Purdue University
Bulletin 1982-84

Indiana University
Purdue University
at Indianapolis

School of SCIENCE

Degree Programs
School of Science

Biology
Bachelor of Arts ..... (PU)
Biology
Bachelor of Science ..... (PU)
Biology
Master of Science ..... (PU)
Biology
Biology Teaching

Chemistry
Bachelor of Arts ..... (PU)
Preprofessional Chemistry Major
Bachelor of Science ..... (PU)
Chemistry Major
Professional Chemistry Major-A.C.S. Certified
Master of Science ..... (PU)
Chemistry

Computer and Information Science
Bachelor of Science ..... (PU)
Computer Science
Master of Science ..... (PU)
Computer Science

Geology
Bachelor of Arts ..... (IU)
Geology
Earth Science Teaching
Bachelor of Science ..... (IU)
Geology

Mathematical Sciences
Bachelor of Science ..... (PU)
Applied Mathematics
Mathematics Teaching
Pure Mathematics
Master of Science ..... (PU)
Applied Mathematics
Mathematics
Master of Arts ..... (PU)
Teaching Mathematics
Doctor of Philosophy ..... (PU)
Applied Mathematics

Physics
Bachelor of Science ..... (PU)
Physics
Physics Teaching

Psychology
Bachelor of Arts ..... (PU)
Psychology
Bachelor of Science ..... (PU)
Psychology
Master of Science ..... (PU)
Applied Social Psychology/Program Evaluation
Habilitation/Early Intervention
Industrial/Organizational Psychology
Rehabilitation Psychology
Doctor of Philosophy ..... (PU)
Rehabilitation Psychology

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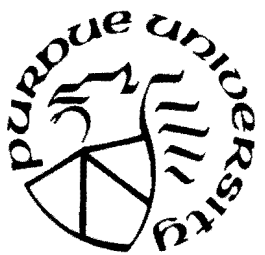

School of SCIENCE

1125 East 38th Street
P.O. Box 647
Indianapolis, IN 46223

IUPUI Calendar 1982-84

Summer Sessions 1982

First Semester 1982-83

Registration	August 17-20, 23
Classes begin	August 25
Labor Day recess	September 6
Thanksgiving recess	November 23-28
Classes resume	November 29
Classes end	December 13
Final exams	December 14-20

Second Semester 1982-83

Registration	January 3-7
Classes begin	January 10
Spring recess	March 13-20
Classes resume	March 21
Classes end	May 1
Final exams	May 2-8

Summer Sessions 1983

Registration	May 9-10
Classes begin	May 11
Classes end	June 22
Registration	June 23-24
Classes begin	June 27
Classes end	August 8

First Semester 1983-84

Registration	August 18, 19, 22
Classes begin	August 24
Labor Day recess	September 5
Thanksgiving recess	November 22-27
Classes resume	November 28
Classes end	December 12
Final exams	December 13-19

Second Semester 1983-84

Registration	January 4-6
Classes begin	January 9
Spring recess	March 11-18
Classes resume	March 19
Classes end	April 29
Final exams	April 30-May 6

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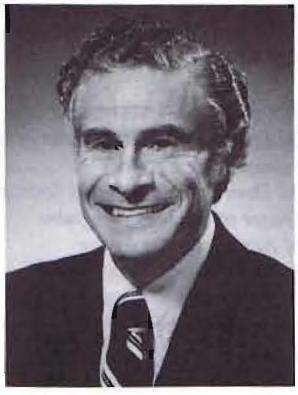

Marshall C. Yovits, Dean

Professor Robert Hall
1980 Recipient
Loren T. Jones Award
as Outstanding Science Teacher

Professor Martin O'Donnell
1981 Recipient
Loren T. Jones Award
as Outstanding Science Teacher

Recipients are chosen annually by the Dean's Student Advisory Committee from nominations received from students and faculty.

Professor John Kremer
1980 Recipient
William A. Nevill Award
for Improvement of Teaching

Recipients have been chosen annually since 1980 by the Improvement of Teaching Committee. No award in 1981.

Professor Patricia Boaz
1981 Recipient
Golden A. Flake Award
for Excellence in Academic Counseling

Recipients have been chosen annually since 1981 by the Dean's Student Advisory Committee from nominations received from students.

Administrative Officers

INDIANA UNIVERSITY-PURDUE UNIVERSITY AT INDIANAPOLIS

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HOWARD G. SCHALLER, Ph.D., *Executive Dean and Dean of the Faculties*
PAUL J. NAGY, Ph.D., *Associate Dean of the Faculties*
WENDELL F. McBURNEY, Ed.D., *Dean for Research and Sponsored Programs*
WILLIAM A. NEVILL, Ph.D., *Director of Graduate Programs*
NEIL E. LANTZ, M.S., *Director of Administrative Affairs*
GEORGE R. LINDLE, *Director of Budgeting and Fiscal Affairs*
GOLAM MANNAN, Ph.D., *Dean for Student Services*
JOHN C. KRIVACS, M.S., *Director of Admissions*
RICHARD SLOCUM, Ph.D., *Registrar*
FRANK E. NORDBY, M.A., *Evening Administrator*

PURDUE UNIVERSITY SCHOOL OF SCIENCE AT IUPUI

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NEAL ROTHMAN, Ph.D., *Chairperson, Mathematical Sciences*
Chairperson, Physics (Appointment pending)
DANIEL LANDIS, Ph.D., *Chairperson, Psychology*

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President (Appointment pending)
FELIX HAAS, Ph.D., *Provost*
STRUTHER ARNOTT, Ph.D., *Vice President for Research and Dean of the Graduate School*
WILLIAM A. NEVILL, Ph.D., *Assistant Dean of the Graduate School*
ROBERT A. GREENKORN, Ph.D., *Administrative Dean for Regional Campuses*
R. BRUCE RENDA, Ph.D., *Dean of the Purdue School of Engineering and Technology at Indianapolis*
MARSHALL C. YOVITS, Ph.D., *Dean of the Purdue School of Science at Indianapolis*

INDIANA UNIVERSITY

JOHN W. RYAN, Ph.D., *President of the University*
HERMAN B WELLS, A.M., LL.D., *Chancellor of the University*
W. GEORGE PINNELL, D.B.A., *Executive Vice President of the University*
GLENN W. IRWIN, JR., M.D., *Vice President Indianapolis*
KENNETH R.R. GROS LOUIS, Ph.D., *Vice President Bloomington*
EDGAR G. WILLIAMS, D.B.A., *Vice President for Administration*
JOHN D. MULHOLLAND, M.B.A., *Treasurer of the University*

IUPUI Perspective

Indiana University established its first extension center at Indianapolis in 1916. The Purdue University Indianapolis campus grew out of World War II training programs sponsored by Purdue and began its major operations in 1946. Indiana University established an Indianapolis regional campus in the mid-1960's. The Indianapolis unit of the Indiana University regional campus system was separated from the other units in 1968 when Indiana University at Indianapolis was created by the board of trustees. Less than a year later, in 1969, the boards of both Indiana and Purdue Universities merged their Indianapolis operations to form Indiana University-Purdue University at Indianapolis.

A restructuring of undergraduate programs at IUPUI in the fall semester, 1972, created three new schools, the School of Liberal Arts (humanities and the social sciences), the School of Science (physical, behavioral and life sciences), and the School of Engineering and Technology. Work in the School of Liberal Arts and the School of Engineering and Technology is concentrated on the main campus on West Michigan Street, while work in the School of Science is at both the 38th Street Campus and the main campus on West Michigan Street.

Because IUPUI combines the arts and sciences and the professions, including engineering and technology, it is the most comprehensive public institution of higher learning in the state. This broad spectrum of educational opportunities enables its students to prepare for a wide range of careers. All degrees earned are from Indiana University or Purdue University.

IUPUI has an urban orientation. Most of its students commute, and many of its programs are directly related to metropolitan concerns and aspirations. IUPUI has a growing enrollment that exceeds 20,000 students, 1,200 faculty, and a 4,900-member supporting staff. Professionals from business, industry, hospitals, and government agencies are often used as part-time lecturers so that their practical experiences provide students with additional educational insights. School of Science students have the opportunity to participate in cooperative education programs with area industry.

IUPUI divisions include the country's second largest medical school, a dental school with an international reputation for its research in preventive dentistry, and the state's only graduate-degree-granting school of nursing. These, with associated teaching hospitals, clinics, and research facilities, form the state's major concentration of health care resources.

Other IUPUI units include the only graduate school of social work in the state, the country's oldest school of physical education, a law school with an urban emphasis, a nationally recognized school of art and Schools of Education, Business, Journalism, and Public and Environmental Affairs. Purdue brought to the merger a growing complex of degree programs and the parent institution's traditional strengths in the physical sciences, engineering and technology.

Both the graduate and undergraduate divisions of IUPUI are fully accredited by the North Central Association of Colleges and Secondary Schools. This assures the recognition of IUPUI credits, and that graduates are able to study in virtually any school in the nation. Because of the organization of the School of Science, all degrees awarded are Purdue University degrees, except those given in Geology which are Indiana University degrees.

The School of Science

The School of Science offers many undergraduate and graduate programs that will prepare students for a variety of careers now open to scientists. Scientists are encouraged by society to pursue new avenues of research, either as individuals, or as part of research teams employing many scientists. Needed to design computers and computer programs, locate and analyze natural resources, and help find ways to protect our environment, scientists can apply

research findings to industrial and human problems. They are wanted as administrators for governmental organizations using other scientists, and as salesmen and managers by companies with science-based products.

Undergraduate training in one or several of 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 School of Science also is very much interested in helping young people whose goal is not a career in science but a general education with emphasis on the scientific aspects of our culture.

Supplementing the full-time instructional staff with rank ranging from instructor through full professor is a contingent of well-qualified, experienced lecturers who are recruited from the reserve of talent existing in the Indianapolis area.

The School of Science offers Bachelor of Arts degrees in Biology, Chemistry, Geology, and Psychology. Bachelor of Science degrees are offered in Biology, Chemistry, Computer Science, Geology, Mathematics, Physics, and Psychology. Master of Science degrees are offered in Computer Science, Biology, Chemistry, Psychology, and Mathematics. A Ph.D. program in Rehabilitation Psychology is also offered. All degrees awarded are Purdue University degrees, except those given in Geology which are Indiana University degrees.

Student Welfare and Responsibility

All colleges and universities establish certain academic requirements which must be met before a degree is granted. These regulations concern such things as curricula and courses, majors and minors, and campus residence. Advisers, directors, and deans will always help students meet these requirements, but students are responsible for fulfilling them. At the end of the course of study, the faculty and the Board of Trustees vote upon the conferring of degrees. If requirements have not been satisfied, degrees will be withheld pending adequate fulfillment. For this reason, it is important for students to acquaint themselves with all regulations and remain currently informed throughout their university career.

This Bulletin lists the requirements and regulations in effect for students who enter IUPUI in January 1982. Students who enter after this date may be subject to different requirements; students who entered prior to January 1982 may elect to follow the graduation requirements which were in effect at the time of their admission to their degree program or the graduation requirements which became effective thereafter. However, the requirements chosen must be from only one Bulletin.

Program Planning and Counseling Guidelines

The experience of faculty advisers and of successful students suggests the following guidelines for effective planning of undergraduate programs:

1. Students should be thoroughly familiar with all academic requirements which must be met before a degree is granted.
2. Students should seek an appointment with a faculty adviser in their major department on or before the dates established by the University calendar for academic counseling. In such conferences, students should, as a minimum objective, make certain that they understand a program for successful completion of the degree requirements and that they have made an appropriate plan for the next semester.
3. Each student should understand that the responsibility for making an appropriate academic program and for meeting every degree requirement rests with the student; faculty members acting in the capacity of advisers are obligated only to assist students in meeting this responsibility. If any student needs clarification of any of the requirements for the degree program, he or she is urged to obtain this clarification from a faculty adviser or from the Office of the Assistant Dean for Academic Affairs, the School of Science, Krannert Science Building, Room 155.

Confidentiality of Student Records

Indiana University, in compliance with the General Education Provisions Act, Section 438, titled Family Educational Rights and Privacy Act, provides that all student records are confidential and available only to the student and to the student's parents, if the student is under twenty-one and dependent as defined by IRS standards. The student may review his or her record upon request and may ask for deletions or corrections of the record in a hearing process described in detail in the booklet, *Student Rights and Responsibilities*. References, recommendations, and other similar documents may carry a voluntary waiver relinquishing the student's right to review this specific material. The student may also release the record to others by signing a written release available in the offices which maintain records. Further details regarding the provisions of the Privacy Act, and a list of offices where student records are kept may be found in the booklet, *Student Rights and Responsibilities*, available in the office of the Dean for Student Services, University Library, Room 002.

Student Conduct

Rules for student conduct are in keeping with the diverse nature of the student body and faith of the University in student responsibility.

A code of student conduct, enacted by the governing Indiana University Board of Trustees, is designed to assure due process for all students requiring disciplinary action. Student conduct is the responsibility of the Dean of each School or academic division. Within the School of Science an Academic Appeals Committee assists the Dean in these matters. The Dean for Student Services has the assignment of implementing central administration action if necessary. More information can be obtained in the *Student Rights and Responsibilities* booklet.

Career Counseling and Placement

The Office of Career Counseling and Placement (OCCP) provides services for students and alumni/ae in evaluating career interests and opportunities and assistance to graduating students in job-search strategies, resume preparation, interviewing techniques, and on-campus recruiting interviews.

The office maintains a career resource library containing company literature, occupational and career information, employment trends, and specific full-time employment opportunities at both the graduate and undergraduate level.

Recruiting companies interview graduating students on campus during the fall and spring semesters. Students may take advantage of this opportunity by registering with the office located in the Business/SPEA Building, Room 2010.

In addition to the Office of Career Counseling and Placement, information about specific career fields is also available in the Office of the Assistant Dean for Academic Affairs and departmental chairpersons' offices.

Housing

Residential housing for IUPUI students is located at the main campus with approximately 600 accommodations for single students and 160 apartments for married students. Facilities are available to students from all divisions of IUPUI on a first-come basis. Residential housing is managed by the Department of Housing. In addition, off-campus housing is available to students throughout Indianapolis. Although the University does not control off-campus housing facilities, the Department of Housing maintains a file of rooms and small private home apartments. In addition, the University manages Park Lafayette, located at 2300 N. Tibbs, featuring one, two, three, and four bedroom units. For information call IUPUI Real Estate, 264-8264 or Park Lafayette, 635-7923.

Information for International Students

International students attending IUPUI are required to register with the Office of International Programs and Services as soon as possible after their arrival in Indianapolis. The Office of

International Programs and Services is officially appointed to represent the U.S. Immigration and Naturalization Service on the IUPUI campus, and it is available to international students at all times to assist them with matters relating to their visas. In addition, the Office of International Programs and Services is prepared to assist international students with any type of problem during their stay at IUPUI, or even prior to their arrival.

The address is:
Office of International Services
Indiana University-Purdue University at Indianapolis
Cavanaugh Hall, Room 101
Indianapolis, IN 46202

Expenses and Financial Aid Admissions and Transfers

Costs and Fees

The cost of attending IUPUI generally is related to the number of credit hours students take. The fee structure for general academic areas of IUPUI as of January 1982 is as follows:

	In-State	**Out-of-State**
Undergraduate	$34.50/credit hour	$85/credit hour
Graduate	$50/credit hour	$131.50/credit hour

There may be other fees, such as laboratory, late registration, parking, and special fees for certain courses and programs.

Fees are subject to change without notice by action of the Board of Trustees of Indiana University. Inquiries about fees should be directed to the Office of the Bursar, University Services Building, Room 115.

Full-time undergraduate students usually enroll for 15 to 17 credit hours per semester; thus an entire year for an in-state resident costs about $1500 for fees, books and class supplies. Other expenses, such as transportation, food and entertainment, vary according to individual needs.

