this policy. However, the University does not approve or disapprove specific housing accommodations since it believes that the choice of housing rests with you, the student.

As a Purdue student, you have a variety of choices when it comes to choosing your new home while attending school. You can live in one of 15 University Residences, a fraternity or sorority house, cooperative housing, or in a privately operated facility within the local community.

Apply for on-campus housing as soon as you have a confirmed interest in attending Purdue. You will need to pay a $100 nonrefundable housing application processing fee (not a deposit).

Apply online at www.housing.purdue.edu, where you can fill out your housing application, choose your preferences, and sign your housing contract. The site also will prompt you to fill out an online preference form, which will be used to assign your residence and match you with a compatible roommate. If you want to live with a friend, both you and your friend must rank your residence preferences in the same order and request the other as a roommate.

May 1 is the housing application deadline. Because the University does not guarantee on-campus housing, it is important that students meet this deadline. Students who apply for housing after the May 1 deadline will be assigned to a residence if space is available. First-year students are not required to live on campus.

Students who apply and sign a housing contract by May 1 will be assigned a random number that will be used to establish priority for hall choice in the housing assignment process. Changes to, or cancellation of, your housing contract may be made until 11:59 p.m., April 30. (Please remember to re-sign the contract if you have made a change to your housing preferences.) Your housing contract becomes binding on May 1. As of that time, your contract can only be cancelled if you do not attend Purdue University during the contract period.

Students requiring special accommodations should contact the University Residences Director’s Office at (765) 494-1000 to discuss their particular needs when their housing application is submitted.

The Office of the Dean of Students offers assistance to students seeking off-campus housing. After being admitted, students should contact the Office of the Dean of Students as early as possible to begin their search for off-campus housing: visit www.purdue.edu/odos, e-mail offcampushousing@purdue.edu, or call (765) 494-7663.

University Residences for Undergraduate Men and Women

University Residences provides accommodations for approximately 10,541 single undergraduate men and women.

The all-male residences include Cary Quadrangle, providing accommodations for 1,166 students, and Tarkington, providing space for about 706 students.

Seven University Residences — Earhart, Harrison, Hillenbrand, McCutcheon, Owen, Shreve, and Wiley — house approximately 800 students each, and Meredith Hall accommodates 620 students. These are coeducational units with male and female students assigned to separate areas of each building.

Duhme, Warren, Wood, and Vawter halls comprise the all-women’s residences for the 2009–10 academic year and are referred to as Windsor Halls. Windsor Halls provide accommodations for 595 students.

First Street Towers opened to Purdue sophomores, juniors, and seniors for the Fall 2009 Semester. Each of the main residential floors of First Street Towers contains two clusters of 22 single rooms with private baths, for 356 residents.

All University Residences contain generous lounge space, recreation areas, kitchenettes, study spaces, and post office facilities.

As a student, you may choose from four meal plans consisting of 10, 12, 15, or 20 meal swipes a week, as suits your lifestyle. University Residences offers students who are 19 years of age or older by August 21, 2009, the Boiler Block Plan, consisting of a block of 246 meal

19
swipes. With this plan, you may use your meal swipes as often as you wish. All meal plans include Dining Dollars, which may be used to buy additional food items at University Residences’ Dining Services retail operations, such as grills and mini-marts. You may eat at any University Residences’ Dining Services facility by using your University ID card.

Computer labs are available in McCutcheon, Meredith, and Tarkington halls. In addition, two computers and a public printer are available in every residence that does not have a computer lab so residents are able to check e-mail and print documents as needed. Residents will have ResNet, a high-speed Internet service, in their room without paying an additional fee.

Room and board rates for the 2009–10 academic year vary from $6,906 to $14,204, depending on your chosen meal plan option, residence, and room size.

Approximately 550 spaces in Hawkins Hall are reserved for assignment to older undergraduate students. Meal plans are not available for residents of Hawkins Hall. Residents of Hawkins may purchase either the Open Dining Card or use BoilerExpress for dining in any University Residences dining facility. Accommodations in Hawkins Hall are on a room-only basis. The cost for a room in Hawkins Hall for the 2009–10 academic year ranges from $375 to $696 a month depending on the type of room selected.

More than 1,000 spaces for single undergraduate students are available in Hilltop Apartments. The apartments house two or three students and are available for both single male and female students. All normal policies and regulations of University Residences apply to the apartments. Students living in the apartments may choose a meal plan that allows access to any University Residences Dining Services facility, or they may choose a room-only option. The room and board rate for the 2009–10 academic year in Hilltop Apartments ranges from $8,940 to $10,866 a year depending upon the apartment and meal plan selected.

Rates quoted are subject to change as approved by the Board of Trustees and undoubtedly will be somewhat higher during the 2010–11 period of this publication.

Visit www.housing.purdue.edu for additional information.

Accommodations for Married Students/Families

Purdue Village provides students with families convenient housing within a one-mile walking distance of campus and is convenient to shopping and bus routes. The family apartments, operated by University Residences, are unfurnished and equipped with a stove and refrigerator. There are one-bedroom and two-bedroom apartments for families; the two-bedroom apartments include washers and dryers.

One-bedroom family apartment costs range from $582 to $597 a month. Two-bedroom units range from $717 to $732 a month. Your rent payment covers all utilities, including local telephone service and Boiler TV (cable). These rates are effective during the 2009–10 academic year and are subject to change as approved by the Board of Trustees.

Each apartment is equipped with a connection for the campus cable TV system as well as for the campus computing network. The apartments are not air-conditioned, but tenants may bring or purchase their own air-conditioning unit as long as it meets specified criteria, has compatible voltage ratings, and the apartment’s maintenance staff does the installation.

With more than 60 countries represented among the residents, Purdue Village is a global community. Families have the benefit of plenty of yard space and playgrounds, and they can take advantage of Purdue Village Preschool and the English for Speakers of Other Languages (ESOL) Program.

Visit www.housing.purdue.edu for more information about Purdue Village.

Cooperatives

Cooperative houses also provide housing for students. These houses are large residences that are owned and operated by 20 to 50 students. Seven women’s houses and five men’s houses have been recognized officially by the Office of the Dean of Students, and each house has a live-out faculty or staff advisor.

Students in cooperative houses significantly decrease their housing costs by contributing three to four hours of house duties a week. Residents of cooperatives pay an average of $3,000 per academic year for room and board. New members are selected by current members through a rush process each January.
To obtain information about becoming a cooperative member, contact the Office of the Dean of Students at (765) 494-1231 or at Schleman Hall, Room 250; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050. Details are also available at www.purduecooperatives.org.

Students are expected to complete and return application information by February 1 or earlier for membership the following fall semester.

**Fraternities and Sororities**

Purdue has 46 fraternities and 24 sororities. Most members live in chapter houses, and membership is by invitation.

Sororities provide an opportunity in the fall for interested women students to join a chapter. Yearly costs for sororities range from $3,300 to $4,380. The average number of women living in a sorority is 88.

In the fall, the Interfraternity Council provides recruitment information through which interested men can become acquainted with the fraternity system. Open recruitment is conducted throughout the academic year. The average number of men belonging to a fraternity is 72, and costs range from $2,000 to $3,500 a semester.

For additional information, contact the Office of the Dean of Students; Purdue University; Schleman Hall, Room 250; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; or call (765) 494-1232. Online information is available at www.purduegreeks.com.

**Student Services**

**Accelerated Programs**

The departments of the College of Science give a variety of honors and offer advanced placement courses. Through the awarding of additional credit hours, you are permitted to complete your programs at an accelerated rate as well as enroll in scientific courses of greater depth.

You also can establish credit by examination on specific Purdue courses. Eligibility is based on advanced work done in high school or on independent study.

For specific information, contact the Academic Advising Office of the College of Science.

**Academic Advising**

The Academic Advising Office of the College of Science will be a valuable resource for you as an undergraduate. Generally, you will work with the same advisor throughout your freshman and sophomore years. During your junior and senior years, you may be assigned a faculty advisor in addition to a professional advisor. Your academic advisor will aid you in developing your total educational plan. In addition to coursework, your education may include the pursuit of experiences such as internships, research opportunities, volunteer work, or study abroad. You will meet with your advisor for curriculum planning assistance each semester. During advising appointments, you will discuss course requirements for your major, placement criteria for courses, elective choices, concentrations and minors of interest, special opportunities, co-curricular opportunities, and your academic progress. Your advisor also will be available to discuss your career goals, refer you to appropriate resources, and address other issues of concern to you.

In the course of your studies, you will encounter situations governed by state laws and University regulations. Although you will be responsible for the fulfillment of degree requirements, your advisor will help keep you informed about such requirements and advise you concerning ways to satisfy various regulations. A thorough study of this College of Science catalog as well as other official University publications is recommended, although they do not include all of the University rules and regulations. From time to time, you will be given notice of required actions (other than those listed in this bulletin) by e-mail, at your campus address, or in the campus press.

Whether you are a prospective student or are already enrolled at the University, you are welcome to contact the Office of Undergraduate Education in Room 231, Mathematical Sciences Building. The office is open weekdays from 8:00 a.m. to 5:00 p.m. For additional information, contact (765) 494-1771 or www.science.purdue.edu.
Center for Career Opportunities – Science Division

The Center for Career Opportunities office in Science — CCO-Science — can help you figure out where you want to go and how to get there. A career counselor can help you find a particular career path, make sure you are in the right major to suit your interests, offer assistance technically to improve your resume, and help guide your job search or other post-graduate plans.

You may make an appointment with a career counselor in the Office of Undergraduate Education, Room 231, Mathematical Sciences Building, or phone 494-1771 to make an appointment.

Science Diversity Office

The Science Diversity Office is an umbrella organization that encompasses both the Multicultural Science Programs and the Women in Science Programs. The College of Science believes that all students have a better educational experience within a diverse environment. Therefore, programming is available to increase the recruitment and retention of students who are underrepresented in the College of Science. All programs are open to all students regardless of race or gender.

Multicultural Science Programs

The College of Science offers programming to increase the number of underrepresented groups graduating in the sciences. Programs include precollege activities for middle and senior high school students, summer transitional programs for matriculating first-year students, classes to cultivate leadership and academic success, mathematics enrichment instruction, and personal counseling.

The Association of Multicultural Science Students, founded in 1972, offers opportunities for multicultural students to grow academically and professionally by featuring workshops, incentive programs, community outreach programs, and coalition building.

Women in Science Programs

The College of Science is committed to making careers in all areas of science accessible to female students. The goals of the Women in Science Programs are to provide personal support, enhance self-esteem, and share effective strategies to assist women in achieving their academic goals. Components of the Women in Science Programs include a residential program for first-year students, tutoring, an undergraduate mentoring program, and a graduate mentoring program.

The residential program puts a group of first-year students together on several floors of a residence hall. Tutoring and other special programs, including the undergraduate mentoring program, are available directly in the residence hall. In the undergraduate mentoring program, each first-year student in the residence is matched with a more advanced student in the same major to provide a unique mentoring relationship.

Both the undergraduate and graduate mentoring programs provide monthly dinner programs in which the students can network with each other and listen to speakers with the goal of increasing the number of females in the College of Science through providing role models and strategies for success.

Directors and Special Program Coordinators

Lynne Horngren, Director of Undergraduate Education and Academic Advising, horngren@purdue.edu
John Fisher, Recruitment Coordinator, jrfischer@purdue.edu
Barbara S. Clark, Director of Science Diversity Office; BarbClark@purdue.edu
Zenephia E. Evans, Director of Multicultural Science Programs; zevans@purdue.edu

Counseling

Each college or school has a general counseling office and academic advisors who can answer questions about degree requirements, registration, dropping and adding courses, and withdrawal from school.

Mature and qualified faculty and staff, graduate students, and older undergraduate students are employed on the University Residences counseling staffs and live in the halls to assist students with personal and scholastic problems.

The Office of the Dean of Students is staffed by professionally trained counselors who provide personal, educational, and career counseling. They can, for example, offer assistance or refer you to specialized help in such areas as
vocational choice, campus activities, scholastic concerns, multicultural programs, assistance for students with disabilities, home and community relationships, and coping strategies.

Other campus services for students include the Counseling and Guidance Center, Counseling and Psychological Services, Financial Advising Service, International Students and Scholars, Learning Center, Marriage and Family Therapy Center, Steer Audiology and Speech-Language Center, Student Health Center, and Writing Lab.

**Services for Students with Disabilities**

Services for students with disabilities (physical, mental, and learning disabilities) are provided through the Disability Resource Center of the Office of the Dean of Students. Services vary according to the needs of students. They include interpreters, readers, note-taking assistance, accessible class scheduling, parking permits, and help working with professors. For further information, contact the Office of the Dean of Students. The Web site is www.purdue.edu/odos.drc. The general office number is (765) 494-1747, and the TDD number for people with hearing or speech impairments is (765) 494-1247.

**College of Education Academic Services**

The College of Education’s Academic Services Unit offers several types of assistance important to students enrolled in teacher education programs. At Purdue, students in teacher education programs are academic majors in the colleges of Agriculture, Consumer and Family Sciences, Education, Liberal Arts, Science, and Technology. The College of Education offers majors in the fields of elementary education, social studies education, and special education. The Academic Services Unit within the College of Education assists all students in teacher education, regardless of the college in which their major is housed, by providing the following specialized services: admission and retention, field experiences, and licensure.

**The Office of Professional Preparation and Licensure** processes students’ applications for all teacher education programs, provides information about programs available at Purdue, and monitors students’ progress for retention within programs. As a student, you should be aware that admission to the Purdue University Teacher Education Programs is a separate and distinct step beyond admission to the University and that the standards for admission to, and retention in, teacher preparation programs are higher than those required to remain in good standing within the University. This office also provides explanation and interpretation of teacher licensing requirements. Students who have completed teacher education programs are evaluated and recommended for licenses. This office maintains licensing records and provides accreditation support.

See www.teach.purdue.edu for additional information.

**The Office of Field Experiences** coordinates all placements in area schools in order to provide students with the early field experiences and student teaching experiences required in all teacher education programs.

See www.education.purdue.edu/fieldexp for more information.

**The Technology Resources Center**

The Technology Resources Center (TRC) provides curricular materials, instructional resources, and technology support and service for educators. It assists students, pre-service teachers, faculty, and staff to ensure that they possess the necessary skills to use technology in support of their professional goals. This includes a 24-workstation computing facility, software and equipment checkout, and an e-Portfolio development site. The TRC also serves as a textbook review site for annual state textbook adoption services. See www.trc.purdue.edu.

**Center for Career Opportunities**

The staff of the campus-wide Center for Career Opportunities assists students and alumni with their career-related employment search. Counseling, guidance, and a wide variety of job search services related to internships and full-time employment are available.

The center maintains contacts with many industrial and business organizations as well as with governmental and nonprofit agencies. Interviews with employer representatives can be requested, and current openings for internships or full-time positions can be explored. For more information, refer to the center’s home page at www.cco.purdue.edu.
For Further Information

University Regulations. The University Regulations publication will provide details about academic, conduct, and student organization policies and procedures. You can access the Web site at www.purdue.edu/univregs. Printed copies are available from Purdue Marketing and Media; South Campus Courts, Building D; 507 Harrison Street; West Lafayette, IN 47907-2025; (765) 494-2034.

Graduation Rates. Graduation rates for the West Lafayette campus are available by contacting the Office of Enrollment Management, Analysis, and Reporting; Schleman Hall; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; (765) 494-0292; enrollmentmanagement@purdue.edu. These rates are calculated and made available as required by the Student Right-to-Know and Campus Security Act.

Safety. The University strives to provide a safe and secure environment for students, staff, and visitors. The University distributes an annual security report containing campus crime statistics and information relating to campus safety and security policies and programs. The report is available on the Web at www.purdue.edu/police. A paper copy may be requested by calling (765) 494-8221 or contacting the Purdue University Police Department; Terry House; 205 S. Intramural Drive; Purdue University; West Lafayette, IN 47907-1971.

Information Technology

The Office of the Vice President for Information Technology is in charge of the integrated computing and telecommunications services on the West Lafayette campus. The information technology (IT) program, formally known by the acronym ITaP, serves Purdue students, faculty, staff, and visitors to campus.

Computing services range from the very visible computing laboratories that are located throughout campus to the unseen but essential enterprise applications that facilitate the business of the University. Computing staff install, maintain, operate, and repair computer equipment. They provide such services as career accounts, e-mail, calendaring, directories, and database administration.

In addition to ITaP’s laboratory facilities, its instructional services include:
1. The Blackboard and Banner course management system.
2. Technology in the Classroom (TIC) sites.
3. Help in preparing multimedia materials to enhance instruction.
4. Help in training students in particular software applications for classroom assignments.
5. Grants for innovative instructional projects including developing courses online using information technology.
6. The Digital Learning Collaboratory, a joint project with the Purdue University Libraries.
7. The Assistive Technology Center for those with special needs.
8. Web-based access to many software applications through Software Remote.

ITaP also provides high-performance research computing equipment and services for faculty through its Rosen Center for Advanced Computing. Multiple Linux clusters, an SGI Altix 4700, and a SiCortex 5832 serve intensive computational needs ranging from engineering and physics simulations and models to computational biology and chemistry. Support for researchers includes partnership on grant proposals; consulting and collaboration on solutions for projects needing advanced computations; management and storage of large data sets; and development of scientific applications, community tools, and science gateways. The HUBzero platform provides Web-based cyberinfrastructure for education and research and supports simulation and modeling in a variety of disciplines, including nanotechnology, pharmaceuticals, and healthcare.

Distributed computing and grid computing are basic elements in the research computing program. ITaP manages DiaGrid, which harnesses tens of thousands of idle processors on and off campus for research and education purposes. Through ITaP, Purdue also has access to resources nationwide on the TeraGrid, the National Science Foundation’s comprehensive cyberinfrastructure for open scientific research, education, and innovation. The optical fiber network known as I-Light links Purdue’s West Lafayette campus to Indiana University and
Indiana University-Purdue University Indianapolis (IUPUI) and joins computers at Purdue and Indiana into a virtual machine room with teraflop capabilities.

The Envision Center for Data Perceptualization provides scientific visualization and multimedia production services, including animation creation and rendering and virtual environment creation, along with computer-aided design, haptic (touch and feel) interaction capabilities, large-scale data handling, and motion capture. The center provides access to, and training for, many popular commercial applications in those areas and can work with faculty members on grant applications and project management needs. The center’s collaboration facilities accommodate on-site and remote participation from multiple locations using technologies such as Polycom, Access Grid, and Web 2.0 technologies.

ITaP also makes video production and audiovisual duplication facilities available as well as satellite uplink and downlink capabilities and broadcast and network services.

ITaP implements and manages campus-wide networks for data and voice communication, improves the security of the data that crosses these networks, and promotes the preservation of personal information security and privacy for all people at Purdue. Telecommunications services provided by ITaP range from basic phone services for campus offices and student residences to telephone operator services and wireless connectivity in the common areas of buildings throughout the campus. ITaP supports the infrastructure that links campus buildings by optical fiber and provides Internet access.

ITaP negotiates contracts and licenses for mass purchases of informational technology equipment and licenses for software used by University personnel. As an additional service, ITaP has negotiated significant discounts for faculty, staff, and students on personal purchases of hardware available through the Web and also for software media sold on campus. The hardware discounts also are available to Purdue alumni. Demonstration computer hardware is displayed at ITaP Shopping Offline in Stewart Center, Room G65. Software is sold at the BoilerCopyMaker in the Purdue Memorial Union, Room 157. Information also is available from www.itap.purdue.edu/shopping.

ITaP offers courses and one-on-one consulting on computing and telecommunications, from selecting phone systems to basic use of Microsoft office applications, programming, visualization, instructional media, e-learning, and research techniques.

For additional information, please consult www.itap.purdue.edu, call (765) 494-4000, or visit the ITaP Customer Service Center in Stewart Center, Room G65; 128 Memorial Mall; West Lafayette, IN 47907-2034.

Libraries

The University Libraries system on the West Lafayette Campus includes 11 subject-oriented libraries, the Hicks Undergraduate Library, and the Karnes Archives and Special Collections Research Center. The Libraries Web site at www.lib.purdue.edu is the Libraries gateway to information services. Libraries faculty and staff provide assistance in person and through www.lib.purdue.edu/askalib; this includes help in gaining access to national and international information. Information about individual libraries can be found under “Libraries and Units” at www.lib.purdue.edu/libraries.

The Libraries offer 2.8 million printed volumes and electronic books, 40,000 electronic and print journals, more than 500 electronic databases, 3.1 million microforms, and access to federal government publications and patents that are received on a depository basis. Local library resources are supplemented by the 4 million items of research materials held by the Center for Research Libraries in Chicago, which includes 7,000 rarely held serial titles. Through Purdue’s membership in the center, faculty and graduate students are assured of fast access to this material through the Interlibrary Loan Office in the Humanities, Social Science, and Education (HSSE) Library in Stewart Center.

The library collections and services of the Big Ten libraries, the University of Chicago, Ball State University, and Indiana State University also are available to Purdue students and
faculty under cooperative agreements. Individuals who wish to use these facilities are encouraged to contact Circulation Services via e-mail to circservices@purdue.edu or by phone, (765) 494-0369.

The John W. Hicks Undergraduate Library may serve many of a student’s library needs, particularly during the first two years at Purdue. Here students will find assistance in locating information needed for papers and speeches along with an extensive collection of reserve books for course assignments. A 24-hour study lounge and the Undergrounds Coffee Shop are located in the Hicks Undergraduate Library.

The Digital Learning Collaboratory (DLC) is located in Hicks Undergraduate Library. It is a joint initiative of the Purdue Libraries and Information Technology at Purdue. The DLC supports student learning through access to state-of-the-art hardware and software for creating multimedia projects in individual, group work, and instructional settings. It facilitates the integration of information and technology literacy into the undergraduate curriculum.

Additional Libraries facts and figures can be found within Purdue’s Data Digest available at www.purdue.edu/DataDigest.

Study Abroad

The Office of Programs for Study Abroad is dedicated to internationalizing Purdue by helping as many students as possible have overseas experiences that enrich lives, enhance academic experiences, and increase career potential. The office helps students overcome academic, financial, or personal concerns that might prevent them from going abroad, and is especially devoted to removing obstacles for first-time travelers.

Purdue offers more than 200 study abroad and internship programs in dozens of countries, lasting from a week to a year, for all majors. Most programs do not require foreign language skills. Program costs vary, but many are comparable to the cost of studying at Purdue (with the exception of the travel expense). Participants earn Purdue grades and credits, so those who study abroad can graduate in the normal length of time. Most of the financial aid that covers Purdue expenses can also be applied to study abroad, and more financial aid specifically for study abroad has been available in recent years.

Students who have taken part in study abroad often describe their experiences as “life changing,” “eye opening,” and “the best choice I ever made.”

Students should begin their international exploration either online at www.studyabroad.purdue.edu, by calling (765) 494-2383, or by contacting The Office of Programs for Study Abroad; Young Hall, Room 105; 302 Wood Street; West Lafayette, IN 47907-2108.

Graduation Requirements

Students should check the College of Science Web site, www.science.purdue.edu/academic-programs/majors and speak with an academic advisor for the most up-to-date information and requirements.

The College of Science offers two bachelor’s degrees, the Bachelor of Science (B.S.) and the Bachelor of Science in Chemistry (B.S. in Chemistry).

The two bachelor’s degrees are traditional four-year degrees. All programs leading to the two degrees have certain requirements in common:

1. Satisfaction of various University-wide requirements, i.e., academic scholarship, residence, etc., as described in the University Regulations handbook.

2. Completion of either the core requirements of the College of Science and of your departmental major (see “Actuarial Sciences,” “Biological Sciences,” “Chemistry,” “Computer Sciences,” “Earth and Atmospheric Sciences,” “Mathematics,” “Physics,” “Statistics,” or “Interdisciplinary Science”).
If you successfully complete the requirements of one of the departmental honors programs (see listings within the applicable sections), your transcript will be appropriately annotated.

It is the responsibility of each student to become familiar with degree requirements, graduation requirements, and all other aspects regarding academic progress. Each student is assigned an advisor who will assist the student in planning curricula and will give advice that assists the student toward timely graduation. However, the ultimate responsibility for understanding and completing degree and graduation requirements lies with the student, not the advisor.

**Composition and Presentation**

**Freshman Composition.** All students must complete Freshman Composition — ENGL 10600 (First-Year Composition) or ENGL 10800 (Accelerated First-Year Composition).

**Technical Writing and Technical Presentation (TWTP).** Non-native English speakers are required to take COM 49100M (Science Writing and Presentation). Native English speakers may fulfill the TWTP requirement using the options listed below.

**Technical Writing.** This requirement can be met by completing one of the following options:
1. Science-based technical communication course: or
2. Course in technical writing from a list of approved courses; or
3. Scholarly publication:
   - Paper accepted for publication in a peer-reviewed journal or peer-reviewed conference proceedings in which the student is the lead author or has written the large majority of the paper; or
   - Paper a College of Science faculty member with expertise in the area deems of publishable quality; or
   - Three approved papers of at least 1,500 words each, at least one of which makes a strong or persuasive argument.

**Technical Presentation.** Requirement can be met by completing one of the following options:
1. Science-based technical presentation course; or
2. Course in technical presentation skills from a list of approved courses; or
3. Presentation at a scientific meeting (sole or predominant presenter); or
4. Presentation of work at an adjudicated poster session
   - Presentation must be made in the presence of a certified judge.
   - Written feedback must be provided to the student; or
5. Presentation of work during an internship or co-op; or
6. Three approved 10-minute (or longer) presentations within science course(s).
Teambuilding and Collaboration

Students must learn the concepts involved in science team projects — team function, team roles, common goal, and utilizing strengths of team members. Requirement can be met by completing one of the following options:

1. An approved teambuilding and collaboration principles course plus participation in at least one experience approved by the College of Science; or
2. Approved teambuilding and collaboration activity that satisfies requirements of both the course and experience; or
3. An approved course in teambuilding and collaboration.

Language and Culture

All College of Science majors are expected to have an understanding of another culture in addition to their own. This can be demonstrated by completing:

1. Three courses from Language and Culture options # 1 below; or
2. Two courses from Language and Culture options # 1 below and one additional course from Language and Culture options # 2 or # 3 below; or
3. An approved study abroad experience that satisfies the following:
   • Must be at least one semester in duration and must take place outside the United States.
   • Must consist of taking courses and/or working on a research project.
   • The student must have significant immersion in the local culture and language independent of any U.S.-based program in which the student may be participating. Students whose native language is not English may also use demonstrated proficiency in their native language to fulfill this requirement. See advisors for guidelines for demonstrating proficiency.

Language and Culture Options

1. Courses in a foreign language, other than your native language. All courses must be in the same language.
2. Courses on culture and/or civilization of a foreign culture.
3. Approved courses on diversity

You may not earn credit toward graduation for courses below the 30000-level in your native language. The Foreign Languages and Literatures department may not allow any native speaker to take 30100/30200 or 40100/40200 language development courses in their native language but will allow students to take history, literature, and culture courses.

If you expect to pursue graduate studies, you should note that at some universities one requirement for a Ph.D. in science is a reading knowledge of one or two modern languages. For serious work in many areas of science, such knowledge is necessary.

If you successfully complete the professional semester in a high school teaching curriculum or the applied physics curriculum, you need only complete, with a regular passing grade, a second-semester, college-level course in a modern language or pass an equivalent proficiency examination.

General Education

Great Issues in Science. The College of Science Great Issues course addresses the impact of science on society and the ramifications of scientific advances. The Great Issues requirement can be met by completing the College of Science Great Issues in Science course or another approved course. Please see an academic advisor for approved courses.

General Education Options

This requirement is divided into two components. Nine total credits are required. Courses must be taken from:

Humanities/Social Science, and/or Management. All College of Science students will be required to select three courses (9 credits) from the areas listed below, according to the following guidelines:

A two-course sequence (6 credits) must be selected from area (a) Humanities/Social Sciences. The second course in the sequence should be an extension or enhancement of the first. (This could be a second course in a series or a course that adds an interdisciplinary approach, i.e., a course in U.S. history could be followed with a course in women’s studies or in African American studies.)