Refund Policy

Refunds during the Fall and Spring semesters and Summer Sessions are based upon the date of withdrawal as stated below:

1. For courses scheduled 9-16 weeks in length:

1st week	100% refund
2nd week	75% refund
3rd week	50% refund
4th week	25% refund
5th week	NO REFUND

2. For courses scheduled 5-8 weeks in length:

1st week	100% refund
2nd week	50% refund
3rd week	NO REFUND

To be eligible for a refund, students must submit a Withdrawal form to the Registrar's Office for the course they wish to drop. Refund amounts are determined by the official date on which the Withdrawal form is received by the IUPUI Registrar's Office, Cavanaugh Hall, Room 119.

Credit by Examination and Special Credit Fee Structure

If the credit is awarded as the result of an examination and:

1. during the first or second consecutive semester of matriculation, there is no charge:
2. the student is a first semester *transfer* student, there is a $10 per credit hour charge; or

If the student is neither 1. nor 2., then the student will pay the standard per semester fee at the appropriate resident or nonresident rate.

If the credit is the result of experience or credentials, the student will be charged $10 per credit hour with a maximum charge of $50 per course.

Health Care and Insurance

The Student Employee Health Service (SEHS) is located in Coleman Hall. All full-time IUPUI students are eligible for the program of outpatient health care provided by SEHS. There is no charge for the services of physicians, nurses, or specialty consultants. In addition, the SEHS clinic has available about 70 specialty clinics to which students may be referred. The University has also arranged for an optional health insurance plan to supplement the services provided by the SEHS Clinic. All students are eligible for this program through a private insurance carrier. Part-time students may be treated in the Student Employee Health Service on a fee for service basis. Information is available at registration and at SEHS (telephone: 317-264-8214).

Financial Aid

It is the philosophy of IUPUI to encourage students in their educational goals and to reduce financial barriers. The University recognizes that many students and their parents cannot afford to finance a college education entirely from their own income and assets. For this reason, a program of financial assistance is available to admitted and enrolled students who have a demonstrated financial need. Aid is available in the form of scholarships, grants, and participation in the work-study program.

Individuals desiring further information about any of the financial aid programs should write to:

Office of Scholarships & Financial Aids
The Berkey Building
920 West Michigan Street
Indianapolis, Indiana 46223
(telephone: 317-264-4162)

Veterans' Benefits

Students eligible for education benefits from the Veterans Administration enroll according to the following benefits scale:

Benefits	**Undergraduate**		**Graduate**	
	Fall/Spring	Summer (8 weeks)	Fall/Spring	Summer (8 weeks)
Full time	12 hrs or more	6 hrs or more	9 hrs or more	6 hrs or more
¾ time	9-11 hrs	4-5 hrs	7-8 hrs	4-5 hrs
½ time	6-8 hrs	3 hrs	5-6 hrs	3 hrs
Tuition only	less than 6 hrs	less than 3 hrs	less than 5 hrs	less than 3 hrs.

For further information including VA paid tutorial assistance and work/study opportunities consult the Office of Veterans Affairs at the Registrar's Office in Cavanaugh Hall, Indianapolis, IN 46202 (317-264-4332).

Admissions and Transfers

All students entering the School of Science must have been officially admitted to the University by the Office of Admissions, 425 Agnes St., Indianapolis, Indiana 46202. Further information and application forms are obtainable at this address. All applications for

admission must be accompanied by a $15 non-refundable fee. Checks should be made payable to IUPUI.

IUPUI offers instruction during two semesters and two six-week summer sessions. Students may start a program of study with any regularly scheduled session. These begin in August, January, and May. Generally admissions are open until registration for classes.

Beginning Students

When entering directly from high school, the application for admission should be filed at the end of the junior year.

Acceptance as a new student in the University is influenced by several factors. The Office of Admissions is guided by the following:

1. Graduation from a high school accredited by a State Department of Public Instruction.
2. The extent to which the student meets or exceeds the minimum subject requirements is indicated below. For admission to the School of Science, the student's record should include:

Subjects	**Semesters**
English	6
History or social studies	2
Algebra*	3
Geometry*	2
Trigonometry or fourth semester Algebra*	2
Laboratory Science*	2

**Students in the B.A. and B.S. programs in Psychology and the B.A. Program in Geology are required to have four semesters of mathematics, two of which will be in algebra, for admission to the School of Science.*

Students may be admitted with some deficiencies in mathematics or laboratory science. Such deficiencies may be removed by taking courses offered by the School of Science. However, these courses may not be counted as credit toward a School of Science degree. If the high school offers more than the above mathematics courses, students may benefit from taking analytic geometry (pre-calculus mathematics). It is advised that one semester of chemistry be included in laboratory science.

In planning high school electives, the curricula of the various departments of the School of Science contained in this bulletin should be reviewed. Note that some degree programs require German. Thus, some study of German in high school may be valuable (although not required). Departmental counselors will be glad to help with preplanning for admission.

3. Rank in High School class
   a. Residents of Indiana must rank in the upper half of their high school graduating class or have a combined verbal-math SAT of 950. Agriculture students must rank in the upper two-thirds of their class or have a combined verbal-math SAT of 950. A marginal applicant may be granted admission, admitted on probation, or have admission denied.
   b. Out-of-state applicants must rank in the top third of their high school graduating class.
4. College Board Scholastic Aptitude Test results
   a. All applicants are required to take the College Board Scholastic Aptitude Test (SAT).
   b. An out-of-state applicant must rank in the top third of the IUPUI distribution on the SAT.
   c. It is recommended that the SAT be taken in the spring of the junior year in high school.
   d. Residents of Indiana must rank in the upper one-half of their high school graduating class or have a combined verbal-math SAT of 950. Agriculture students must rank in

the upper two-thirds of their class or have a combined verbal-math SAT of 950. A marginal applicant may be granted admission, admitted on probation, or have admission denied.

5. Information provided by the high school counselor

If one declares a major at the time of application for admission, a departmental adviser will be assigned. It is recommended that preplanning be directed toward a choice of major at the time of admission. Premedical and pre-dental students should declare a chemistry or biology major at the time of admission. Students who have not selected a major are assigned to the Assistant Dean for Academic Affairs for counseling.

Advanced Academic Standing

The School of Science permits high school students to take University courses following completion of the junior year under specified conditions. To determine whether a student qualifies for such advanced credit, consult the high school counselor and the Office of Admissions.

On the basis of departmental examinations, departmental credit and/or advanced placement may be awarded. To determine qualification for such consideration, consult the department concerned.

Adult Non-Degree Students

Adult applicants, especially those with work experience in the field in which they wish to study, receive special consideration. If admitted in this category, the student may enroll in up to a maximum of 30 hours, after which the student must apply for admission to the University before enrolling in additional classes. All applicable credits earned as an adult non-degree student may be counted toward a School of Science degree.

Transient Students

It is the responsibility of the individual as a transient student to determine whether credits earned at IUPUI may be applied toward the degree being sought from one's own university.

Transfers

From other Indiana University campuses

If a student is enrolled at another Indiana University campus and wishes to enter the School of Science at Indianapolis for the first time, the student must indicate this intention by formal notice to the Office of the Dean at the campus at which he or she is enrolled. This notice must be received no later than June 15 for the fall semester. December 5 for the spring semester or April 15 for the summer session. A student must have a 2.0 grade point average to transfer to the School of Science.

A student in the School of Science at Indianapolis who wishes to attend another Indiana University campus must indicate this intention to the Office of the Assistant Dean for Academic Affairs, to secure an inter-campus transfer.

From other IUPUI schools

If a student desires to transfer to the School of Science from another IUPUI school, the student should consult the department in which he or she plans to major. Students are required to have a minimum cumulative grade-point average of 2.0, the signature of the chairperson of a School of Science department which approves the request, and the signature of the Assistant Dean for Academic Affairs of the School of Science. Obtain a transfer form from that office and submit the completed form to it. A request for transfer must be completed by June 15 for the fall semester, December 5 for the spring semester, and April 15 for the summer session.

From other Purdue University campuses

Students in good academic and disciplinary standing may transfer from other campuses of Purdue University. Since Indiana University maintains the official records of all students at

IUPUI, it is necessary to make an official application to IUPUI through the Office of Admissions. Students continuing to pursue Purdue degrees at IUPUI will have their records transferred intact and upon receiving a Purdue degree will have a permanent transcript created at Lafayette. Students electing to pursue an Indiana University degree will be processed as regular transfer students from another university.

From other colleges and universities
If the student has earned transfer credit for 12 semester hours and a cumulative grade-point average of 2.0 on a 4.0 scale (3.0 for nonresidents of Indiana) in other institutions, he or she may be admitted to the School of Science. Submit with the application for admission:

1. A copy of the high school record showing satisfactory completion of entrance requirements.
2. An official transcript of work completed in each institution previously attended.
3. Evidence of good academic and disciplinary standing at the institution last attended.

To assure admission for any given semester the application should be received at least 30 days before the beginning of classes.

Credit from other institutions is evaluated by the Office of Admissions and its applicability toward degree requirements in the School of Science is determined by the major department.

Transfer Credit Acceptability of transfer credits from another college or university is determined by the student's major department. However, transfer credit will be allowed for the master's degree only after one semester of satisfactory work in residence at IUPUI.

From IUPUI to other Indiana University and Purdue University campuses
Students transferring from IUPUI to other Indiana University and Purdue University campuses should consult the appropriate departments at those campuses about equivalence of courses.

International Students

Applicants from foreign countries will be considered for admission without taking the American Entrance Examination on the basis of credentials certifying the completion of secondary school. Official translations must accompany transcripts and other credentials not written in English. Financial aids for new international students are not available.

Graduate Students

To be considered for admission, candidates must have a baccalaureate degree from an accredited institution, and show promise of ability to engage in advanced work and evidence of adequate preparation to pursue graduate study in their chosen field. An applicant not meeting these requirements should take the Aptitude Test Section of the Graduate Record Examination.

Application should normally be made at least three months before the beginning of the session in which the student wishes to enroll. However, late applications will also be accepted. The applicant will be advised of action on his application by the Office of the Director of Graduate Studies.

Financial support in the form of teaching and research assistantships is available through the departments of the School of Science.

Regular Graduate Student Application Application forms for admission as a regular graduate student may be obtained from the major department.

Applicants must submit complete official transcripts of all previous college and university studies and three letters of academic reference for evaluation by the major department.

Temporary Graduate Student Application Application for admission as a temporary graduate student must be made before a student starts graduate work. The temporary

graduate student classification is primarily for those casual students who wish to take courses for personal improvement. A student who wishes to become a candidate for an advanced degree should consult with the chosen major department at the time of application for admission as a temporary graduate student. The major department will advise applicants of the procedure for obtaining regular graduate student status. Admission as a temporary graduate student is made by the Office of the Director of Graduate Studies in the Union Building. NOT MORE THAN NINE HOURS OF CREDIT EARNED UNDER THIS CLASSIFICATION MAY BE USED IN A PLAN OF STUDY WITHOUT MAJOR DEPARTMENT APPROVAL.

Graduation Requirements

Baccalaureate Degree

General Requirements

1. A minimum of 124 hours—(122 for Geology). Acceptance must be obtained from the Assistant Dean for Academic Affairs to use as credit toward graduation any course which was completed ten or more years previously.
2. A minimum grade-point average of 2.0.
3. A minimum of 24 hours must be taken in a major subject (see departmental requirements) with a minimum average of 2.0. No grade below C− is acceptable in the major subject.
4. A minimum of 9 hours in the major subject must be completed at IUPUI (see departmental requirements).
5. Residence at IUPUI for at least two semesters and completion, while at IUPUI, of at least 32 semester hours of work in courses at the 300-level or higher.
6. With the approval of the Assistant Dean for Academic Affairs, students who have had at least four semesters of resident study may complete up to 15 hours of the senior year in another approved college or university.
7. Courses taken on the Pass/Fail option can be applied only as electives in meeting degree requirements.
8. Not more than 60 hours earned in accredited junior colleges can be applied toward a degree.
9. By permission of the department, credit may be earned through special credit examination. Students may enroll in Independent Study courses up to a maximum of 12 hours with permission of the Assistant Dean for Academic Affairs. Credits earned by special credit examination and by Independent Study may be used toward the total hours required and to satisfy Area Requirements for a degree.
10. The following courses do not count for any credit toward any degree program in the School of Science: AGR 101; BIOL N100, N120, N200; CHEM C100; all COAS courses; EDUC U205, X150, X151, X152, ENG W001, MATH 001, 002, 111, 112, 123, 130, 131, 132.
11. Departments may have further restrictions on which courses outside the School of Science and School of Liberal Arts will count toward their degrees. See the departmental counselor for details.
12. In general, credit is not allowed for both of two overlapping courses. See the departmental counselor for details.
13. An application for a degree must be filed in the Office of the Recorder, School of Science, Krannert Building, Room 155, at least one semester prior to the anticipated graduation. Degrees are conferred in May, August and December; Commencement is held only in May. Candidates for degrees in August may participate in May Commencement.

Area Requirements

The Faculty of the School of Science has adopted the following degree requirements for the Bachelor of Arts and Bachelor of Science degrees. Students may follow the School of Science

and departmental requirements which are in effect when they enter IUPUI, or they may choose new requirements which become effective after that date. However, the requirements must be chosen from only one Bulletin. School of Science requirements are the minimal requirements in various areas and individual departments *may require more* as stated in their degree descriptions. Students should consult with departmental counselors in planning their courses of study.

Students should note the following:

1. Check departmental descriptions for courses which are considered overlaps. Some courses may not be used to fulfill distributional requirements. Students should consult with their advisers on these points.
2. Cross-listed courses may count only once in fulfilling requirements.
3. English W131 and other composition courses may not be used to complete the area III requirements.
4. It is recommended that a student who intends to pursue graduate studies should plan to take the Graduate Record Examination at the beginning of the senior year.

Bachelor of Arts Degree

Area I

English Composition and Communicative Skills One course in English composition of at least three credits and one course in speech skills of at least three credits are required. The English composition requirement is satisfied by completing English W131 with a grade of C or better.

Area II

Foreign Language No courses are required by the School of Science. Consult departmental requirements.

Area III

IIIA. Arts and Humanities Four courses totaling at least 12 credits are required. There must be at least two courses in one discipline in either IIIA or IIIB. History is cross-listed.

American Studies
English
Fine Arts
Folklore
French
History
German
Journalism
Music
Philosophy
Religious Studies
Spanish
Theatre

Performing arts courses are not accepted as fulfilling Arts and Humanities requirements. Writing courses are not accepted as English courses.

IIIB. Social and Behavioral Sciences Four courses outside the major department totaling at least 12 credits are required. There must be at least two courses in one discipline in either IIIA or IIIB. History is cross-listed.

Anthropology
Economics
Geography
History
Linguistics
Political Science
Psychology
Sociology

IIIC. Physical and Biological Sciences At least four science courses totaling a minimum of 12 credits outside the major department are required. At least one of the courses must be a laboratory course. Not acceptable are BIOL N100, N120, N200, all agriculture courses, and CHEM C100. If GEOL G130 is selected, a minimum of three 1-credit sections must be taken for fulfillment of this requirement.

Biology
Chemistry
Geology
Physics (including Astronomy)

IIID. Mathematical Sciences No courses are required.

Computer Science	Mathematics
Statistics	

Area IV

Major Department Consult the listing of the major subject as well as courses required by the major department in other areas.

Bachelor of Science Degree

Area I

English Composition and Communicative Skills One course in English composition of at least three credits and one course in speech skills of at least three credits are required. The English composition requirement shall be satisfied by completing English W131 with a grade of C or better.

Area II

Foreign Language No courses are required by the School of Science. Consult departmental requirements.

Area III

IIIA. Arts and Humanities Two courses totaling at least six credits are required. There must be two courses in one discipline in either IIIA or IIIB. History is cross-listed.

American Studies	Journalism
English	Music
Fine Arts	Philosophy
Folklore	Religious Studies
French	Spanish
History	Theatre
German	

Performing arts courses are not accepted as fulfilling Arts and Humanities requirements. Writing courses are not accepted as English courses.

IIIB. Social and Behavioral Sciences Two courses totaling at least six credits are required. There must be two courses in one discipline in either IIIA or IIIB. History is cross-listed.

Anthropology	Linguistics
Economics	Political Science
Geography	Psychology
History	Sociology

IIIC. Physical and Biological Sciences At least four science courses totaling a minimum of 12 credits outside the major department are required. At least one of the courses must be a laboratory course. Not acceptable are BIOL N100, N120, N200, all agriculture courses, and CHEM C100. If GEOL G130 is selected, a minimum of three 1-credit sections must be taken for fulfillment of this requirement.

Biology	Geology
Chemistry	Physics

IIID. Mathematical Sciences At least two courses beyond algebra and trigonometry, totaling a minimum of six credits, are required.

Computer Science	Mathematics
Statistics	

Courses in applied statistics are not acceptable.

Area IV

Major Department Consult the listing of the major department for courses required within the major subject as well as other courses required by the major department in other areas.

Purdue University Graduate Degrees

Currently, all of the graduate programs offered by the School of Science lead to master's degrees awarded by Purdue University.

General Requirements

1. Regular graduate student standing.
2. English requirement satisfied.
   Candidates for advanced degrees whose native language is English satisfy the English requirement (1) if they made no grade below B in undergraduate courses in composition or (2) if they make a scaled score of 600 or higher on the Verbal Aptitude Section of the Graduate Record Examination or 36 or higher on the verbal portion of the Admission Test for Graduate Students in Business. If the English requirement is satisfied in one of the above ways and the information is included as a part of the information submitted with the graduate application, English clearance will be given automatically. If the student takes the G.R.E. or the Admission Test for Graduate Students in Business after applying for admission to the Graduate School, the student must be certain the Educational Testing Service sends test scores to the Graduate School.

   Those not cleared as specified above must write a test paper for the Committee on Standards in English and are held for further writing if the test paper is not acceptable. Students so held are expected to work toward satisfying the requirement without delay. The student should make certain that the Committee on Standards in English sends the Graduate School notice of satisfaction when completed. See the secretary in the graduate counselor's office for the person to contact for clearance in this manner.
3. Plan of study — The plan of study shall include a primary area and a related area or areas which are chosen on the basis of the student's interests and needs. A tentative plan of study should be drawn up in advance of registration for the first semester of graduate work. This should be done by the student and the individual graduate adviser. The formal plan of study should be submitted as soon as possible and before the final semester. The English requirement must be met before the plan of study may be filed.
4. Grades and index requirement — Only grades of A, B, and C are acceptable on a plan of study. An advisory committee may require higher performance than C in certain courses. There is no general Graduate School cumulative index requirement. Specific requirements, if any, are up to the individual departments.
5. Hours of work required — this varies by department from 30 to 36 semester hours of credit.
6. Oral and written examinations — The Graduate School has no general requirement for oral and written examinations for the master's degree. In any department the final examinations may be waived if the student meets the minimum requirements of the department. In any event, a final examining committee is appointed for each candidate for the master's degree. The committee must certify to the Graduate School either that the student has passed the required examinations of the department in which the major graduate study has been taken or that the committee is satisfied with the accomplishment of the student as based on a committee conference.
7. A student who has previously earned a bachelor's degree may enroll in graduate courses without making formal application as a degree-seeking student. Application as a temporary graduate student is, however, required and may be accomplished through the IUPUI Office of Graduate Programs in the Union Building. A maximum of nine hours of courses completed as a temporary student may be used in completing the requirements of a degree upon acceptance as a degree-seeking student and upon departmental approval.

Academic Regulations

Grades

The School of Science uses a grading system which may include plus and minus grades as well as straight grades for all undergraduate and graduate courses:

A+ (4.0)
A (4.0)
A− (3.7)
B+ (3.3)
B (3.0)
B− (2.7)
C+ (2.3)
C (2.0)
C− (1.7)
D+ (1.3)
D (1.0)
D− (0.7)
F (0.0) (No credit) Failed the work in a course or failed to complete an official withdrawal
R (Deferred Grade)
S Satisfactory
P Passed (See Pass-Fail Option)
F Failing (see Pass-Fail Option) (No credit)

Each instructor has the prerogative of using the plus-minus or the conventional grading system for his or her courses.

P or F Pass/Fail During the four years of his or her undergraduate program, any undergraduate student in good standing (not on probation) may enroll in up to a maximum of eight elective courses to be taken with a grade of P (pass) or F (fail). The pass/fail option is open for a maximum of two courses per year, including summer sessions. For this option, the year is defined as August 15 to August 15. The course selected for pass/fail must be an elective. It may not be used to satisfy any of the school area requirements, nor may it be counted as a part of the student's concentration area. The course or courses may be used to meet the 300-400 level course requirement. A grade of P cannot be changed subsequently to a grade of A, B, C, or D.

Computation of GPA To compute the grade-point average (GPA) the number of grade points received (4.0 for an A, 3.0 for a B, etc.) is multiplied by the number of credits assigned for each course. The sum of grade points received for all courses is then divided by the total number of course credits. Grades of P and S are not included in the computation; a grade of F is included.

W or Withdrawal Students may officially withdraw from classes without penalty during the first one-half of a semester or session if they secure the approval of their adviser; a grade of "W" is recorded on the final grade report. Students may withdraw from classes during the third quarter of a semester or session if they secure the approval of their adviser and the instructor of the course; a grade of "W" is assigned by the instructor of the affected course. The grade so assigned is recorded on the final grade report. Students may withdraw from classes during the last quarter of a semester or session if they secure the approval of their adviser, the instructor of the course, and the Dean of their School; a grade of "W" is assigned by the instructor of the affected course. The grade so assigned is recorded on the final grade report. *Students will be allowed to withdraw from class during the last quarter of the semester only under extenuating circumstances. A written justification from a doctor, clergyman, adviser, etc., must be presented.*

Students who alter their schedule, whether by personal incentive or by departmental directive, must follow withdrawal procedures. Students who do not follow these procedures risk jeopardizing their record by incurring a failing grade in a course not properly dropped, or may risk not receiving credit for work done in a course which has not been properly added.

Incomplete The grade of I (Incomplete) indicates that the work is satisfactory as of the end of the semester, but has not been completed. The grade of Incomplete may be given only when the student has completed three-fourths of the semester with course work of passing quality. Instructors may award the grade of Incomplete only upon a showing of such hardship to a student as would render it unjust to hold the student to the time limits previously fixed for the completion of the work.

Removal of Incomplete The removal of a grade of Incomplete is the responsibility of the student. A grade of Incomplete must be removed within one year from the time that is given. An Incomplete grade which has not been removed by the end of one year will be converted by the Registrar's Office to the grade of F. The Dean may authorize adjustment of the one year period in exceptional circumstances.

Removal of F or FX Option Beginning Fall Semester, 1976, IUPUI initiated the following policy regarding repeated coursework: an undergraduate student who retakes a course previously failed shall have only the second grade in that course counted in the determination of the official transcript cumulative grade point average. The student's transcript, however, shall record all enrollments in the course and all grades earned for each enrollment. The grade of FX is used to replace the original grade of F on the transcript, but the FX grade will not be counted in computing the grade point average. All previous grades of F for the course will be replaced by the grade of FX when the course is retaken and passed.

In retaking the course, the student must receive a grade of A, B, C, D, S, or P to remove the original F grade. The designation W/Withdrawal will not remove the original F unless the student is withdrawn from the original enrollment. Under this policy, a student may replace a grade through re-enrollment only in a course in which a grade of F was received. A grade of D, C, or B cannot be improved by this policy. *Students who wish to take advantage of this option must secure the approval of the Deans of their schools prior to repeating the course.*

Courses Repeated

The School of Science computes a School grade-point average which is the basis for recommending the awarding of a degree. The computation of this grade-point average, including repeated courses, is done during the senior year at IUPUI, and is made using the rule that only the most recent grade in repeated courses counts in computing the School grade-point average for the purpose of graduation. The official grade point average, which is based upon all grades earned, appears on all transcripts.

Credit by Examination and Special Credit

Students may receive course credit by examination or credit for credentials and/or experience. Departments within the School of Science authorize and determine such credits and administer the exams in their areas. The student must obtain a Special Credit Form from the consenting department, obtain the necessary signatures, and pay the examination or special credit fee to the Bursar (see Expenses and Financial Aid). Credit earned by examination will be assigned an A (highest passing grade) or S (passing grade). Credit earned by credentials and/or experience will be assigned an S.

Course Audits

While auditing of courses is permitted under University policy, audited courses may not be retaken at a later date for academic credit. Written permission from the instructor to audit a class must be obtained before the student attempts to register.

Petition for Grade Change

Course grades may be changed by petition from either the student or the faculty member.

1. Faculty petition: A faculty member may request a change of grade for the student. This request can be honored only after approval of the Department Chairman and the Assistant Dean for Academic Affairs of the School of Science.
2. Student petition: A student may request a change of grade by filing a petition with the Assistant Dean for Academic Affairs, and should include:
   a. A statement of attempted, but unsuccessful, interview with the faculty member and the Chairman of the department.
   b. Supportive evidence for petition.

The necessary forms for withdrawal from a course; change of class, school or major; change of grade; pass/fail option; and FX option are available in the departmental offices, the Assistant Dean for Academic Affairs' Office, or the Registrar's Office.

Class Standing

Class standing is based on the number of credit hours completed:

Freshman ..... 0 to 25
Sophomore ..... 26 to 55
Junior ..... 56 to 85
Senior ..... 86 or more

Science Scholars and Dean's Honor Lists

The School of Science recognizes exceptional academic performance prior to graduation from the University by periodically publishing the Science Scholars List and the Dean's Honor List. The Science Scholars List is a list of names of full-time or part-time students who have completed at least 26 hours of coursework at IUPUI and who have a semester and cumulative GPA of at least 3.75. The Dean's Honor List contains the names of the students who have achieved a GPA of 3.5 or higher during a semester in which they carry 12 or more credit hours. Part-time students who are juniors or seniors and who have a cumulative and semester GPA of 3.5 or higher also will be included on the Dean's Honor List. Courses assigned a deferred grade (R) will count toward the 12 hour minimum required of full-time students. Courses taken on a pass/fail basis will not count toward the 12 hour minimum. Students who received an Incomplete (I) will not be placed on the Science Scholars List or the Dean's List. No Science Scholars or Dean's List is published for the Summer Sessions.

Candidates For Baccalaureate Degrees

Students are considered to be candidates in good standing for a baccalaureate degree awarded by the School of Science when they have been admitted as regular students by the Office of Admissions, their last semester's grade point average is not less than a C (2.0), and their cumulative grade point average is not below this same level.

Second Baccalaureate Degree

Normally the holder of a baccalaureate degree who wishes to pursue a further educational goal is encouraged to become qualified for admission to a graduate degree program. In certain cases, however, the Assistant Dean for Academic Affairs of the School of Science may admit a student who has earned a baccalaureate degree to candidacy for a second baccalaureate degree. The student should petition the Dean for this privilege before beginning the program. If such admission is granted, the candidate must earn at least 32 additional credit hours in residence and meet the requirements of the School of Science and of the department in which the student is a candidate.

Degrees Awarded With Distinction

IUPUI recognizes outstanding performance in course work of any student by awarding bachelor's degrees with distinction. Purdue degrees are awarded with Distinction and Highest

Distinction. IU degrees are awarded with Distinction, High Distinction, and Highest Distinction. To be eligible a student must have taken a minimum of 60 credit hours at IUPUI.

Degree GPA	PU	IU
3.5500-3.7499	Distinction	Distinction
3.7500-3.8499	Highest Distinction	High Distinction
3.8500-4.0000		Highest Distinction

Academic Standing

Academic Probation

Full-time students are on academic probation when either their semester grade point or cumulative grade point average is below C (2.0). Part-time students are on academic probation when their grade point average for two consecutive semesters or cumulative grade point average is below C (2.0).

Each student on academic probation will be so advised by letter from the Assistant Dean for Academic Affairs of the School of Science. The student is informed of all conditions and restrictions required for reestablishing a status of good academic standing.

Dismissal

Students are dismissed from the University when, in the opinion of the Assistant Dean for Academic Affairs of the School of Science, they have ceased to make progress toward their degree.

Full-time students are subject to dismissal when they have failed to attain a C (2.0) average in any two consecutive semesters and when the cumulative grade point average is below C (2.0).

Part-time students are subject to dismissal when their grade point average for three consecutive semesters or cumulative grade point average is below C (2.0).

Each student who is dismissed will be so advised by letter from the Office of the Dean.

Readmission

A student dismissed for the first time may immediately petition the Office of the Dean for readmission. A student dismissed for the second time may submit a petition for readmission after a period of at least one regular semester.

In order that petitions for readmission have sufficient time for consideration, students eligible to submit them should do so before July 1 for the fall semester, November 15 for the spring semester and April 1 for the summer sessions.

Students who are readmitted will be so informed by letter from the Assistant Dean for Academic Affairs. They are informed of conditions and restrictions upon which readmission depends.

Special Facilities and Services

Libraries

The IUPUI Library system is composed of six separate libraries which are open to all students enrolled at the University. These are located at the Dental School, Herron School of Art, University Library, Law School, Medical School, and 38th Street Campus. The School of Physical Education also maintains a reference room of professional physical education materials. The Dental, Herron, Law, and Medical libraries contain specialized collections reflecting their respective curricula. The collections at the University Library and the 38th Street campus cover a wide range of academic disciplines from humanities to science, engineering, and technology.

Since procedures vary slightly among the different libraries, students should consult each before checking out books and other materials.

Audio-Visual Facilities

Audio-visual learning centers are located in the Krannert Building at the 38th Street Campus, and in Cavanaugh Hall. The centers provide a variety of audio-visual materials, equipment, and services for student and faculty use. Study carrels equipped with cassette tape recorders and slide projectors provide convenient facilities for individual study of recorded course and reference material. Equipment available for classroom and laboratory use includes audio and video tape recorders, closed-circuit TV, and various projectors (overhead, movie, and slide).

Evening Administration

Administrative offices are open for the convenience of night students at each IUPUI location after 5 p.m., when general offices close. Students should contact the most appropriate office.

Business-SPEA/Education-Social Work 801 W. Michigan Street, Room 3010 U, phone 264-2078

Krannert Science Building, 38th Street, Room 018, phone 923-1321, exts. 238, 260, and 264-3552.

Mary Cable Building, 525 N. Blackford, Room 117, phone 264-8374.

Nursing Building, 610 Barnhill Drive, Room 105, phone 264-4228.

These offices provide all of the bulletins and brochures of the University, all of the forms for admission and registration, all Graduate School forms, process course reservation cards, supply information about classes and locations, and maintain a complete list of all students in the University. These Evening Administration Offices are open Monday through Thursday until 9:00 p.m., Friday until 7:00 p.m. Parking services are provided at the 38th Street Office.

Engineering and Technology, 799 W. Michigan Street, phone 264-2533.

The office of the dean is open to serve faculty and students, Monday through Thursday, until 8 p.m.

Computing Services

Computing Services provides computer assistance to the faculty, staff, and students of IUPUI and the other campuses of Indiana University. With two computer centers at IUPUI, Computing Services has a large DEC-10 timesharing facility available, as well as an IBM 370/125. The primary responsibility of Computing Services is in support of academic computing requirements. Technical assistance for faculty and other researchers is offered through consultation on programming problems, statistical analysis, acquisition and use of computer software and hardware, including mini and micro computers, and other computing-related problem areas. Programs can be designed and written for faculty by Computing Services personnel. Also, consultants are present at all Computing Services locations to assist students and faculty with programming problems. For more information, contact the Director, Computing Services, Engineering/Technology Building, Room 1025 (telephone: 317-923-1321, ext. 376).