To complete the requirement, students must take one additional course (3 credits) from either of the two areas listed below.

1. Humanities/Social Science. Approved courses in literature, philosophy, history, polit-
Laboratory Science
Students in the College of Science must complete a from an approved list a two-course sequence and related laboratory experiences in a science outside of the major department. These courses must be foundational laboratory science coursework in biological sciences, chemistry, earth and atmospheric sciences, or physics offered at a level appropriate for science majors.

Mathematics
Students must take a minimum of a one-year sequence of single variable calculus. The following courses are acceptable: MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (4 cr.); or an approved two-course mathematics sequence for a particular major.

Statistics
Students must take a statistics course from an approved list. The following courses and their equivalents are currently acceptable: STAT 30100 (Elementary Statistical Methods) (3 cr.); STAT 35000 (Introduction to Statistics) (3 cr.); STAT 50300 (Statistical Methods for Biology) (3 cr.); and STAT 51100 (Statistical Methods) (3 cr.). Please check specific department and/or major requirements as there may be departmental restrictions on which courses are allowed.

Computing
Students must take a course in computing concepts taught using an interpreted or compiled programming language. Course content will include basic control structures and function calls. To fulfill this requirement, one of the following courses must be completed: CS 15800 (C Programming) (3 cr.); CS 15900 (Programming Applications for Engineers) (3 cr.); CS 17700 (Programming with Multimedia Objects) (4 cr.); CS 18000 (Programming I) (4 cr.); CS 1900C (Introduction to Computational Thinking) (3 cr.).
"Pass/Not-Pass" Option. In addition to the grades “A,” “B,” “C,” etc., traditionally assigned to indicate the level of performance in classwork, an alternate grading system, the pass/not-pass option, has been established. This option gives you the opportunity to broaden your education with minimal concern for grades earned. Only free electives and courses at the 50000-level in the 18-credit general education block may be taken under the pass/not-pass option.

The option is open only to students who are classified as sophomores or upper-division students. This option is not available to students on probation.

A student who is enrolled in a course under this option has the same obligations as those who are enrolled in the course for credit with letter grade. When the instructor reports final grades in the course, he/she will report that any such student who would have earned a grade of “A,” “B,” or “C” has passed the course and any other such student has not passed.

You may elect to use the pass/not-pass option for no more than two courses per year and not more than 20 percent of the 124 credits required for graduation. These two restrictions do not apply to credits taken beyond the 124-credit requirement for graduation. For example, if you complete 130 credits, you may take the extra six credits pass/not-pass, if those six credits are not specific courses required by your major or by the college.

The pass/not-pass option cannot be elected for a course that already appears on your academic record. If you are enrolled in a course under this option, you have the same obligations as those who will receive a letter grade. Courses taken under the pass/not-pass option are not used in computing grade indexes. See University Regulations for more information.

Multiple Course Enrollments. Occasionally, College of Science students may find it necessary to repeat coursework in order to make appropriate progress toward their degree objectives. Science students may attempt a course twice with the permission of their advisor. A third enrollment in a course, or an equivalent course, requires the permission of the dean or designee. An “attempt” is considered to be any time a course is recorded on the academic record, including withdrawals.

Declaration of Major. It is expected that students will refine their academic goals during the course of taking classes. Students must have declared a major in the College of Science before registering for classes in the college as a junior. Occasionally students will decide to pursue a different major outside of the College of Science but will have not yet met the entrance requirements for the new program. Students in the College of Science may register as an “undesignated” student for no more than four semesters, and only while classified as a freshman or sophomore.

Academic Credit Load. In accordance with University policy, science students may take up to 18 credits with the permission of their academic advisor. Enrollment in more than 18 credits requires permission of the dean or designee. Students with a graduation index of less than 3.0 are advised not to take more than 17 credits in any one semester. Students on academic probation may not attempt more than 15 credits without permission.

Equivalent, Preparatory, and Transfer Courses. Current and relevant academic coursework is essential to providing a quality academic experience for science students. Credit that was earned more than 10 years ago may not be acceptable to meet degree requirements of the College of Science. A determination by the
Transfer students are welcome, but students are expected to complete at least 50 percent of the credits in their major in residence, with the vast majority of upper-level courses taken at Purdue. Exceptions will be reviewed by the dean or designee.

Minors. Science students may pursue minors in areas outside of their major that have been approved by the various faculties of Purdue. See www.science.purdue.edu/academic-programs/minors for the list of currently approved minors for College of Science students.

**Abbreviations**

The following abbreviations of subject fields are used in the “Graduation Requirements” and the “Plans of Study” sections of this catalog. Alphabetization is according to abbreviation.

**ABE** — Agricultural and Biological Engineering  
**AGEC** — Agricultural Economics  
**AGRY** — Agronomy  
**ANSC** — Animal Sciences  
**ANTH** — Anthropology  
**ASTR** — Astronomy  
**BCHM** — Biochemistry  
**BIOL** — Biological Sciences  
**BMS** — Basic Medical Sciences  
**BTNY** — Botany and Plant Pathology  
**CE** — Civil Engineering  
**CHE** — Chemical Engineering  
**CHM** — Chemistry  
**COM** — Communication  
**CS** — Computer Science  
**EAS** — Earth and Atmospheric Sciences  
**ECON** — Economics  
**EDCI** — Educational Curriculum and Instruction  
**EDST** — Educational Foundations and Administration  
**EDPS** — Educational Psycho-Educational Studies  
**ECE** — Electrical and Computer Engineering  
**ENGL** — English  
**ENGR** — Engineering  
**ENTM** — Entomology  
**FNR** — Forestry and Natural Resources  
**HORT** — Horticulture  
**HSCI** — Health Sciences  
**IE** — Industrial Engineering  
**MA** — Mathematics  
**ME** — Mechanical Engineering  
**MGT** — Management  
**MSE** — Materials Engineering  
**PHIL** — Philosophy  
**PHYS** — Physics  
**POL** — Political Science  
**PSY** — Psychology  
**SCI** — General Science  
**SOC** — Sociology  
**STAT** — Statistics
The College of Science undergraduate program gives you the opportunity to acquire a broad science education and/or to concentrate your studies in one of more than 60 specialized scientific areas. This wide variety of study is provided by the seven academic departments — Biological Sciences, Chemistry, Computer Science, Earth and Atmospheric Sciences, Mathematics, Physics, and Statistics — and by the interdisciplinary science major as supplemented by courses offered in other colleges/schools of the University.

All of the options described in the following pages are based on major programs in the College of Science. The names of the options are frequently taken from the supplementary courses. Students who want more depth in one of these supplementary areas than is possible while pursuing a science major should consult the catalog of the college/school offering the supplemental courses for a possible major in that field.

**Actuarial Science**

The interdisciplinary actuarial science major is administered jointly by the Department of Mathematics and the Department of Statistics. The purpose of the program is to provide the broad quantitative background in mathematics, statistics, and related areas that is necessary for success in the actuarial profession and to provide the academic background needed to pass the first four actuarial exams.

Actuaries use mathematics, statistics, and financial theory to study uncertain future events, especially those of concern to insurance and pension programs. Actuaries may work for insurance companies, consulting firms, government, employee benefits departments of large corporations, hospitals, banks and investment firms, or, more generally, in businesses that need to assess the financial consequences of risk.

A career as an actuary is better described as a “business” career with a technical basis than as a “technical” career. Actuaries assess their work as challenging and interesting and generally enjoy a good working environment. Actuaries are well paid, and, according to several studies, the profession is more open than others to women and members of underrepresented minority groups. As might be expected, entry into the profession is very competitive, and success in the field demands commitment and hard work during college and the few years after graduation when the actuarial exams continue to be taken.

To become an actuary, one must become an associate, and ultimately a fellow, of one of the professional societies — the Society of Actuaries (SOA) or the Casualty Actuarial Society (CAS) — by passing examinations administered by the societies, completing required coursework, and satisfying additional requirements.

The Purdue actuarial science program provides preparation for the first four examinations as well as fulfilling the economics, finance, and applied statistical methods requirements of SOA/CAS. Students who wish to pursue actuarial careers should coordinate their actuarial exam schedules with their academic plans of study and may begin taking exams in the freshman year.

For current information on the academic program, as well as more career information, see our Web site at www.math.purdue.edu/actuary.

In meeting the following requirements, a student will also automatically fulfill the College of Science graduation requirements listed on pages 27–29.
In addition to courses required for graduation, students should carefully consider electives that will coordinate with an actuarial career. In particular, additional courses from Krannert School of Management or courses in writing and communication are very helpful. Most actuarial majors also obtain a statistics degree and a management minor.

**Actuarial Science Requirements**

**Actuarial Science Core 37 credits**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 25100 (Microeconomics) (3 cr.)</td>
<td></td>
</tr>
<tr>
<td>and ECON 25200 (Macroeconomics) (3 cr.)</td>
<td>6 cr.</td>
</tr>
<tr>
<td>MA 37300 (Financial Mathematics) (4 cr.)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>MGMT 20000 (Introductory Accounting) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>MGMT 20100 (Management Accounting I) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>MGMT 31000 (Financial Management) (3 cr.)</td>
<td>9 cr.</td>
</tr>
<tr>
<td>STAT 47200 (Actuarial Models)</td>
<td></td>
</tr>
<tr>
<td>and STAT 47300 (Actuarial Models II) (6 cr.)</td>
<td></td>
</tr>
<tr>
<td>STAT 51200 (Applied Regression Analysis) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>MA/STAT 41600 (Probability) (3 cr.)</td>
<td></td>
</tr>
<tr>
<td>STAT 47000 (Statistical Theory) (3 cr.)</td>
<td></td>
</tr>
<tr>
<td>STAT 42000 (Time Series Analysis) (3 cr.)</td>
<td>18 cr.</td>
</tr>
</tbody>
</table>

**Mathematics Requirements 19–22 credits**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 16010 (Plane Analytic Geometry and Calculus I) (5 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>MA 16500 (Analytic Geometry and Calculus I) (4 cr.)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>One of: MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>MA 16600 (Analytic Geometry and Calculus II) (4 cr.)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>MA 17300 (Calculus and Analytic Geometry II) (5 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>MA 18100 (Honors Calculus I) (5 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>One of: MA 26100 (Multivariate Calculus) (4 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>MA 17400 (Multivariable Calculus) (4 cr.)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>MA 18200 (Honors Calculus II) (5 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>MA 27100 (Several Variable Calculus) (5 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>MA 35100 (Elementary Linear Algebra) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>or MA 35000 (Elementary Linear Algebra: Honors) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>MA 36600 (Ordinary Differential Equations) (4 cr.)</td>
<td>4 cr.</td>
</tr>
</tbody>
</table>

**Free Electives 21–31 credits**

Free electives can be selected from any department of the University. Students are encouraged to use free electives to broaden their knowledge. However, free elective credit is not allowed for courses that significantly overlap courses taken to fulfill departmental degree requirements. This excludes, in particular, introductory courses. Students must take at least as many free electives as is needed to bring the credit hour total to 124.

**Grade Requirements**

All actuarial science majors must have a graduation index of at least 2.5 in MA 35100, MA 36600, and all courses required for the actuarial science core.

**Honors Program**

Students who successfully complete the requirements for this program are certified at the time of graduation as having graduated “with honors in actuarial science.” The honors class STAT 47900 completes the material required for the fourth actuarial exam, Exam C. Students may enter the program any time. Entering the honors program indicates an intention to meet the more rigorous requirements of graduation “with honors” as outlined in the following text. There is no penalty if a student later changes plans.

In addition to the general degree requirements, students must satisfy the following requirements: (a) obtain a GPA of at least 3.3 overall; (b) obtain at least a “B” in each of ECON 25100 (or ECON 34000), 25200 (or ECON 35200), MGMT 31000, 41100; (c) take STAT 47900 (Honors Loss Models); (d) obtain an average GPA of at least 3.5 in the following set of classes: STAT 41700, 47900, 47200, 47300; (e) obtain grades of “A” or “B” in all of the mathematics and statistics classes required for the actuarial science degree; (f) provide documentation of having passed two of the Society of Actuaries (SOA) or Casualty Actuarial Society (CAS) actuarial exams prior to the end of classes in the semester of graduation.

**Special Programs and Opportunities**

The Actuary Club coordinates a very active summer internship program. The majority of internship opportunities are for juniors, although a number of sophomores and even freshmen participate in the program.
By the third year, students can build upon the courses in chemistry, physics, math, and the biology core, and branch out into one of a number of areas. Those interested in medicine or veterinary medicine can concentrate on preprofessional studies. Those who are still interested in sampling many areas of biology can take our general biology emphasis or consider biology teaching. Those who might want to specialize in a particular area can do so in majors such as biochemistry; cell, molecular, and developmental biology; ecology, evolution, and environmental biology; genetics; microbiology; and neurobiology and physiology.

These disciplinary emphases are differentiated by upper-level undergraduate and graduate courses that are nationally known for their excellence. However, the key to our curriculum is the way that advanced laboratory courses and experiences are built into the degree. Thus, we have a series of advanced modular laboratories that provide state-of-the-art experimentation for upperclassmen in all disciplines. In addition, we emphasize undergraduate research so that all students can perform independent research in laboratories within the Department of Biological Sciences, in other laboratories on the Purdue campus, and in various industrial and government laboratories.

Many students who participate in this program have written undergraduate honors theses and have been co-authors on papers in top scientific journals. This is the type of experience that can only be obtained at a research-intensive institution such as Purdue with the tremendous resources available from federal and industrial grants.

Finally, the Department of Biological Sciences has developed a student-centered environment to enable all students to succeed. There are three seminars for biology majors. In the first semester, students may take a resource and problem-solving seminar that is coordinated with the first-semester biology course, BIOL 12100. The second seminar, titled Planning Your Future in Biology, is one in which successful alumni talk to students about their careers and their science and why the path between points A and B in career planning is almost never a straight line. This seminar also introduces students to the exciting world of research and the
role that undergraduates play in the discovery process.

The third seminar, Preparing for Your Future in Biology, equips upper-level undergraduates with the tools needed to search for jobs or seek admission to graduate or professional schools. These and many other elements of our curriculum were designed in conjunction with resources provided by the Howard Hughes Medical Institute Undergraduate Initiative Program. The Department of Biological Sciences at Purdue is one of only a handful of major institutions that have received support from this organization over many years. We have utilized these resources to develop many new courses and approaches to teaching and learning, and we are confident that we will continue this excellence in undergraduate learning well into the twenty-first century.

The three broad areas of concentration in this department include:

1. Basic biology
2. Biology teaching
3. Preprofessional studies

Our graduates pursue a broad variety of career opportunities. Many go into professional schools (medicine, veterinary medicine, dentistry, etc.) or graduate schools in biology, biochemistry, management, education, and other health-related programs. Students who enter the workforce after the bachelor of science degree take positions such as research assistants, associate scientists, laboratory technicians, and technologists in industry, government, hospitals, and universities; teachers in junior highs and high schools; salespeople in scientific and health-related firms; and park/zoo staff. Because of the strong training in basic sciences and analytical thinking, biologists are well poised to meet the demands of a constantly changing workplace … and of their constantly evolving selves.

The Web site for the biology department can be found at www.biology.purdue.edu.

**General Degree Requirements**

The College of Science recently implemented a revised undergraduate curriculum. Students should check the College of Science Web site, www.science.purdue.edu/academic-programs/majors and speak with an academic advisor for the most up-to-date information and requirements.

The Biology Core consists of courses taken during a sequence of four semesters required of all undergraduate majors. The sequence begins with an overview of the evolutionary development of organismal diversity and ways organisms interact with their environment and each other; it is followed by a course that introduces the principles of plant and animal development and explores the relationship between their structure and function. The third course includes the study of how cells are structurally organized and how they function. Finally, students are introduced to the principles of genetics and the molecular mechanisms of gene expression, mutation, and replication.

In addition to the core and elective biology courses, students majoring in biology must take certain courses in chemistry, mathematics, and physics, as well as English, foreign language, humanities, and the social sciences. In meeting the various requirements (in the following summary), a student automatically fulfills the College of Science graduation requirements listed on pages 27–29.

A student wishing to graduate with a degree from the Department of Biological Sciences must have a 2.0 grade point average in all biology and biology elective courses required for his or her major. This may include courses outside the Department of Biological Sciences if such courses fulfill biology or biology elective requirements for that major.

Additionally, each student wishing to graduate with a degree from the Department of Biological Sciences must also complete a 50000-level biology course other than 50000 or 54200. This course may be a required course, a biology elective, or a free elective.

Students have the choice of focusing or broadening their education by the selection of electives. These elective courses are offered in many aspects of biology. Usually, they take these specialized courses after the sophomore year. It is advantageous for a student to decide by the end of the sophomore year what aspect of the biological sciences he or she wants to emphasize in order to begin the correct sequence of courses required by each major. The majors described on the following pages build on the biology core courses.
Biological Sciences Requirements

Biology Core 19–21 credits
BIOL 12100 (Diversity, Ecology, and Behavior) (2 cr.); BIOL 13100 (Development, Structure and Function of Organisms) (3 cr.); BIOL 13500 (First-Year Biology Lab) (2 cr.); BIOL 23200 (Laboratory in Cell Structure and Function) (2 cr.); BIOL 24200 (Laboratory in Genetics and Molecular Biology) (2 cr.); BIOL 23100 (Cell Structure and Function) (3 cr.); BIOL 24100 (Genetics and Molecular Biology) (3 cr.); BIOL 28600 (Ecology and Evolution) (2 cr.) 16 cr.

Intermediate-Level Biology* One of:
BIOL 39500 (Principles of Development) (4 cr.); or BIOL 39500 (Principles of Physiology) (4 cr.); or BIOL 39500 (Macromolecules) (3 cr.); or both BIOL 43800 (General Microbiology) (3 cr.) and BIOL 43900 (Lab in Microbiology) (2 cr.) 3–5 cr.

Upper-Level Biology 15–27 credits
Each student majoring in biology is required to select additional credit hours of upper-division biology courses beyond the core. Courses that can be selected are determined by the individual major and areas in which the student is interested.

Science Requirements 25–35 credits
One of the following two sequences:
a. CHM 11500 (General Chemistry) (4 cr.) and CHM 11600 (General Chemistry) (4 cr.)
b. CHM 12500 (Introduction to Chemistry I) (5 cr.) and CHM 12600 (Introduction to Chemistry II) (5 cr.) 8–10 cr.

One of the following three sequences:
a. CHM 25500 (Organic Chemistry) (3 cr.) and CHM 25501 (Organic Chemistry Laboratory) (1 cr.); and CHM 25600 (Organic Chemistry) (3 cr.) and CHM 25601 (Organic Chemistry Laboratory) (1 cr.);
b. CHM 25700 (Organic Chemistry) (4 cr.) and CHM 25701 (Organic Chemistry Laboratory) (1 cr.); and either CHM 33700 (Principles of Biochemistry) (3 cr.) or BCHM 30700 (Biochemistry) (3 cr.)
c. CHM 26505 (Organic Chemistry) (3 cr.) and CHM 26605 (Organic Chemistry) (3 cr.); and CHM 26300 (Organic Chemistry Laboratory) (1 cr.) and CHM 26400 (Organic Chemistry Laboratory) (1 cr.) 8 cr.

Plus one of the following:* BCHM 22100 (Analytical Biochemistry) (3 cr.); BCHM 56100 (General Biochemistry) (3 cr.); CHM 22400 (Quantitative Analysis) (4 cr.); CHM 32100 (Analytical Chemistry) (4 cr.); CHM 37200 (Physical Chemistry) (4 cr.); CHM 37300 (Physical Chemistry) (3 cr.); CHM 53300 (Biochemistry) (3 cr.) 3–4 cr.

PHYS 22000 (General Physics) (4 cr.) and PHYS 22100 (General Physics) (4 cr.); or PHYS 17200 (Modern Mechanics) (4 cr.) and select one of the following:
a. PHYS 24100 (Electricity and Optics) (3 cr.); PHYS 24200 (Introduction to Heat and Thermal Physics) (1 cr.); PHYS 25200 (Electricity and Optics Laboratory) (1 cr.) 8–9 cr.
b. PHYS 27200 (Electric and Magnetic Interactions) (4 cr.)

For specific chemistry sequences and additional requirements, see individual biology majors on the following pages.

For specific physics sequences and additional requirements, see individual biology majors on the following pages.

Mathematics Requirements 12–14 credits
Select one of the following:
a. MA 23100 (Calculus for Life Sciences I) (3 cr.) and MA 23200 (Calculus for Life Sciences II) (3 cr.);
b. MA 16100 (Plane Analytic Geometry and Calculus I) (4 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.);
c. MA 16500 (Analytic Geometry and Calculus I) (4 cr.) and MA 16600 (Analytic Geometry and Calculus II) (4 cr.);
d. MA 17300 (Calculus and Analytic Geometry II) (5 cr.) 9–10 cr.

Biology majors must complete STAT 50300 (Statistical Methods for Biology) (3 cr.) for the statistics requirement.

For specific mathematics sequences and additional requirements, see individual biology majors on the following pages.

Additional Requirements 33–41 credits
English Composition: See page 27 for English composition requirements. 6–7 cr.
Modern Foreign Language: All College of Science majors are expected to have proficiency in another language in addition to their native language. Competency in the second language must be demonstrated at the fourth-semester college level. (See Modern Foreign Language requirements on page 28.) 12–6 cr.

* Some majors specify which option you may/must complete. See the descriptions of the majors for more information.
General Education Requirements:
You must complete 18 credit hours of study in
the humanities, social sciences, and behavioral
sciences. (See pages 28-29 for requirements.) 18 cr.

Free Electives  0–27 credits
Free electives can be selected from any department
of the University. Students are encouraged to use
free electives to broaden their knowledge. However,
free-elective credit is not allowed for courses
that significantly overlap courses taken to fulfill
departmental degree requirements. Students must take
at least as many free electives as is needed to bring
the credit hour total to 124.

Biological Sciences Majors and
Requirements
The majors in biology offered by the Depart-
ment of Biological Sciences reflect several principal areas of faculty strength. Programs also are
offered in preprofessional areas. Descriptions of
the majors and their requirements follow.

Biology Major
This program is designed to allow for a broad
foundation in the biological sciences while pro-
viding sufficient free electives for the student to
explore and develop additional interests. The student is given maximum flexibility in design-
ing a plan of study that may contain courses
from a wide variety of biology disciplines.

Biology Major Requirements  15 credits
In addition to the requirements listed under “General Degree Requirements” on pages 27–29, 15 credits in
the upper-division courses listed in group A, group
B, and laboratory courses are required to complete a
biology major. These credits must include at least one
laboratory course and at least one course from each
group as a minimum distribution requirement.

Group A
Select from the following:
BIOL 39500 (Macromolecules) (3 cr.); BIOL
41500 (Introduction to Molecular Biology)
(3 cr.); BIOL 41600 (Molecular Virology)
(3 cr.); BIOL 42000 (Eukaryotic Cell
Biology) (3 cr.); BIOL 43600 (Introduction
to Neurobiology) (3 cr.); BIOL 43800
(Generic Microbiology) (3 cr.); BIOL 43900
(Laboratory in Microbiology) (2 cr.); BIOL
44400 (Human Genetics) (3 cr.); BIOL 44600
(Cellular Microbiology) (3 cr.); BIOL 47800
(Introduction to Bioinformatics) (3 cr.); BIOL
48100 (Eukaryotic Genetics) (3 cr.); BIOL
51100 (Introduction to X-Ray Crystallography)
(3 cr.); BIOL 51400 (Laboratory in
Crystallography) (2 cr.); BIOL 51600
(Molecular Biology of Cancer) (3 cr.); BIOL
51700 (Molecular Biology: Proteins) (2 cr.);
BIOL 52900 (Bacterial Physiology) (3 cr.);
BIOL 53300 (Medical Microbiology)
(3 cr.); BIOL 53800 (Molecular, Cellular, and
Developmental Neurobiology) (3 cr.); BIOL
54100 (Molecular Genetics of Bacteria) (3 cr.);
BIOL 54900 (Microbial Ecology) (2 cr.);
BIOL 55000 (Plant Molecular Biology) (3 cr.);
BIOL 56200 (Neural Systems) (3 cr.); BIOL 57300
(The Molecular Biology of Animal Cells)
(3 cr.); BIOL 59500 (Protein Bioinformatics)
(2 cr.); BIOL 59500 (Methods and
Measurements in Physical Biochemistry) (3 cr.)
BCHM 56100 (General Biochemistry I)* (3 cr.);
BCHM 56200 (General Biochemistry II)
(3 cr.); BCHM 57200 (Advanced Biochemical
Techniques) (2–4 cr.)
CHM 53300 (Introductory Biochemistry)* (3 cr.)

†  If both BIOL 30100 and 30200 are completed, three of the six credits will count toward the 15-credit
requirement. The other three credits will count as free electives. If only BIOL 30100 or 30200 is completed,
the credits will count only as free-elective credits.
Upper-Division Laboratory Courses)* (1 cr.); BIOL 54200 (Bacterial Genetics); BIOL 54200 (Animal Cell Culture); BIOL 54200 (Analysis of Disease States); BIOL 54200 (Introduction to Labview); BIOL 54200 (Introduction to Nucleic Acid Sequence Analysis); BIOL 54200 (Microscopy and Cell Biology); BIOL 54200 (Neurophysiology); BIOL 54200 (Exploration of Protein Structure); BIOL 54200 (DNA Sequencing Lab); BIOL 54200 (Molecular Virology); BIOL 54200 (Exploring the Living Cell); BIOL 59100 (Field Ecology) (4 cr.)

BIOL 49400 (Biology Research) or BIOL 49900 (Biology Honors Thesis Research), taken during the junior or senior years can be used as partial fulfillment of the 15-elective-hour requirement. However, these credits cannot be used to fulfill the minimum distribution requirement or the laboratory requirement.

Students who anticipate working immediately after earning a B.S. in biology should consider supplementing departmental requirements with courses in applied areas. Advisors can make specific recommendations.

**Biochemistry Major**

Biochemistry investigates the chemical and molecular foundations of life processes. A student may study the transfer of genetic information into biological structures, the conversion of nutrients into cell constituents and their utilization as sources of energy, the storage of memory, and the chemical nature of neural processes. Relevant laboratory techniques include electrophoresis, chromatography, Western blotting, protein sequence analysis, and peptide mapping. Understanding the development and application of enzymatic assays is fundamental to the field of study. Students can also study biochemistry through majors in the Department of Chemistry in the College of Science (page 46) and the Department of Biochemistry in the College of Agriculture.

To complete the biochemistry major, the following courses must be selected when fulfilling the “General Degree Requirements” listed on page 37:

a. MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); or MA 16500 (Analytic Geometry and Calculus I) (4 cr.) and MA 16600 (Analytic Geometry and Calculus II) (4 cr.); or MA 17300 (Calculus and Analytic Geometry II) (5 cr.)

b. CHM 26100 (Organic Chemistry) (3 cr.) and CHM 26200 (Organic Chemistry) (3 cr.); and CHM 26300 (Organic Chemistry Laboratory) (1 cr.) and CHM 26400 (Organic Chemistry Laboratory) (1 cr.) 8 cr.

c. BCHM 22100 (Analytical Biochemistry) (3 cr.) or CHM 22400 (Introductory Quantitative Analysis) (4 cr.) or CHM 32100 (Analytical Chemistry I) (4 cr.) 3–4 cr.

**Biochemistry Major Requirements** 28–33 credits

Biochemistry majors must choose BIOL 39500 (Macromolecules) (3 cr.) to satisfy the intermediate-level requirement.

One of the following:

a. CHM 37200 (Physical Chemistry) (4 cr.)

b. CHM 37300 (Physical Chemistry) (3 cr.) and CHM 37400 (Physical Chemistry) (3 cr.) 4–6 cr.

BCHM 56100 (General Biochemistry I) (3 cr.) and BCHM 56200 (General Biochemistry II) (3 cr.); BIOL 41500 (Introduction to Molecular Biology) (3 cr.); BIOL 42000 (Eukaryotic Cell Biology) (3 cr.); BIOL 50000 (Introduction to Protein Expression) (2 cr.) and BIOL 59500 (Methods and Measurements in Physical Biochemistry) (3 cr.) 21 cr.