SPECIAL PROGRAMS

Secondary Teachers' Certificate

With careful planning, a student may earn a baccalaureate degree in the School of Science and may receive a provisional secondary teacher's certificate, completing the requirements for both in four years. The Secondary School Teacher Certificate, Provisional, qualifies the holder to teach in the subject-matter fields for which it is endorsed in any public secondary school in Indiana. It is granted upon completion of a baccalaureate degree based upon a program of teacher education and the recommendation of the graduating institution. It is valid for five

years from the date of issue and may be renewed one time only for a period of two years, provided a minimum of 20 semester hours towards the master's degree on a teacher education program has been accumulated.

Every student who plans to obtain a teaching certificate must pass a speech and hearing test, which is given usually during the first week of fall and spring semesters, and be admitted formally to the teacher education program by the end of his sophomore year. Application forms are available from the student's departmental adviser or from the School of Education, 902 West New York, Indianapolis, IN 46202.

A candidate for a secondary teacher's certificate *and* a bachelor's degree must satisfy the appropriate degree requirements of the IUPUI School of Science, the departmental requirements, and the certification requirements. The student must, therefore, plan a complete program with the departmental adviser to insure that all requirements are satisfied.

A candidate for a secondary teacher's certificate must earn a baccalaureate degree which includes 124 credit hours. The student must have an average grade of C or above in all university work taken, in all education courses (with at least a C in the methods course in the major), and in all the course work of his or her teaching major and of the teaching minor if one exists.

For a Provisional Certificate the State of Indiana sets the following General Education, Professional Education and Subject Matter Area requirements:

General Education
40 credits as follows:
Humanities: minimum of 18 credits (for example English, Fine Arts, Folklore, Foreign Language, Music, Philosophy, Speech & Theatre)
Social and Behavioral Sciences: minimum of 9 credits (for example Anthropology, Economics, Geography, History, Political Science, Psychology, Sociology)
Life and Physical Sciences: minimum of 9 credits (subject matter area meets this requirement; some departments specify lab sciences)
Electives as needed for a total of 40 credits.

Professional Education
EDUC H340 — Education and American Culture (3 Cr)
EDUC P253 — Educational Psychology for Secondary Teachers (3 Cr.)
EDUC M300 — Introduction to Teaching in a Culturally Pluralistic Society (3 Cr)
EDUC M462 — Methods of Teaching High School Reading (3 Cr)
EDUC M440-478 — Special Methods in major academic area (4 Cr)
EDUC M480 — Student Teaching in Secondary School (9 Cr)
EDUC M313 — Teaching in the Secondary School (3 Cr)
(Required for Indiana University degrees. Recommended for Purdue University degrees.)

Subject Matter Area
A minor is not required. Program planning should be done in consultation with the student's adviser in the major department.

Pre-Dental and Pre-Medical Programs

Admission to dental and medical schools is highly competitive. The preprofessional student is therefore urged to elect a degree program, rather than to strive for the minimal requirements of these schools. Skilled preprofessional counseling is available in the Departments of Biology and Chemistry, which also offer preprofessional degree programs. This service will assist the student to prepare well for the professional school admissions process. It will also suggest alternative, rewarding career opportunities should the application to the professional school be unsuccessful. Graduate students holding nonscience degrees, who are electing courses in

the School of Science to prepare for professional school, are also invited to use this counseling service.

Counselors: Professors Boaz, Fife, and Fricke (Chemistry) and Ockerse and Carroll (Biology)

Honors Program

The IUPUI Honors Program is open to students in both the Purdue and Indiana University degree programs. Students with a 3.3 overall grade point average after their first full semester of work or entering freshmen with a combined SAT score of 1200 or those who graduated in the top 10 percent of their high school class are invited to participate in the Honors Program. Students with less than a 3.3 G.P.A. may be permitted to take honors courses. They should, however, discuss the matter with their adviser and the Honors counselor before doing so.

To obtain an Honors Degree, a student must have an overall G.P.A. of 3.3 and a 3.5 Honors G.P.A. at graduation, In addition, students must have completed 24 hours of honors work, eighteen of which must be in their major. Six hours must be taken in courses outside their major. Students majoring in Geology or Psychology should follow the requirements below since both departments have their own departmental programs:

Geology

The student must complete 24 credit hours of Honors work, 18 in Geology and six hours in other approved Honors work. The following upper division Geology courses are approved for H-Option contracts: G323, **Structural Geology;** G334, **Principles of Sedimentation and Stratigraphy:** G403, **Optical Mineralogy and Petrology;** G404, **Geobiology** (3 credits) plus G410, **Field Project** (1 credit); G406, **Introduction to Geochemistry;** G413, **Introduction to Earth Physics;** G415, **Principles of Geomorphology;** G416, **Economic Geology;** G430, **Principles of Hydrology;** G499, **Honors Research in Geology.** The student must complete three credits in G499, **Honors Research in Geology,** to satisfy the requirements for the Honors component. The overall G.P.A. must be 3.3 with a 4.0 in all Honors work.

Psychology

To graduate with Honors in Psychology students must earn at least 24 hours of Honors credit, six in Psychology and six that may be outside Psychology— the remaining 12 credits can be in either division. At least three hours must be earned in B499, **Honors Research in Psychology,** which requires an Honors thesis. Only grades of "A" or "B" will count for Honors credit. To graduate with Honors, the student must have an over-all G.P.A. of 3.3, with at least 3.5 in Honors courses and at least a 3.5 in Psychology courses.

In general, students may take no more than six hours of Honors work a semester. Students may earn Honors credit by taking special Honors courses (H300, H399, H400), by taking specially designated sections of multi-section courses, by taking special overseas or internship work or by contracting for Honors credit using an H-Option contract in conjunction with regular classes. H-Options are the most popular and frequent way that students earn Honors credit. An H-Option requires that a student work out with the instructor of a course a specific contract for a paper, field project, oral presentation, etc. during the first four weeks of the semester. By the end of that period, the H-Option form with all the necessary signatures must be submitted to the Honors Office.

Students completing Honors work or an Honors Degree will, upon request, receive an Honors course record, listing all Honors work, to be included with official University grade transcripts.

For additional information, contact the Honors Office (CA331, 264-2660).

Cooperative Education Program

The School of Science Cooperative Education Program gives science students the opportunity of supervised professional employment with course work while studying for degrees.

If a student chooses to participate in cooperative education, it may extend the time required to earn a degree, but the benefits received are important. Based on past experiences of students in co-op programs, one can expect that (1) earnings will be enough to pay for remaining years of employment/studies, and (2) valuable professional experience will be gained in a scientific field—giving students a feeling for a career, making course work more relevant, and increasing one's value as a future employee.

A cooperative education employer has been approved by the School of Science and has agreed to offer a meaningful work experience related to a student's scientific interests. Normally, a student will work for the same employer throughout his program and be given increasing responsibility.

To be accepted into the co-op program, a student must apply to the School of Science Cooperative Education Coordinator. If one is interested in co-op, he should contact the Cooperative Education Coordinator as early as possible, to facilitate job placement and to assure eligibility.

A student should apply directly to the Cooperative Education Coordinator for information and specifics of program implementation.

Officer Training Programs (ROTC)

Both Army and Air Force ROTC are available to IUPUI students. Completion of either program leads to a commission as a 2nd Lieutenant. Programs are available to both men and women. Courses are pursued in conjunction with academic curriculum and receive academic credit as electives. Placement credit is available to veterans and students with high school ROTC backgrounds. For information, contact Professor of Military Science (Army ROTC) (317) 264-2691 or Professor of Aerospace Studies (Air Force ROTC) (812) 335-4191.

Department of Biology

Professors Ockerse *(Chairperson)*, Sanborn

Associate Professors Bard, Bayer, Keck, Lees, McCracken, Pflanzer, Stillwell, Wilson

Assistant Professors Carroll, Jarrett, Juillerat, Kirk, Russo, Spencer

Adjunct Professors Petersen, Schmidtke

Lecturers Wiese, Zevin

Departmental Counselors *Preprofessional:* Carroll, Ockerse; *Pre-pharmacy and Preoptometry:* Lees; *Pre-veterinary, Agriculture and Forestry:* McCracken; *Biology programs:* all faculty.

Undergraduate Program

The Department of Biology offers instructional programs leading to the Bachelor of Arts and Bachelor of Science degrees. These programs are designed to prepare students for a variety of careers in the biological sciences and allow sufficient flexibility to accommodate the needs and interests of students. Postgraduate activities frequently selected by our Biology majors include graduate schools, medical and dental schools, other health care professions, agricultural schools, industrial positions in research and technology, and secondary teaching. The selection of a particular degree program in Biology should be made in consultation with a departmental counselor.

Research in Biology is an important part of the curricular course program. Students are encouraged to participate in research programs with faculty and selection of a topic from a wide variety of biological areas is available to students in the Department.

Students who intend to major in Biology must begin their program with K101 and K103, Concepts of Biology I and II. However, Biology N105, Introduction to Botany, and/or N107, Introduction to Zoology, are accepted in lieu of K101 and/or K103 respectively only in cases of transfer from another department or institution where these courses are normal to that curriculum (e.g. Agriculture—Purdue), or when the uncommitted student decides to major in Biology upon completion of N105 and/or N107.

Graduate Program

The Department of Biology offers graduate study in three areas leading to the M.S. Degree in Biology: cell biology and physiology, genetics and developmental biology, and organismal and environmental biology. The M.S. degree program may be completed with one of three options: thesis, non-thesis, and teaching of biology.

The Biology Department offers a variety of opportunities for research and graduate study. Students may work in such specific areas as microbial genetics, biochemical and biophysical studies of membranes, immunology, enzymology, cardiovascular and respiratory physiology of diving, vitamin A metabolism, reproductive physiology, parasitology, neuroanatomy, membrane receptors and transport, phytohormone physiology and regulation, morphogenesis and ultrastructure of plants, fresh water plant ecology, and mosquito ecology. The requirements for the degree also include a comprehensive written examination in the candidate's primary area of interest and presentation of a thesis for candidates who elect to complete the M.S. degree with thesis option.

Bachelor of Arts

Degree Requirements

Area I See School of Science requirements.
Fullfillment of the following is also strongly recommended: Two semester courses dealing with communication of data, to be selected in consultation with departmental adviser (courses might include: foreign language, photography, graphics, drawing, logic, computer science, etc.)

Area II There is no foreign language requirement; however, knowledge of a foreign language is strongly recommended for the student planning to attend graduate school.

Area IIIA and **IIIB** See School of Science requirements.

Area IIIC Physical and Biological Sciences:

Physics Two semesters of basic Physics (Physics 218-219 or 152-251). Students should have Math 148 or equivalent (trigonometry) before enrolling in either Physics sequence. Math M118 and M119 do not provide this background.

Chemistry Through 2 semesters of Organic Chemistry (C341, C342, C343): plus prerequisite basic sequence or background to enter sequence above. Basic Chemistry sequence to be worked out with departmental counselor based on SAT scores and/or background of the student. The second laboratory in organic chemistry (C344) is strongly recommended for students in most programs—consult departmental counselor.

Area IIID

Mathematics One semester of mathematics to be selected from the following courses: MATH M118 or MATH M119

Area IV Biology Requirements
Introductory Courses: K101-K103
Upper Division Courses:

A. Four courses to be selected from four of the five programs listed below. Two of these courses must be taken with a laboratory.
B. Electives—to establish 25 total credit hours in Biology. To be selected in consultation with departmental counselor.
    I. Program in Cellular Biology and Physiology
    II. Program in Genetics
    III. Program in Developmental Biology
    IV. Program in Environmental Biology
    V. Program in Organismal Biology

Transfer policy A maximum of 12 hours of biology earned at other institutions is applicable to the B.A. degree.

Bachelor of Science

Degree Requirements

Area I See School of Science requirements. For teacher certification, the requirement is one course in English Composition, one course in Speech, and one additional course in English Composition or Speech.

Fulfillment of the following is also strongly recommended: Two semester courses dealing with communication of data, to be selected in consultation with departmental counselor (courses might include: foreign language, logic, computer science, graphics, etc.)

Area II There is no foreign language requirement; however, knowledge of a foreign language is strongly recommended for the student planning to attend graduate school.

Area IIIA and **IIIB** See School of Science requirements.

Area IIIC Physical and Biological Sciences

Physics Two semesters of basic Physics (Physics 218-219 or 152-251).

Chemistry Through two semesters of Organic Chemistry with laboratory (C341, C342, C343, C344) plus prerequisite basic sequence or background to enter sequence above. Basic Chemistry sequence to be worked out with departmental counselor based on SAT scores and/or background of the student. (A course in Analytical Chemistry or Biochemistry is also strongly recommended—determination to be made in consultation with department counselor.)

Area IIID

Mathematics Through two semesters of Calculus (MATH 221-222 or MATH 163-164). Starting point to be worked out with departmental adviser based on SAT scores and/or background of the student.

Area IV Biology Requirements
Introductory Courses: K101-K103
Upper Division Courses:

A. One course from each of the five programs listed below. Three must be taken with a laboratory.
B. Electives—to establish 35 total credit hours in Biology to be selected in consultation with departmental counselor. No more than 4 credit hours of research K493 will be accepted towards the 35 hour requirement.
    I. Program in Cellular Biology and Physiology
    II. Program in Genetics
    III. Program in Developmental Biology
    IV. Program in Environmental Biology
    V. Program in Organismal Biology

Transfer policy A maximum of 17 hours of biology earned at other institutions is applicable to the B.S. degree.

Biology Plans of Study

Undergraduate

There is no single semester-by-semester plan of study for any of the degree options, because of the flexibility encouraged within the program for each option. However, one possible sequence of courses for each option is given below; variations from these examples of plans of study should be made in consultation with a departmental counselor.