Two of the following:

BIOL 41600 (Molecular Virology) (3 cr.); BIOL 43800 (General Microbiology) (3 cr.); BIOL 47800 (Introduction to Bioinformatics) (3 cr.); BIOL 48100 (Eukaryotic Genetics) (3 cr.); BIOL 51100 (Introduction to X-Ray Crystallography) (3 cr.); BIOL 51700 (Molecular Biology of Proteins) (2 cr.); BIOL 52900 (Bacterial Physiology) (3 cr.); BIOL 53700 (Immunology) (3 cr.); BIOL 53800 (Molecular, Cellular and Developmental Neurobiology) (3 cr.); BIOL 54100 (Molecular Genetics of Bacteria) (3 cr.) 5–6 cr.

One of the following:

a. Two additional 50000 or 54200 laboratory modules (various course titles). See page 38 for a list of BIOL 50000 and 54200 modules. (2–3 cr.);

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* Students who choose BIOL 43800 and BIOL 43900 to meet the intermediate-level requirement will be exempt from the lab requirement, but will not count either course toward the 15-credit requirement.

† Students who choose to meet the laboratory requirement for the biology major with modular upper-division laboratory courses must take BIOL 50000 (Introduction to Protein Expression) and one additional BIOL 50000 or 54200 module. Advisors will have the complete list of available modules for any given semester.
b. BIOL 43900 (Microbiology Laboratory) (2 cr.)
c. BIOL 51400 (Laboratory in Crystallography) (2 cr.);
d. Four credits of undergraduate research — BIOL 49400 (Biology Research) or BIOL 49900 (Biology Honors Thesis Research). Must be approved in advance by the Biophysics, Biochemistry, and Structural Biology Area Committee (4 cr.) 2–4 cr.

**Biochemistry Honors Curriculum**

Additionally, students in the biochemistry honors curriculum must complete, as part of the “General Degree Requirements” listed on pages 27-29, PHYS 17200 (Modern Mechanics) and PHYS 27200 (Electric and Magnetic Interaction) (4 cr.); or PHYS 24100 (Electricity and Optics), PHYS 25200 (Electricity and Optics Laboratory) and PHYS 24200, (Heat and Thermal).

Students must also complete one of the following:

a. CHM 32100 (Analytical Chemistry I) (4 cr.)
   (from “General Degree Requirements”)

b. CHM 37300–37400 (Physical Chemistry) (6 cr.)
   (from “Biochemistry Major Requirements”)

Additionally, a 3.0 graduation index is required at the time of graduation.

**Biology Teaching Major**

The biology teaching program at Purdue University combines a strong emphasis on biology content knowledge with a thorough grounding in the theoretical and practical aspects of science teaching. A student completing the requirements in biology teaching is qualified to teach high school life science. Biology teaching majors are advised that it is wise to select an additional developmental area, such as middle school, and additional courses in physics, chemistry, or earth and atmospheric science.

Although each state has different requirements for teacher certification, an Indiana certificate will be reciprocal in many states. In addition, students can ascertain the requirements in other states by writing directly to the Certification Office, Department of Public Instruction, in the capital city of any state. Indiana now requires those seeking certification to pass the PRAXIS I and PRAXIS II exams.

Prospective teachers are exempt from the second year of the foreign-language requirement and from the last course of the chemistry requirement. During the professional semester, students take coursework on campus followed by student teaching.

**Biology Teaching Major Requirements**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper-Division Courses</td>
<td>10 credits</td>
</tr>
<tr>
<td>Ten additional credits in the upper-division courses listed in groups A and B (following) are required to complete a biology teaching major. These 10 credits must include at least one laboratory course and, as a minimum distribution requirement, each group must be represented by at least one course in a student’s selections.</td>
<td></td>
</tr>
</tbody>
</table>

**Group A**

Select from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 39500 (Macromolecules)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 41500 (Introduction to Molecular Biology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 41600 (Molecular Virology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 42000 (Eukaryotic Cell Biology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 43600 (Introduction to Neurobiology)</td>
<td>3 cr.</td>
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<tr>
<td>BIOL 43800 (General Microbiology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 43900 (Laboratory in Microbiology)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>BIOL 44100 (Human Genetics)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 44600 (Cellular Microbiology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 47800 (Introduction to Bioinformatics)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 48100 (Eukaryotic Genetics)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 51100 (Introduction to X-Ray Crystallography)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 51400 (Laboratory in Crystallography)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>BIOL 51500 (Molecular Genetics)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>BIOL 51600 (Molecular Biology of Cancer)</td>
<td>3 cr.</td>
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<tr>
<td>BIOL 51700 (Molecular Biology: Proteins)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>BIOL 51900 (Molecular Biology: Nucleic Acids)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>BIOL 52900 (Bacterial Physiology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 53300 (Medical Microbiology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 53800 (Molecular, Cellular, and Developmental Neurobiology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 54100 (Molecular Genetics of Bacteria)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 54900 (Microbial Ecology)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>BIOL 55000 (Plant Molecular Biology)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 56200 (Neural Systems)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 57300 (The Molecular Biology of Animal Cells)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BIOL 59500 (Protein Bioinformatics)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>BIOL 59900 (Methods and Measurements in Physical Biochemistry)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BCHM 56100 (General Biochemistry I)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BCHM 56200 (General Biochemistry II)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>BCHM 57200 (Advanced Biochemical Techniques)</td>
<td>2–4 cr.</td>
</tr>
<tr>
<td>CHM 53300 (Introductory Biochemistry)</td>
<td>3 cr.</td>
</tr>
</tbody>
</table>

* These courses may be used as biology electives or to meet the chemistry requirement, but not both.
Group B
Select from the following:
BIOL 30100 (Human Design: Anatomy and Physiology I)* (3 cr.); BIOL 30200 (Human Design: Anatomy and Physiology II)* (3 cr.); BIOL 32800 (Principles of Physiology) (4 cr.); BIOL 36600 (Principles of Development) (4 cr.); BIOL 43200 (Reproductive Physiology) (3 cr.); BIOL 45500 (Animal Physiology) (3 cr.); BIOL 48300 (Environmental and Conservation Biology) (3 cr.); BIOL 49300 (Introduction to Ethology) (3 cr.); BIOL 53700 (Immunobiology) (3 cr.); BIOL 55900 (Endocrinology) (3 cr.); BIOL 58000 (Evolution) (3 cr.); BIOL 58500 (Ecology) (3 cr.); BIOL 59100 (Field Ecology) (4 cr.); BIOL 59200 (The Evolution of Behavior) (3 cr.); BIOL 59500 (Developmental Biology) (3 cr.); BIOL 59500 (Animal Communication) (3 cr.); BIOL 59700 (Sex and Evolution) (3 cr.)
HORT 30100 (Plant Physiology) (4 cr.)

Laboratory Courses
Select from the following:
BIOL 43900 (Laboratory in General Microbiology)† (2 cr.); BIOL 44800 (Physiology Biodesign Laboratory) (2 cr.); BIOL 50000 (Modular Upper-Division Laboratory Courses)‡ (2 cr.); BIOL 50000 (Animal Physiology) or BIOL 50000 (Introduction to Protein Expression); BIOL 51400 (Laboratory in Crystallography) (2 cr.); BIOL 54200 (Modular Upper-Division Laboratory Courses)‡ (1 cr.); BIOL 54200 (Bacterial Genetics); BIOL 54200 (Animal Cell Culture); BIOL 54200 (Analysis of Disease States); BIOL 54200 (Introduction to Labview); BIOL 54200 (Introduction to Nucleic Acid Sequence Analysis); BIOL 54200 (Microscopy and Cell Biology); BIOL 54200 (Neurophysiology); BIOL 54200 (Exploration of Protein Structure); BIOL 54200 (Chromatin Structure); BIOL 54200 (DNA Sequencing Lab); BIOL 54200 (Molecular Virology); BIOL 54200 (Exploring the Living Cell); BIOL 59100 (Field Ecology) (4 cr.)
BIOL 49400 (Biology Research) or BIOL 49900 (Biology Honors Thesis Research) (maximum 2 cr.), taken during the junior or senior years can be used as partial fulfillment of the 10-credit requirement. However, these credits cannot be used to fulfill the minimum distribution requirement or the laboratory requirement.

Professional Education Courses 32 credits
The following education courses are required for certification to teach in Indiana schools. In addition, EDPS 23500 can be used in partial fulfillment of the College of Science general education requirement.
EDCI 20500 (Exploring Teaching as a Career) (3 cr.); EDCI 27000 (Introduction to Educational Technology and Computing) (2 cr.); EDCI 28500 (Multiculturalism and Education) (3 cr.); EDPS 23500 (Learning and Motivation) (3 cr.); EDPS 26500 (The Inclusive Classroom) (3 cr.); EDST 20000 (History and Philosophy of Education) (3 cr.); EDCI 42100 (The Teaching of Biology in Secondary Schools) (3 cr.); EDCI 42800 (Teaching Science in the Middle and Junior High School) (2 cr.); and EDCI 49800 (Supervised Teaching) (10 cr.)

Cell, Molecular, and Developmental Biology Major
Understanding how eukaryotic cells process information from their environment and initiate programs of gene expression leading to growth, development, and functional specification is the essence of a Cell, Molecular, and Developmental (CMD) major. Students enrolled in this curriculum will take courses providing a solid foundation in the molecular biology of cells and gain a full appreciation of how molecular complexes interact to make a cell function. This fundamental knowledge in cell and molecular biology will be applied through further coursework in genetics and developmental biology to examine how eukaryotic organisms function and how specific aspects of that function are perturbed by disease. Within the CMD major, students have the option of focusing their studies on animal systems, plant systems, or both.

Graduates with a CMD major are well-prepared to pursue careers in academic or industrial research, biotechnology, genetic engineering, medicine, veterinary medicine, and other health-related professions.

* If both BIOL 30100 and 30200 are completed, three of the six credits will count toward the 15-credit requirement. The other three credits will count as free electives. If only BIOL 30100 or 30200 is completed, the credits will count only as free-elective credits.
† Students who choose BIOL 43800 and BIOL 43900 to meet the Intermediate-Level requirement will be exempt from the lab requirement, but will not count either course toward the 15-credit requirement.
‡ Students who choose to meet the laboratory requirement for the biology major with modular upper-division laboratory courses must take BIOL 50000 (Introduction to Protein Expression) and one additional 50000 or 54200 module. Advisors will have the complete list of available modules for any given semester.
Cell, Molecular, and Developmental Biology Major Requirements 22–23 credits

Cell, Molecular, and Developmental Biology Courses 16–17 credits

Cell, Molecular, and Developmental majors must choose BIOL 39500 (Principles of Development) (3 cr.) to satisfy the intermediate-level requirement.

Two courses from the following:
- BIOL 41500 (Introduction to Molecular Biology) (3 cr.); BIOL 42000 (Eukaryotic Cell Biology) (3 cr.);
- BIOL 48100 (Eukaryotic Genetics) (3 cr.); BIOL 50000 (Introductory to Protein Expression)

6 cr.

Two other BIOL 50000 or BIOL 54200 lab courses. See page 28 for a complete list of courses titles.

BCHM 56100 (General Biochemistry I) (3 cr.) or CHM 53300 (Introductory Biochemistry) (3 cr.)

3 cr.

Select one of the following:
- BIOL 51600 (Molecular Biology of Cancer) (3 cr.); BIOL 55500 (Plant Molecular Biology) (3 cr.); BIOL 59500 (Developmental Biology); BIOL 59500 (Cellular Biology of Plants) (3 cr.)

Electives 6 credits

Select six credits from:

1. Any advanced biology elective (40000- or 50000-level) with the exception of BIOL 49700 (Biology Honors Seminar), BIOL 49800 (Biological Teaching), or one-credit electives in biology. BIOL 49500 or 59500 (Special Assignments in Biology) requires the approval of the Cell, Molecular, and Developmental Biology Area Committee.
2. BCHM 56200 (General Biochemistry II) (3 cr.)

Ecology, Evolution, and Environmental Biology Major

This area investigates how organisms interact with their physical environment and other organisms, from an evolutionary perspective. Ecologists' work includes research and/or teaching involving population genetics and evolution, adaptive strategies for survival, the nature of populations, and community ecology. Ecologists also offer technical services in connection with environmental impact decisions and regional planning, and environmental education at various levels as teacher, naturalist, or journalist.

Students with a particularly strong interest in the environment may choose to select the environmental science option. This option allows greater latitude in selecting electives to broaden one’s environmental perspective. Students interested in this area may consider programs in interdisciplinary science (page 76) and the College of Agriculture.

Ecology, Evolution, and Environmental Biology Major Requirements 17–20 credits

Ecology, Evolution, and Environmental Biology Major Courses 10–13 credits

BIOL 58000 (Evolution) (3 cr.); BIOL 58500 (Ecology) (3 cr.)

BIOL 59200 (Evolution of Behavior) (3 cr.); or BIOL 59500 (Animal Communication) (3 cr.); or BIOL 59700 (Evolution of Behavior) (3 cr.)

3 cr.

One of the following:
- a. BIOL 49400 (Biology Research) (1–4 cr.)
- b. BIOL 49900 (Biology Honors Thesis Research) (1–4 cr.)
- c. BIOL 59100 (Field Ecology)* (4 cr.)

Electives 7 credits

Select from the following:

- BIOL 41500 (Introduction to Molecular Biology) (3 cr.); BIOL 43800 (General Microbiology) (3 cr.); BIOL 44000 (Biological Teaching), or one-credit electives in biology. BIOL 49500 or 59500 (Special Assignments in Biology) requires the approval of the Cell, Molecular, and Developmental Biology Area Committee.
- BCHM 56200 (General Biochemistry II) (3 cr.)

Ecology, Evolution, and Environmental Biology Major

This area investigates how organisms interact with their physical environment and other organisms, from an evolutionary perspective. Ecologists' work includes research and/or teaching involving population genetics and evolution, adaptive strategies for survival, the nature of populations, and community ecology. Ecologists also offer technical services in connection with environmental impact decisions and regional planning, and environmental education at various levels as teacher, naturalist, or journalist.

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Ecology, Evolution, and Environmental Biology Major Requirements 17–20 credits

Ecology, Evolution, and Environmental Biology Major Courses 10–13 credits

BIOL 58000 (Evolution) (3 cr.); BIOL 58500 (Ecology) (3 cr.)

BIOL 59200 (Evolution of Behavior) (3 cr.); or BIOL 59500 (Animal Communication) (3 cr.); or BIOL 59700 (Evolution of Behavior) (3 cr.)

3 cr.

One of the following:
- a. BIOL 49400 (Biology Research) (1–4 cr.)
- b. BIOL 49900 (Biology Honors Thesis Research) (1–4 cr.)
- c. BIOL 59100 (Field Ecology)* (4 cr.)

Electives 7 credits

Select from the following:

- BIOL 41500 (Introduction to Molecular Biology) (3 cr.); BIOL 43800 (General Microbiology) (3 cr.); BIOL 44000 (Biological Teaching), or one-credit electives in biology. BIOL 49500 or 59500 (Special Assignments in Biology) requires the approval of the Cell, Molecular, and Developmental Biology Area Committee.
- BCHM 56200 (General Biochemistry II) (3 cr.)

* PHYS courses may also be chosen as part of the General Degree Requirements listed on page 35.
a cell cancerous; and on an organismal level, we examine the reproductive habits of various organisms. Crucial principles include the structure, function, and transmission of genes. Laboratory techniques explore genetic engineering from the “inside.” Genetics is crucial to all of biology; so, a genetics major has wide applicability. Students interested in applied genetics also should consider programs in the College of Agriculture.

**Genetics Major Requirements 20–21 credits**

**Genetics Courses 14–15 credits**
Genetics majors must choose BIOL 39500 (Principles of Physiology) (4 cr.); or BIOL 39500 (Principles of Development) (4 cr.); or BIOL 39500 (Macromolecules) (3 cr.) to satisfy the intermediate level requirement.

BCHM 56100 (General Biochemistry I) or CHM 53300 (Introductory Biochemistry) (3 cr.); BIOL 41600 (Molecular Virology) (3 cr.); BIOL 44100 (Senior Seminar in Genetics) (1 cr.); BIOL 48100 (Eukaryotic Genetics) (3 cr.) 10 cr.

One of the following:

a. BIOL 50000 (Introductory to Protein Expression) (2 cr.) and two other BIOL 50000 or BIOL 54200 lab courses. See page 38 for a complete list of course titles. (2–3 cr.)

b. Three credits of BIOL 49400 (Biology Research), or BIOL 49900 (Biology Honors Thesis Research). Must be approved in advance by Molecular Genetics and Microbiology Area Committee. (3 cr.) 3–5 credits

**Electives 6 credits**
Select from the following: BIOL 43800 (General Microbiology) (3 cr.); BIOL 44400 (Human Genetics) (3 cr.); BIOL 47800 (Introduction to Bioinformatics) (3 cr.); BIOL 51600 (Molecular Biology of Cancer) (3 cr.); BIOL 54100 (Molecular Genetics of Bacteria) (3 cr.); BIOL 55000 (Plant Molecular Biology) (3 cr.); BIOL 57300 (The Molecular Biology of Animal Cells) (3 cr.); BIOL 58000 (Evolution) (3 cr.); AGRY 53000 (Plant Genetics) (3 cr.); ANSC 51100 (Population Genetics) (3 cr.); BCHM 56200 (General Biochemistry II) (3 cr.)

**Microbiology Major**
Microbiology includes the study of viruses, bacteria, and fungi. A student can expect to study topics such as microbial growth, nutrition, metabolism, pathogenesis, morphogenesis, and production of antibiotics.

The American Board of Microbiology, a committee of the American Academy of Microbiology, has established a National Registry of Microbiologists to recognize individuals at the bachelor’s level who have an adequate understanding of basic and applied microbiology. Parts of the requirements for registration specify 30 credits in biological sciences, 20 credits of which must be in microbiology. It is likely that similar criteria will be used for classification as a microbiologist by the U.S. Civil Service Commission. Students should consider this when selecting elective courses.

**Microbiology Major Requirements 21 credits**

**Microbiology Courses 18 credits**
BIOL 41600 (Molecular Virology) (3 cr.); BIOL 43800 (General Microbiology) (3 cr.); BIOL 43900 (Laboratory in Microbiology) (2 cr.); BIOL 52900 (Bacterial Physiology) (3 cr.); BCHM 56100 (General Biochemistry I) (3 cr.); BIOL 44100 (Senior Seminar in Genetics) (1 cr.); BIOL 54100 (Molecular Genetics of Bacteria) (3 cr.) 18 cr.

**Electives 3 credits**
Select from the following:
BIOL 44600 (Molecular Bacterial Pathogen) (3 cr.); BIOL 47800 (Introduction to Bioinformatics) (3 cr.); BIOL 50000 or 54200 (Modular Upper-Division Laboratory Courses) (2 cr.); see page 40 for a complete list of titles (1–2 cr.); BCHM 53300 (Medical Microbiology) (3 cr.); BIOL 54900 (Microbial Ecology) (2 cr.); BCHM 56200 (General Biochemistry II) 18 cr.

**Microbiology Honors Curriculum**

**Microbiology Honors Course Requirements 16–23 credits**
To complete the microbiology honors curriculum, the following courses must be selected:
MA 26100 (Multivariate Calculus) (4 cr.); or MA 17400 (Multivariable Calculus) (4 cr.); or MA 27100 (Several Variable Calculus) (5 cr.)

* PHYS courses may also be chosen as part of the General Degree Requirements listed on page 35.*
Choose at least one of the following:

a. BIOL 48800 (Physiology BioDesign Laboratory) (2 cr.), BIOL 50000 (Animal Physiology Laboratory) (2 cr.), or BIOL 54200 (Laboratory in Neurophysiology) (1 cr.) plus any other two 50000 or 54200 laboratories

b. Three credits of BIOL 49400 (Biology Research) or BIOL 49900 (Biology Honors Thesis Research). Must be approved in advance by Neurobiology and Physiology Area Committee. (3 cr.)

One of the following:

BCHM 56100 (General Biochemistry I) (3 cr.); CHM 37200 (Physical Chemistry) (4 cr.); CHM 37300 (Physical Chemistry) (3 cr.); or CHM 53300 (Introductory Biochemistry) (3 cr.)

Electives 6 credits

Select 6 credits from the following four options:

a. BIOL 30100 (Human Design: Anatomy and Physiology I) (3 cr.) and BIOL 30200 (Human Design: Anatomy and Physiology II) (3 cr.). Both courses must be completed, but only three of these credits may be used toward this requirement.

b. Any advanced biology elective (40000- or 50000-level) with the exception of BIOL 49700 (Biology Honors Seminar), BIOL 49800 (Biology Teaching), or one-credit electives in biology. BIOL 49500 or 59500 (Special Assignments in Biology) requires the approval of the Neurobiology and Physiology Area Committee.

c. Three (but no fewer) credits of advanced research (BIOL 49400 or 49900) can count toward the six-credit requirement, provided the research is not also used as a substitute for a modular laboratory course. Approval of the Neurobiology and Physiology Area Committee is required.

d. BCHM 56200 (General Biochemistry II) (3 cr.)

Neurobiology and Physiology Major

Physiology is the study of the functions of living organisms and the organ and tissue systems of which they are composed. The goal of physiology is to understand, in terms of physical and chemical principles, the mechanisms that operate in living organisms from the subcellular level to the level of the whole animal. The emphasis is on how these mechanisms are integrated to produce a viable organism. Neurobiology is the study of the structure, function, and development of the nervous system. It originated, in part, as a subdiscipline of physiology. In recent years, neurobiology is one of the most rapidly changing and exciting areas of biology.

Neurobiology and Physiology Major Requirements 18–22 credits

Neurobiology and Physiology Courses 12–16 credits

Neurobiology and Physiology majors must choose BIOL 39500 (Principles of Physiology) (4 cr.) to satisfy the intermediate-level requirement.

Two of the following courses:

BIOL 43200 (Reproductive Physiology) (3 cr.); BIOL 43600 (Neurobiology) (3 cr.); BIOL 53800 (Cellular, Molecular, and Development Biology) (3 cr.); BIOL 56200 (Neural Systems) (3 cr.); BIOL 59900 (Quantitative Physiology) (3 cr.) 6 cr.

Neurobiology and Physiology Major

Physiology is the study of the functions of living organisms and the organ and tissue systems of which they are composed. The goal of physiology is to understand, in terms of physical and chemical principles, the mechanisms that operate in living organisms from the subcellular level to the level of the whole animal. The emphasis is on how these mechanisms are integrated to produce a viable organism. Neurobiology is the study of the structure, function, and development of the nervous system. It originated, in part, as a subdiscipline of physiology. In recent years, neurobiology is one of the most rapidly changing and exciting areas of biology.

Neurobiology and Physiology Major Requirements 18–22 credits

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Neurobiology and Physiology majors must choose BIOL 39500 (Principles of Physiology) (4 cr.) to satisfy the intermediate-level requirement.

Two of the following courses:

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* PHYS courses may also be chosen as part of the General Degree Requirements listed on page 35.
Special Programs and Opportunities

Preprofessional Major
This is a program designed for students who plan to attend a school of medicine, dentistry, optometry, or veterinary medicine upon completion of their coursework at Purdue. The program allows students to complete approximately three-fourths of the credit hours and all of the courses required for graduation in six semesters. After successfully completing the first year at an accredited school of medicine, dentistry, optometry, or veterinary medicine, the student may transfer his or her professional school credits back to Purdue, and the Bachelor of Science degree is granted. This is called the three-plus-one program.

It is important for the student who chooses to enroll in the three-plus-one program to realize that enrollment in the program does not guarantee admission to a professional school. Medical schools no longer encourage students to apply after three years of study, but they will review the applications of three-plus-one students. Strong students enrolled in the three-plus-one program often are admitted to schools of dentistry, veterinary medicine, and optometry. Three-plus-one students who are not accepted to a professional school after the third year have the option of completing a fourth year of study in the biological sciences and earning the B.S. degree. Three-plus-one students should meet regularly with their academic advisors to ensure that they are meeting the professional school requirements and to develop an alternate plan of study should they need to add a fourth year of undergraduate coursework.

Undergraduate Research
Students interested in doing research but who will not participate in the Honors Research Program can do so for credit. Students must fill out the “Initial Enrollment for Undergraduate Research” form available in the Biology Counseling Office. Once the form is approved, students register for credit in BIOL 29400 or 49400, depending upon their semester classification. These courses can be repeated for credit.

Special Assignments
Students who would like to undertake special study in areas not available through formal coursework offered by the department are strongly encouraged to find a faculty member whose work is in the area of their interest and

Honors Curriculum Programs
An honors curriculum program is available in biochemistry, microbiology, and biochemistry. Each major that offers an honors curriculum program has designated advanced courses/course sequences that are required to earn a degree in the honors curriculum. Additionally, a 3.0 graduation index is required at the time of graduation. For specific requirements, see the applicable individual major section.
arrange to enroll in special assignment courses: BIOL 19500, 29500, 39500, and 49500. The special study can be directed readings; independent study; supervised library, laboratory, or field work; or discussions. Credit will be given for the work, and a title of the area investigated will appear on the transcript. These courses can be repeated for credit.

Summer Internships
Students are encouraged to pursue summer internships both off and on campus. The Biology Counseling Office collects information about available summer internships.

Professional Practice Program
The Department of Biological Sciences participates in the Professional Practice Program as described on page 9. Interested students should contact the Coordinator of the Professional Practice Program, Department of Biological Sciences, Room 1–123, Lilly Hall of Life Sciences. The department coordinator will have information about available programs and can offer advice.

To be eligible for the Professional Practice Program, a student must have a cumulative index of 2.5 or better and have an index of 2.8 or better in biology courses at the end of three semesters.

If grade achievements do not meet these requirements but a student possesses other qualifications that should be considered, he or she can petition for special consideration.

While a Professional Practice student employee, a student must register for the non-credit departmental course BIOL 39699 (Professional Practice Internship) and pay the special University fee for Professional Practice registration.

Under specified circumstances, students who want to participate in some form of independent study while off campus can register for Special Assignments: BIOL 39500 or 49500 (1–4 cr.) with the consent of the departmental coordinator of the program.

Minor in Biological Sciences
The minor in biological sciences is designed to allow a non-biology major to establish a strong background knowledge of the biological sciences. It requires courses that cover the spectrum of basic biology, from diversity and ecology to molecular biology and genetics. Students who complete the minor will have sufficient background to understand foundational concepts from any area of biology and their application in everyday settings.

Changes in the Biological Sciences minor are in progress. Students should check with the department for the most recent information.

Minor in Biological Sciences
Requirements 17–20 credits

All courses for the biology minor must be completed at Purdue University and at least one-half the courses for the minor must be completed on the West Lafayette campus.

The minor in biological sciences requires the following courses:

I. One of these two sequences: 7–8 cr.
   a. BIOL 12100 (Diversity, Ecology, and Behavior) (2 cr.); BIOL 13100 (Development, Structure, and Function of Organisms) (3 cr.); BIOL 13500 (First-Year Biology Lab) (2 cr.) 7 cr.
   b. BIOL 11000 (Fundamentals of Biology I) (4 cr.); and BIOL 11100 (Fundamentals of Biology II) (4 cr.) 8 cr.

II. And the following courses:
   BIOL 23100 (Cell Structure and Function) (3 cr.) or BIOL 23000 (Biology of the Living Cell) (3 cr.) 3 cr.
   BIOL 24100 (Genetics and Molecular Biology) (3 cr.) or AGRY 320 (Genetics) (3 cr.) 3 cr.

III. One of the following courses:
   BIOL 28600 (Introduction to Ecology and Evolution) (2 cr.); BIOL 30100 (Human Anatomy and Physiology)* (3 cr.); BIOL 30200 (Human Anatomy and Physiology)* (3 cr.); BIOL 39500 (Principle of Physiology)† (4 cr.); BIOL 39500 (Principles of Development)† (4 cr.); BIOL 39500 (Macromolecules)† (4 cr.); BIOL 41500 (Introduction to Molecular Biology) (3 cr.); BIOL 41600 (Molecular Virology) (3 cr.); BIOL 42000 (Eukaryotic Cell Biology) (3 cr.); BIOL 43200 (Reproductive Physiology) (3 cr.); BIOL 43600 (Introduction to Neurobiology) (3 cr.); BIOL

* If both BIOL 30100 and 30200 are completed, they will meet the requirements for Parts III and IV of the minor. BIOL 30100 or 30200 alone will not meet any requirement for the minor.
† Any one of BIOL 32800 (Principles of Physiology) or BIOL 36600 (Developmental Biology) or BIOL 39500 (Macromolecules) alone will meet the requirements for Parts III and IV of the minor.
43800 (General Microbiology) (3 cr.); BIOL 43900 (Microbiology Lab) (2 cr.); BIOL 44400 (Human Genetics) (3 cr.); BIOL 44600 (Cellular Microbiology) (3 cr.); BIOL 47800 (Introduction to Bioinformatics) (3 cr.); BIOL 48100 (Eukaryotic Genetics) (3 cr.); BIOL 48300 (Environmental and Conservation Biology) (3 cr.); BIOL 49300 (Introduction to Ethology) (3 cr.); BIOL 51100 (Introduction to X-Ray Crystallography) (3 cr.); BIOL 51400 (Laboratory in Crystallography) (2 cr.); fall; BIOL 51600 (Molecular Biology of Cancer) (3 cr.); BIOL 51700 (Molecular Biology: Proteins) (2 cr.); BIOL 53700 (Immunology) (3 cr.); BIOL 53800 (Molecular, Cellular, and Developmental Neurobiology) (3 cr.); BIOL 55900 (Endocrinology) (3 cr.); BIOL 56200 (Neural Systems) (3 cr.); BIOL 57300 (Molecular Biology of Animal Cells) (3 cr.); BIOL 58000 (Evolution) (3 cr.); BIOL 59200 (Evolution of Behavior) (3 cr.); BIOL 59500 (Animal Communication) (3 cr.); BIOL 59500 (Developmental Biology) (3 cr.); BIOL 59500 (Methods and Measurement in Physical Biochemistry) (3 cr.); BIOL 59500 (Protein Bioinformatics) (3 cr.); BIOL 59700 (Sex and Evolution) (3 cr.)

IV. One of the following laboratory courses:
BIOL 23200 (Laboratory in Cell Structure and Function) (2 cr.); BIOL 24200 (Laboratory in Genetics and Molecular Biology) (2 cr.); BIOL 30100 (Human Anatomy and Physiology)* (3 cr.); BIOL 30200 (Human Anatomy and Physiology)* (3 cr.); BIOL 36600 (Developmental Biology)† (4 cr.); BIOL 39500 (Principles of Physiology)† (4 cr.); BIOL 39500 (Macromolecules)† (3 cr.); AGRY 32100 (Genetics Laboratory) (3 cr.)
The following courses are prerequisite or corequisite for some of the above courses:
CHM 11500 (General Chemistry) (4 cr.); and CHM 11600 (General Chemistry) (4 cr.)

Chemistry

The Department of Chemistry offers three baccalaureate programs:
A. Bachelor of Science in Chemistry, which is certified by the American Chemical Society (ACS) 54–56 credits
B. Bachelor of Science degree with chemistry major, including specializations in atmospheric chemistry, biochemistry, bioinformatics, computational chemistry, environmental chemistry, and materials science 40–79 credits
C. Bachelor of Science degree with chemistry teaching major 71–73 credits

The educational objectives for individual programs are given in the “Special Degree Requirements” section.

In the past five years, 40 percent of chemistry graduates attended graduate school, 40 percent started working in industry (primarily in chemical and pharmaceutical industries), 10 percent went to professional schools (medicine, law), and 10 percent became teachers.

The most recent Web information can be found at www.chem.purdue.edu.

General Degree Requirements

The following courses are required for chemistry majors in all programs. In meeting these general degree requirements, you also will automatically fulfill the College of Science graduation requirements listed on 27–29 and online at www.science.purdue.edu.

Special requirements for individual degrees are given in the following section.

Chemistry Core 39–41 credits

CHM 12500 (Introduction to Chemistry I) (5 cr.); or CHM 11500 (General Chemistry) (4 cr.); or CHM 12300 (General Chemistry for Engineers I) (4 cr.) 4–5 cr.
CHM 12600 (Introduction to Chemistry II) (5 cr.); or CHM 11600 (General Chemistry) (4 cr.); or CHM 12400 (General Chemistry for Engineers II) (4 cr.); or CHM 13600 (General Chemistry Honors) 4–5 cr.
CHM 24100 (Introductory Inorganic Chemistry) (4 cr.); CHM 342 (Inorganic Chemistry) (3 cr.); CHM 26505 (Organic Chemistry) (3 cr.); CHM 26500 (Organic Chemistry Laboratory) (2 cr.); CHM 29400 (Sophomore Chemistry Seminar) (1 cr.);
CHM 26605 (Organic Chemistry) (3 cr.); CHM 26600 (Organic Chemistry Laboratory) (2 cr.); CHM 32100 (Analytical Chemistry) (4 cr.); CHM 37300 (Physical Chemistry)

* If both BIOL 30100 and 30200 are completed, they will meet the requirements for Parts III and IV of the minor. BIOL 30100 or 30200 alone will not meet any requirement for the minor.
† Any one of BIOL 32800 (Principles of Physiology) or BIOL 36600 (Developmental Biology) or BIOL 39500 (Macromolecules) alone will meet the requirements for Parts III and IV of the minor.
General Education: Students must complete 3 credits of a course approved for Great Issues and 9 credits of Social Studies/Humanities and/or Management. See description and list of approved courses at www.science.purdue.edu, College of Science Core Requirements.

Teambuilding and Collaboration: Science students must learn the concepts involved in science team projects. Chemistry students can fulfill the principles portions with CHM 19400 or SCI 13000 (1 cr.). See description and list of approved courses at www.science.purdue.edu, College of Science Core Requirements.

Free Electives 18 cr.
Free electives can be selected from any department of the University. Students are encouraged to use free electives to broaden their knowledge in chemistry or to gain experience in a non-chemistry area that is of special interest or that will help professionally. However, free elective credit is not allowed for courses that significantly overlap courses taken to fulfill departmental degree requirements. This excludes, in particular, introductory courses. Students must take at least as many free electives as is needed to bring the credit hour total to 124.

Grade Requirement
An undergraduate student is expected to have an average grade point index of at least 2.0 in general chemistry courses and in CHM 24100 (Introductory Organic Chemistry), CHM 26505 (Organic Chemistry), and CHM 26700 (Organic Chemistry, Honors) to continue in a chemistry program. A student must have an average grade point index of at least 2.0 in required chemistry courses to graduate in any of the chemistry options, except for the teaching option, which requires an index of 2.5.

Chemistry Degrees/Majors

Bachelor of Science in Chemistry
This degree program is designed primarily for students planning professional careers as chemists in industry, universities, or research institutes. This degree program fulfills the recommendations of the Committee on Professional Training of the American Chemical Society (ACS); graduates who follow this program will be certified by the American Chemical Society as having fulfilled its recommended requirements.

By concentrating advanced elective credit hours in biochemistry and by taking biology courses for the laboratory science requirement,
this degree provides an excellent preparation for medical, dental, or veterinary schools. This program would particularly benefit those planning careers in medical research.

B.S. in Chemistry (ACS) Additional Requirements 16 credits

The following courses are required for this option in addition to those listed under “General Degree Requirements” on page 46:

- CHM 34201 (Inorganic Chemistry Laboratory) (1 cr.);
- CHM 42400 (Analytical Chemistry II) (4 cr.);
- CHM 51300 (Chemical Literature) (1 cr.);
- Advanced chemistry elective (3 cr.); and
- CHM 53300 (Introductory Biochemistry) (3 cr.) 12 cr.

- MA 26200 (Linear Algebra and Differential Equations) (4 cr.) 4 cr.

Bachelor of Science Degree with Chemistry Major

This degree program is designed for those who want less specialized training in chemistry than is required for the B.S. in Chemistry degree. This program requires the basic courses listed under the “General Degree Requirements” section and permits 9 to 22 credit hours in free electives.

Free electives allow a student to build a program of study in another area to complement a chemistry background. It is possible, for example, to concentrate elective credit hours in one of the following areas: administration, biochemistry, chemical literature, chemical physics, computer applications in chemistry, cosmochemistry, geochemistry, patent law, and preprofessional.

More information about recommended courses for these programs as well as other programs of study are available from an advisor or faculty member.

Bachelor of Science with Chemistry Major — Options

ACS-Accredited Degree in Chemistry/Biochemistry

Biochemists study the chemical basis of life. Some of the major problems include the transfer of genetic information to biological structures, the conversion of nutrients into cell constituents and their utilization as sources of energy, the storage of memory, and the chemical nature of neural processes. Furthermore, biochemists are interested in the chemical details of important processes such as photosynthesis, blood clotting, fertilization, and other functions that may be unique to certain organisms.

A major in biochemistry also is available through the Department of Biochemistry in the College of Agriculture, and students majoring in the Department of Biological Sciences can elect a biochemistry concentration as listed on page 38.

ACS-Accredited Degree in Chemistry/Biochemistry Additional Requirements 22 credits

The following courses are required for this option in addition to those listed under “General Degree Requirements” on pages 46–47:

- BIOL 23100 (Biology III: Cell Structure and Function) and BIOL 23200 (Laboratory in Biology III: Cell Structure and Function) (5 cr.);
- BIOL 24100 (Biology IV: Genetics and Molecular Biology) and BIOL 24200 (Laboratory in Biology IV: Genetics and Molecular Biology) (5 cr.) 10 cr.

- CHM 53300 (Introductory Biochemistry) (3 cr.) and CHM 53800 (Molecular Biotechnology) (3 cr.); or BCHM 56100 (General Biochemistry I) (3 cr.) and BCHM 56200 (General Biochemistry II) (3 cr.) 6 cr.

- CHM 49900 (Undergraduate Research in Biochemistry) 6 cr.

Atmospheric Chemistry

Measurements of atmospheric constituents conducted since the middle of the 19th century have shown that human activities have had a significant impact on the chemical composition of the atmosphere. These changes are manifested in local and global scale pollution problems, including stratospheric ozone depletion, increases in ground-level ozone and photochemical smog, global climate change, and acid rain. Problems associated with global atmospheric change have resulted in an increased demand for scientists with a solid education in the fundamentals of atmospheric chemistry. To help meet this need and to provide a unique opportunity for our students in applied chemistry, the Department of Chemistry has created an atmospheric chemistry degree option. Students completing this option will be well positioned to seek employment with government environmental agencies or with consulting and manufacturing firms in the private sector, or they may elect to attend graduate school.
Atmospheric Chemistry

Additional Requirements 19 credits

The following courses are required for this option in addition to those listed under “General Degree Requirements” on page 46–47:

CHM 42400 (Analytical Chemistry II) (4 cr.); CHM 58100 (Atmospheric Chemistry) (3 cr.); CHM 58200 (Chemistry of the Earth’s Upper Atmosphere) (3 cr.) 10 cr.

EAS 22500 (Science of the Atmosphere) (3 cr.); EAS 42100 (Atmospheric Thermodynamics) (3 cr.); EAS 53500 (Atmospheric Observation on Measurements) (3 cr.) 9 cr.

Students pursuing this option are encouraged to take EAS 43100 (Synoptic Laboratory) (1 cr.).

Bioinformatics

Bioinformatics is a branch of science that combines applied math, statistics, computer science, and biochemistry to solve biological problems. Chemists with a bioinformatics specialization can work in the pharmaceutical industry or in companies associated with genomics and proteomics.

Bioinformatics Requirements 11 credits

The following courses are required for this option in addition to those listed under “General Degree Requirements” on page 46-47.

CHM 53300 (Introductory Biochemistry) (3 cr.); CHM 49900 (Undergraduate Research in Bioinformatics) (3 cr.); BIOL 47800 (Introduction to Bioinformatics) (3 cr.); MA 26200 (Linear Algebra and Differential Equations) (4 cr.); STAT 58100 (Bioinformatics) (1 cr.)

Recommended — BIOL 23100 (Biology III: Cell Structure and function) (3 cr.) or BIOL 23000 (Biology of the Living Cell) (3 cr.)

Computational Chemistry

Additional Requirements 25 credits

The following courses are required for this option in addition to those listed under “General Degree Requirements” on page 46-47:

Chemistry: Undergraduate Research in Computational Chemistry or related field: CHM 49900 (Special Assignments) (6 cr.) and CHM 57900 (Computational Chemistry) (3 cr.) 9 cr.

Computer Science: CS 18000 (Programming I) (4 cr.); CS 24000 (Programming in C) (3 cr.); CS 25100 (Data Structures) (3 cr.); CS 31400 (Numerical Methods) (3 cr.); and CS 18200 (Foundations of Computer Science) (3 cr.) 16 cr.

Environmental Chemistry

Society faces many challenges involving environmental issues. Important issues such as ground water pollution, hazardous chemical waste treatment, ozone depletion, radioactive waste treatment, industrial hygiene, and water treatment require a strong fundamental understanding of the chemistry involved. This degree option has been designed to provide students a means to tailor a field of study with an emphasis on chemistry and the environment.

Environmental Chemistry Requirements 25 credits

The following courses are required for this option in addition to those listed under “General Degree Requirements” on page 46-47:

One of the following:

a. BIOL 11000–11100 (Fundamentals of Biology I and II) (8 cr.)
b. EAS 24300–24400 (Earth Materials I and II) (8 cr.)

CE 35300 (Physico-Chemical Principles of Environmental Engineering) (4 cr.); CHM 48100 (Topics in Environmental Chemistry) (3 cr.); CHM 42400 (Analytical Chemistry II) (4 cr.) 11 cr.

Undergraduate research: CHM 49900 (Special Assignments) (6 cr.) Undergraduate research in an environmentally related area. Need not be restricted to the Chemistry Department, e.g. CE 49700 (Civil Engineering Projects), HSCI 49000 (Special Topics), FNR 49900 (Forestry and Natural Resources Honors Thesis), etc. Students must complete two semesters of research. In special cases, an additional 6 credits of environmental electives may be substituted. 6 cr.

Forestry and Natural Resources: FNR 48800 (Global Environmental Issues) (3 cr.) 3 cr.
In order to fulfill the general education requirement, it is suggested that students consider taking some or all of the following courses:

**POL 22300 (Introduction to Environmental Policy)**
(3 cr.) and **POL 52300 (Environmental Politics and Public Policy)** (3 cr.); **CE 55300 (Environmental Law for Engineers)** (3 cr.) (recommended as a free elective)

**Materials Science Specialization**
This plan of study meets the requirements for the B.S. with Chemistry major as well as providing a strong background in materials science and engineering. Please refer to the College of Engineering Catalog for more information on the materials engineering field.

**Materials Science Specialization**

**Additional Requirements**

In addition to the requirements for the B.S. with Chemistry major, the following courses are required:

- **MA 26200 (Linear Algebra and Differential Equations)** (4 cr.)
- **MSE 23000 (Structure and Properties of Materials)** (3 cr.); **MSE 23500 (Materials Properties Laboratory)** (2 cr.); **MSE 33000 (Processing and Properties of Materials)** (3 cr.); **MSE 33500 (Materials Characterization Laboratory)** (3 cr.);
- **MSE 34000 (Transport Phenomena)** (3 cr.); **MSE 35000 (Thermodynamics of Materials)** (3 cr.); **MSE 36700 (Materials Processing Laboratory)** (3 cr.); **MSE 37000 (Electrical, Optical, and Magnetic Properties of Materials)** (3 cr.)
- **CHE 54400 (Structure and Physical Behavior of Polymer Systems)** (3 cr.);
- **CHM 34201 (Inorganic Chemistry Lab)** (1 cr.)

**Bachelor of Science Degree with Chemistry Teaching Major**

This program of study meets the requirements for certification to teach chemistry in the secondary schools of Indiana in addition to meeting the requirements for the B.S. degree with chemistry major on page 48. Students preparing to teach in junior/high/middle/secondary schools (grades 5–12) must meet the requirements set by the Teacher Education Council. These requirements are outlined in the Guide to Teacher Preparation and Licensure from the Office of Professional Preparation and Licensure at Purdue, www.teach.purdue.edu.

The program of study for prospective teachers differs from the program leading to the B.S. degree with a chemistry major in three requirements: **CHM 53300 (Introduction to Biochemistry)** is required, foreign language is two semesters, and Organic Chemistry Laboratory can be substituted by CHM 26300 and 26400, which have one less credit, respectively. However, all chemistry education students are encouraged to take CHM 26500 and 26600 to meet the regular chemistry major requirements in case they switch to a non-teaching option.

The following 32 credit hours of education courses are required for certification to teach in Indiana high schools. One of the courses, EDCI 42800, is taken during the first six weeks of the professional semester, before student teaching.

**Bachelor of Science Degree with Chemistry Teaching Major**

**Requirements**

<table>
<thead>
<tr>
<th>Professional Education</th>
<th>32 credits</th>
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<tbody>
<tr>
<td>EDCI 27000 (Introduction to Educational Technology and Computing) (2 cr.), and EDCI 28500 (History and Philosophy of Education) (3 cr.)</td>
<td>5 cr.</td>
</tr>
<tr>
<td>EDCI 20500 (Exploring Teaching as a Career) (3 cr.)</td>
<td>6 cr.</td>
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<tr>
<td>EDPS 23500 (Learning and Motivation) (3 cr.)</td>
<td>6 cr.</td>
</tr>
<tr>
<td>EDCI 42400 (The Teaching of Earth/Physical Science in Secondary Schools) (3 cr.)</td>
<td>15 cr.</td>
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<tr>
<td>EDCI 42800 (Teaching Science in the Middle and Junior High School) (2 cr.)</td>
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<tr>
<td>EDCI 49800 (Supervised Teaching) (10 cr.)</td>
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**Bachelor of Science in Chemistry/ Bachelor of Science in Chemical Engineering**

The Department of Chemistry and the School of Chemical Engineering offer a joint program for students that leads to a dual degree of B.S. in Chemistry and B.S. in Chemical Engineering. Graduates of this program will be certified as having fulfilled the recommended requirements of the American Chemical Society. The curriculum in chemical engineering is accredited by the Engineer’s Council for Professional Development.
B.S. in Chemistry/B.S. in Chemical Engineering Requirements

First-Year Engineering Requirements  29–34 credits

For admission to this degree program, students must be admitted to First-Year Engineering.

Chemistry: CHM 12500 (Introduction to Chemistry I) (5 cr.); CHM 11500 (General Chemistry) (4 cr.); or CHM 12300 (General Chemistry for Engineers I) (4 cr.); and either CHM 12600 (Introduction to Chemistry II) (5 cr.); CHM 11600 (General Chemistry (4 cr.); or CHM 12400 (General Chemistry for Engineers II) (4 cr.)  8–10 cr.


Physics: PHYS 17200 (Modern Mechanics) (4 cr.)  4 cr.

Engineering: ENGR 12600 (Engineering Problem-Solving and Computer Tools) (3 cr.) and ENGR 10000 (Freshman Engineering Lectures) (1 cr.)  4 cr.

Communications: COM 11400 (Fundamentals of Speech Communication) (3 cr.) or COM 21700 (Science Writing and Presentation) (3 cr.)  3 cr.

English composition: ENGL 10600 (English Composition) (4 cr.) or ENGL 10800 (Accelerated First-Year Composition) (3 cr.)  3 cr.

Additional Requirements  42 credits

In addition to the requirements for the ACS B.S. in Chemistry degree on page 48 and First-Year Engineering described above, the following courses are required:

CHE 20500 (Chemical Engineering Calculations) (3 cr.); CHE 21100 (Introductory Chemical Engineering Thermodynamics) (3 cr.); CHE 30600 (Design of Staged Separation Processes) (3 cr.); CHE 32000 (Statistical Modeling and Quality Enhancement) (3 cr.); CHE 33000 (Principles of Molecular Engineering) (3 cr.); CHE 34800 (Chemical Reaction Engineering) (3 cr.); CHE 37700 (Momentum Transfer) (3 cr.); MA 30300 (Differential Equations and Partial Differential Equations for Engineering and the Sciences) (3 cr.); CHE 37800 (Heat and Mass Transfer) (3 cr.); CHE 43400 (Chemical Engineering Laboratory I) (3 cr.) and CHE 43500 (Chemical Engineering Laboratory II) (3 cr.); CHE 45000 (Design and Analysis of Processing Systems) (3 cr.); CHE 45600 (Process Dynamics and Control) (3 cr.)  42 cr.

CHE 44900 (Design and Cost Analysis) (3 cr.)  3 cr.

Engineering Electives  6 credits

The following courses satisfy particular requirements of the School of Chemical Engineering:

18 cr. of General Education, the general elective requirements; CHM 32100 (Analytical Chemistry I) and CHM 42400 (Analytical Chemistry II), two engineering electives; and CHM 34200 (Inorganic Chemistry), and one technical elective. In the chemistry plan, CHE 21100 (Introductory Chemical Engineering Thermodynamics) can replace CHM 37300 (Physical Chemistry) and CHE 45600 (Process Dynamics and Control) can count as a chemistry elective. Details about the requirements of the B.S. in Chemical Engineering curriculum as well as acceptable chemical engineering and engineering electives are explained on the College of Engineering Web site, www.engineering.purdue.edu.

Bachelor of Science in Chemistry/Bachelor of Science in Materials Science and Engineering

The Department of Chemistry and the School of Materials Engineering offer a joint program that leads to a dual degree of B.S. in Chemistry and B.S. in Materials Science and Engineering. Graduates of this program will be certified as having fulfilled the requirements of the American Chemical Society and accredited by the Accreditation Commission of the Accreditation Board for Engineering and Technology.

For admission to this degree program, students must complete the plan of study for First-Year Engineering (with an index of 2.5) which is:

CHM 12500 (Introduction to Chemistry I) (5 cr.); CHM 11500 (General Chemistry) (4 cr.); or CHM 12300 (General Chemistry for Engineers I) (4 cr.); and either CHM 12600 (Introduction to Chemistry II) (5 cr.); CHM 11600 (General Chemistry (4 cr.); or CHM 12400 (General Chemistry for Engineers II) (4 cr.)  8–10 cr.

MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); or MA 16500 (Analytic Geometry and Calculus I) (4 cr.) and MA 16600 (Analytic Geometry and Calculus II) (4 cr.)  8–10 cr.

PHYS 17200 (Modern Mechanics) (4 cr.)  4 cr.

CS 15900 (Programming Applications for Engineers)  3 cr.

ENGR 12600 (Engineering Problem-Solving and Computer Tools) (3 cr.) and ENGR 10000 (Freshman Engineering Lectures) (1 cr.)  4 cr.

COM 11400 (Fundamentals of Speech Communication) (3 cr.)  3 cr.

ENGL 10600 (English Composition) (4 cr.)  4 cr.
In addition to the requirements for the ACS B.S. in Chemistry degree (page 48) and First-Year Engineering described on page 51, the following courses are required:

**MSE 27000** (Atomistic Materials Science) (3 cr.) 3 cr.
**MSE 23000** (Structure and Property of Materials) (3 cr.); **MSE 23500** (Materials Properties Laboratory) (2 cr.); **MSE 26000** (Thermodynamics of Materials) (3 cr.); **MSE 33000** (Processing and Properties of Materials) (3 cr.); **MSE 33500** (Materials Characterization Laboratory) (3 cr.);
**MSE 34000** (Transport Phenomena) (3 cr.); **MSE 36700** (Materials Processing Laboratory) (3 cr.); **MSE 37000** (Electrical, Optical, and Magnetic Properties of Materials) (3 cr.); **MSE 38200** (Mechanical Response of Materials) (3 cr.); **MSE 43000** (Materials Processing and Design I) (3 cr.); **MSE 44000** (Materials Processing and Design II) (3 cr.) 36 cr.

**Engineering Electives** 6 credits
Details about the requirements of the B.S. in Materials Science and Engineering curriculum as well as acceptable engineering electives can be found in the College of Engineering Catalog.

**Programs and Opportunities**

**Preprofessional Preparation**
Any chemistry degree program can serve as an excellent basis of preparation for dental, medical, or veterinary school. Knowledge of chemistry is a valuable asset when studying biochemistry, physiology, endocrinology, pharmacology, and anatomy.

For example, a student who wants to apply to medical school — in addition to the courses in his or her chemistry program — will need one year of biology BIOL 11000 (Fundamentals of Biology I) (4 cr.) and BIOL 11100 (Fundamentals of Biology II) (4 cr.) or BIOL 23100 (Biology III: Cell Structure and Function) (3 cr.) and BIOL 23000 (Laboratory in Biology III: Cell Structure and Function) (2 cr.); and BIOL 24100 (Biology IV: Genetics and Molecular Biology) (3 cr.) and BIOL 24200 (Laboratory in Biology IV: Genetics and Molecular Biology) (2 cr.) to meet general admission requirements for most medical schools. Since admission requirements vary, it is essential to check the specific requirements for each school that interests the student.

**Honors Program**
The Department of Chemistry has an honors program for superior students. Participation can begin during the sophomore year, and a student will be assigned to advanced sections in chemistry courses taken during the sophomore year. During the junior and senior years, a student engages in undergraduate research, participates in research seminars, and completes honors courses in the selected degree plan. The undergraduate research experience (CHM 49900) is to be a minimum of six credits. In addition, the student must write an honors thesis based on the CHM 49900 work. A committee of two faculty members will read the thesis, and the student will give a public presentation of the research.

Admission to the chemistry honors program must be made by the junior year. The honors student is expected to achieve and maintain a scholastic graduation index of at least 3.4. Students fulfilling requirements of the chemistry honors program will be graduated “with honors in chemistry.”

**Honors Program Courses**
Except for CHM 49900, the honors courses listed below replace the corresponding courses in the degree requirements.
Chemistry: CHM 26700 (Organic Chemistry Laboratory [Honors]) (2 cr.); CHM 26800 (Organic Chemistry Laboratory) (2 cr.); and CHM 32300 (Analytical Chemistry I [Honors]) (4 cr.)
Undergraduate Research: CHM 49900 (Special Assignments) (6 cr. minimum)
MSE 27000 (Thermodynamics of Materials) (3 cr.); Special Programs and Opportunities

**Professional Practice Program**
The Department of Chemistry participates in the Professional Practice Program as described on page 9. This program requires five years and involves four work periods — either semesters or summer modules — with a cooperating company in the chemical industry. As a student gains experience, he or she is given increasingly responsible industrial assignments and receives more compensation.

A student can enter the program at the end of the freshman or sophomore year if he or she ranks in the upper half of the class, has completed two semesters of chemistry, and has a chemistry index greater than 2.8. Information is available from the Coordinator of Professional Practice Program in the Department of Chemistry. Check with your advisor for further information.
Advanced Technical Experience Program

In this program, students spend all three work sessions with a single employer, much like five-session Co-Op students. Students begin in fall, spring, or summer of their junior year. This program is a transcript-recorded experience and provides an academic certificate upon completion.

Applications are accepted at any time during the student’s sophomore year. Applicants are chosen by the employer host organizations during on-campus interviews. Selection depends upon the student’s academic achievement on campus (2.6/4.0 minimum GPA) and their success during the interview.

Additionally, ATEP students who complete one term of work experience overseas have an international experience endorsement added to their certificates.

Information is available from the Coordinator of ATEP in the Department of Chemistry. Check with your advisor for further information.

Chemistry Minor

A student may earn a minor in chemistry upon completion of 16 credit hours of chemistry courses beyond general chemistry (CHM 11500 and 11600, 12500 and 12600, or 12300 and 12400). The following courses (designed for non-science majors) will not count toward a minor: CHM 22400 (Introductory Quantitative Analysis), CHM 25700 (Organic Chemistry [for non-science majors]), and CHM 33300 (Principles of Biochemistry).

Up to three credits of undergraduate research (CHM 49900) may be used toward fulfillment of the minor. All courses must be offered by the Department of Chemistry, Purdue University.

Computer Science

Using creativity, logic, teamwork, and problem-solving skills, computer scientists solve problems throughout business, industry, and government; discover new knowledge in research laboratories and universities; and help prepare students for careers in computing and many other areas. Today’s computer scientists need imagination, determination, and the skills provided by a rigorous program like the one described here.