Bachelor of Arts Sample Program

Freshman					
1	BIOL K101 (4) Concepts of Biology I-Plants	CHEM C105 (5) Principles of Chemistry I	MATH M118, or MATH M119	ENG W131 (3) English Composition I	
2	BIOL K103 (4) Concepts of Biology II-Animals	CHEM C106 (5) Principles of Chemistry II	SPCH C110 (3) Speech	Elective (3) Arts and Humanities	
Sophomore					
3	BIOLOGY (3-5) Program I-V Elective	CHEM C341 (3) Organic Chemistry I	CHEM C343 (2) Organic Chem Laboratory I	PHYS 218 (4) or PHYS 152 (5) Physics	Elective (3) Arts and Humanities
4	BIOLOGY (3-5) Program I-V Elective	CHEM C342 (3) Organic Chemistry II	Elective (3) Behavioral and Social Sciences	PHYS 219 (4) or PHYS 251 (5) Physics	
Junior					
5	BIOLOGY (3-5) Program I-V Elective	Elective (3) Behavioral and Social Sciences	Elective (3) Arts and Humanities	Elective (3)	Elective (3)
6	BIOLOGY (3-5) Program I-V Elective	Elective (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences	Elective (3)	Elective (3)
Senior					
7	BIOLOGY (1-5) Elective	Elective (3) Behavioral and Social Sciences	Elective (3) Arts and Humanities	Elective (3)	Elective (3)
8	BIOLOGY (1-5) Elective	Elective (3)	Elective (3)	Elective (3)	Elective (3)

Pre-Professional Bachelor of Arts Sample Program

Freshman					
1	BIOL K101 (4) Concepts of Biology I-Plants	CHEM C105 (5) Principles of Chemistry I	MATH 118 or MATH 119	ENG W131 (3) English Composition	
2	BIOL K103 (4) Concepts of Biology II-Animals	CHEM C106 (5) Principles of Chemistry II	SPCH C110 (3) Speech	Elective (3) Arts and Humanities	
Sophomore					
3	BIOL K322 (3) Genetics	BIOL K323 (2) Genetics Laboratory	CHEM C341 (3) Organic Chemistry I	CHEM C343 (2) Organic Chem. Laboratory I	Elective (3) Behavioral and Social Sciences
4	CHEM C342 (3) Organic Chemistry II	CHEM C344 (2) Organic Chem. Laboratory II	Elective (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences	Elective
Junior					
5	BIOL 561 (3) Immunology	PHYS 218 (4) Physics	Elective (3) Arts and Humanities	Elective (3)	Elective (3)
6	BIOL 501 (3) Cell Physiology	PHYS 219 (4) Physics	Elective (3) Behavioral and Social Sciences	Elective	Elective
Senior					
7	BIOL K331 (4) Embryology	Elective (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences	Elective	Elective
8	BIOL K356 (3) Microbiology	Elective	Elective	Elective	Elective

Bachelor of Science with Secondary Teaching Certification Sample Program

Freshman					
1	BIOL K101 (4) Concepts of Biology I-Plants	CHEM C105 (5) Principles of Chemistry I	MATH 221 (3) or MATH 163 (5) Calculus	ENG W131 (3) English Composition	
2	BIOL K103 (4) Concepts of Biology II-Animals	CHEM C106 (5) Principles of Chemistry II	MATH 222 (3) or MATH 164 (5) Calculus	SPCH C110 (3) Speech	
Sophomore					
3	Biology (3-5) Program I-V Elective	CHEM C341 (3) Organic Chemistry I	CHEM C343 (2) Organic Chem. Laboratory I	EDUC H340 (3) Education and Am. Culture	Elective (3) Behavioral and Social Sciences
4	Biology (3-5) Program I-V Elective	CHEM C342 (3) Organic Chemistry II	CHEM C344 (2) Organic Chem. Laboratory II	Elective (3) Humanities or Foreign Language	EDUC M300 (3) Intro. to Teaching in P. Society
Junior					
5	Biology (3-5) Program I-V Elective	Biochemistry (3-5) or Physical Chem. or Analytical Chem.	Elective (3) Behavioral and Social Sciences	PHYS 218 (4) Physics	
6	Biology (3-5) Program I-V Elective	EDUC P253 (5) Ed. Psych. for Secondary Teachers	Elective (3)	PHYS 219 (4) Physics	
Senior					
7	Biology (3-5) Program I-V Elective	Biology (1-5) Elective	EDUC M449 (3) Methods of Teaching	Elective (3-6)	
8	Biology (1-5) Elective	EDUC M480 (9) Student Teaching	EDUC M462 (3) Methods of Teaching		

Bachelor of Science Sample Program

Freshman					
1	BIOL K101 (4) Concepts of Biology I-Plants	CHEM C105 (5) Principles of Chemistry I	MATH 221 (3) or MATH 163 (5) Calculus	ENG W131 (3) English Composition	
2	BIOL K103 (4) Concepts of Biology II-Animals	CHEM C106 (5) Principles of Chemistry II	MATH 222 (3) or MATH 164 (5) Calculus	SPCH C110 (3) Speech	
Sophomore					
3	Biology (3-5) Program I-V Elective	CHEM C341 (3) Organic Chemistry I	CHEM C343 (2) Organic Chem. Laboratory I	PHYS 218 (4) or PHYS 152 (5) Physics	Elective (3) Behavioral and Social Sciences
4	Biology (3-5) Program I-V Elective	CHEM C342 (3) Organic Chemistry II	CHEM C344 (2) Organic Chem. Laboratory II	PHYS 219 (4) or PHYS 251 Physics	Elective (3) Humanities or Foreign Lang.
Junior					
5	Biology (3-5) Program I-V Elective	Biochemistry (3-5) or Physical Chem. or Analytical Chem.	Elective (3) Behavioral and Social Sciences	Elective (3)	Elective (3) Humanities or Foreign Lang.
6	Biology (3-5) Program I-V Elective	Elective (3)	Elective (3)	Elective (3)	Elective (3)
Senior					
7	Biology (3-5) Program I-V Elective	Biology (1-5)	Elective	Elective	Elective
8	Biology (1-5) Elective	Biology (2-5) Elective	Elective	Elective	Elective

Master of Science Degrees

Master of Science degree programs are administered under the Chairperson by a Graduate Advisory Committee composed of a Graduate Adviser and two Graduate Committee members appointed by the Chairperson.

Degree Options

M.S. nonthesis: 30 credits (21 credits from one of the three primary areas; 9 credits in a supporting area which may include courses below the 500 level)

M.S. thesis: Intensive research required leading to a thesis. No stated number of credit hours required.

M.S. teaching of biology: 30 credits (21 credits from one of the three primary areas; 9 credits in a supporting area, including courses required for teaching certification)

Admission Requirements

1. Students must hold a baccalaureate degree from an accredited institution of higher learning and demonstrate good preparation in the following subjects:
   Biological Sciences
   Organic chemistry—at least 2 semesters
   Physics—at least 2 semesters
   Mathematics—through calculus
   Recommended: additional work in biochemistry and/or physical chemistry
2. GRE aptitude tests
3. Three letters of recommendation
4. A minimum graduation grade point index of 3.0 or equivalent is required for unconditional admission.

Transfer of Credit

Transfer of credit will be given for up to 9 credits of graduate work completed elsewhere with a grade of B or above, only after one semester of satisfactory work completed in residence at IUPUI.

Grades

Only grades of A, B, or C are acceptable although the Graduate Advisory Committee may require a higher performance than C. Pass/Fail grades are unacceptable.

Requirements

Residence Requirements
Two units of residence (26 credits or more) are required for the M.S. degree. Students entering with advanced standing from another graduate school are credited with resident study commensurate with the graduate work accomplished.

Comprehensive Examination
A comprehensive written examination in the individual's primary area will be required of all students to be administered at or near the end of the student's degree program. Administration is by the student's Graduate Advisory Committee.

Primary Areas of Concentration
Courses in the primary areas of Cell Biology and Physiology, Genetics and Developmental Biology, and Organismal and Environmental Biology will be selected from the list of Biology courses below. A student must consult his or her Graduate Advisory Committee.

Secondary Areas
Secondary area courses for the M.S. non-thesis option may be selected from related areas such as statistics, computer science, chemistry, physics, or mathematics. Secondary area courses for the M.S. in teaching of biology should be in education.

Thesis
Students training for the M.S. thesis degree must complete a research thesis (BIOL 698) and present the results in the seminar course (BIOL 696).

Financial Assistance
The Biology Department has available financial support in the form of tuition-refund assistantships and associate faculty positions on a very limited basis.

Other Programs

Pre-pharmacy Currently the pre-pharmacy program is designed to encompass one year at IUPUI followed by four years at Purdue University, West Lafayette. However, it is possible to complete two full years of credit prior to transfer. The second year program has not been specified in detail at this time but the two-plus-three year plan of study has been arranged on an informal basis. The pre-pharmacy program has also been designed to interface with the School of Pharmacy at Butler University.

Pre-Pharmacy Sample Program

Freshman					
1	BIOL K101 (4) Concepts of Biology I-Plants	CHEM C105 (5) Principles of Chemistry I	MATH 147 (3) or MATH 163 (5) or MATH 221	ENG W131 (3) English Composition	Elective (1)
2	BIOL K103 (4) Concepts of Biology II-Animals	CHEM C106 (5) Principles of Chemistry II	MATH 148 (3) or MATH 164 (5) or MATH 222 (3)	SPCH C110 (3) Speech	Elective (3)
Sophomore to Senior					
	Transfer to School of Pharmacy and Pharmacal Sciences, Purdue University, West Lafayette campus				

Pre-optometry This program is specifically designed for transfer to the professional program at Indiana University Bloomington. Typically, three pre-optometry years are spent at IUPUI although exceptional students can qualify for admittance to the School of Optometry with two years of pre-optometry study.

Pre-optometry Program Requirements

Subject	Minimum hours required
Inorganic Chemistry	8
Organic Chemistry	3
English Composition	2
Calculus	5
General Physics	8
Psychology	
Introductory and above	4
Sensation and Perception	3
Statistical Techniques	3
Biology/Zoology	
Introductory	4
Comparative or Human Anatomy	4
Advanced	3
Foreign Language	8
Elective as needed	-
	64-90 credit hours

Pre-veterinary Medicine IUPUI offers an organized four-semester pre-veterinary curriculum for students who want to meet the requirements for admission to the School of Veterinary Medicine. This curriculum also provides for a rigorous program in the biological and physical sciences which may be used as a basis for continued training in the School of Agriculture should the degree of Bachelor of Science be desired.

The student who has successfully completed two or more years of pre-veterinary instruction at IUPUI is eligible to apply for admission to the School of Veterinary Medicine at Purdue University in West Lafayette. Admission to the School of Veterinary Medicine is highly competitive. Students are selected on the basis of college coursework and grades, Veterinary Aptitude Test scores, and the extent and nature of the applicant's experience with animals and practicing veterinarians. The selection committee is also concerned with the individual's level of motivation, degree of maturity, and general character.

The requirements for admission to the pre-veterinary curriculum are the same as those for other programs in the School of Agriculture.

Pre-veterinary Sample Program

Freshman						
1	BIOL K101 (4) Concepts of Biology I-Plants	AGR 101 (1) Introduction to Agriculture	MATH 147 (3) or MATH 221 (3)	CHEM C105 (5) Principles of Chemistry I	ENG W131 (3) English Composition I	ANSC 101 Animal (3) Agriculture
2	BIOL K103 (4) Concepts of Biology II-Animals		MATH 148 (3) or MATH 222 (3)	CHEM C106 (5) Principles of Chemistry II	ENG W132 (3) English Composition II	Elective (3)
Sophomore						
3	SPCH C110 (3) Speech	CHEM C341 (3) Organic Chemistry I	CHEM C343 (2) Organic Chem. Laboratory I	PHYS 218 (4) Physics	ECON E202 (3) Economics	Elective (3)
4	ANSC 221 (3) Animal Nutrition	CHEM C342 (3) Organic Chemistry II	CHEM C344 (2) Organic Chem. Laboratory II	PHYS 219 (4) Physics	BIOL N322 (3) Principles of Genetics	

Junior Senior

5-8 Transfer to School of Veterinary Science and Medicine Purdue University West Lafayette campus

*Electives commonly selected from:

AG ECON, Agronomy	Geography	Philosophy
Biology	Geology	Political Science
Business	History	Psychology
Economics	Horticulture	Sociology

Forestry, Natural Resources, Wildlife Management: The School of Agriculture offers a four-year undergraduate plan of study in forestry which leads to the Bachelor of Science in Forestry (B.S.F.) degree. After successfully completing the two-year pre-forestry program at IUPUI, the student is then eligible to apply for admission to the two-year professional forest resources program in the Department of Forestry and Natural Resources at Purdue University in West Lafayette. Possible areas of specialization include forest management, forest products, forest recreation, urban forestry, and wildlife management.

High school students who expect to apply for admission to the forestry program should enroll as college freshmen in the pre-forestry program. Because the pre-forestry program requires a full year of calculus, it is recommended that students complete a minimum of six semesters of high school mathematics (including trigonometry) and preferably eight semesters. Students will also find high school chemistry useful preparation for the pre-forestry program.

Agriculture (Including Forestry) Students at IUPUI are offered the opportunity to complete the first two years' requirements for most of Purdue's Bachelor of Science in Agriculture degrees. Students must then transfer to the West Lafayette campus to complete requirements for graduation in either Agriculture or Forestry.

The first two years of training are based upon a solid foundation of biology, chemistry, mathematics, physics, economics, and English. Much of this foundation is laid during the freshman year when the program of study is basically the same for all agriculture students. A special effort is made during the freshman year to familiarize the students with the career

opportunities in Agriculture and Forestry. Elective courses give each student the flexibility either to begin course work in his or her chosen field of study or to explore other possible areas of interest.

At the sophomore level, students are asked to select an option (major) within Agriculture or Forestry so that they might develop a sequence of courses leading to a more clearly defined career objective. Each option has substantial opportunities for electives which permit additional specialization in the major areas of interest or permit a broad choice in liberal arts or general education.

Pre-Forestry Sample Program

Freshman					
1	AGR 101 (1) Introduction to Agriculture	ENG W131 (3) English Composition I	CHEM C101 (5) Elementary Chemistry	BIOL K101 (4) Concepts of Biology I-Plants	MATH 150 (5) Mathematics for Technology
2	CET 104 (3) Elementary Surveying	ENG W132 (3) English Composition II	CHEM C102 (5) Elementary Chemistry	BIOL K103 (4) Concepts of Biology II-Animals	MATH 163 (5) Integrated Calculus & Analytical Geometry
Sophomore					
3	BIOL K341 (5) Ecology	FOR 225 (4) Dendrology	ECON 201 (3) Economics	STAT 301 (3) Statistics	CSCI 220 (3) Introduction to Data Processing
4	SPCH C110 Speech	AGRY 225 (3) Soil Science	AGRY 210 Turf Management	MATH 164 (5) Integrated Calculus & Analytical Geometry	Humanities (3) Elective

Junior-Senior

Transfer to Department of Forestry and Natural Resources, Purdue University, West Lafayette campus

Agriculture Sample Program

Freshman						
1	AGRL 101 (1) Introduction to Agriculture	ENG W131 (3) English Composition I	BIOL K101 (4) Concepts of Biology	CHEM C101 (5) Elementary Chemistry	MATH 147 (3) Algebra and Trigonometry	
2	Agronomy or (3) Animal Science Elective**	BIOL K103 (4) Concepts of Biology II-Animals	MATH 148 (3) Alegbra and Trigonometry	ENG W132 (3) English Composition II	Humanities (3) Elective	HORT 102 (3) Fundamentals of Horticulture
Sophomore						
3	Science (3-5) Elective*	ECON E201 (3) Economics	SPCH C110 (3) Speech	Humanities (3) Elective	Elective (3)	
4	Agriculture (3) Elective	ANSC 221 (3) Animal Nutrition	ECON E202 (3) Economics	Humanities (3) Elective	Elective (3)	

Junior Senior

5-8 Transfer to School of Agriculture Purdue University West Lafayette Campus

*Select one of the following courses: CHEM C102, CHEM C207 (biochemistry), PHYS 218, or STAT 301. (Not required of all).

**Select one of the following courses: AGRY 105, AGRY 210, or ANSC 101.

Courses in Biology

All courses designed for the Biology major are identified by the letter prefix K on the course number or have no prefix. All courses identified by the letter prefix N are primarily designed to serve students uncommitted to a degree in Biology or for the student where these courses are normal to his or her curricular program (e.g., Allied Health).

NOTE: P—prerequisite; C—concurrent registration; R—recommended; Fall—offered Fall Semester; Spring—offered Spring Semester; Summer—offered in one or both of the Summer Sessions; Day—offered as a daytime section; Night—offered as an evening section.

Introductory

K101 Concepts of Biology I—Plants (4 Cr)
P: High School or college chemistry. Fall, Spring; day, night.
An introductory course emphasizing the principles of cellular biology, molecular biology, genetics, and plant anatomy, diversity, development, and physiology.

K103 Concepts of Biology II—Animals (4 Cr)
P: K101. Fall, Spring; day, night.
An introductory biology course emphasizing structure, physiology, development, diversity, and behavior in animals, and evolution and ecology of plants and animals.

I. PROGRAM IN CELLULAR BIOLOGY AND PHYSIOLOGY

Undergraduate and Graduate Level

501 Cell Physiology (3 Cr)
P: K103, Chem C343. Spring; day, night.
A study of cells at the physiological level including the structure and function of organelles and membranes, enzymology, energy relationships and metabolic control, response to radiation, excitability and contractility, and the regulation of cell growth and differentiation.