The demand for well-trained and highly qualified computer scientists in the United States remains strong. Virtually every field of science and engineering is affected by computing, and computer scientists play a key role in a number of interdisciplinary efforts. There are challenging opportunities in areas as diverse as:

- Bioinformatics
- Computational nanotechnology
- Data integration and data mining
- Distributed and peer-to-peer computing
- Graphics and visualization
- Security and information assurance
- Mobile and wireless systems
- Software engineering

Because computer science is a young and rapidly developing field, the curriculum must be revised frequently to keep it up-to-date. The information here reflects the state of the curriculum as of April 2009. The most recent description, sample plans of study, and more detailed information are usually available at the Computer Science Web site, www.cs.purdue.edu and at the Computer Science Undergraduate Advising Office, Lawson Hall, Room 1123; (765) 494-6010.

The Department of Computer Science offers a Bachelor of Science (B.S.) degree program with majors in:

- Computer Science (CS major)
- Computer Science/Honors (Honors major), and
- Computer Science/Software Engineering (SE major)

Qualified students in the bachelor’s program may participate in the Professional Practice (formerly Cooperative Education) Program.

The Department of Computer Science also offers a combined five-year B.S./M.S. program, a master’s program, and a doctoral program.

To earn the B.S., students must fulfill the requirements of the College of Science and the requirements of one of the computer science majors. Each major that the student completes is recognized on the student’s transcript, except that the CS major is not recognized if the honors major is recognized, the latter being a strong instance of the former.

All CS courses used to fulfill major requirements must be completed with a grade of C- or better. The semesters given with courses below are those in which students usually take them.
Restrictions of College Requirements

To fulfill the mathematics requirements of the College of Science, students may take only:

MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr., sem. 1) or MA 16500 (Analytic Geometry and Calculus I) (4 cr., sem. 1)

And one of:

MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr., sem. 2); MA 16600 (Analytic Geometry and Calculus II) (4 cr., sem. 2); MA 17300 (Calculus and Analytic Geometry II) (5 cr., sem. 1);

MA 18100 (Honors Calculus I) (5 cr., sem. 1)

To fulfill the statistics requirement of the College of Science, students may take only:

STAT 35000 (Introduction to Statistics) (3 cr.); or STAT 51100 (Statistical Methods) (3 cr.).

Free electives

Free electives are courses used to satisfy only the number of credits needed for the bachelor’s degree. They do not satisfy any other requirements. Students in the Computer Science B.S. program may choose free electives from any department within the University; but courses from departments other than Computer Science must be approved by the student’s academic advisor, and courses that significantly overlap courses taken to fulfill CS degree requirements are not permitted. In particular, introductory programming courses cannot be used as free electives, regardless of the language used.

Computer Science Major

Computer Science Courses 38 credits

There are eight specifically required (core) CS courses:

CS 18000 (Programming I) (4 cr., sem. 1);

CS 18200 (Foundations of Computer Science) (3 cr., sem. 2);

CS 24000 (Programming in C) (3 cr., sem. 2);

CS 25000 (Computer Architecture) (4 cr., sem. 3 or 4);

CS 25100 (Data Structures) (3 cr., sem. 3 or 4);

CS 35200 (Compilers: Principles and Practice) (3 cr., sem. 5 or 6);

CS 35400 (Operating Systems) (3 cr., sem. 5 or 6);

CS 38100 (Introduction to the Analysis of Algorithms) (3 cr., sem. 5 or 6)

Four more (CS elective) courses are required. These may be any CS courses level 3 (indicated by the “3” as the first digit of the course number) or higher, except that individual study courses (formerly independent study, special project, or reading courses) are subject to the approval of the Undergraduate Committee. Three credits of Engineering Projects in Community Service (EPICS) courses approved by the student’s academic advisor may be used in lieu of one CS elective.

Computer Science students are strongly urged to take the following courses, which are intended to promote students’ success:

CS 19100 (Freshman Resources Seminar) (1 cr., sem. 1); CS 29100 (Sophomore Development Seminar) (1 cr., sem. 3); CS 39100 (Junior Resources Seminar) (1 cr., sem. 6)

Mathematics Courses 15–18 credits

One of:

MA 17400 (Multivariable Calculus) (4 cr., sem. 2);

MA 18200 (Honors Calculus II) (5 cr., sem. 2);

MA 26100 (Multivariate Calculus) (4 cr., sem. 1–3);

MA 27100 (Several Variable Calculus) (5 cr., sem. 1)

Also:

MA 26500 (Linear Algebra) (3 cr., sem. 1–4) or MA 35100 (Elementary Linear Algebra) (3 cr., sem. 1–4).

Honors Major

Students enter the honors major in one of three ways:

1. By invitation upon admission.

2. By invitation after the first semester.

3. By application. Students may request admission to the honors major to be effective in the semester following the completion of the level 2 core courses. The Undergraduate Committee may grant admission if the student meets the grade-point-average requirements of the honors major and has the recommendation of his or her CS academic advisor.

Honors students must maintain a cumulative grade point average (GPA) of at least 3.25 and a cumulative GPA of at least 3.6 in CS courses used to fulfill major requirements from the time they are admitted to the honors major until they graduate.

Honors students are encouraged, but not required, to take CS 19700 (Freshman Honors Seminar) (1 cr.) in the spring semester of their freshman year.

Honors Major Course Requirements

The requirements for honors students are the same as for the CS major, but honors students must take the following courses:

MA 35100 (Elementary Linear Algebra) (3 cr.) (not MA 26500); an approved* mathematics course beyond MA 35100 or an approved* statistics course beyond STAT 51100; ECE 27000 (Introduction to Digital System Design) (4 cr.); CS 39700 (Honors Seminar) (0 cr.), to be followed by CS 49700; CS 49700 (Honors Research Project) (3 cr.), as a CS elective. If taken more than once, it counts only

* Course must be approved by the Computer Science Undergraduate Committee for use in the honors major.
once as a CS elective; however, one other instance can be used as a free elective. Any other instances cannot be used to fulfill any degree requirements; An approved* level 5 course, as a CS elective. Individual study courses other than CS 49700 may only be used as free electives.

Software Engineering Major
Students apply to enter the interdisciplinary software engineering (SE) major at the end of their sophomore year. Students are selected by the Software Engineering Curriculum Committee based on a solid grounding in programming (at least a “B” in CS 18000 and CS 24000) and the results of an interview with the committee. Formal acceptance is at the beginning of the junior year, following the student’s first internship.

The requirements are the same as for the CS major but with the four CS electives replaced by the following:

1. CS 30700, Software Engineering (3 cr.)
2. Twelve or more credits from the courses listed below, including at least six credits of CS courses and at least six credits of non-CS courses. Some of the courses are still in development and may be given as temporary courses (e.g. CS 49000).
   - **Software Design:** ECE 43500 (Object-Oriented Design Using C++ and Java) (3 cr.)
   - **Embedded Systems:** ECE 36200 (Microprocessor Systems and Interfacing) (4 cr.)
   - **Software Testing and Quality Assurance:** CS course
     - Information Security: CS 35500 (Introduction to Cryptography) (3 cr.); CS 42600 (Computer Security) (3 cr.); ECE course in security
     - Information Systems: CS 34800 (Information Systems) (3 cr.)
   - **Software Architecture:** CS course
   - **Software Process Management:** IE course
   - **Projects:** Courses from EPICS or the VIP program. Must be approved by the Software Engineering Curriculum Committee. Limited to 3 credits. The projects must be software-intensive or software/hardware-intensive.

3. Internships
   Two summer internships of at least eight weeks, each in a commercial software development group provided by a corporate partner. The responsibility of finding the internships lies with the student. Students who cannot secure the two internships but fulfill all other requirements for the software engineering major will be awarded the B.S. degree with the computer science major.

4. SE Seminar
   This one-credit seminar must be taken in the junior or senior — preferably junior — year.

Professional Practice
The Department of Computer Sciences offers professional practice whereby students in the Computer Science B.S. program can gain practical experience as employees in business, industry, or government in conjunction with their studies. More information can be found at the CS Web site, www.cs.purdue.edu.

Five-Year combined B.S./M.S. Program
The five-year combined B.S./M.S. Degree program enables outstanding students to complete the B.S. and the M.S. in a total of five, rather than the usual six, years.

The program entails no alteration of the requirements for either degree but does allow students to count up to nine credits of level 5 and/or level 6 courses toward both degrees, which reduces the total time to the M.S. degree by about one semester. With Advanced Placement credit, credit by examination at Purdue, full course loads, summer courses, or a combination of them in the B.S. program, students can then complete the combined program within five years of the beginning of their B.S. studies.

Interested students should consult with their academic advisor as early as possible to arrange the B.S. program of study to prepare for the B.S./M.S. program.

Students apply for the program at the beginning of what, in an ordinary B.S. program, would be their third-from-last semester (typically the second semester of the junior year) to begin graduate study the following semester. Requirements for admission include a cumulative GPA of at least 3.0; a cumulative GPA of at least 3.5 in CS courses; and projected completion, before entering the B.S./M.S. program, of at least 100 of the 124 credits required for the B.S.


Minor Concentration in Computer Science
To obtain a minor concentration in Computer Science, students must pass — with grades of “C-” or better (not a “P,” as in “pass”) — five CS courses at or above CS 18000 that can be used to fulfill CS major requirements. All five courses must be taken at Purdue University. At most, one of the courses may be an individual-study CS 49000.

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* Course must be approved by the Computer Science Undergraduate Committee for use in the honors major.
None of the following courses can be used to fulfill a minor concentration in CS:
- CS 49000 other than the one permitted above.
- CS 19000, 29000, 39000, 59000, 69000.
- EPCS (EPICS) courses

Earth and Atmospheric Sciences

Earth and atmospheric sciences (EAS) focus on the study of the atmosphere, oceans, and the solid earth. These disciplines are concerned with the quality of life and the physical environment in which we live. Earth and atmospheric scientists have accepted the challenge of arriving at solutions to basic and applied problems that affect our planet.

Faculty and students in the Department of Earth and Atmospheric Sciences study a wide range of geophysical phenomena. These phenomena include events that affect daily life on earth, such as mineral and oil exploration and weather forecasting, events that are the source of devastating natural disasters, such as earthquakes, landslides, and tornadoes, and events that explore the distant past or the projected future of our stay on earth, such as climate change, plate tectonics, and Arctic and Antarctic fossil discoveries.

The Department of Earth and Atmospheric Sciences prepares students to investigate a variety of problems. The basic core courses listed on pages 58–59, supplemented by courses relevant to each specialized area of interest, provide a broad scientific education that prepares students for graduate programs or for entry-level employment positions after completing the B.S. degree.

A master’s degree is desirable for research, advancement in secondary school teaching in Indiana, and many positions in government or industry. The Ph.D. degree is required for advancement in university teaching and higher-level positions in research.

Earth and atmospheric sciences students have many career options. The following are several possible areas of emphasis, and the career options that may be available to students. For specific information on which core courses and option would best match a program, please speak with an advisor.

Careers in Earth and Atmospheric Sciences

Atmospheric Science (Meteorology). Meteorology is the study of atmospheric phenomena. This includes the physics, chemistry, and dynamics of the atmosphere; and many of the interactions between the atmosphere, solid earth, and oceans.

The undergraduate meteorology curriculum includes not only core courses in atmospheric science, but also complementary exposure to mathematics, physics, chemistry, and computer science. Thus, graduates are prepared to enter the work force in specialties such as weather forecasting and air pollution as well as to further their education by pursuing graduate degrees.

With the atmospheric science major, students may also choose to focus on employment with the National Weather Service or other government agencies, broadcasting (media), a business-related career or environmental monitoring, or pursue graduate school/research.

Geology. Geology is the study of the internal structure, materials, chemical/physical processes, and physical/biological history of the earth. Students of geology encounter science in the broadest sense because geology involves the application of principles of physics, mathematics, biology, and chemistry as well as many aspects of engineering and environmental sciences.

Because the scope of geology is broad, specialized branches have evolved. For example, geomorphologists investigate the nature and origin of land forms by studying the causes and effects of dynamic earth processes; structural geologists are concerned with the arrangement of rock masses in the earth’s crust and the types of forces that have affected them; and stratigraphers investigate the thickness, geometry, and distribution of layered rocks to understand the chronology of geologic events.
Geologists also may specialize as economic geologists who explore the earth for various kinds of mineral deposits and supervise their development. Others may become ground-water geologists concerned with the distribution, movement, and chemical quality of our precious underground water supply. Many have become petroleum geologists who explore for and develop deposits of coal, oil, natural gas, and other earth resource materials. Another area that appeals to many geology majors is environmental geology, in which geological skills are required to help predict, avoid, or mitigate problems connected with pollution, urban development, and geologic hazards such as flooding and excessive erosion.

Students completing the B.S. curriculum in geology would be prepared to undertake graduate studies for advanced degrees or enter a variety of careers related to some of the specialty areas.

**Paleontology and Paleoecology.** Paleontology is the study of fossils, with the aim of discerning the nature, occurrence, and evolution of life throughout geologic time. Paleoecology deals with the relationship between fossil organisms and their inferred environments. Coursework in this area emphasizes methods by which data derived from fossils can be interpreted and applied to geologic and biologic problems.

**Geochemistry, Mineralogy, and Petrology.** This program uses concepts from disciplines such as chemistry, physics, and mathematics to help clarify geological phenomena and problems. In general, the problems are directly related to the basic materials comprising the earth, namely, the origin and occurrence of minerals, rocks, and ore deposits. Mineralogy, petrology, and geochemistry are so closely related that a combined treatment is necessary.

**Engineering Geology.** Engineering geology involves the use of geological data, techniques, and principles to interpret the geologic factors affecting the planning, design, and safety of engineering projects. The undergraduate curriculum should be a blend of engineering and geology courses designed to teach engineering principles and foster understanding of engineering problems.

Engineering geology work includes studies related to site location and investigation; environmental assessment; design recommendations; construction, monitoring, and maintenance of engineering structures such as dams, tunnels, bridges, buildings, mines, cut slopes in rocks, quarries, etc.; and analysis of the geology of urban areas.

**Hydrogeology.** The hydrogeologist is called on to assess an area for groundwater development potential for domestic, industrial, or agricultural supply. His or her skills may be required to determine the origin and fate of naturally occurring or man-made chemicals in ground water. Hydrogeology is also intimately related to knowledge of earth surface processes (geomorphology), environmental studies, engineering geology, and exploration geophysics. A background in these related specialties is desirable.

**Structural Geology.** Structural geology is the study of how earth deforms. To understand rock deformation, we might examine rocks at any scale from microscopic to continental. We study the forces that cause folds, faults, and even whole mountain ranges. We investigate rocks that have flowed quietly for millions of years, and others that have ruptured catastrophically in earthquakes. These types of processes are responsible for much of the large-scale configuration of the Earth’s surface.

Structural geology is one of the keys to understanding the geologic history of the Earth and hazards such as earthquakes, tsunamis, and landslides. It is also an essential tool in the search for petroleum and mineral resources.

**Geophysics.** Geophysics applies principles of physics to the study of the earth. Studies of natural gravity, magnetic and electrical fields, seismic wave propagation, and heat flow are used to deduce the nature of the earth’s interior — the structure, composition, physical properties, and dynamic processes that cause earthquakes and move continents. Similar studies are used to explore for petroleum and mineral deposits, and to investigate the shallow portions of the earth’s crust to determine conditions that influence the location of engineering structures.

Geophysics includes theoretical and laboratory studies as well as field investigations that may be located in interesting and remote areas of the world. Often geophysicists use sophisticated instrumentation, computer processing of data, and interpretation and integration of information from several related disciplines.
**Environmental.** Using a background in geology or atmospheric science as their foundation, environmental scientists can use an interdisciplinary approach to study ground-water contamination, landfill management, landslide risk, urban planning, climate change, and many other contemporary environmental issues. These scientists must develop quantitative problem-solving skills acquired in an educational framework that couples their geological and/or atmospheric science background with basic principles of chemistry, physics, mathematics, and engineering to meet the challenges facing the environment.

Environmental employment areas include science, engineering, and consulting, particularly on decisions regarding environmental public policy. There are also many opportunities for graduate education in these areas.

**Earth/Space Science Teaching.** This program provides a broad earth science core as well as a strong background in math, chemistry, and physics along with required courses in education to prepare students to teach in junior high/middle/secondary schools (grades 5–12) and meet the requirements set by the University-wide Teacher Education Council.

**Marine Science.** Students interested in pursuing a career in marine sciences are encouraged to major in earth or atmospheric sciences, or another basic science such as biology. A program can be arranged that will qualify students to study marine science in graduate school.

The most recent Web information can be found at www.purdue.edu/eas/

**General Degree Requirements**
Science core requirements for the College of Science are listed on pages 27–29 and online at www.science.purdue.edu. To qualify for a B.S. degree, students must complete the requirements for one of the following options:

- Atmospheric science
- Geology and geophysics
- Earth/Space science teaching

**Earth and Atmospheric Sciences Requirements**

<table>
<thead>
<tr>
<th>Laboratory Science Requirements (all options)</th>
<th>14–16 credits</th>
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</thead>
<tbody>
<tr>
<td>Chemistry: CHM 11500 and 11600 (General Chemistry). Earth/space science teaching majors can substitute CHM 11100 and CHM 11200 (General Chemistry) (3 cr. each).</td>
<td>6–8 cr.</td>
</tr>
<tr>
<td>Physics: PHYS 17200 (Modern Mechanics) (4 cr.) and PHYS 27200 (Electric and Magnetic Interactions) (4 cr.). Earth/space science teaching majors can substitute PHYS 22000 and 22100 (General Physics) (4 cr. each). Geology and Geophysics majors can consult an advisor for options for this second lab sequence.</td>
<td>8 cr.</td>
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<tr>
<th>Mathematics Requirements (all options)</th>
<th>8–21 credits</th>
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</thead>
<tbody>
<tr>
<td>MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) or MA 16500 (Analytic Geometry and Calculus I) (4 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>One of: MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); MA 16600 (Analytic Geometry and Calculus II) (4 cr.); MA 17300 (Calculus and Analytic Geometry II) (5 cr.); MA 18100 (Honors Calculus I) (5 cr.)</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>One of: MA 26100 (Multivariate Calculus) (4 cr.); MA 17400 (Multivariable Calculus) (4 cr.); MA 18200 (Honors Calculus II) (5 cr.); MA 27100 (Several Variable Calculus) (5 cr.). Required for Atmospheric Science and Earth/Space Science Teaching majors only.</td>
<td>4–5 cr.</td>
</tr>
<tr>
<td>MA 26500 (Linear Algebra) (3 cr.) and MA 26600 (Ordinary Differential Equations) (3 cr.). Required for Atmospheric Science and Earth/Space Teaching majors only</td>
<td>6 cr.</td>
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</tbody>
</table>

**Computer Science**

| 3–4 credits |
| CS 15800 (Programming I) (3 cr.) for Atmospheric Science. Earth/Space Science Teaching and Geology and Geophysics majors can enroll in either CS 15800 (C Programming) or CS 17700 (Programming with Multimedia Objects) (4 cr.) |

**Statistics**

| 3 credits |
| STAT 30100 (Elementary Statistical methods) (3 cr.); STAT 3500 (Introduction to Statistics) (3 cr.); STAT 50300 (Statistical Methods for Biology) (3 cr.); STAT 51100 (Statistical Methods) (3 cr.) |
Additional Science Core Requirements 24–31 credits

English Composition and Technical Writing and Presentation: See page 27–28 for these requirements 6–10 cr.

Teambuilding and Collaboration: Students must learn the concepts involved in science team projects. See the requirements on page 28. 1–3 cr.

Multidisciplinary Experience: See page 29 for requirements. 3–9 cr.

Language and Culture: Science majors are expected to have proficiency in another language in addition to their native language. Competence in the second language must be demonstrated to the third semester, or to the second semester (with an additional culture or diversity class), or an approved study abroad experience. See page 28 for the Language/Culture requirements. 9 cr.

General Education: Students must complete 3 credits of a course approved for Great Issues and 9 credits of Social Studies/Humanities and/or Management. See pages 28–29 for the General Education Requirements, including the two-course sequence in Social Studies or Humanities. 12 cr.

Free Electives 3–24 credits

Free electives can be selected from almost any department of the University, and students are encouraged to use free electives to broaden their knowledge. Free-elective credit is not allowed for courses that significantly overlap courses taken to fulfill degree requirements or that do not count for credit in the College of Science. Students must take as many free electives as is needed to bring the credit hour total to 124 credits, and the number of free electives may depend on the student’s option and the courses taken to meet core and degree requirements. Students in atmospheric science who wish to be qualified for employment as meteorologists in the federal government must elect EAS 43400 (Weather Analysis and Forecasting) (3 cr.).

Additional Requirements for Entry into the Upper Division in All EAS Options

A student pursuing a major in atmospheric science, earth/space science teaching, or geology and geophysics must satisfy the following requirements before being permitted to enter the upper division:

1. Completion of MA 161000 (Plane Analytic Geometry and Calculus I) (5 cr.), and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); CHM 11500 (General Chemistry) (4 cr.) and CHM 11600 (General Chemistry) (4 cr.); and PHYS 17200 (Modern Mechanics) (4 cr.); or equivalents — each with a grade of “C−” or better; and

2. Completion of required lower-division EAS courses in the student’s major area, each with a grade of “C−” or better. For the application of these requirements, entry into the upper division is defined as registration for the semester that includes EAS 35300 (Surface Processes) (3 cr.) or EAS 35400 (Plate Tectonics) (3 cr.) for geology and geophysics or earth/space science teaching; or EAS 42100 (Atmospheric Thermodynamics) (3 cr.) for atmospheric science.

Grade Requirement

To graduate in any EAS major, a student must have an average grade point average of 2.0 or above in EAS courses required for the major. Information is also available on the Department of Earth and Atmospheric Sciences Web site, www.purdue.edu/eas, or by consulting with an advisor.

Atmospheric Science Requirements

Atmospheric Science Core 48 credits

EAS 10900 (The Dynamic Earth) (3 cr.); EAS 11700 (Introduction to Atmospheric Science) (2 cr.); EAS 13700 (First-Year Seminar in Earth and Atmospheric Sciences) (1 cr.); EAS 22500 (Science of the Atmosphere) (3 cr.); EAS 32000 (Physics of Climate) (3 cr.); EAS 42100 (Atmospheric Thermodynamics) (3 cr.); EAS 42200 (Atmospheric Dynamics I) (3 cr.); EAS 42300 (Atmospheric Dynamics II) (3 cr.); EAS 43100 (Synoptic Laboratory I) (1 cr.); EAS 43200 Synoptic Laboratory II (1 cr.); EAS 43300 (Synoptic Laboratory III) (1 cr.); EAS 53200 (Atmospheric Physics I) (3 cr.); EAS 53500 (Atmospheric Observations and Measurements) (3 cr.). 30 cr

Electives 18 credits

Elective courses (at least 6 courses, 3 credits each).
Geology and Geophysics Requirements  
60–62 credits

Geology and Geophysics Core
EAS 10900 (The Dynamic Earth) (3 cr.);
EAS 11800 (Introduction to Earth Science) 
(3 cr.); EAS 13700 (First-Year Seminar in 
Earth and Atmospheric Sciences) (1 cr.); 
EAS 24300 (Earth Materials I) (4 cr.);
EAS 31900 (Exploring Earth through Time) 
(3 cr.); EAS 30900 (Computer-Aided 
Analysis for Earth and Atmospheric Sciences) 
(3 cr.); EAS 35300 (Surface Processes) 
(3 cr.); EAS 35400 (Plate Tectonics) (3 cr.); 
EAS 49000 (Field Geology Summer Field 
Camp) (4–6 cr.).

Students participate in the field experience the summer before the senior year. Additional information about the field experience is included on this page.

Electives  
33 credits
Two EAS electives (3 cr. each), four EAS professional electives numbered 30000 and above (3 cr. each), two science or engineering electives numbered 20000 or above (3 cr. each), and at least three free electives (3 cr. each).

Earth/Space Science Teaching Requirements  
86–89 credits

Earth/Space Science Teaching 
Core  
62–64 credits
EAS 10900 (The Dynamic Earth) (3 cr.);
EAS 11800 (Introduction to Earth Science) 
(3 cr.); EAS 13700 (First-Year Seminar in 
Earth and Atmospheric Sciences) (1 cr.); EAS 
24300 (Earth Materials I) (4 cr.); EAS 31900 
(Exploring Earth through Time) (3 cr.); EAS 
35300 (Surface Processes) (3 cr.); EAS 35400 
(Plate Tectonics) (3 cr.); EAS 49000 (Field 
Geology Summer Field Camp) (4–6 cr.).

Students participate in the field experience the summer before the senior year. Additional information about the field experience is included on this page.

Two of the following (3 credits each):
ASTR 26300 (Description Astronomy: The 
Solar System); ASTR 26400 (Descriptive 
Astronomy: Stars and Galaxies); EAS 
10400 (Oceanography); EAS 10500 (The 
Planets); EAS 11500 (Dinosaurs); EAS 11600 
(Earthquakes and Volcanoes); EAS 12000 
(Introduction to Geography); EAS 13800 
(Thunderstorms and Tornadoes); EAS 22100 
(Survey of Atmospheric Science); EAS 22500 
(Science of the Atmosphere) 6 cr.

Professional Education 32 credits
EDCI 27000 (Introduction to Educational Technology 
and Computing) (2 cr.); EDST 20000 (History 
and Philosophy of Education) (3 cr.); EDCI 20500 
(Exploring Teaching as a Career) (3 cr.) and EDCI 
28500 (Multiculturalism and Education) (3 cr.); 
EDPS 23500 (Learning and Motivation) (3 cr.) and 
EDPS 26500 (The Inclusive Classroom) (3 cr.); 
EDCI 42400 (The Teaching of Earth and Physical 
Science in the Secondary Schools) (3 cr.); EDCI 
49800 (Supervised Teaching) (10 cr.); 30 cr.

EDCI 42800 (Teaching Science in the Middle and 
Junior High School) (2 cr.) is taken before student 
teaching during the first six weeks of the profes-
sional semester. A student can choose either the 
seventh or eighth semester for the professional 
semester. 2 cr.

Honors Research Program
Outstanding students are invited to participate in the earth and atmospheric sciences honors research program. The focus of this program is the completion of an undergraduate research thesis and the oral presentation of this research in a departmental seminar. The thesis can be a laboratory, field, or theoretical investigation. This program offers students the opportunity to explore in depth a specific topic of their interest through tutorials, independent research, and seminars. The student thus obtains a better preparation for advanced study or a career in the geosciences.

A student can graduate with honors in earth and atmospheric sciences by completing the following requirements:
1. At least a 3.25 cumulative graduation index;
2. Successful completion of EAS 49400 (Earth and Atmospheric Sciences Undergraduate Seminar) (1 cr.);
3. A research thesis supervised and approved by a member of the faculty; and
4. Submission of application for graduation with honors during the semester before graduation.

If you are interested in this program, contact the chair of the Undergraduate Committee in the Department of Earth and Atmospheric Sciences.

Special Programs and Opportunities
Summer Field Experience
Earth science majors must take a four- to six-
week summer field experience. The experience 
brings together the various solid earth courses
and helps students make the transition from classroom scholar to field-based geologist. Through the experience, they gain an appreciation of the problems professional scientists encounter.

Students generally find it easier to comprehend the subject matter of subsequent courses as a result of the summer field experience, which they are encouraged to attend between the junior and senior years.

Earth and Atmospheric Sciences Minor
Students who wish to complement their major area of study with coursework in the earth and atmospheric sciences may be interested in the department’s minor program.

Mathematics
The Department of Mathematics offers a broad range of programs leading to the Bachelor of Science degree. Students majoring in another area of science may also choose to pursue a minor in mathematics. Detailed descriptions of these programs and brief summaries of the kinds of careers for which graduates are prepared can be found in the following “Plans of Study” section. Additional information about career opportunities is available from the College of Science Counseling Office and by taking MA 10800 (Mathematics as a Profession and a Discipline) (1 cr.).

Some math graduates choose to continue their education in law schools, business schools, or medical schools. Others choose to teach. Many graduates choose to go on to graduate school in mathematics, engineering, computational finance, or other areas. Job options include positions such as database managers, programming, actuarial work, software engineering, defense work, insurance, banking, and finance.

The most recent information can be found on the Web site, www.math.purdue.edu.

General Degree Requirements
The College of Science recently implemented a new undergraduate curriculum. Students should check the College of Science Web site, www.science.purdue.edu/academic-programs/major, and speak with an academic advisor for the most up-to-date information and requirements.

Earth and Atmospheric Sciences
Minor Course Requirements  
17 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAS 11100 (Physical Geology) (3 cr.), or EAS 10900 (The Dynamic Earth) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>EAS 22100 (Survey of Atmospheric Science) (3 cr.), or EAS 22500 (Science of the Atmosphere) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>EAS 23000 (Laboratory in Atmospheric Science) (1 cr.)</td>
<td>1 cr.</td>
</tr>
</tbody>
</table>

Ten additional credits selected from any 20000-level or above EAS courses. One 10000-level EAS course may be used to meet this requirement.  
10 cr.

Note: EAS 11100 (Physical Geology) (3 cr.) and EAS 11200 (Earth through Time) (3 cr.) are an approved laboratory sequence for the College of Science core requirements.

Mathematics
All mathematics majors must satisfy the following general degree requirements. In doing so, they will automatically fulfill the College of Science requirements listed on pages 27–29. A total of 124 credit hours is required. Mathematics courses below MA 16100 (except MA 10800) do not count as credit toward graduation.

Mathematics Requirements  
43–81 credits

One of the following calculus sequences  
12–15 credits

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.); MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); and MA 26100 (Multivariate Calculus) (4 cr.)</td>
<td>14 cr.</td>
</tr>
<tr>
<td>b. MA 16500 (Analytic Geometry and Calculus I) (4 cr.); MA 16600 (Analytic Geometry and Calculus II) (4 cr.); and MA 26100 (Multivariate Calculus) (4 cr.)</td>
<td>12 cr.</td>
</tr>
<tr>
<td>c. Calculus: MA 17300 (Calculus and Analytic Geometry II) (5 cr.); and MA 17400 (Multivariable Calculus) (4 cr.)</td>
<td>10 cr.</td>
</tr>
<tr>
<td>d. MA 18100 (Honors Calculus I) (5 cr.) and MA 18200 (Honors Calculus II) (5 cr.)</td>
<td>10 cr.</td>
</tr>
<tr>
<td>e. MA 27100 (Several Variable Calculus)</td>
<td>5 cr.</td>
</tr>
<tr>
<td>MA 36600 (Differential Equations) (4 cr.) (except for the statistics option)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>Students transferring from other majors and those getting a second major in mathematics may replace MA 36600 with MA 26600 (with a “B” or better)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>MA 35100 (Linear Algebra) (3 cr.) Students transferring from other majors and those getting a second major in mathematics may replace MA 35100 with MA 26500 (with a “B” or better)</td>
<td>3 cr.</td>
</tr>
</tbody>
</table>
Entry into Upper-Division and Honors Courses

The Department of Mathematics accepts students as upper-division majors after they complete MA 35100 (Elementary Linear Algebra) (3 cr.).

Any of the options can be enriched under the honors program described on page 66. Students who want to maximize their educational opportunities are urged to consider this program.

Many of the required courses can be replaced by more advanced courses. Consult your academic advisor for details.

MA 18100 (Honors Calculus I), MA 18200 (Honors Calculus II), MA 44000 (Real Analysis Honors), and MA 45000 (Algebra Honors) are, respectively, honors versions of Calculus, MA 34100 (Foundations of Analysis) and MA 45300 (Elements of Algebra I). The honors version of a course has more content: material is covered in greater depth and/or more material is covered. Honors courses are recommended for students intending to pursue graduate work in any area involving mathematics or simply for those interested in a more challenging and rewarding educational experience.

Mathematics Options

Seven options for mathematics majors are described in this section. They are designed to provide foundations for a variety of careers in fields that use mathematics. Students in any option are encouraged to use their electives to build breadth in all of the mathematical sciences (pure and applied mathematics, computer science, and statistics). Such breadth is especially appreciated by employers in business, industry, and government.

Core Mathematics Option

This option provides preparation for graduate study in pure mathematics or for advanced work in theoretical sciences and in other fields where strong mathematical backgrounds are valuable, such as business administration, economics, computer science, statistics, educational research, psychology, law, and medicine.
Core Mathematics Option
Course Requirements  24 credits
MA 35300 (Linear Algebra II)  3 cr.
MA 36200 (Vector Calculus) or MA 51000 (Vector Calculus)  3 cr.
MA 34100 (Foundations of Analysis) (3 cr.) or MA 44000 (Real Analysis: Honors) (3 cr.)  3 cr.
MA 45300 (Elements of Algebra) (3 cr.) or MA 45000 (Algebra: Honors) (3 cr.)  3 cr.
Any four courses from among the following (but no more than two from each group):
a. CS 24000 (Programming Laboratory C) (3 cr.), CS 25100 (Data Structures) (3 cr.)
b. CS 31400 (Numerical Methods) (3 cr.), CS 51400 (Numerical Analysis) (3 cr.), CS 51500 (Numerical Analysis of Linear Systems) (3 cr.); CS 52000 (Computational Methods in Analysis) (3 cr.)
c. MA 45400 (Galois Theory) (3 cr.)
d. MA 52000 (Boundary Value Problems) (3 cr.); MA 52300 (Introduction to PDEs) (3 cr.); MA 54300 (Introduction to the Theory of Differential Equations) (3 cr.)
e. MA 37500 (Introduction to Discrete Mathematics) (3 cr.); MA 38500 (Introduction to Logic) (3 cr.); MA 38700 (Set Theory and the Real Numbers) (3 cr.); CS 38100 (Introduction to the Analysis of Algorithms) (3 cr.); MA 38700 (Set Theory of Computation) (3 cr.)
f. MA 42500 (Complex Analysis) (3 cr.); MA 44000 (Real Analysis) (3 cr.); MA 44200 (Multivariate Analysis I) (3 cr.); Introduction to Optimization Problems (3 cr.)
g. MA 46200 (Elementary Differential Geometry) (3 cr.); MA 57100 (Elementary Topology) (3 cr.)
h. MA 41600 or STAT 41600 (Probability) (3 cr.); STAT 51600 (Basic Probability and Applications) (3 cr.); STAT 41700 (Statistical Theory) (3 cr.); STAT 51700 (Statistical Inference) (3 cr.)  12 cr.

Applied Mathematics Option
Graduates with training in applied mathematics are employed in business, industry, and government. Their jobs involve working with scientists in other fields, so some breadth is desirable, for instance, in physics, computer science, statistics, economics, or engineering.
This option also provides good preparation for graduate studies in applied mathematics and in subjects that use mathematics.

Applied Mathematics Option
Course Requirements  27 credits
MA 36200 (Topics in Vector Calculus) (3 cr.) or MA 51000 (Vector Calculus) (3 cr.)  3 cr.
CS 31400 (Numerical Methods) (3 cr.) or CS 51400 (Numerical Analysis) (3 cr.)  3 cr.
MA 35300 (Linear Algebra II)  3 cr.
MA 30300 (Differential Equations for Engineering and the Sciences) (3 cr.) or MA 30400 (Differential Equations and Partial Differential Equations for Engineering and the Sciences) (3 cr.)  3 cr.
MA 34100 (Foundations of Analysis) (3 cr.) or MA 44000 (Real Analysis: Honors) (3 cr.)  3 cr.
MA 42500 (Elements of Complex Analysis) (3 cr.) or MA 52500 (Introduction to Complex Analysis) (3 cr.)  3 cr.
MA 45300 (Elements of Algebra I) (3 cr.) or MA 45000 (Algebra: Honors) (3 cr.)  3 cr.
MA 52000 (Boundary Value Problems of PDEs) (3 cr.), or MA 52300 (Introduction to PDEs) (3 cr.), or special topics course with approval of the undergraduate committee chairman.  3 cr.
One of the following: MA 37500 (Introduction to Discrete Mathematics) (3 cr.); MA 42100 (Linear Programming and Optimization Techniques) (3 cr.); MA 52100 (Introduction to Optimization Problems) (3 cr.); MA 41600/STAT 41600 (Probability) (3 cr.); STAT 51600 (Advanced Probability and Options with Numerical Methods) (3 cr.)  3 cr.

Business Mathematics Option
An analytical background is becoming increasingly valuable for students who wish to pursue careers in business. This option, designed with the help of business and financial professionals, gives a strong mathematical foundation and courses in related areas to provide a suitable background for such a career. Students choosing this option should consider obtaining a minor in management.

Business Mathematics Option
Course Requirements  30–31 credits
MGMT 20000 (Introductory Accounting)  3 cr.
Two of: MA 37500 (Introduction to Discrete Mathematics) (3 cr.); CS 31400 (Numerical Methods) (3 cr.); STAT 41700 (Statistical Theory) (3 cr.); STAT 51700 (Statistical Inference) (3 cr.); MA 42100 (Linear Programming and Optimization Techniques) (3 cr.)  6 cr.
Two of: MA 37300 (Financial Mathematics) (4 cr.); MGMT 31000 (Financial Management) (3 cr.); MGMT 41100 (Investment Management) (3 cr.); MGMT 54400 (Database Management Systems) (3 cr.); MGMT 32300 (Introduction to Market Analysis) (3 cr.)  6–7 cr.
MA 41600/STAT 41600 (Probability) (3 cr.) or STAT 51600 (Basic Probability and Applications) (3 cr.)  6 cr.
MA 34100 (Foundations of Analysis) (3 cr.) or MA 44000 (Real Analysis Honors) (3 cr.)  3 cr.
MA 35300 (Linear Algebra II)  3 cr.
MA 45300 (Elements of Algebra I) (3 cr.) or MA 45000 (Algebra Honors) (3 cr.)  3 cr.
STAT 51200 (Applied Regression Analysis)  3 cr.

Operations Research Option
Roughly speaking, operations research is the science of decision making. It uses mathematics, statistics, and computer science to determine the optimal way of performing a sequence of operations or to choose which of several competing programs is best. In this way, operations research can be an important component of the management of large projects.

Operations Research Option
Course Requirements  24 credits

Numerical Analysis: CS 31400 (Numerical Methods) (3 cr.) or CS 51400 (Numerical Analysis) (3 cr.)  3 cr.
MA 35300 (Linear Algebra II)  3 cr.
MA 362 (Topics in Vector Calculus) (3 cr.) or MA 510 (Vector Calculus) (3 cr.)  3 cr.
MA 45300 (Elements of Algebra I) (3 cr.) or MA 45000 (Algebra Honors) (3 cr.)  3 cr.
MA 41600/STAT 41600 (Probability) (3 cr.) or STAT 51600 (Basic Probability and Applications); and STAT 41700 (Statistical Theory) (3 cr.) or STAT 51700 (Statistical Inference) (3 cr.)  6 cr.
One of: CS 52000 (Computational Methods in Analysis) (3 cr.); MA 34100 (Foundations of Analysis) (3 cr.); MA 44000 (Real Analysis Honors) (3 cr.); MA 47400/STAT 47400 (Random Modeling) (3 cr.); MA 52300 (Introduction to PDEs) (3 cr.); or MA 54300 (Introduction to the Theory of Differential Equations) (3 cr.)  3 cr.
One of: MA 37500 (Introduction to Discrete Mathematics) (3 cr.); MA 42100 (Linear Programming and Optimization Techniques) (3 cr.); MA 52100 (Introduction to Optimization Problems) (3 cr.); or IE 33500 (Operations Research – Optimization) (3 cr.)  3 cr.

Statistics Option
Professional statisticians deal with — among other things — the collection and statistical analysis of data, the design of experiments, and quality control.

This option prepares students for work in statistics. A dual degree in mathematics and statistics can be obtained. See page 74.
Statistics Option Course Requirements  27–28 credits

One of: MA 36600 (Ordinary Differential Equations) (4 cr.); MA 37500 (Introduction to Discrete Mathematics), MA 42100 (Linear Programming and Optimization Techniques) (3 cr.); MA 42500 (Complex Analysis) (3 cr.); MA 52500 (Introduction to Complex Analysis) (3 cr.); MA 45300 (Elements of Algebra I) (3 cr.); MA 45000 (Algebra Honors) (3 cr.); or MA 52000 (Boundary Value Problems of Differential Equations) (3 cr.) 3–4 cr.

MA 35300 (Linear Algebra II) 3 cr.

MA 36200 (Vector Calculus) (3 cr.); MA 44200 (Multivariate Analysis I Honors) (3 cr.); or MA 51000 (Vector Calculus) (3 cr.) 3 cr.

STAT 35000 (Introduction to Statistics) 3 cr.

MA 34100 (Foundations of Analysis) (3 cr.) or MA 44000 (Real Analysis Honors) (3 cr.) 3 cr.

MA 41600/STAT 41600 (Probability) (3 cr.); or STAT 51600 (Basic Probability and Applications) (3 cr.) 3 cr.

STAT 41700 (Statistical Theory) (3 cr.) or STAT 51700 (Statistical Inference) (3 cr.) 3 cr.

STAT 51200 (Applied Regression Analysis) 3 cr.

One of: MA 47400/STAT 47400 (Random Modeling) (3 cr.); IE 53000 (Quality Control) (3 cr.); STAT 51300 (Statistical Quality Control) (3 cr.); or STAT 51400 (Design of Experiments) (3 cr.) 3 cr.

Mathematics Education Option

This option provides the mathematical preparation necessary for teaching secondary school mathematics in Indiana.

Teacher certification requires a professional semester consisting of six weeks of coursework at Purdue followed by 10 weeks of student teaching. EDCI 42600 (Teaching Mathematics in the Middle and Junior High School) is taken during the first six weeks of the professional semester, before student teaching. A student can choose either the seventh or eighth semester for the professional semester.

Requirements for teacher certification vary from state to state. They can be obtained by writing to the Certification Office, Department of Public Instruction, in the capital city of the state of interest.

Mathematics Courses Requirements  56–57 credits

Mathematics Courses  24–25 credits

MA 30100 (Introduction to Real Analysis) 3 cr.

One of the following: MA 34100 (Foundations of Analysis) (3 cr.); 35300 (Linear Algebra II) (3 cr.); MA 37500 (Introduction to Discrete Mathematics) (3 cr.); MA 42500 (Elements of Complex Analysis) (3 cr.); MA 52500 (Introduction to Complex Analysis) (3 cr.); or MA 44000 (Real Analysis) (3 cr.) 3 cr.

MA 45300 (Elements of Algebra) (3 cr.) or 45000 (Honors Algebra) (3 cr.) 3 cr.

MA 46000 (Geometry) 3 cr.

STAT 31100 (Introductory Probability) (3 cr.); MA 41600/STAT 41600 (Probability) (3 cr.); or STAT 51600 (Basic Probability and Applications) (3 cr.) 3 cr.

One of the following: CS 15800 (C Programming) (3 cr.); CS 15900 (Programming Applications for Engineers) (3 cr.); CS 17700 (Programming with Multimedia Objects) (3 cr.); or CS 18000 (Programming I) (4 cr.) 3–4 cr.

STAT 35000 (Introduction to Statistics) (3 cr.) and one additional three-credit course in mathematics at 30000-level or above, approved by the Undergraduate Mathematics Committee.

Professional Education Courses  32 credits

EDCI 27000 (Introduction to Educational Technology and Computing) (2 cr.); EDST 20000 (History and Philosophy of Education) (3 cr.); EDCI 20500 (Exploring Teaching as a Career) (3 cr.); EDCI 28500 (Multiculturalism and Education) (3 cr.); EDPS 23500 (Learning and Motivation) (3 cr.); EDPS 26500 (The Inclusive Classroom) (3 cr.); EDCI 42500 (Teaching of Mathematics in Secondary Schools) (3 cr.); EDCI 42600 (Teaching Mathematics in the Middle and Junior High School) (3 cr.); EDCI 49800 (Supervised Teaching in Secondary Mathematics Education) (3 cr.)

Actuarial Science

An interdisciplinary program in actuarial science is offered jointly by the Department of Mathematics and the Department of Statistics. See page 32.
Honors Program
The Department of Mathematics offers a wide variety of educational opportunities for superior students. Honors courses are available from the freshman level to the senior level. Qualified undergraduates may also substitute graduate-level classes for undergraduate classes.

Most honors classes are taught in small sections — usually fewer than 20 students. This provides a unique opportunity for students to experience a small-college atmosphere in the midst of a large university. Honors work also gives the student the opportunity to obtain a richer and deeper knowledge of mathematics. This is particularly important for individuals contemplating graduate work, either in mathematics or some mathematics-related discipline.

There is also an official “honors option.” Students who successfully complete the requirements for this program are certified at the time of graduation as having graduated “with honors in mathematics.” Students may enter the program any time after completing MA 35100. Entering the honors program indicates an intention to meet the more rigorous requirements of graduation “with honors” as outlined in the following text. There is no penalty if a student later changes plans.

In the honors program, students must satisfy the general degree requirements via one of the options listed and include MA 44000 (Real Analysis Honors), 44200 (Multivariate Analysis I Honors), and 45000 (Algebra Honors) in all options except Education, which requires only MA 44000 and 44200. In either case, a grade-point average of at least 3.5 is required in these courses.

Special Programs and Opportunities
Professional Practice Program. The Department of Mathematics participates in the Professional Practice Program as described on page 9. If interested, a student should contact the Coordinator of the Professional Practice Program, Mathematics Department, Mathematical Sciences Building.

To be eligible for the Professional Practice Program, a student must:
1. Have completed one of the following calculus sequences:
   a. MA 16100 (Plane Analytic Geometry and Calculus I)/MA 16200 (Plane Analytic Geometry and Calculus II) (10 cr.) and MA 26100 (Multivariate Calculus) (4 cr.)
   b. MA 16500 (Analytic Geometry and Calculus I)/MA 16600 (Analytic Geometry and Calculus II) (8 cr.) and MA 21600 (Multivariate Calculus) (4 cr.)
   c. Calculus: MA 17300 (Calculus and Analytic Geometry II) (5 cr.) and MA 21700 (Several Variable Calculus) (5 cr.)
   d. MA 18100 (Honors Calculus I) (5 cr.) and MA 18200 (Honors Calculus II) (5 cr.)
   e. MA 27100 (Several Variable Calculus) (5 cr.)

2. Have at least a 3.0 grade index in all mathematics, statistics, and computer science courses and;

3. Have an overall graduation index of at least 2.8.

Although it is not required, students are encouraged to take CS 15800 (C Programming) (3 cr.); CS 17700 (Programming with Multimedia Objects) (4 cr.); or CS 18000 (Programming I) (4 cr.) before starting their work experience.

Mathematics Minor
The mathematics minor provides a strong background in mathematics for students majoring in some other discipline. To qualify for the minor, the following classes must be completed with an average grade index of at least 2.0, with no grade lower than “C-.”

Mathematics Minor Course Requirements 12–13 credits

<table>
<thead>
<tr>
<th>Course Options</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of the following: MA 35100 (Elementary Linear Algebra) (3 cr.); MA 51100</td>
<td>3 cr.</td>
</tr>
<tr>
<td>(Linear Algebra with Applications) (3 cr.); or MA 26500* (Linear Algebra) (3 cr.)</td>
<td></td>
</tr>
<tr>
<td>One of the following: MA 45300 (Elements of Algebra) (3 cr.); MA 45000 (Algebra Honors) (3 cr.); MA 34100 (Foundations of Analysis) (3 cr.)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>MA 44000 (Real Analysis Honors) (3 cr.)</td>
<td></td>
</tr>
</tbody>
</table>

* For many students, MA 26500 may not be adequate preparation for upper-division mathematics classes. Students planning to minor in mathematics should consider taking MA 35100 instead. Only students with a very firm grasp of the MA 26500 material should contemplate taking MA 35300 without MA 35100.
Two additional courses selected from the following:

MA 30100 (An Introduction to Proof Through Real Analysis) (3 cr.); MA 34100 (Foundations of Analysis) (3 cr.); MA 36200 (Topics in Vector Calculus) (3 cr.) or MA 51000 (Vector Calculus) (3 cr.); MA 42500 (Elements of Complex Analysis) (3 cr.) or MA 52500 (Introduction to Complex Analysis) (3 cr.); MA 44000 (Real Analysis Honors) (3 cr.) 3 cr.

MA 37500 (Introduction to Discrete Mathematics) (3 cr.); MA 38500 (Introduction to Logic) (3 cr.); MA 45300 (Linear Algebra II with Applications) (3 cr.)

MA 35300 (Introduction to Discrete Mathematics) (3 cr.); MA 38500 (Introduction to Logic) (3 cr.); MA 45300 (Elements of Algebra) (3 cr.) or MA 45000 (Algebra Honors) (3 cr.); MA 45000 (Algebra Honors) (3 cr.)

MA 44000 (Real Analysis Honors) (3 cr.)

Physics

Physics is the study of matter and energy, and the fundamental forces of nature that govern the interactions between particles. Physicists study a wide range of physical phenomena, from quarks to black holes, from individual atoms to the many-body systems of superconductors. It is the foundation of all the physical sciences. The knowledge and problem-solving skills acquired by physics graduates enable them to pursue careers in a wide range of scientific and professional disciplines.

A bachelor of science degree from the Department of Physics prepares students to investigate a variety of problems in physics, chemistry, biology, and engineering. The basic core courses, supplemented by courses relevant to each specialized major option, provide a broad scientific education that prepares students for entry into many careers as well as for graduate schools in physics, engineering, other sciences, and for professions such as law, medicine, and finance.

A master’s degree is desirable for research, advancement in secondary-school teaching in Indiana, and many positions in government or industry. The Ph.D. degree is required for advancement at a university and higher-level positions in research in several areas.

The undergraduate program in Purdue’s Department of Physics prepares students for participation in the frontiers of discovery in nanotechnology, condensed matter, nuclear physics, high energy particle physics, astronomy, biophysics, medical physics, and other branches of physics.

The Department of Physics emphasizes undergraduate research as an integral part of the learning experience that reinforces and amplifies skills acquired in the classroom. A seminar class “Introduction to Current Physics and Forefront Research” is offered in the first semester to introduce freshman students to research. The class serves to familiarize students with research being carried out currently in the department and prepares them to become involved in undergraduate research as early as their second semester at Purdue.

In their sophomore year, students are encouraged to enroll in a one-credit-hour seminar class that helps them explore different careers in physics. It offers an opportunity for students to meet with alumni and professors in the Department of Physics and to learn valuable career-development skills from these experiences.

The Department of Physics offers a bachelor of science with a major in physics with different specializations. A physics/math double major is also available to physics majors by taking additional courses in math.

A bachelor’s degree in physics prepares students to pursue careers in an extraordinary variety of areas, including technical and managerial careers in industry and basic research in universities, industrial laboratories, and national laboratories. The general problem-solving skills developed in physics studies serve students well not only in careers in physics but also in careers in other sciences, engineering, law, medicine, management, finance, and government.

Some examples of careers chosen by physics majors include teacher, doctor, research scientist, lawyer, Physician, architect, technical salesperson, electrical engineer, aeronauti-
cal engineer, astronaut, geophysicist, software designer, technical analyst, reliability engineer, and process engineer.

The most recent information on careers can be found at www.physics.purdue.edu/career.

The following courses are required of all bachelor of science physics majors. In meeting these requirements, candidates will also automatically fulfill the College of Science graduation requirements listed on pages 27–29. The core courses taken by all physics majors provide a solid foundation in classical mechanics, electricity and magnetism, waves and optics, quantum mechanics, thermal and statistical physics, modern physics, relativity, electronics, and computational physics. Choices are offered in advanced laboratory.

**General Degree Requirements**
The College of Science has in place a new undergraduate curriculum. Students should check the College of Science Web site, at www.science.purdue.edu, and speak with an academic advisor for the most up-to-date information and requirements.

**Physics Requirements** 37–57 credits
Students must complete the requirements for one of the following options:
1. Physics (43–44 credit hours in physics)
2. Physics Honors (56–57 credit hours in physics)
3. Applied Physics (37 credit hours in physics)
4. Applied Physics Honors (40 credit hours in physics)
5. Physics Teaching (40–41 credit hours in physics)

**Science Requirements**
(All Options) 8–10 credits
CHM 11500 (General Chemistry) (4 cr.); CHM 12300 (General Chemistry for Engineers I) (4 cr.); or CHM 12500 (Introduction to Chemistry I) (5 cr.)
CHM 11600 (General Chemistry) (4 cr.); CHM 12400 (General Chemistry for Engineers II) (4 cr.); or CHM 12600 (Introduction to Chemistry II) (5 cr.)

There are additional requirements of science/engineering courses for physics, physics honors, and physics teaching programs. Information follows.

**Mathematics Requirements**
(All Options) 12–15 credits
MA 16500 (Analytic Geometry and Calculus I) (4 cr.) or MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.)
MA 16600 (Analytic Geometry and Calculus II) (4 cr.) or MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); MA 17300 (Calculus and Analytic Geometry II) (5 cr.) or MA 18100 (Honors Calculus II) (5 cr.);
MA 26100 (Multivariate Calculus) (4 cr.); MA 17400 (Multivariate Calculus) (4 cr.); MA 18200 (Honors Calculus II) (5 cr.); or MA 27100 (Several Variable Calculus) (5 cr.)

There are additional requirements of mathematical methods of physics for all physics programs. Information follows.

**Additional Requirements** 33–45 credits
Students must also satisfy all additional requirements as stipulated by the College of Science. This includes: Statistics: STAT 30100 (Elementary Statistical Methods) (3 cr.); STAT 35000 (Introduction to Statistics) (3 cr.); STAT 50300 (Statistical Methods for Biology) (3 cr.); STAT 51100 (Statistical Methods) (3 cr.); or equivalent
Computing: CS 15800 (C Programming) (3 cr.); CS 17700 (Programming with Multimedia Objects) (4 cr.); CS 18000 (Programming I) (4 cr.); or equivalent
Composition, Technical Writing, and Presentation:
Teambuilding and Collaboration:
Multidisciplinary Requirement:
Language and Culture:
Great Issues:

There are many different ways to satisfy these requirements that may change over time. Therefore, there is no way to describe them fully here. Please refer to the College of Science Web site, www.science.purdue.edu, for more details. Also, some of the physics (and other) courses that satisfy physics requirements may simultaneously satisfy some of these college requirements as well. Please consult an academic advisor for more details.

**Free Electives:** (All Options) 0–22 credits
Free electives can be selected from any department within the University. Students are encouraged to use free electives to broaden their knowledge. However, free-elective credit is not allowed for courses that significantly overlap courses taken to fulfill departmental degree requirements. Students must take at least as many free electives as are needed to bring the credit hour total to 124.

A student can also use free electives to acquire a minor in a related field or in other departments at Purdue University.
Grade Requirement
Students majoring in physics or applied physics programs must have a grade-point average of 2.0 or above in all physics courses. For students majoring in Physics Honors or Applied Physics Honors programs, grades of “B-” or above must be maintained in all physics courses as well as a grade-point average of 3.0 or above in all physics courses. In addition, these honors students must maintain an overall grade-point average of 3.0 or above in all courses, and they cannot have a grade of “D+” or below in any course. For students in the Physics Teaching Program, the minimum grade-point average requirement is 2.5 in content areas and 3.0 in professional education courses.

Physics Major — Options
Students wishing to major in physics should complete the “General Degree Requirements” on page 68 plus requirements specific to the physics option as stated in this catalog.

Physics
This program offers a specialization in physics as the core of a broad general education. By using free electives in the program, a student can include concentrations in condensed matter physics, nuclear physics, astrophysics, particle physics, and other areas. Students also are encouraged to participate in one or two semesters of individual research projects with a selected faculty member.

Opportunities for employment in fields related to physics will be enhanced by taking free electives in other science courses, such as biological sciences, chemistry, computer science, geosciences, geophysics, mathematics, meteorology, statistics, and/or in various branches of engineering. With assistance from an advisor, a student can prepare an individualized program suited to career plans by selecting electives from these areas or from any other area within the University. Normally, these courses are taken as juniors or seniors. (See the sample program at www.physics.purdue.edu.)