502 Cell Physiology Laboratory (2 Cr)
P or C: BIOL 501. Spring; day.
Experimental laboratory work in cell physiology including enzymology, membrane physiology, metabolic activities and biosynthesis, growth regulation, and tissue culture.

551 Plant Physiology (3 Cr)
P: K101 or N105; CHEM C343. Spring; day, night.
The major processes of plant function (photosynthesis, carbohydrate metabolism, translocation, water relations, and ion uptake) and the integration of these processes in plant growth and development.

552 Laboratory in Plant Physiology (2 Cr)
P or C: BIOL 551. Spring; day, night.
Quantitative experiments in plant physiology. Emphasis on modern experimental methods of investigating physiological processes.

556 General and Comparative Physiology (3 Cr)
P: K103 or equivalent, CHEM C106, PHYS 219. Fall; day, night.
Principles of physiology. Nerve and muscle, temperature regulation, ion and water balance.

557 Mammalian Systemic Physiology (3 Cr)
P: BIOL 556 or consent of instructor. Spring; day, night.
A systems analysis of animal physiology with emphasis on mammals. The operation of systems such as respiratory, cardiovascular, neuro-muscular and endocrine will be considered. Interactions between components of individual systems as well as intersystem interactions will be discussed.

558 Laboratory in Physiology (2 Cr)
P or C: BIOL 557. Spring; day, night.
The laboratory exercises are designed to illustrate fundamental physiological principles and to introduce the student to important physiological techniques.

559 Endocrinology (3 Cr)
P: Either BIOL 572 or BIOL 556, and CHEM C342 or by consent of instructor. Fall of even numbered years; day, night.
The study of hormone function. Consideration will be given to the role of hormones in growth, development, metabolism, homeostasis, and reproduction.

570 Biological Membranes (3 Cr)
P: Either BIOL 501 or BIOL 556. Fall of odd numbered years; day, night.
An examination of structure and function of biological membranes. Topics include lipid and protein composition and interactions, physiological properties of membranes, physiological methods of analysis, model membrane systems and survey of specific biological membranes and their mode of action.

571 Neurobiology (3 Cr)
P: BIOL 501 or BIOL 572. Fall of odd numbered years; day, night.
An introduction to the basic principles of neurobiology. The organization, function, and development of the nervous system of representative animals will be considered.

572 Comparative Animal Physiology (3 Cr)
P: K103, CHEM C342, PHYS 219, Calculus. Fall of odd numbered years; day, night.
Physiology of invertebrates and vertebrates with special reference to regulation of water and ionic content, excretion, respiration, oxygen transport, comparative intermediary metabolism, and responses to and regulation of body temperature. Emphasis on reading original literature.

595 Special Assignments (1-3 Cr)
P: Consent of chairman. Fall, Spring, Summer.
Special work, such as directed reading, independent study or research, supervised library, laboratory or field work, or presentation of material not available in the formal courses of the department.

Graduate Level

650 Advanced Topics in Plant Physiology (1-3 Cr)
P: BIOL 551 or equivalent. Fall, Spring; day, night.
May be repeated for a total of 8 credits. This course consists of 4 two-credit topics. One will be offered each semester over a two-year period, with the cycle repeating. Topics will be: photosynthesis (Keck), chemical regulation of growth and photomorphogenesis (Ockerse), membrane structure and function (Stillwell), and nitrogen metabolism (Keck, Ockerse). Check department announcement for topics offered any given semester.

696 Seminar (1 Cr)
Fall, Spring. (May be repeated for credit)
Each semester there are several separate seminar offerings. They will likely be on the following topics: biochemistry, biology teaching, ecology and population biology, genetics, mechanisms of development, microbiology, neurobiology and plant physiology. Oral presentations required.

697 Special Topics (1-3 Cr)
(May be repeated for credit) Fall, Spring.
The frontiers of biology. Critical examination of developments in the various specialties represented by the members of the department. Currently, advanced work in the following and related fields can be offered: molecular genetics; structure and biosynthesis of biologically significant molecules; the nature of biological specificity and enzyme catalysis; the fine structure and chemistry of sub-cellular particles, cells, and tissues; microbial and plant metabolism; comparative biochemistry; genetics and physiology of viruses, bacteria, fungi, protozoa, helminths, and cells of higher forms of life; the genetics, structure, development and physiology of plants and animals, including endocrinology and work physiology; neurobiology, ecology, systematics, and evolution of microorganisms, plants and animals; host-parasite relationships including immunology; and the teaching of biology. The field in which work is offered will be indicated in the student's record.

698 Research. M.S. Thesis (Arr)
Research. M.S. Thesis (Credit arranged)

II. PROGRAM IN GENETICS

Undergraduate Level

K322 Genetics (3 Cr)
P: K103, CHEM C106. Fall; day.
Principles of genetics at the molecular, cellular, organismal, and population level.

K323 Genetics Laboratory (2 Cr)
P or C: K322. Fall; day.
Applied principles of genetics using organisms of increasing complexity from viruses to the fruit fly.

Graduate Level

641 Microbial Genetics (2 Cr)
P: K323 and consent of instructor. Spring of odd numbered years; day, night.
Genetics of bacteria, bacterial viruses, and other microorganisms with emphasis on organization, replication and function of the genetic material.

For Additional Graduate Courses in this Area, Consult Program III

III. PROGRAM IN DEVELOPMENTAL BIOLOGY

Undergraduate Level

K331 Embryology (4 Cr)
P: K103. Spring; day, night.
The development of animals through differentiation of cells, tissues, organs, and organ systems will be examined.

K332 Plant Growth and Development (3 Cr)
P: K101 or N105, CHEM C341. Fall; day, night.
An examination of growth and developmental patterns in plants as affected by growth regulators, age, heredity, photoperiod, and environmental factors.

Undergraduate and Graduate Level

566 Developmental Biology (3 Cr)
P: BIOL 501 or BIOL 520 and K332. Spring of odd numbered years; day, night.
Principles of development with emphasis on concepts and underlying mechanisms; including descriptive, physiological, and molecular approaches.

567 Laboratory in Developmental Biology (1 Cr)
P or C: BIOL 566. Spring of odd numbered years; day, night.
Descriptive and experimental study of plants and animals.

Other Graduate Courses Applied to the Graduate Program In Genetics and Developmental Biology

595 Special Assignments (1-3 Cr)
P: Consent of chairman. Fall, Spring, Summer.
Special work, such as directed reading, independent study or research, supervised library, laboratory or field work or presentation of material not available in the formal courses of the department.

696 Seminar (1 Cr)
Fall, Spring. (May be repeated for credit.)
Each semester there are several separate seminar offerings. They will likely be on the following topics: biochemistry, biology teaching, ecology and population biology, genetics, mechanisms of development, microbiology, neurobiology, and plant physiology. Oral presentations required.

697 Special Topics (1-3 Cr)
(May be repeated for credit.) Fall, Spring.
The frontiers of biology. Critical examination of developments in the various specialties represented by members of the department. Currently, advanced work in the following and related fields can be offered: molecular genetics; structure and biosynthesis of biologically significant molecules; the nature of biological specificity and enzyme catalysis; the fine structure and chemistry of sub-cellular particles, cells, and tissues; microbial and plant metabolism; comparative biochemistry; genetics and physiology of viruses, bacteria, fungi, protozoa, helminths and cells of higher forms of life; the genetics, structure, development and physiology of plants and animals, including endocrinology and work physiology; neurobiology, ecology, systematics, and evolution of microorganisms, plants and animals; host-parasite relationships including immunology; and the teaching of biology. The field in which work is offered will be indicated in the student's record.

698 Research. M.S. Thesis (Arr)
Research. M.S. Thesis (Credit arranged)

IV. PROGRAM IN ENVIRONMENTAL BIOLOGY

Undergraduate Level

K341 Principles of Ecology (5 cr)
P: K103. Fall; day.
A study of the basic concepts of the interrelation of living organisms and their environment.

Undergraduate and Graduate Level

568 Limnology (4 Cr)
P: K341 and CHEM C106. Fall of odd numbered years; day.
Study of the structure and function of aquatic systems; field and laboratory techniques for analysis of chemical, physical, and biological features.

590 Population, Systems and Community Ecology (3 Cr)
P: K341, MATH 222 or MATH 164. Spring of even numbered years; day, night.
A quantitative approach to the dynamics or single- and multi-species populations and communities with analytical and simulation model techniques; mathematical and statistical techniques applied to population, systems, and community ecologies; critical survey of models of population growth, niche metrics, competition, predation, ecological genetics, species diversity and distribution, and ecological succession.

For additional graduate courses in this area consult Program V.

V. PROGRAM IN ORGANISMAL BIOLOGY

Undergraduate Level

K253 Comparative Vertebrate Anatomy (4 Cr)
P: K103. Fall; day, night.
An examination of representative chordates to investigate the principles of chordate evolution and the functional basis for structural change.

K353 Plant Anatomy (4 Cr)
P: K101 or N105. Spring; day, night.
A course in the structure of higher plants incorporating developmental aspects and phylogenetic considerations of cells, tissues, and organs.

K355 Entomology (4 Cr)
P: K103. Fall; day.
An overview of insect taxonomy, structure, and roles which insects play in their natural habitats.

K356 Microbiology (3 Cr)
P: K103, CHEM C341. Equiv. M250. Spring; day, night.
Introduction to microorganisms: cytology, nutrition, physiology, and genetics. Importance of microorganisms in applied fields including infectious disease.

K357 Microbiology Laboratory (2 Cr)
P or C: K356. Equiv. M255. Spring; day, night.
Laboratory experiments and demonstrations to yield proficiency in aseptic cultivation and utilization of microorganisms; experimental investigations of biological principles in relation to microorganisms.

K443 Medical Parasitology and Entomology (3 Cr)
P: K103 or equivalent. Spring of odd numbered years; day, night.
A case-oriented approach to the study of the major parasitic diseases of man. Emphasis will be placed on parasite and vector life cycles, disease symptomatology and treatment, and control measures.

Undergraduate and Graduate Level

530 Introductory Virology (3 Cr)
P: K356, CHEM C342. Fall of odd numbered years; day, night.
Detection, titration, and chemistry of viruses. Viral host interactions: Bacteriophage—bacterium, animal virus—animal cell, plant virus—plant cell. Tumor viruses: infection and transformation.

532 Topics in Bacteriology (2 Cr)
P: K356 and CHEM C342. Fall of even numbered years; day, night.
Selected topics in bacterial physiology: cell division, chemotaxis, bacterial plasmids, and sporulation, bacterial toxins, recombinant DNA.

560 Plant Structure (4 Cr)
P: K101 or N105. Spring; day, night.
All major plant groups will be studied in an intensive investigation of structure as related to function and classification. Students will learn and apply techniques of tissue preparation for microscopic observation and cytochemical analysis.

Other Graduate Courses Applied to the Graduate Program in Organismal and Environmental Biology

595 Special Assignments (1-3 Cr)
P: Consent of chairman. Fall, Spring, Summer.
Special work, such as directed reading, independent study or research, supervised library, laboratory or field work, or presentation of material not available in the formal courses of the department.

696 Seminar (1 Cr)
Fall, Spring. (May be repeated for credit.)
Each semester there are several separate seminar offerings. They will likely be on the following topics: biochemistry, biology teaching, ecology and population biology, genetics, mechanisms of development, microbiology, neurobiology, and plant physiology. Oral presentations required.

697 Special Topics (1-3 Cr)
(May be repeated for credit) Fall, Spring.
The frontiers of biology. Critical examination of developments in the various specialties represented by the members of the department. Currently, advanced work in the following and related fields can be offered: molecular genetics; structure and biosynthesis of biologically significant molecules; the nature of biological specificity and enzyme catalysis; the fine structure and chemistry of sub-cellular particles, cells, and tissues; microbial and plant metabolism; comparative biochemistry; genetics and physiology of viruses, bacteria, fungi, protozoa, helminths, and cells of higher forms of life; the genetics, structure, development

and physiology of plants and animals, including endocrinology and work physiology; neurobiology, ecology, systematics, and evolution of microorganisms, plants and animals; host-parasite relationships including immunology; and the teaching of biology. The field in which work is offered will be indicated in the student's record.

698 Research. M.S. Thesis (Arr)
Research. M.S. Thesis (Credit arranged)

ADDITIONAL COURSES FOR UNDERGRADUATE IN BIOLOGY

K295 Special Assignments (Arr)
P: None. Fall, Spring.
Special work such as directed readings, laboratory or field work, or presentation of material not available in the formal courses in the department.

K317 Laboratory Techniques in Physiology (3 cr)
P: CHEM C106 and one year of college biology. Spring; day, night.
A laboratory course for undergraduate students designed to offer "hands on" experience in instrumentation and to develop technical as well as library and writing skills.

K477 Techniques of Transmission Electron Microscopy (3 Cr)
P: K103, CHEM C341, and consent of instructor. Spring; day, night.
Biological tissue preparation, ultramicrotomy, photography, and related laboratory technique for transmission electron microscopy. Also considered are principles of fixation and staining, cytochemical techniques, and interpretation of ultrastructure.

K483 Biological Chemistry (3 Cr)
Same as CHEM C483. P: CHEM C342. Spring; day, night.
Chemistry of biologically important molecules including carbohydrates, lipids, proteins, and nucleic acids. Special emphasis on chemistry of intermediary metabolism.

K493 Independent Research (1-3 Cr)
P: Consent of chairman. Fall, Spring, Summer.
A course designed to give undergraduate students majoring in biology an opportunity to do research in a field in which they have a special interest.

Undergraduate and Graduate

561 Immunology (3 Cr)
P: K103, C341. Fall; day.
Introduction to the basic principles of immunology and serology at the molecular, cellular, and organismal level.

COURSES FOR THE NON-MAJOR

N100 Contemporary Biology (3 Cr)
P: None, Equiv. BIOL L111. Fall, Spring; day, night.
Selected principles of biology with emphasis on issues and problems extending into everyday affairs of the student.

N105 Introduction to Botany (4 Cr)
P: None. Equiv. PU BIOL 108. Fall, Spring, Summer; day.
This course probes the functions of plants on the cellular and total organisms levels, examines the roles of plants in the environment, and surveys the major plant groups alive today.

N107 Introduction to Zoology (4 Cr)
P: None. Equiv. PU BIOL 109. Fall, Spring, Summer; day, night.
Basic principles of biology, growth, reproduction, energy transport, heredity as they occur in animals. Survey of the animal kingdom emphasizing structure as related to function as well as taxonomic relationships.

N120 Topics in Biology (1-3 Cr)
P: None. Fall, Spring; day, night.
A course dealing with topical aspects of biology designed for undergraduate students not in

the School of Science. A topic such as genetics and man, environmental biology and reproductive biology will be offered as a separate course in a given semester.

N200 The Biology of Women (3 cr)
P: None. Fall, Spring; day, night.
This course examines the biological basis for bodily functions and changes that take place throughout the life of females.

N212 Human Biology (2 Cr)
P: None. Equiv. PU BIOL 201. Fall; day.
Two semester sequence in human biology with emphasis on anatomy and physiology providing a solid foundation in body structure and function.

N213 Human Biology Laboratory (1 Cr)
P or C: N212. Equiv. PU BIOL 203. Fall; day.
Accompanying laboratory for N212.

N214 Human Biology (2 Cr)
P: N212. Equiv. PU BIOL 202. Spring; day.
Continuation of N212.

N215 Human Biology Laboratory (1 Cr)
P or C: N214. Equiv. PU BIOL 204. Spring; day.
Accompanying laboratory for N214.

N217 Human Physiology (5 Cr)
P: None. Equiv. IU PHYS P204. Fall, Spring, Summer; day.
Lectures and laboratory work related to cellular, musculoskeletal, neural, cardiovascular, gastrointestinal, renal, endocrine, and reproductive function in man.