Physics Major Course Requirements 49–50 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 17200 (Modern Mechanics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 27200 (Electric and Magnetic</td>
<td>4 cr.</td>
</tr>
<tr>
<td>Interactions)</td>
<td></td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods</td>
<td>3 cr.</td>
</tr>
<tr>
<td>of Physics I)</td>
<td></td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods</td>
<td>3 cr.</td>
</tr>
<tr>
<td>of Physics II)</td>
<td></td>
</tr>
<tr>
<td>PHYS 34000 (Modern Physics Laboratory)</td>
<td>1 cr.</td>
</tr>
<tr>
<td>PHYS 34400 (Modern Physics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 31000 (Intermediate Mechanics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 33000 (Intermediate Electricity</td>
<td>3 cr.</td>
</tr>
<tr>
<td>and Magnetism)</td>
<td></td>
</tr>
<tr>
<td>PHYS 36000 (Quantum Mechanics)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 42200 (Waves and Oscillations)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 45000 (Intermediate Laboratory)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 51500 (Thermal and Statistical</td>
<td>3 cr.</td>
</tr>
<tr>
<td>Physics)</td>
<td></td>
</tr>
<tr>
<td>Advanced Physics Laboratory Requirement:</td>
<td></td>
</tr>
<tr>
<td>PHYS 53600 (Electronic Techniques for Research) (4 cr.) or approved advanced laboratory courses e.g., PHYS 58000 (Computational Physics) (3 cr.)</td>
<td>3–4 cr.</td>
</tr>
<tr>
<td>Science/Engineering Electives Requirement:</td>
<td></td>
</tr>
<tr>
<td>Two courses offered by any Science/</td>
<td></td>
</tr>
<tr>
<td>Engineering department at 30000 level</td>
<td></td>
</tr>
<tr>
<td>or higher (or by approval)</td>
<td>6 cr.</td>
</tr>
<tr>
<td>Physics/Astronomy Elective Requirement:</td>
<td></td>
</tr>
<tr>
<td>One physics or astronomy course at the</td>
<td></td>
</tr>
<tr>
<td>30000 level or higher (or by approval)</td>
<td></td>
</tr>
<tr>
<td>The two mathematical methods courses can be replaced by courses from the math department by petition, depending on the content and performance.</td>
<td>3 cr.</td>
</tr>
</tbody>
</table>

Physics Honors Program
The honors program offers an intensive concentration in physics that provides a solid foundation for advanced studies. Successful graduates of this challenging program are recognized for both the depth and breadth of their physics education. Some have gone on to the premier graduate schools in the country and ultimately to many different career choices.

The honors program provides a solid theoretical and experimental background in mechanics, electromagnetism, optics, thermal physics, quantum mechanics, and the microstructure of matter. See the sample program at www.physics.purdue.edu.

A very important feature of this plan is a senior-year research project (PHYS 59300) in some area of modern physics, such as condensed matter physics, nuclear physics, elementary particle physics, biophysics, geophysics, etc. Students receive individual supervision and guidance from a faculty member whose specialty matches the area of their research project. PHYS 59300 introduces students to the type of research.
atmosphere that they later might encounter as professional physicists, and it promotes self-motivation and independence in their work.

Students interested in the honors program typically start by taking PHYS 17200 (Modern Mechanics) and PHYS 27200 (Electric and Magnetic Interactions) as freshmen. Transfer students or students from other majors who have taken PHYS 15200 (Mechanics) and PHYS 24100 (Electricity and Optics) (3 cr.) or PHYS 26100 (Electricity and Optics) (4 cr.) may switch into the physics honors major by taking PHYS 24200 (Introduction to Heat and Thermal Physics) (1 cr.) and PHYS 25200 (Electricity and Optics Laboratory) (1 cr.). All students should take PHYS 34000 (Modern Physics Laboratory); PHYS 34400 (Modern Physics); PHYS 42200 (Waves and Oscillations), and the two mathematical methods courses during the sophomore year. Admission to, and continuation in, the honors program is contingent upon satisfying the grade requirement described earlier.

**Physics Honors Major Course Requirements** 62–63 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 17200 (Modern Mechanics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 27200 (Electric and Magnetic Interactions)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods of Physics I)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods of Physics II)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 34000 (Modern Physics Laboratory)</td>
<td>1 cr.</td>
</tr>
<tr>
<td>PHYS 34400 (Modern Physics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 41000 (Physical Mechanics I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 41100 (Physical Mechanics II Honors)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 41600 (Thermal and Statistical Physic Honors)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 42200 (Waves and Oscillations)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 43000 (Electricity and Magnetism I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 43100 (Electricity and Magnetism II Honors)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 45000 (Intermediate Laboratory)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 46000 (Quantum Mechanics I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 46100 (Quantum Mechanics II Honors)</td>
<td>3 cr.</td>
</tr>
</tbody>
</table>

**Advanced Physics Laboratory Requirement**

PHYS 53600 (Electronic Techniques for Research) (4 cr.) or approved advanced laboratory courses, e.g., PHYS 58000 (Advanced Computational Physics) (3 cr.) 3–4 cr.

Science/Engineering Electives Requirement:

Two courses offered by any Science/Engineering department at the 30000 level or higher (or by approval) 6 cr.

Physics Specialty Electives Requirement:

Two physics specialty courses at 50000 level 6 cr.

Senior Honors Project Requirement:

PHYS 59300 (Independent Research), which leads to an approved written final report 3 cr.

The two mathematical methods courses can be replaced by courses from the math department by petition, depending on the content and performance.

**Applied Physics**

The applied physics plan of study is especially geared toward providing the physics graduate with specific expertise in preparation for immediate employment in the corporate research world or in government laboratories or graduate study. Students obtain a solid physics background plus significant experience in one or more specialties of their own choosing, selected from a wide range of choices offered by the colleges of Science and Engineering at Purdue.

The basic plan of study combines 37 credit hours of physics with 30 credit hours of applied electives. (See links on www.physics.purdue.edu.)

**Applied Physics Course Requirements** 67 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 17200 (Modern Mechanics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 27200 (Electric and Magnetic Interactions)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 34000 (Modern Physics Laboratory)</td>
<td>1 cr.</td>
</tr>
<tr>
<td>PHYS 34400 (Modern Physics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 41000 (Physical Mechanics I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 41100 (Physical Mechanics II Honors)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 41600 (Thermal and Statistical Physic Honors)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 42200 (Waves and Oscillations)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 43000 (Electricity and Magnetism I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 43100 (Electricity and Magnetism II Honors)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 45000 (Intermediate Laboratory)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 46000 (Quantum Mechanics I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 46100 (Quantum Mechanics II Honors)</td>
<td>3 cr.</td>
</tr>
</tbody>
</table>

**Applied Electives Requirement**

Additional courses in chosen applied area(s) as approved by the Department of Physics 30 cr.

Applied physics elective courses totaling 30 credit hours must be approved and signed by the advisor.
A number of recommended specialties for this major are listed below. New combinations may possibly be arranged in consultation with the department. Each student is required to have a major concentration in one specialty (14 credit hours or more) or a minor concentration in two specialties (9 credit hours or more each). Four of the elective courses must involve laboratory work.

**Applied Physics — Specialties**
The specialties under the applied physics curriculum include nanoscience and nanotechnology, nuclear engineering, aeronautical and astronautical engineering, biophysics and biomedical engineering, medical physics, computer science, electrical and computer engineering, and geophysics. Individually tailored specialties may be chosen by the student in consultation with an advisor.

**Applied Physics with Honors**
A Bachelor of Science degree with a major in applied physics with honors can be obtained by replacing several required courses in the regular applied physics program with the corresponding honors courses and adding a senior honors project. All other applied physics requirements must still be met. In addition, the grade requirements must be satisfied as described earlier.

**Applied Physics Honors Major Course Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 17200 (Modern Mechanics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 27200 (Electric and Magnetic Interactions)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods of Physics I)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods of Physics II)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 34000 (Modern Physics Laboratory)</td>
<td>1 cr.</td>
</tr>
<tr>
<td>PHYS 34400 (Modern Physics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 41000 (Physical Mechanics I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 41600 (Thermal and Statistical Physics Honors)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 42200 (Waves and Oscillations)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 43000 (Electricity and Magnetism I Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 45000 (Intermediate Laboratory)</td>
<td>2 cr.</td>
</tr>
<tr>
<td>PHYS 46000 (Quantum Mechanics I: Honors)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>Applied Electives Requirement:</td>
<td></td>
</tr>
<tr>
<td>Additional courses in chosen applied area(s) as approved by the Department of Physics</td>
<td>30 cr.</td>
</tr>
<tr>
<td>Senior Honors Project Requirement:</td>
<td></td>
</tr>
<tr>
<td>PHYS 59300 (Independent Research), which leads to an approved written final report</td>
<td>3 cr.</td>
</tr>
</tbody>
</table>

The two mathematical methods courses can be replaced by courses from the math department by petition, depending on the content and performance.

Applied physics elective courses totaling 30 credit hours are required in addition to the above courses. These must be approved and signed by the advisor. A number of recommended specialties for this major were listed in the previous section. New combinations may possibly be arranged in consultation with the department. Each student is required to have a major concentration in one specialty (14 credit hours or more), or a minor concentration in two specialties (9 credit hours or more each). Four of the elective courses must involve laboratory work.

**Physics Teaching**
This degree provides a strong background in physics, in addition to a license to teach physics at a high school and middle school level. The requirements for this degree are listed below. Additional guidelines are available at the College of Science Undergraduate Academic Advising Office, www.science.purdue.edu/counseling, and the Office of Professional Preparation and Licensure, www.teach.purdue.edu/licensure.

Since teacher certification requirements are determined by each individual state, a student will need to contact the state education licensing agency in the state(s) where he or she plans to teach. This information is available online at www.teach.purdue.edu/licensure/outstate.html. The professional semester includes six weeks of a methods course at Purdue and 10 weeks of teaching.

To receive a Bachelor of Science with a major in physics teaching, a student must maintain a grade-point average of 2.5 or above in all physics courses and 3.0 or above in education courses required to meet licensing requirements.

**Physics Teaching Major Course Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 17200 (Modern Mechanics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 27200 (Electric and Magnetic Interactions)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods of Physics I)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 29000 (Mathematical Methods of Physics II)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 31000 (Intermediate Mechanics)</td>
<td>4 cr.</td>
</tr>
<tr>
<td>PHYS 33000 (Intermediate Electricity and Magnetism)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>PHYS 34000 (Modern Physics Laboratory)</td>
<td>1 cr.</td>
</tr>
<tr>
<td>PHYS 34400 (Modern Physics)</td>
<td>4 cr.</td>
</tr>
</tbody>
</table>
PHYS 36000 (Quantum Mechanics) 3 cr.
PHYS 42200 (Waves and Oscillations) 3 cr.
PHYS 45000 (Intermediate Laboratory) 2 cr.

Advanced Physics Laboratory
Requirement: PHYS 53600 (Electronic Techniques for Research) (4 cr.) or approved advanced laboratory courses e.g., PHYS 58000 (Computational Physics) (3 cr.) 3–4 cr.

Science/Engineering Electives Requirement:
Two courses offered by any Science/Engineering department at the 30000 level or higher (or by approval) 6 cr.

Physics/Astronomy Elective Requirement:
One Physics or Astronomy course at the 30000 level or higher (or by approval) 3 cr.

The two mathematical methods courses can be replaced by courses from the math department by petition, depending on the content and performance. In addition, there are 32 credits of professional education courses required.

Professional Education Courses 32 credits
EDCI 20500 (Exploring Teaching as a Career) (3 cr.); EDCI 27000 (Introduction to Educational Technology and Computing) (2 cr.); EDCI 28500 (Multiculturalism and Education) (3 cr.); EDCI 42400 (The Teaching of Earth and Physical Sciences in the Secondary Schools) (3 cr.); EDCI 42800 (Teaching Science in the Middle and Junior High School) (2 cr.); EDCI 49800 (Supervised Teaching in Secondary Mathematics Education) (10 cr.); EDPS 23500 (Learning and Motivation) (3 cr.); EDPS 26500 (The Inclusive Classroom) (3 cr.); EDST 20000 (History and Philosophy of Education) (3 cr.)

Special Programs and Opportunities

Fifth-Year M.S. Option. Many positions for physicists require a Master of Science in physics. Students who complete the bachelor of science requirements in applied physics at Purdue with at least a 3.0 grade-point average can apply for admission to the Purdue Graduate School as a master’s candidate in physics with a specialization in applied physics. The master’s degree requirements (12 credit hours in physics and 18 credit hours in applied electives) can be completed in one year under the usual rules of the Purdue Graduate School. Note: Physics hours include 6 hours of mathematics or mathematical methods.

Professional Practice Program. The Department of Physics participates in the Professional Practice Program. Interested students can contact the Professional Practice Coordinator, Department of Physics, Physics Building, (765) 494-5383.

A student with a grade index of 3.0 or better in physics and 2.8 or better overall is eligible to apply for the Professional Practice Program. The program typically starts after the freshman year.

The department encourages students to participate in study abroad, summer internship programs, and summer undergraduate research opportunities offered around the world.

Physics Minor
The physics minor provides a strong background in physics for students majoring in some other discipline at Purdue University. To qualify for the minor, the following classes must be completed with an average grade index of at least 2.0.

Physics Minor Course Requirements 18–19 credits
PHYS 17200 (Modern Mechanics) 4 cr.
PHYS 27200 (Electric and Magnetic Interactions) 4 cr.
PHYS 34000 (Modern Physics Laboratory) 1 cr.
PHYS 34200 (Modern Physics) (3 cr.) or PHYS 34400 (Modern Physics) (4 cr.) 3–4 cr.

Physics/Astronomy Electives Requirement:
Six additional credits at the 30000 level or higher in physics or astronomy 6 cr.

PHYS 17200 (Modern Mechanics) (4 cr.) can be replaced by a combination of PHYS 15200 (Mechanics) (4 cr.) and PHYS 24200 (Introduction to Heat and Thermal Physics) (1 cr.); and PHYS 27200 (Electric and Magnetic Interactions) (4 cr.) can be replaced by a combination of PHYS 24100 (Electricity and Optics) (3 cr.) and PHYS 25200 (Electricity and Optics Laboratory) (1 cr.); or PHYS 26100 (Electricity and Optics) (4 cr.) and PHYS 25200 (Electricity and Optics Laboratory) (1 cr.) for transfer students and others who have the latter set of courses. To meet the requirements, the following prerequisite courses must be completed.

MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); or MA 16500 (Analytic Geometry and Calculus I) (4 cr.) and MA 16600 (Analytic Geometry and Calculus II) (4 cr.) 8–10 cr.

Astronomy Minor
The Astronomy minor provides a strong background in astronomy and astrophysics. This program is administered by the Department of Physics.
Astronomy Minor Course
Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 24100* (Electricity and Optics)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>equivalent</td>
<td></td>
</tr>
<tr>
<td>ASTR 36300 (Solar System Astronomy)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>ASTR 36400 (Stars and Galaxies)</td>
<td>3 cr.</td>
</tr>
<tr>
<td>ASTR 37000 (Cosmology)</td>
<td>3 cr.</td>
</tr>
</tbody>
</table>

* PHYS 17200 is a prerequisite for this course. PHTS 27200 also satisfies this requirement.

Physics/Astronomy Electives Requirement:
Three credits chosen from PHYS/ASTR 56000 (Stellar Evolution) (3 cr.); PHYS/ASTR 56100 (Galaxies and Large Scale Structure) (3 cr.); PHYS/ASTR 56200 (Introduction to High Energy Astrophysics) (3 cr.); PHYS/ASTR 56300 (Astroparticle Physics) (3 cr.); or an approved PHYS/ASTR course at or above the 40000 level.

3 cr.

Statistics

Statistics is the mathematical and computational study of data and chance. It is a methodological discipline; statisticians often work closely with people in other fields to design production of data and experiments, analyze data, and draw conclusions from data.

The Department of Statistics offers two plans of study leading to the Bachelor of Science degree:

1. Applied statistics option — prepares students for careers in applied statistics, statistical programming, and other areas that require broad knowledge of statistical ideas and techniques.
2. Mathematical statistics option — prepares students for graduate work in both applied and mathematical statistics or a quantitative field; can lead to a double major in statistics and mathematics (see page 74).

Students who complete the mathematical statistics option can arrange to obtain the M.S. in Applied Statistics degree in one additional calendar year of study. (See page 75.) Students majoring in another discipline may also choose to pursue a minor in statistics.

Students interested in becoming actuaries should consider the interdisciplinary program in actuarial science jointly administered by the Department of Statistics and the Department of Mathematics. (See page 32.) Students who complete a major in actuarial science will also, as a subset of these requirements, already fulfill the requirement for an applied statistics major. Most actuarial science majors also obtain a management minor.

The department also participates in the Professional Practice Program. (See page 9.)

Statistics is one of the few major disciplines in which having expertise can have a significant effect in fields as diverse as analytics, bioinformatics and medicine, finance and insurance, management and marketing, agriculture and forestry, economics and education, as well as communications and software design, to name a few.

Statisticians develop methods for collecting and interpreting data gathered in science, government, business and industry, and academia, to aid in the planning, decision making, and research crucial to modern society. Statisticians use computers as a tool for analyzing complex or massive data sets and solving mathematical problems. They use statistical methods to discover relationships between disease state and differences in the DNA sequences among individuals; predict election results, population growth, or the behavior of financial instruments; establish insurance or quality control standards; determine new drug effectiveness through clinical trials; or estimate the number of animals remaining in a vanishing species.

Statisticians with advanced degrees develop and evaluate statistical methods along with the mathematical and computational theories supporting these methods.

The most recent information about the statistics plans of study and opportunities is available at www.stat.purdue.edu/academic_programs/undergraduate.

General Degree Requirements

The College of Science has a recently revised undergraduate curriculum. Students should check the College of Science Web site, www.science.purdue.edu/undergraduate–curriculum/majors, and speak with an academic advisor for the most up-to-date information and requirements.

All statistics majors must satisfy the following general degree requirements. Students who meet these requirements also automatically fulfill the College of Science graduation requirements listed on pages 27–29. A total of 124 credit
hours is required. Some lower-level courses cannot be used as credit toward the degree. A higher-level course in the same subject area can be substituted for a requirement listed below. Consult academic advisors for details.

Statistics Major Course Requirements
Mathematical Statistics Option 124 credits

This rigorous program can lead to a double major in statistics and mathematics with the addition of MA 45300 (Elements of Algebra I) or MA 45000 (Algebra Honors), and MA 36600 (Ordinary Differential Equations). It prepares students for graduate work in both applied and mathematical statistics or a quantitative field. Students should consider electives in mathematics or additional courses in applied statistics. MA 30100 (Introduction to Proof Through Real Analysis) is encouraged for most students as preparation for MA 34100 (Foundations of Analysis).

STAT 35000 (Introduction to Statistics) 3 cr.
MA 35100 (Elementary Linear Algebra) 3 cr. and MA 35300 (Linear Algebra) 3 cr. 6 cr.
MA 36200 (Topics in Vector Calculus) (3 cr.); MA 44200 (Multivariate Analysis Honors I) (3 cr.); or MA 51000 (Vector Calculus) (3 cr.); MA 34100 (Foundations of Analysis) (3 cr.); or MA 44000 (Real Analysis Honors) (3 cr.) 3 cr.
STAT 41600 (Probability) 3 cr.
STAT 41700 (Statistical Theory) 3 cr.
STAT 51200 (Applied Regression Analysis) 3 cr.

Statistics Elective:
One of STAT 42000 (Introduction to Time Series) (3 cr.); or STAT 51300 (Statistical Quality Control) (3 cr.); or STAT 51400 (Design of Experiments) (3 cr.). 6 cr.

Mathematics Elective:
One of the following: MA 36600 (Ordinary Differential Equations) (4 cr.); MA 37500 (Introduction to Discrete Math) (3 cr.);
MA 42100 (Linear Programming and Optimization Techniques) (3 cr.); MA 42500 (Elements of Complex Analysis) (3 cr.);
MA 45000 (Algebra Honors) (3 cr.);
MA 453000 (Elements of Algebra I) (3 cr.); or
MA 52000 (Fourier Series and Boundary Value Problems) (3 cr.) 3 cr.

Statistics Major Course Requirements
Applied Statistics Option 124 credits

This option prepares students for careers in applied statistics, statistical programming, or other areas that require broad knowledge of statistical ideas and techniques. Employers in science, government, business, and industry appreciate this breadth. Students are encouraged to choose electives or a minor program in a field to which statistics is applied. Statistics faculty can suggest appropriate areas and courses. Because statisticians often manage and analyze large quantities of complex data, additional courses in computer science also are helpful. Advisors can help in selecting appropriate courses.

STAT 35000 (Introduction to Statistics) 3 cr.
MA 35100 (Linear Algebra) 3 cr.
MA 36200 (Topics in Vector Calculus) (3 cr.) or STAT 42000 (Introduction to Time Series) (3 cr.) 3 cr.
STAT 41600 (Probability) 3 cr.
STAT 41700 (Statistical Theory) 3 cr.
STAT 51200 (Applied Regression Analysis) 3 cr.

Statistics Electives:
Two of the following: STAT 42000 (Introduction to Time Series) (3 cr.);
STAT 47200 (Actuarial Models) (3 cr.);
STAT 47300 (Actuarial Models II) (3 cr.);
STAT 50600 (Statistical Programming and Data Management) (3 cr.); STAT 51300 (Statistical Quality Control) (3 cr.);
STAT 51400 (Design of Experiments) (3 cr.); STAT 52200 (Sampling and Survey Techniques) (3 cr.). 6 cr.

Additional Requirements for both major options in Statistics found on pages 28–29.

Science Requirements: 12–19 credits

Four laboratory courses. See page 29 for requirements. Students are strongly encouraged to elect CS 17700 (Programming with Multimedia Objects) (4 cr.) or equivalent as one of the four courses for the laboratory science requirement.

Mathematics Requirements: 12–15 credits

MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) or MA 16500 (Analytic Geometry and Calculus I) (4 cr.) 4–5 cr.

One of: MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.); MA 16600 (Analytic Geometry and Calculus II) (4 cr.); MA 17300 (Calculus and Analytic Geometry II) (5 cr.); MA 18100 (Honors Calculus I) (5 cr.) 4–5 cr.

One of: MA 26100 (Multivariate Calculus) (4 cr.);
MA 17400 (Multivariable Calculus) (4 cr.); MA 18300 (Honors Calculus II) (5 cr.); MA 27100 (Several Variable Calculus) (5 cr.) 4–5 cr.

Additional Requirements: 36–41 credits

English Composition: See page 27 for English composition requirements. 6–7 cr.
Modern Foreign Language: All College of Science majors are expected to have proficiency in another language in addition to their native language. Competency in the second language must be demonstrated at the fourth-semester college level. (See Modern Foreign Language requirements on page 28).

General Education Requirements: Students must complete 18 credit hours of study in the humanities, social sciences, and behavioral sciences. (See pages 28–29 for requirements.)

Free Electives 23–40 cr.
Free electives can be selected from any department of the University. Students are encouraged to use free electives to broaden their knowledge. However, free-elective credit is not allowed for courses that significantly overlap courses taken to fulfill departmental degree requirements. This excludes, in particular, introductory courses. Students must take at least as many free electives as is needed to bring the credit hour total to 124.

Grade Requirement
A 2.0 GPA in all mathematics and statistics courses used to meet the requirements of the major, and an overall GPA of 2.0 are required for graduation. Students are encouraged to select some free electives that will strengthen their major program. Such electives include additional courses in computer science, mathematics, or statistics, as well as courses in a discipline to which statistics is applied. Note that free electives can be selected from any department within the University, although some lower-level courses cannot be used.

Honors Program
The designation “with honors in statistics” may be awarded at commencement to students who have completed the statistics major with the mathematical statistics option with distinction and with at least three of these course substitutions:

Statistics Honors Course Substitution Requirements
MA 35000 (Elementary Linear Algebra Honors) for MA 35100 (Elementary Linear Algebra) (3 cr.)
MA 44000 (Real Analysis Honors) (3 cr.) for MA 34100 (Foundations of Analysis) (3 cr.)
MA 44200 (Multivariate Analysis I Honors) (3 cr.) or MA 51000 (Vector Calculus) (3 cr.) for MA 36200 (Topics in Vector Calculus) (3 cr.)
STAT 51600 (Basic Probability and Applications) (3 cr.) for STAT 41600 (Probability) (3 cr.)
STAT 51700 (Statistical Inference) (3 cr.) for STAT 41700 (Statistical Theory) (3 cr.)

Actuarial Science
An interdisciplinary program in actuarial science is offered jointly by the Department of Mathematics and the Department of Statistics. See page 32.

Special Programs and Opportunities
Professional Practice Program
The Department of Statistics participates in the Professional Practice Program as described on page 9. Interested students should contact the Coordinator of the Professional Practice Program, Department of Statistics, Mathematical Sciences Building. The department coordinator will have information about available programs and will be able to offer advice.

Fifth-Year Program
Many positions for statisticians require the M.S. in Applied Statistics degree. This is normally a two-year degree program; however, a student who elects the statistics major with mathematical statistics option can earn the M.S. in one additional year of study. Details are available from the Purdue Graduate School and on the Department of Statistics Web site. Students considering the fifth-year program should consult a faculty advisor as early as possible about suitable electives in their undergraduate program.

Statistics Minor
The statistics minor offers a strong quantitative background for students majoring in another discipline. Because first courses in probability and statistics are taught in several departments, the minor allows some courses taken outside the Department of Statistics. Five courses are required. At least three of these courses must be listed in the Department of Statistics.
Statistic Minor Course
Requirements  15 credits

1. An introductory statistics course: 3 cr.
   STAT 35000 (Introduction to Statistics) (3 cr.);
   STAT 50300 (Statistical Methods for
   Biology) (3 cr.); STAT 51100 (Statistical
   Methods) (3 cr.)

2. An introductory probability course: 3 cr.
   STAT 22500 (Introduction to Probability
   Models) (3 cr.); STAT 31100 (Introductory
   Probability) (3 cr.); STAT 41600 (Probability)
   (3 cr.); or an equivalent course in another
   department.

3. Applied Regression Analysis course: 3 cr.
   STAT 51200 (Applied Regression
   Analysis) (3 cr.)

4. Two of the following courses: 6 cr.
   STAT 41600 (Probability) (3 cr.) (if not
   used to satisfy requirement # 2); STAT 41700
   (Statistical Theory) (3 cr.); STAT 51300
   (Statistical Quality Control) (3 cr.);
   STAT 51400 (Design of Experiments) (3 cr.);
   IE 33600 (Operations Research–Stochastic
   Models) (3 cr.)

Interdisciplinary Science

The interdisciplinary science major is designed
to give the student a Bachelor of Science degree
with a broad base in the sciences. The major
consists of a primary area, a supporting area, and
the broad education of all College of Science
majors. The core courses are common across
the major, but the student customizes the major
by selecting a departmental or interdepartmental
primary area based in science and a supporting
area that may come from any college or school at
the University. There is a primary area represent-
ing each department in the College of Science,
and cross-disciplinary areas will be explored and
added as appropriate. Several supporting areas
have been suggested, and a student may petition
for approval of others.

Students completing the interdisciplinary sci-
ence major have gone on to a variety of careers
in and out of the world of science. These careers
include medicine, law, and other advanced-study
professions, scientific sales, technical and sci-
entific writing, computer programming, and engi-
neering.

The most recent information is available at
www.science.purdue.edu/academic–programs/
majors

General Degree Requirements

The College of Science has recently imple-
mented a revised undergraduate curriculum.
Students should check the College of Science
Web site, www.science.purdue.edu/academic–
programs/majors, and speak with an academic
advisor for the most up-to-date information and
requirements.
### Math (select one option): 6–10 credits
- a. MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.)
- b. MA 16500 (Analytic Geometry and Calculus I) (4 cr.) and MA 16600 (Analytic Geometry and Calculus II) (4 cr.)
- c. MA 223 (Introductory Analysis I) (3 cr.) and MA 22400 (Introductory Analysis II) (cr.)
- d. MA 23100 (Calculus for Life Sciences I) (3 cr.) and MA 23200 (Calculus for Life Sciences II) (3 cr.)