N241 Nature Study (4 Cr)
P: None. Summer; day.
A course dealing with outdoor aspects of biology for students not in School of Science. Areas of biology to be stressed will be birds, insects, trees, and wild flowers. The laboratory will be conducted in the field and will stress activities involving observation, identification, and simple manipulation of environment.
Not acceptable as a Physical or Biological Science course (category III-C) for a School of Science major.

N251 Introduction to Microbiology (3 Cr)
P: One semester general chemistry or one semester life science. Spring; day.
The isolation, growth, structure, functioning, heredity, identification, classification, and ecology of microorganisms, their role in nature and significance to man.

N261 Human Anatomy (5 Cr)
P: None. Equiv. IU ANAT A210. Fall Spring, Summer; day, night.
Lecture and laboratory studies of the histology and gross morphology of the human form, utilizing a cell-tissue-organ system-body approach.

N322 Introductory Principles of Genetics (3 Cr)
P: N105 or N107 or K101. Equiv. PU AGRY 430. Spring; day, night.
Basic principles of plant and animal genetics. Emphasis on transmission mechanisms as applied to individuals and populations. For students in health and agricultural sciences.

N400 Contemporary Biological Skills for Teachers (3 Cr)
P: Consent of instructor. Fall; night.
Concepts and laboratory skills necessary to prepare teachers with diverse backgrounds to return to graduate academic biology courses are reviewed. Topics include general principles of biology, biochemistry, and biomathematics.

RELATED DEPARTMENT COURSES

Agriculture

101 Agricultural Lectures (1 Cr)
To acquaint new students in agriculture with the important problems and opportunities in the various fields of agriculture.

Agronomy

105 Crop Production (3 Cr)
Fundamental principles of crop production and distribution. An introduction to basic soil relations, current field crop production practices, agricultural meteorology, turfgrass management, and plant breeding.

210 Turf Management (2 Cr)
P: None. Spring; day.
Introductory course emphasizing culture, management, and production of turf grown for golf courses, parks, lawns, sod farms, and highways.

255 Soil Science (3 Cr)
P: One year college chemistry.
Differences in soils; soil genesis; physical, chemical and biological properties of soils; relation of soils to problems of land use and pollution; soil management relative to tillage, erosion, drainage, moisture supply, temperature, aeration, fertility and plant nutrition. Introduction to fertilizer chemistry and use.

Animal Science

101 Animal Agriculture (3 Cr)
Importance of livestock in the field of agriculture, and the place of meats and other animal products in the human diet.

221 Introductory Animal Nutrition (3 Cr)
P: CHEM C101 or equiv.
Classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, and formulation of diets for domestic animals.

Forestry and Conservation

103 Introduction to Natural Resource Conservation (3 Cr)
A broad treatment of the scientific basis for forestry and associated natural resources. For students majoring in forestry and conservation and those interested in a natural resources course as an elective.

225 Dendrology (3 Cr)
P: BIOL N105. Fall; day.
Field identification, taxonomy, and silvical characteristics of forest trees and shrubs.

Horticulture

101 Fundamentals of Horticulture (3 Cr)
Study of the biology and technology of horticultural plants and products. Laboratories include: field trips to horticultural farms and industries, experiments to demonstrate both the theoretical and practical aspects of horticultural plant growth and development, and exercises in landscape design.

Department of Chemistry

Professors Boschmann, Fife, Nevill, Rabideau, Zeldin (*Chairperson*)

Professor Emeritus Welcher

Associate Professors Boaz, Cutshall, Fricke, Lipkowitz, Nurok, O'Donnell, Wyma

Assistant Professors Dubin, Malik, Stodulski

Visiting Assistant Professor Larter

Adjunct Professors Boyd, Jackson, McCarthy, Shields

Departmental Counselors For chemistry programs, all chemistry faculty. Preprofessional counselors are Boaz, Fife, and Fricke. Contact the Department for assignment to a counselor.

The Department of Chemistry offers the Bachelor of Arts degree, the Bachelor of Science degree, and the Master of Science degree.* One Bachelor of Science degree option carries certification by the American Chemical Society Committee on Professional Training. The Master of Science degree has both a thesis and nonthesis option.

The Department of Chemistry offers special courses in cooperation with the Continuing Education Department which can be taken either on a credit or noncredit basis. Offered at both the graduate and undergraduate levels, individual courses are given when there is sufficient demand or need. The professional chemist with a degree will find them useful in keeping up with the latest developments in a particular field or in broadening his or her knowledge and background, and the student presently working toward a degree may enrich his or her educational program with a "special topic" course or an interdisciplinary course.

Students in programs which require only one semester of chemistry (e.g., degree requirement in physical science, 3-year nursing, education) take C101. Students with an insufficient background in high school chemistry to qualify for C105 should take C101 as a preparatory course. Students in programs which require two semesters of chemistry take either the C101-C102 sequence or the C105-C106 sequence (see specific program for degree major). The C101-C102 sequence is designed for students who do not need chemistry as a tool subject. The C105-C106 sequence is designed for students pursuing advanced work in scientific fields (e.g., biology, chemistry, geology, medicine, physics). If both C101 and C105 are taken, the credit hours earned in C101 will not count toward the total hours needed for graduation. Admission to C106 on a basis of C101 is not granted.

Students expecting to major in Home Economics and 4-year Nursing should take the C101-C102 sequence. Students expecting to major in Agriculture, Biology, Chemistry, Geology, Physics, and Pre-Pharmacy should take the C105-C106 sequence. Students majoring in Engineering should take the C111-C112 sequence, or C105-C106 if qualified. If Engineering students wish to take a laboratory, they may enroll in C125 along with C111 and in C126 along with C112. For satisfying graduation requirements in chemistry, C105 is considered equivalent to the combined courses C111-C125, and C106 is considered equivalent to the combined courses C112-C126. Credit can only be earned in either the C105-C106 or C111-C112-C125-C126 course sequence.

To enter the curriculum in chemistry, a student should have completed a minimum of two years of high school algebra, one-half year of trigonometry, one year each of chemistry and physics, and three to four years of a modern foreign language. The choice of a particular degree program in chemistry should be made in consultation with a departmental counselor. The level, time, and sequence of courses in the chemistry curriculum is rigid. Thus, all study plans should be made with the assistance of the chemistry counselor.*

* All degrees carry the general requirements of the School of Science. These are described elsewhere in this bulletin.

Bachelor of Arts

PREPROFESSIONAL CHEMISTRY MAJOR

For students who require a knowledge in chemistry as a basis for work in other fields. Suitable for students who plan chemical industry positions as laboratory technicians. Recommended for premedical students with minimum preparation.

Degree Requirements

Areas I, IIIA, and IIIB See the School of Science requirements in this bulletin.

Area II: Foreign Language No language required.

Area IIIC: Physical and Biological Sciences PHYS 218 and 219. Recommended PHYS 152 and 251. Also, at least two additional courses in a laboratory science outside chemistry are required which may be chosen from, e.g., Biology, Geology, or Physics.

Area IIID: Mathematical Sciences MATH 221 and MATH 222. Recommended MATH 163 and MATH 164.

Area IV: Chemistry Concentration Requirements C105, C106, C224, C225, C341, C342, C343 (2 credits), C344 (2 credits), C360 (recommended C361). Recommended C483, C301 or C302.

Bachelor of Science

CHEMISTRY MAJOR

Recommended to students who plan to be professional chemists, secondary school teachers, and those who plan nonresearch industrial positions (e.g., sales). Not recommended to students who plan to pursue graduate studies in chemistry.

Degree Requirements

Areas I, IIIA, and IIIB See the School of Science requirements in this bulletin.

Area II: Foreign Language No language required.

Area IIIC: Physical and Biological Sciences PHYS 152 and 251 and at least two additional courses in a laboratory science outside chemistry which may be chosen from, e.g., Biology, Geology, or Physics.

Area IIID: Mathematical Sciences MATH 163, MATH 164, MATH 261 and CSCI 220.

Area IV: Chemistry Concentration Requirements C105, C106, C310, C311, C315, C341, C342, C343 (2 credits), C344 (2 credits), C361, C362, and at least one of the following—C430, C483, or both C410 and C316. In addition to the requirements in Areas I to III and the chemistry course requirements, the student must choose a minimum of two courses from the following list:

Business	A201 Introduction to Accounting I A202 Introduction to Accounting II L203 Commercial Law I L303 Commercial Law II
Economics	E201 Introduction to Microeconomics E202 Introduction to Macroeconomics
Engineering	190 Elementary Engineering Design 196 Engineering Problem Solving

To become certified to teach chemistry at the secondary level the student must meet the requirements as presented under the MAT degree in chemistry.

PROFESSIONAL CHEMISTRY MAJOR

A.C.S. Certified

For students who plan to become professional chemists. Recommended to students who plan to pursue graduate studies in chemistry. Available only to students of high academic standing with permission of the Departmental Counselor at the beginning of the junior year. This degree carries certification by the Committee on Professional Training of the American Chemical Society.

Areas I, IIIA, and IIIB See the School of Science requirements in this bulletin.

Area II: Foreign Language German G095 and G096.

Area IIIC: Physical and Biological Sciences PHYS 152, 251, 342, and at least one additional course in a laboratory science outside chemistry which may be chosen from, e.g., Biology, Geology, or Physics.

Area IIID: Mathematical Sciences MATH 163, MATH 164, MATH 261, MATH 262, and CSCI 220.

Area IV: Chemistry Concentration Requirements C105, C106, C301 (or C302), C310, C311, C315, C316, C341, C342, C343 (2 credits), C344 (2 credits), C361, C362, C409 (3 credits), C410, and C430.

Chemistry Plans of Study

Bachelor of Arts—Preprofessional Chemistry Major

Freshman				
1	C105 (5) Principles of Chem. I	MATH 221 (3) Calculus	ENG W131 (3) Composition I	SPCH C110 (3) Speech
2	C106 (5) Principles of Chem. II	MATH 222 (3) Calculus	PHYS 218 (4) Gen. Physics	Elective (4)
Sophomore				
3	C341 (3) Organic Chem. I	C343 (2) Organic Chem. Lab. I	PHYS 219 (4) Gen. Physics	Electives (6)
4	C342 (3) Organic Chem. II	C344 (2) Organic Chem Lab II	Electives (10)	
Junior				
5	C224 (4) Quantitative Analysis	C360 (3) Elem. Physical Chemistry	Electives (9)	
6	C225 (4) Quantitative Anal./Inst.	Electives (12)		
Senior				
7	Electives (16)			
8	Electives (16)			

Bachelor of Science—Chemistry Major

Freshman					
1	C105 (5) Principles of Chem. I	MATH 163 (5) Calculus I	ENG W131 (3) Composition I	Elective (3)	
2	C106 (5) Principles of Chem. II	MATH 164 (5) Calculus II	PHYS 152 (4) Mechanics	Elective (3)	
Sophomore					
3	C341 (3) Organic Chem. I	C343 (2) Organic Chem. Lab. I	MATH 261 (4) Multivar. Calculus	PHYS 251 (5) Heat, Elect., Optics	Elective (3)
4	C342 (3) Organic Chem. II	C344 (2) Organic Chem. Lab. II	SPCH C110 (3) Speech	CSCI 220 (3) Computer Programming	Electives (6)
Junior					
5	C310 (3) Analytical Chemistry	C311 (2) Anal. Chem. Lab.	C361 (3) Phys. Chem. I	Electives (9)	
6	C362 (3) Phys. Chem. II	C315 (3) Chem. Meas. Lab. I	Electives (9)		
Senior					
7	Chemistry Elect. (3-5)	Electives (9)			
8	Electives (13)				

Bachelor of Science—Professional Chemistry Major—A.C.S. Certified

Freshman					
1	C105 (5) Principles of Chem. I	MATH 163 (5) Calculus I	ENG W131 (3) Composition I	SPCH C110 (3) Speech	
2	C106 (5) Principles of Chem. II	MATH 164 (5) Calculus II	PHYS 152 (4) Mechanics	Elective (3)	
Sophomore					
3	C341 (3) Organic Chem. I	C343 (2) Organic Chem. Lab. I	MATH 261 (4) Multivar. Calculus	PHYS 251 (5) Heat, Elec., Optics	Elective (3)
4	C342 (3) Organic Chem. II	C344 (2) Organic Chem. Lab. II	MATH 262 (4) Lin. Algebra Diff. Eq.	PHYS 342 (3) Modern Physics	Elective (3)
Junior					
5	C310 (3) Analytical Chemistry	C311 (2) Anal. Chem. Lab.	C361 (3) Phys. Chem. I	G095 (3) German I	CSCI 220 (3) Computer Programming
6	C362 (3) Phys. Chem. II	C315 (3) Chem. Meas. Lab. I	C410 (3) Instrumental Methods	G096 (3) German II	Elective (3)
Senior					
7	C430 (3) Inorganic Chemistry	C316 (3) Chem. Meas. Lab. II	Area IIIC Elective (3)	Electives (6)	
8	C409 (3) Chemical Research	C302 (1) Chemistry Seminar	Electives (11)		

The Department of Chemistry will not grant credit for a course where considerable duplication of course content may occur with another course taken. In general, credit will be allowed for the higher level course, but not for the lower level course. The following listings are considered to be duplications (lower level courses listed first):

CHEM	C224-C225	and	CHEM	C310-C311
CHEM	C360	and	CHEM	C361
MATH	221-222	and	MATH	163-164
PHYS	218-219	and	PHYS	152-251

E.g., if a student has earned credit in MATH 163-164, the student will receive no credit for MATH 221-222, even if earned previously.

On occasion, a student who initially enrolled in the preprofessional B.A. in Chemistry program decides to transfer to the B.S. in Chemistry program, having already taken one or more of the above-listed lower level courses. The following policies will apply:

If a student has a minimum grade of B− in both C224 and C225, the C310-C311 requirement will be considered fulfilled. If the grade is less than B− in either C224 or C225, the student must take C310-C311.

If a student has a minimum grade of B (B− or lower unacceptable) in C360 and approval of the departmental chairperson, credit will be granted for C361 and the student may proceed to C362.

If a student has earned credit for the MATH 221-222 sequence, the student will be placed in MATH 164. If the student passes MATH 164, the MATH 163-164 requirement will be considered fulfilled. If the student does not pass MATH 164, the student must start with MATH 163.

If a student has earned credit for MATH 221 only, the student must take the MATH 163-164 sequence, and no credit will be allowed for MATH 221.

If a student has earned credit for the PHYS 218-219 sequence, the student will be placed in PHYS 251. If the student passes PHYS 251, the PHYS 152-251 requirement will be considered fulfilled. If the student does not pass PHYS 251, the student must start with PHYS 152.

If a student has earned credit for PHYS 218 only, the student must take the PHYS 152-251 sequence, and no credit will be allowed for PHYS 218.

On occasion, a student who initially enrolled in the B.S. in Chemistry program decides to transfer to the preprofessional B.A. in Chemistry program, having already taken one or more of the above-listed higher level courses. In general, a higher level course will always substitute for a lower level course to satisfy the requirement. However, CHEM C310-C311 may be substituted for CHEM 224 only. CHEM C225 will still be required.

In all situations outlined above, the student will receive the total credit hours for the courses allowed.

The Department of Chemistry will accept a maximum of 12 credit hours towards graduation in courses outside the areas of Science and Liberal Arts (e.g. technology, physical education, military science, therapy, etc.).

Master of Science

The complete course and research work for the M.S. degree in chemistry with thesis or nonthesis option is offered at IUPUI. The nonthesis program is designed mainly for the part-time student who works in local industry or in chemically-related fields such as quality control, high school teaching, etc., and the thesis program is designed for the full-time student who is preparing for a career in the research-oriented fields of chemistry.

Admission Requirements

The prospective student should have a baccalaureate degree from an accredited institution, show promise of ability to engage in advanced work, and have made an adequate preparation (approximately 35 hours of coursework in undergraduate chemistry) to enter graduate study in chemistry. Anyone not meeting these requirements should take the Aptitude Test Section of the Graduate Record Examination or seek immediate counseling.