### Physics (select one option): 8–9 credits
- a. PHYS 17200 (Modern Mechanics) (4 cr.); PHYS 24100 (Electricity and Optics) (3 cr.); PHYS 25200 (Electricity and Optics Laboratory) (1 cr.)
- b. PHYS 17200 (Modern Mechanics) (4 cr.) and PHYS 27200 (Electric and Magnetic Interactions) (4 cr.)
- c. PHYS 22000 (General Physics) (4 cr.) and PHYS 22100 (General Physics) (4 cr.)

### Statistics (select one course): 3 credits
- STAT 35000 (Introduction to Statistics) (3 cr.); STAT 50300 (Statistical Methods for Biology) (3 cr.); or STAT 51100 (Statistical Methods) (3 cr.)

### Primary Area 12–18 credits
#### Biological Sciences: 15 credits
- BIOL 23100 (Cell Structure and Function) 3 cr.
- BIOL 23200 (Laboratory in Cell Biology) 2 cr.
- BIOL 24100 (Genetics and Molecular Biology) 3 cr.
- BIOL 24200 (Laboratory in Genetics and Molecular Biology) 2 cr.
- BIOL 28600 (Introduction to Ecology and Evolution) 2 cr.

One of:
- BIOL 39500 (Macromolecules) (3 cr.);
- BIOL 39500 (Principles of Development) (4 cr.);
- BIOL 39500 (Principles of Physiology) (4 cr.);
- BIOL 43800 (General Microbiology) (3 cr.)
- BIOL 43900 (Laboratory in Microbiology) (2 cr.)

3–5 cr.

#### Chemistry: 16 credits
- CHM 24100 (Introductory Inorganic Chemistry) 4 cr.

One of the following:
- a. CHM 25500 (Organic Chemistry (3 cr.), CHM 25501 (Organic Chemistry Laboratory) (1 cr.), CHM 25600 (Organic Chemistry) (3 cr.), and CHM 25601 (Organic Chemistry Laboratory) (1 cr.) (8 cr.)
- b. CHM 26505 (Organic Chemistry) (3 cr.), CHM 26300 (Organic Chemistry Laboratory) (1 cr.), CHM 26605 (Organic Chemistry) (3 cr.), and CHM 26400 (Organic Chemistry Laboratory) (1 cr.) 8 cr.

CHM 37200 (Physical Chemistry) 4 cr.

### Computer Science: 16 credits

#### Note:
For this primary area, CS 18000 (Programming I) (4 cr.) and MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) or equivalent must be part of the Interdisciplinary core.
- CS 18200 (Foundations of Computer Science) 3 cr.
- CS 24000 (Programming I) 3 cr.
- CS 25000 (Computer Architecture) 4 cr.
- CS 25100 (Data Structures) 3 cr.

CS elective at or above the 30000 level. 3 cr.

### Earth and Atmospheric Sciences: 16 credits

#### Note:
For this primary area, EAS 11100 (Physical Geology) (3 cr.) or equivalent must be part of the Interdisciplinary core.
- EAS 23000 (Laboratory in Atmospheric Science) (1 cr.), EAS 22100 (Survey of Atmospheric Science) (3 cr.), or EAS 22500 (Science of the Atmosphere) (3 cr.) 3 cr.

Any EAS course at or above the 20000 level or EAS 11200 (Earth Through Time) 12 cr.

### Mathematics: 17 credits

#### Note:
For this primary area, MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.) or equivalent must be part of the Interdisciplinary core.
- MA 26100 (Multivariate Calculus) (4 cr.) or MA 27100 (Several Variable Calculus) (5 cr.) 4 cr.
- MA 36600 (Ordinary Differential equations) (3 cr.) or MA 26200 (Linear Algebra and Differential Equations) (4 cr.) 3 cr.
- MA 35100 (Elementary Linear Algebra) 3 cr.

One of the following:
- a. MA 45000 (Algebra Honors) (3 cr.) or MA 45300 (Elements of Algebra I) (3 cr.)
- b. MA 34100 (Foundations of Analysis) (3 cr.)
- c. MA 44000 (Real Analysis Honors) (3 cr.) 3 cr.

MA elective at or above 30000 level. 3 cr.

### Physics: 13–14 credits

#### Note:
For this primary area, PHYS 17200 (Modern Mechanics) (4 cr.), PHYS 27200 (Electric and Magnetic Interactions) (4 cr.), and MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.), MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.), or equivalent must be part of the Interdisciplinary core.
- MA 26100 (Multivariate Calculus) (4 cr.) or equivalent 4 cr.
- PHYS 34200 (Modern Physics) (3 cr.) or PHYS 34400 (Modern Physics) (4 cr.) 3–4 cr.

Physics or Astronomy electives at or above the 30000 level. 6 cr.
Statistics: 12–13 credits

Note: For this primary area, MA 16100 (Plane Analytic Geometry and Calculus I) (5 cr.) and MA 16200 (Plane Analytic Geometry and Calculus II) (5 cr.), or equivalent must be part of the Interdisciplinary core.

One of the following:
- STAT 22500 (Introduction to Probability Models) (3 cr.), STAT 31100 (Introductory Probability) (3 cr.), STAT 41600 (Probability) (3 cr.), or STAT 51600 (Statistical Consulting Problem) (3 cr.)
- STAT 51200 (Applied Regression Analysis) (3 cr.)
- STAT 51300 (Statistical Quality Control) (3 cr.) or STAT 51400 (Design of Experiments) (3 cr.)

One of the following:
- STAT 51300 (Statistical Quality Control) (3 cr.), STAT 51400 (Design of Experiments) (3 cr.), or MA 26100 (Multivariate Calculus) (4 cr.)

Environmental Biology: 17 credits

- BIOL 23100 (Cell Structure and Function) (3 cr.)
- BIOL 24100 (Genetics and Molecular Biology) (3 cr.)
- BIOL 28600 (Introduction to Ecology and Evolution) (2 cr.)
- BIOL 48300 (Environmental and Conservation Biology) (3 cr.)
- BIOL 58500 (Ecology) (3 cr.)

One of:
- BIOL 39500 (Macromolecules) (3 cr.); BIOL 39500 (Principles of Development) (4 cr.); BIOL 39500 (Principles of Physiology) (4 cr.); or BIOL 43800 (General Microbiology) (3 cr.) and BIOL 43900 (Laboratory in Microbiology) (2 cr.)

Supporting Area 18 credits

Supporting area courses may not overlap core or primary area courses, but may overlap the General Education area. The supporting area may be built on the numerous minors or may be built on any coherent grouping of courses with a central unifying theme. These might include management, preprofessional, international studies, foreign language, history, creative writing, science policy, ethics, psychology, women’s studies, African American studies, etc. See www.science.purdue.edu/academic–programs/minors, Any plan must be approved by the dean or designee.

Sample Supporting Area for Environmental Biology:
- AGR 49000 (Special Problems) (3 cr.); CE 35000 (Environmental Engineering) (3 cr.); EAS 42000 (Global Change Modeling) (3 cr.); FNR 48800 (Global Environmental Issues) (3 cr.); PHIL 29000 (Environmental Ethics) (3 cr.); POL 52300 (Environmental Policy and Public Policy) (3 cr.)

Other courses may be used upon approval.

Additional Requirements

General Degree Requirements 36–46 credits

English Composition and Technical Writing and Presentation: See pages 27–28 for these requirements. 6–10 credits

Teambuilding and Collaboration: Students must learn the concepts involved in science team projects. See the requirements on page 28. 1–3 credits

Multidisciplinary Experience: See page 29 for requirements. 3–9 credits

Language and Culture: Science majors are expected to have proficiency in another language in addition to their native language. Competence in the second language must be demonstrated to the third semester, or to the second semester (with an additional culture or diversity class), or by an approved study abroad experience. See page 28 for the Language/Culture requirements. 9 credits

General Education: Students must complete three credits of a course approved for Great Issues and nine credits of Social Studies, Humanities, and/or Management. See pages 28–29 for the General Education requirements including the two-course sequence in Social Studies or Humanities. 12 credits

Free Electives

Free electives can be selected from almost any department of the University, and students are encouraged to use free electives to broaden their knowledge. Free-elective credit is not allowed for courses that significantly overlap courses taken to fulfill degree requirements or that do not count for credit in the College of Science. Students must take as many free electives as is needed to bring the credit hour total to 124 credits.
Information about Courses

Official Purdue University course information is available on the Web at www.courses.purdue.edu. Click on the “Search by term” link at the top of the page.

The Official Purdue University Course Repository is maintained by the Office of the Registrar and is updated instantaneously. It contains a multitude of information, including course descriptions and requisites for retired, current, and future courses offered at the West Lafayette campus as well as at Purdue Calumet, Purdue North Central, Indiana University-Purdue University Fort Wayne, Indiana University-Purdue University Indianapolis, and the College of Technology locations around the state.

The course information available online is organized by term, subject area, and course number, which enables you to tailor your search. You also may want to consult your academic advisor if you have questions about the courses required for your plan of study.

College of Science Administration and Faculty

Administration

Jeffrey Roberts, Ph.D., Frederick L. Hovde Dean of the College of Science
Jeffrey T. Bolin, Ph.D., Associate Dean of the College of Science, Research
George P. McCabe, Ph.D., Associate Dean of the College of Science, Academic Affairs
Harshvardhan, Ph.D., Associate Dean of the College of Science, Graduate Studies and International Programs
Christie L. Sahley, Ph.D., Associate Dean of the College of Science, Undergraduate Education

Heads of Instructional Departments

Ernest M. Agee, Ph.D., Head of the Department of Earth and Atmospheric Sciences
Mary Ellen Bock, Ph.D., Head of the Department of Statistics
Nicholas J. Giordano, Ph.D., Head of the Department of Physics
Richard J. Kuhn, Ph.D., Head of the Department of Biological Sciences
Rodrigo Bañuelos, Ph.D., Head of the Department of Mathematics
Aditya P. Mathur, Ph.D., Head of the Department of Computer Science
Paul B. Shepson, Ph.D., Head of the Department of Chemistry
Actuarial Science Program

R. C. Penney and J. A. Beckley, Co-Directors of the Program

M. D. Ward, Associate Director of the Program

Professors: R. C. Penney, Ph.D. (MATH); F. G. Viens, Ph.D. (MATH/STAT)

Assistant Professor: M. D. Ward, Ph.D. (STAT)

Continuing Lecturer: J. A. Beckley, B.S., F.S.A. (MATH/STAT)

Biological Sciences

R. J. Kuhn, Head of the Department

P. J. Hollenbeck, Associate Head of the Department for Research and Graduate Education

D. J. Minchella, Associate Head of the Department for Undergraduate Studies

M. C. McCann, Assistant Head for Learning and Discovery in Biological Sciences

Distinguished Professors: W. A. Cramer, Ph.D., Henry Koffler Distinguished Professor of Biological Sciences; S. B. Gelvin, Ph.D., Edwin Umbarger Distinguished Professor of Biology; W. L. Pak, Ph.D., Paul F. Oreffice Distinguished Professor of Biological Sciences; M. G. Rossmann, Ph.D., Hanley Distinguished Professor of Biological Sciences


* Joint appointment with the Department of Computer Science.
† Joint appointment with the Department of Biomedical Engineering.
‡ Joint appointment with the Department of Forestry and Natural Resources.
Chemistry

P. B. Shepson*, Head of the Department

P. T. Kissinger, Associate Head of the Department

G. C. Weaver, Associate Head of the Department

Distinguished Professors: G. M. Bodner, Ph.D., Arthur Kelly Distinguished Professor of Chemistry and Education; J. A. Chmielewski, Ph.D., Alice Watson Kramer Distinguished Professor of Chemistry; R. G. Cooks, Ph.D., Henry Bohn Hass Distinguished Professor of Chemistry; J. S. Francisco, Ph.D.*, William Moore Distinguished Professor of Earth and Atmospheric Sciences, and Chemistry; A. Ghosh, Ph.D., Distinguished Professor of Chemistry; P. S. Low, Ph.D., Joseph F. Foster Distinguished Professor of Chemistry; S. McLuckey, Ph.D., John A. Leighty Distinguished Professor of Chemistry; E. Negishi, Ph.D., Herbert C. Brown Distinguished Professor of Chemistry; F. E. Regnier, Ph.D. Distinguished Professor of Chemistry

Named Professor: P. L. Fuchs, Ph.D., R. B. Wetherill Professor of Chemistry


Assistant Professors: S. Bart Ph.D.; D. Colby, Ph.D.; C. Das, Ph.D.; B. Dian, Ph.D.; S. N. Savinov, Ph.D.; L. Slipchenko, Ph.D.; A. Wasserman, Ph.D.; Yu Xia, Ph.D.; C. Yang, Ph.D.

* Joint appointment with the Department of Earth and Atmospheric Sciences.
Computer Science

A. P. Mathur, Head of the Department

M. J. Atallah, Associate Department Head

J. T. Korb, Assistant Head of the Department

W. J. Gorman, Assistant to the Head

Distinguished Professors: M. J. Atallah, Ph.D., Distinguished Professor of Computer Science; D. E. Comer, Ph.D., Distinguished Professor of Computer Science

Named Professor: A. H. Sameh, Ph.D., Samuel D. Conte Professor of Computer Science

Professors Emeriti: W. Gautschi, Ph.D.; E. N. Houstis, Ph.D.; R. E. Lynch, Ph.D.; J. R. Rice, Ph.D., W. Brooks Fortune Distinguished Professor Emeritus of Computer Science; J. M. Steele, M.S.


Adjunct Appointments: S. Jones, Ph.D.; J. Vitter, Ph.D.

Lecturers: W. Crum, M.S.; L. Martino, Ph.D.; G. McFall, M.S.; G. Rodriguez-Rivera, Ph.D.

* Joint appointment with the Department of Mathematics.
‡ Joint appointment with Discovery Park, serving as the Director of the Cyber Center.
§ Joint appointment with the Computing Research Institute, serving as the director.
§ Joint appointment with the Department of Biological Sciences.
|| Joint appointment with the Department of Statistics.
Earth and Atmospheric Sciences

E. M. Agee, Head of the Department
T. R. Filley, Associate Head of the Department
D. A. Gillespie, Assistant to the Head

Distinguished Professors: J. H. Cushman, Ph.D.*, University Distinguished Professor of Earth and Atmospheric Sciences; J. S. Francisco, Ph.D.†, William Moore Distinguished Professor of Earth and Atmospheric Sciences, and Chemistry; H. J. Melosh, Ph.D., University Distinguished Professor of Earth and Atmospheric Sciences


Mathematics

R. Bañuelos, Head of the Department
J. E. Brown, Associate Head of the Department
D. J. Naughton, Assistant to the Head
R. L. Saerens, Assistant to the Head

Distinguished Professors: S. S. Abhyankar, Ph.D., Marshall Distinguished Professor of Mathematics; L. de Branges, Ph.D., Edward C. Elliott Distinguished Professor of Mathematics; J. H. Cushman, Ph.D.‖, Distinguished Professor of Earth and Atmospheric Sciences; A. E. Eremenko, Ph.D., Distinguished Professor of Mathematics; L. Lempert, Ph.D., Distinguished Professor of Mathematics; F. Shahidi, Ph.D.


* Joint appointment with the Department of Mathematics.
† Joint appointment with the Department of Chemistry.
‡ Joint appointment with the College of Education, Department of Curriculum and Instruction.
§ Joint appointment with the Department of Earth and Atmospheric Sciences.
‖ Joint appointment with the Department of Computer Science.
◊ Joint appointment with the Department of Statistics.


Physics

N. J. Giordano, Head of the Department

Distinguished Professors: N. J. Giordano, Ph.D., Hubert James Distinguished Professor of Physics; A. K. Ramdas, Ph.D., Lark-Horovitz Distinguished Professor of Physics; I. P. Shipsey, Ph.D., Julian Schwinger Distinguished Professor of Physics; Daniela Bortoletto, Ph.D., Distinguished Professor of Physics


* Joint appointment with the Department of Earth and Atmospheric Sciences.
† Joint appointment with the Department of Statistics.
‡ Joint appointment with the College of Education, Department of Curriculum and Instruction,
Statistics

M. E. Bock, Head of the Department

R. W. Doerge, Associate Head of the Department

Distinguished Professor: W. S. Cleveland, Ph.D., Shanti S. Gupta Distinguished Professor of Statistics


Associate Professors: A. Gluhovsky, Ph.D.; M. Levine, Ph.D.; J. Xie, Ph.D.; T. L. Zhang, Ph.D.; M. Zhu, Ph.D.


Courtesy Appointment: L. Si, Ph.D.

Lecturers: J. Beckley, FSA*; J. Deely, Ph.D.; J. Dobbin, M.S.; E. Gundlach, M.S.; T. Howell, M.S.; T. Qin, Ph.D.; S. Sorola, M.S.

* Joint appointment with the Department of Mathematics.
† Joint appointment with the College of Agriculture, Department of Agronomy.
‡ Joint appointment with the Department of Computer Science.
Instructional Units

Agriculture
Agricultural and Biological Engineering
Agricultural Economics
Agronomy
Animal Sciences
Biochemistry
Botany and Plant Pathology
Entomology
Food Science
Forestry and Natural Resources
Horticulture and Landscape Architecture
Youth Development and Agricultural Education

Consumer and Family Sciences
Child Development and Family Studies
Consumer Sciences and Retailing
Foods and Nutrition
Hospitality and Tourism Management

Education
Curriculum and Instruction
Educational Studies

Engineering
Aeronautics and Astronautics
Agricultural and Biological Engineering
Biomedical Engineering
Chemical Engineering
Civil Engineering
Construction Engineering and Management
Electrical and Computer Engineering
Engineering Education
Industrial Engineering
Interdisciplinary Engineering
Materials Engineering
Mechanical Engineering
Nuclear Engineering

Health Sciences

Liberal Arts
Aerospace Studies
Anthropology
Bands
Communication
English
Foreign Languages and Literatures
General Studies
Health and Kinesiology
History

Interdisciplinary Studies
Military Science
Naval Science
Philosophy
Political Science
Psychological Sciences
Sociology
Speech, Language, and Hearing Sciences
Visual and Performing Arts

Management
Economics
Management

Nursing

Pharmacy and Pharmaceutical Sciences
Industrial and Physical Pharmacy
Medicinal Chemistry and Molecular Pharmacology
Pharmacy Practice

Science
Biological Sciences
Chemistry
Computer Science
Earth and Atmospheric Sciences
Mathematics
Physics
Statistics

Technology
Aviation Technology
Building Construction Management Technology
Computer Graphics Technology
Computer and Information Technology
Electrical and Computer Engineering Technology
Industrial Technology
Manufacturing Engineering Technology
Mechanical Engineering Technology
Organizational Leadership and Supervision

Veterinary Medicine
Basic Medical Sciences
Comparative Pathobiology
Veterinary Clinical Sciences
Veterinary Medicine
Index

Abbreviations, 31
Academic advising, 21
Academic credit load, 30
Academic policies, 30
Accelerated programs, 21
Actuarial science, 32, 33, 65
Admissions, 14
     statewide system, 15
     transfer criteria, 14
Advanced Technical Experience Program, 53
Advisors, academic, 21
Applied mathematics, 63
Applied physics
     astronomy minor, 72
     fifth-year M.S. option, 74
     Professional Practice Program, 84
     program with honors, 72
     specialties, 71
Astronomy minor, 72
Atmospheric science, 56, 59
Bachelor of Science degree, 27
Biochemistry, 38
Bioinformatics, 49
Biological sciences
     administration and faculty, 79, 80
     biochemistry, 38
     biochemistry honors, 39
     biology, 37
     cell, molecular, and developmental, 40
     department, 34
     ecology, evolution, and environmental, 41
     general degree requirements, 35
     genetics, 41
     honors programs, 39, 44
     honors research program, 43
     microbiology, 42
     microbiology honors, 42
     minor, 45
     neurobiology and physiology, 43
     plans of study, 34
     preprofessional major, 44
     Professional Practice Program, 45
     special assignments, 44
     special programs and opportunities, 44
     summer internships, 45
     teaching major, 39
     undergraduate research, 44
Career counseling, 21, 23
Cell, molecular, and environmental biology, 40
Center for Career Opportunities, 22, 23
Chemistry
     ACS–accredited degree in chemistry/
     biochemistry, 48
     administration and faculty, 79, 81
     advanced technical experience program, 53
     atmospheric, 48
     bioinformatics, 49
     B.S. in chemistry, 47
     B.S. in chemistry/chemical
     engineering (dual degree), 50
     B.S. in chemistry/materials science and
     engineering (dual degree), 51
     B.S. with chemistry major, 50
     B.S. with chemistry major/materials science
     specialization, 50
     B.S. with chemistry teaching major, 50
     computational, 49
     department, 46
     environmental, 49
     grade requirement, 47
     honors program, 52
     minor, 53
     plans of study, 46
     preprofessional major preparation, 52
     Professional Practice Program, 52
College of Education Academic Services, 23
College of Science, 8, 79
Computer science
     administration and faculty, 79, 82
     department, 53
     five-year combined B.S./M.S. program, 55
     honors program, 54
     minor concentration, 55
     Professional Practice Program, 55
     restrictions of college requirements, 54
     software engineering, 55
Cooperatives, 20
Core mathematics option, 62
Costs, 18
Counseling, 21, 22
Courses
     equivalent, preparatory, and transfer, 30
     information about, 79
     multiple enrollments, 30
Developmental biology, cell, molecular, and, 40
Early registration (STAR), 14
Earth and atmospheric sciences
     administration and faculty, 79, 83
     applied statistics option, 74
     atmospheric science (meteorology), 56, 58
     careers, 56
     department, 53
     earth/space science teaching, 58, 60
     engineering geology, 57
     environmental, 58
     general degree requirements, 58
     geochemistry, mineralogy, and petrology, 57
     geology, 56, 60
     geophysics, 57, 60
     grade requirement, 59
     honors research program, 60
     hydrogeology, 57
     marine science, 58
     minor, 61
     paleontology and paleoecology, 57
     plans of study, 56
     special programs and opportunities, 60
     structural geology, 57
     summer field experience, 60
     upper-division requirements, 59
Ecology, evolution, and environmental biology, 41
Engineering geology, 57
Environmental chemistry, 49
Environmental science, 58
Expenses, 17
Family accommodations, 20
Fees, 17
Financial aid, 18
Fraternities, 21

General requirements of College of Science, 26
Genetics biology, 41
Geochemistry, mineralogy, and petrology, 57
Geology and geophysics, 60
Geology, general, 56
Graduate school, 8
Graduation rates, 24
Graduation requirements, 26

Heads of instructional departments, 79
Honors programs
  applied physics, 71
  biological sciences honors research, 43
  chemistry, 52
  computer science, 54
  earth and atmospheric sciences honors research, 60
  mathematics, 67
  physics, 69
  statistics, 75
Housing, 19

Immunization, proof of, 15
Indiana Department of Education, 13
Information about courses, 79
Instructional department heads, 79
Instructional units, 86
Interdisciplinary science, 76
  biological sciences, 77
  chemistry, 77
  computer science, 77
  earth and atmospheric sciences, 77
  general degree requirements, 76
  mathematics, 77
  physics, 77
  statistics, 78
International students, 15

Language and culture requirements, 28
Libraries, 25
Living accommodations, 19

Major
  choosing a, 9
  declaration of, 30
Married student/family accommodations, 20
Mathematics
  actuarial science (interdisciplinary), 32, 65
  administration and faculty, 79, 83
  applied option, 63
  business option, 63
  computer science option, 64
  core option, 62
  department, 61
  general degree requirements, 61
  grade requirement, 62
  honors program, 62, 66
  minor, 66
  operations research option, 64
  Professional Practice Program, 66
  statistics option, 64
  teacher education, 65

Men’s residences, 19
Meteorology, 56
Microbiology, 42
Military training, 15
Minors, 31
  biological sciences, 45
  chemistry, 53
  computer science, 55
  earth and atmospheric sciences, 61
  mathematics, 66
  physics, 72
  statistics, 75
Molecular biology, 40
Multidisciplinary experience, 29

Neurobiology and physiology, 43
Nondiscrimination policy statement, 15
Office of Field Experiences, 12, 13
Office of Professional Preparation and Licensure, 11, 14
Operations research, 64
Organization and purpose of College of Science, 8

Paleontology and paleoecology, 57
Pass/not-pass option, 30

Physics
  administration and faculty, 79, 84
  applied, 70, 71
  applied physics — specialties, 71
  applied physics with honors, 71
  astronomy minor, 72
  atmospheric science (meteorology), 56, 58
  department, 69
  fifth-year M.S. option, 72
  general degree requirements, 68
  grade requirement, 69
  minor, 74
  physics honors, 67
  physics major, 67, 69
  plans of study, 67
  Professional Practice Program, 72
  teaching, 71
Placement service, 22, 23

Plans of study, 32
  ACS–accredited chemistry/biochemistry, 48
  actuarial science, 32, 33
  applied mathematics, 63
  applied physics, 70
  applied physics with honors, 71
  applied statistics, 74
  astronomy minor, 72
  atmospheric chemistry, 49
  biochemistry, 38
  biochemistry honors, 39
  bioinformatics, 49
  biological sciences honors research, 43
  biological sciences minor, 45
  biology, 37
  biology honors research, 43
  biology preprofessional program, 44
  biology teaching, 39
  B.S. in chemistry, 47
  B.S. in chemistry/chemical engineering (dual degree), 50
  B.S. in chemistry/materials science and engineering (dual degree), 51
B.S. with chemistry major, 48
B.S. with chemistry teaching major, 50
business mathematics, 63
cell, molecular, and developmental biology, 40
chemistry honors, 52
chemistry minor, 53
chemistry preprofessional, 44
computational chemistry, 49
computer science, 54
computer science five-year combined B.S./M.S., 55
computer science honors, 54
earth and atmospheric sciences, 56, 58
earth and atmospheric sciences honors research, 60
earth and atmospheric sciences minor, 61
earth/space science teaching, 58, 60
ecology, evolution, and environmental biology, 41
environmental chemistry, 49
genetics, 41
interdisciplinary science, 76
mathematical statistics option, 64
mathematics, computer science option, 64
mathematics, core, 62
mathematics honors, 62, 66
mathematics minor, 66
mathematics operations research, 64
mathematics teaching, 65
microbiology, 42
microbiology honors, 42
neurobiology and physiology, 43
operations research, 64
physics, 67, 69
physics honors, 67
physics minor, 74
physics teaching, 71
preprofessional major, 44, 52
software engineering, 55
statistics, 75
statistics, applied statistics option, 74
statistics, fifth-year program, 75
statistics honors, 75
statistics, mathematical statistics option, 74
statistics minor, 5, 76
teaching, 39, 50, 58, 60, 65, 71
Preprofessional major, 44, 52
Professional Practice Program, 9, 45, 52, 55, 66, 72, 75
Purdue: A world of possibilities, 5
Refunding of fees and tuition, 18
Requirements for graduation, 26
Residences, University, 22
Scholarships, 9
Science Diversity Office, 22
Science teaching, 10, 23, 26, 27, 39, 50, 58, 60, 65, 71
Services for students, 23
Sororities, 21
Statewide Purdue system, 15
Statistics administration and faculty, 79, 85
applied statistics option, 74
department, 73
fifth-year program, 75
general degree requirements, 73
grade requirement, 75
honors program, 75
mathematical statistics option, 74
minor, 75, 76
Professional Practice Program, 75
Student Access, Transition and Success Programs (SATS), 14
Student orientation and support programs, 15
Students international, 15
transfer, 14
with disabilities, 26
Study abroad, 26
Summer field experience, 60
Summer Transition, Advising, and Registration (STAR), 15
Teacher education program, 10
Teacher education requirements, 10
Teacher preparation, 10, 23, 26, 39, 50, 58, 60, 65, 71
Technology Resources Center, 23
Title II reporting requirements, 10
Transfer admissions criteria, 14
Transfer students, 14
University Regulations publication, 24
University Residences, 21
Women in Science Programs, 22
Women’s residences, 19
Zachary’s Law, 11, 12, 13