Incoming students with an undergraduate grade point average of 3.00 or higher (A=4.00) will automatically be recommended for admission as regular graduate students. Those with an average below 3.00 will be admitted as temporary graduate students with the provision that a 3.00 average must be achieved in the first three graduate courses (or nine credit hours) if they are to be admitted as regular graduate students.

Application for Admission

Regular graduate student application forms should be obtained from the Department of Chemistry, IUPUI. Usually eight weeks are required for final approval of these applications. Regular graduate students are eligible to become candidates for advanced degrees.

Temporary graduate student application forms may be obtained from the IUPUI Office of Graduate Programs in the Union Building. The temporary graduate classification is primarily for those who wish to take courses for personal improvement. Not more than nine hours of credit earned under this classification may be applied toward an advanced degree.

Transfer Credit

The chemistry department will accept by transfer a maximum of six hours of graduate credit from approved institutions which are in excess of undergraduate degree requirements.

General Degree Requirements

The general requirements include admission to regular graduate status, completion of the English requirement, and satisfactory completion of an approved plan of study. A suitable research or library thesis must be submitted for the thesis option.

The English requirement for candidates whose native language is English is satisfied by having no undergraduate grades below B in composition or by scoring 600 or higher on the Verbal Aptitude Section of the Graduate Record Examination. Students who do not satisfy the English requirement by either of the above methods may take a written examination administered by the English Department to demonstrate their proficiency.

A plan of study should be drawn up by the student and the graduate adviser in advance of registration for the first semester of graduate work. The English requirement must be satisfied before the plan of study may be filed. Only grades of A, B, and C are acceptable as satisfactorily completing an approved plan of study. All grades earned count toward the calculation of the grade point average.

Departmental Degree Requirements

The requirements for each degree are designed to provide both depth and diversity in knowledge. Of the 30-hour requirement for the nonthesis program or the 20-hour course requirement for the thesis program, 12 hours must be at the CHEM 600-level and 9 hours must be in a declared major. Courses from three of the following areas must be taken: biochemistry, CHEM 533 (I.U. C483); organic, CHEM 651 (IU C540); analytical, CHEM 525, CHEM 621 (I.U. C510); inorganic, CHEM 641 (I.U. C530); and physical, CHEM 672 (I.U. C661), CHEM 675 (I.U. C673) or CHEM 679 (I.U. C563). Electives to meet the total number of credits may be taken in other departments, but prior approval of the advisory committee is required. A minimum grade point average of 3.00 must be maintained.

Financial Assistance

The Chemistry Department has available financial support in the form of partial tuition-refund assistantships and associate faculty positions. More information can be obtained by writing to the department chairperson.

Master of Science Industrial Co-op Program in Chemistry

The combined effort of the Purdue University School of Science, IUPUI, and the industrial community of Indianapolis affords a unique opportunity to quality students seeking graduate work in chemistry. The M.S. Industrial Co-Op Program requires 24 months of full-time study, and provides a Purdue M.S. degree in chemistry. It includes a parallel work experience of 20 hours per week during the final 20 months of the program. Graduates of this program may expect to be quite competitive in the industrial job market.

Academic Program

All academic requirements are identical to the normal Purdue M.S. with thesis program. The first semester provides the most intense period of study, including an introduction to laboratory research, seminar, and visits to local industry. At the end of the Fall Semester students will begin work experiences of 20 hours per week. Thesis research also formally begins at this point, and course work continues at a reduced rate throughout the 24-month program.

In this program, students are vital members of academic scientist research groups during the co-op period. Furthermore, meetings of the academic advisers, industrial supervisors, and students to discuss progress in all aspects of the program are required. These students will be much better prepared to contribute to the industrial effort than the usual co-op students since they will have completed a full semester of graduate study in addition to a baccalaureate degree.

Admission

Students must meet the usual admission requirements of the Purdue University Graduate School. Application materials are available from the Chemistry Department, IUPUI. Completed applications, transcripts, and letters of recommendation should be sent to the graduate adviser in Indianapolis.

Acceptance into Co-op Option

During the first semester of graduate work, students will interview with local industry, and co-op assignments will be made by the graduate adviser and the industrial representatives. If a mutually satisfactory position cannot be found for a particular student, the student will be offered a research or teaching assistantship in the department assuming satisfactory performance in course work.

Financial Support

A stipend will be awarded for the first four months. This stipend will be increased for the successful student for the remaining 20 months of the program. Those who are qualified, but are not accepted or do not choose the co-op option can continue as teaching or research assistants in the department. Most students qualify for complete remission of tuition and fees

Industrial Program

The industrial experience will consist of 20 hours per week for the last 20 months of the 24-month program at one of several fine laboratories within a five mile radius of the University. (Students must furnish their own transportation.) Industrial participants include American Monitor Corporation, Dow Chemical Company, and Eli Lilly Company. The types of

industrial positions may include any of the four traditional areas of chemistry as well as medicinal (pharmaceutical), chemistry, and biochemistry.

Areas of Research

Students may select a major from any of the four areas of chemistry (analytical, inorganic, organic, or physical). The research programs of the department are supported by modern instrumentation including gas chromatographs, high pressure liquid chromatographs, proton NMR, carbon-13 NMR, emission spectograph, atomic absorption spectrophotometer, far IR spectophotometer, a variety of recording UV, visible and IR spectrophotometers, and differential pulse polarograph. In addition to a departmental mini computer system, the computing facilities include access to an IBM 370/125, a DEC 10, and a CDC 6600 computer.

Commitments

Neither students nor employers have a commitment for continued employment at the end of the students' program. However, the program allows 20 months of close contact between students and employers, and serves as an excellent basis for career decisions.

Students will be involved in employee/employer relationships with the industrial laboratory, and as such will be subject to the normal terms of employment.

Courses in Chemistry

Note: P—prerequisite; C—concurrent registration; Equiv.—course is equivalent to the indicated course taught at Indiana University Bloomington or the indicated course taught at Purdue University West Lafayette.

C100 Chemistry (3 Cr)
P: none. Fall, day; Spring, day.
How molecules are built, react, and affect our lives. Lectures, demonstrations, and discussion. For students desiring only one semester of chemistry. Does not count toward any degree requirements in the School of Science.

C101 Elementary Chemistry I (5 Cr, 3 Cr without laboratory)
P: At least 1 semester of high school algebra. Equiv. PU CHEM 113. Fall, day, night; Spring, day, night; Summer, day, night.

Essential principles of chemistry; atomic and molecular structure; bonding; properties and reactions of elements and compounds; stoichiometry; solutions; acids and bases. For students who are not planning careers in the sciences and for those with no previous coursework in chemistry. Lectures, recitation, laboratory. N.B. Most degree programs which include C101 require laboratory. Before registering for 3 credits, the student should be certain that this meets the requirements of his or her program.

C102 Elementary Chemistry II (5 Cr, 3 Cr without laboratory)
P: C101. Continuation of C101. Equiv. PU CHEM 251. Fall, day, night; Spring, day, night; Summer, day.

Introduction to organic and biochemistry; organic compounds and their reactions. Lectures, recitation, laboratory.

C105 Principles of Chemistry I (5 Cr, lecture, recitation, laboratory).
P: Two years of high school algebra, one year of high school chemistry. Equiv. PU CHEM 117. Fall, day, night; Spring, day; Summer, day.
Inorganic chemistry emphasizing physical and chemical properties, atomic and molecular structure, states of matter.

C106 Principles of Chemistry II (5 Cr, lectures, recitation/laboratory).
P: C105. Equiv. PU CHEM 126. Fall, day; Spring, day, night; Summer, day.
Continuation of C105. Topics in inorganic chemistry emphasizing solution chemistry, thermodynamics, equilibrium and kinetics.

C111 Chemical Science I (4 Cr, lectures, recitation).
P: Two years of high school algebra, one year of high school chemistry. Equiv. PU CHEM 101, IUPUI C105 lecture. Fall, day, night; Summer, day.
Inorganic chemistry emphasizing physical and chemical properties, atomic and molecular structure, states of matter. A lecture course for engineering and other students with no laboratory requirement.

C112 Chemical Science II (3 Cr, lectures)
P: C111. Equiv. PU CHEM 102, IUPUI C106 lecture. Spring, day, night; Summer, day.
Continuation of C111. Topics in inorganic chemistry emphasizing solution chemistry, thermodynamics, equilibrium and kinetics. Included also are topics in organic chemistry.

C125 Experimental Chemistry I (1 Cr, laboratory).
P or C: C111 or its equivalent. Fall, day, night; Spring, day; Summer, day. Scheduled with the C105 laboratory.
Laboratory work illustrating topics covered in the lecture of C105 and C111.

C126 Experimental Chemistry II (2 Cr, recitation, laboratory).
P or C: C112 or its equivalent. Fall, day; Spring, day, night; Summer, day. Scheduled with the C106 laboratory.
Continuation of C125. Laboratory work illustrating topics covered in the lecture of C106 and C112.

C209 Special Problems (1-2 Cr)
P: Two semesters of college chemistry and consent of instructor. Equiv. PU CHEM 290. Every semester, time arranged.
Individually supervised special problems of chemical interest, e.g., environmental problems, development of experiments, development of audiovisual materials, etc. May be repeated for credit, but maximum credit of 2 hours may be applied toward a chemistry degree.

C224 Quantitative Analysis (4 Cr)
P: C106. Equiv. PU CHEM 224. Fall.
Introduction to the major methods of chemical analysis for the chemical technician or preprofessional chemistry major.

C225 Quantitative Analysis/Instruments (4 Cr)
P: C106. Equiv. PU CHT 225. Spring.
Instrumental methods of chemical analysis and separation for the chemical technician or preprofessional chemistry major.

C301 Chemistry Seminar I (1 Cr)
P: C341 and junior standing. Fall, day.
Topics in basic chemistry and interdisciplinary applications. Research reports and discussion by students, faculty and outside speakers. C301 and C302 may be elected three semesters for credit.

C302 Chemistry Seminar II (1 Cr)
P: C341 and junior standing (C301 is not prerequisite). Spring, day. Content same as C301.

C309 Cooperative Education in Chemistry (1 Cr)
P: general and organic chemistry and consent of department chairperson. Every semester. Time arranged.

Industrial or similar experiences in chemically-oriented employment. Grade is determined on basis of employment visitations, a written student report, and a supervisor evaluation report. May be repeated for a maximum of 5 credits of which 3 may be used as satisfying an advanced chemistry elective.

C310 Analytical Chemistry (3 Cr)
P: C342. Equiv. PU CHEM 321. Fall.
Fundamental analytical processes including solution equilibria, theory and applications of electrochemistry and spectrophotometry, and chemical methods of separation.

C311 Analytical Chemistry Laboratory (2 Cr)
P or C: C310. Fall.
Laboratory instruction in the fundamental analytical techniques discussed in C310.

C315 Chemical Measurements Laboratory I (3 Cr)
P: C310, C361, CSCI 220; C: C362. Fall. Spring.
Experimental work dealing with inorganic synthesis and various physical chemical studies. Selected topics: structural analysis, vacuum techniques, thermodynamics, kinetics, spectroscopy, synthetic inorganic chemistry.

C316 Chemical Measurements Laboratory II (3 Cr)
P: C310, C311, C361, C362, C410. Fall.
Experimental techniques in instrumental analysis. Selected topics: statistical analysis, chemical analysis, chemical separations, electrochemistry, and spectroscopy.

C341 Organic Chemistry I (3 Cr)
P: C106. Equiv. PU CHEM 261. Fall, day, night; Spring, day; Summer, day, night.
Comprehensive study of aliphatic and aromatic compounds. Nomenclature, qualitative theory of valence and reactions. Commercial and laboratory syntheses and uses of monofunctional compounds.

C342 Organic Chemistry II (3 Cr)
P: C341. Equiv. PU CHEM 262. Fall, day; Spring, day, night; Summer, day.
Syntheses and reactions of polyfunctional compounds. Natural and industrial products. Physical and chemical methods of purification.

C343 Organic Chemistry Laboratory I (1 or 2 Cr)
P or C: C341. Equiv. PU CHEM 255L (1 Cr), CHEM 263L (1 Cr), CHEM 265L (2 Cr). Fall, day, night; Spring, day; Summer, day, night. (1 Cr option offered only in Summer).
Fundamental laboratory techniques of organic chemistry and general synthetic methods.

C344 Organic Chemistry Laboratory II (1 or 2 Cr)
P or C: C342, P: C343. Equiv. PU CHEM 256L (1 Cr), CHEM 264L (1 Cr), CHEM 266L (2 Cr). Fall, day; Spring, day, night; Summer, day. (1 Cr option offered only in Summer).
Preparation, isolation and identification of organic compounds; emphasis on modern research methods.

C360 Elementary Physical Chemistry (3 Cr)
P: C106, MATH 222, PHYS 219. Fall.
Chemical thermodynamics, chemical equilibria, solutions, phase equilibria, electrochemistry, and kinetics. For students who desire a survey course in physical chemistry.

C361 Physical Chemistry I (3 Cr)
P: C106, MATH 164, PHYS 219 or 251. Equiv. PU CHEM 373. Fall, day; Spring, night.
Kinetic-molecular theory, gases, chemical thermodynamics, solutions, phase and chemical equilibria, and introduction to statistical thermodynamics.

C362 Physical Chemistry II (3 Cr)
P: C361, MATH 164, PHYS 219 or 251, CSCI 220. Equiv. PU CHEM 374. Fall, night; Spring, day.
Introduction to quantum chemistry, symmetry, atomic and molecular structure and spectra, solids, liquids, electrochemistry, chemical kinetics and photochemistry.

C409 Chemical Research (1-5 Cr)
P: junior or senior standing and consent of instructor. Equiv. PU CHEM 499. Every semester. Time Arranged.
Chemical or literature research with a report. Can be elected only after consultation with research adviser and approval of program. May be taken for a total of 10 credit hours which count toward graduation. However, a maximum of 3 hours may be used to satisfy the 6 hours of advanced chemistry electives in the Bachelor of Science in Chemistry degree programs.

C410 Instrumental Methods of Analysis (3 Cr)
P: C310, C311, C361; P or C: C362. Equiv. PU CHEM 424. Spring.
Modern analytical methods, including electroanalytical techniques, quantitative spectrophotometry, chromatography and radiochemical methods.

C430 Inorganic Chemistry (3 Cr)
P: 1 year of physical chemistry. Equiv. PU CHEM 342. Fall.
An introduction to the principles of inorganic chemistry with emphasis on the chemistry of the nontransition elements. A brief introduction to coordination chemistry and ligand field theory.

C483 Biological Chemistry (3 Cr)
Same as and co-listed with BIOL K483. P: C342 or equivalent. Equiv. PU CHEM 533. Spring, night.
Chemistry of biologically important molecules, including carbohydrates, lipids, proteins, and nucleic acids. Special emphasis on chemistry of intermediary metabolism.

525 Intermediate Analytical Chemistry (3 Cr)
P: C310, C410 or equivalent, C362. Equiv. IU C520. Fall, night.
Survey of chemical and instrumental methods of analysis.

542 Inorganic Chemistry (3 Cr)
P: 1 year of physical chemistry. Equiv. IU C430. Fall.
An introduction to the principles of inorganic chemistry with emphasis on the chemistry of the nontransition elements.

573 Physical Chemistry (3 Cr)
P: C106, MATH 164, PHYS 219 or 251. Fall, day; Spring, night.
Order of taking 573 and 574 optional. Kinetic-molecular theory, gases, chemical thermodynamics, solutions, phase and chemical equilibria, introduction to statistical thermodynamics.

574 Physical Chemistry (3 Cr)
P: C106, MATH 261 and PHYS 251. Fall, night; Spring, day.
Order of taking 573 and 574 optional. Introduction to quantum chemistry, symmetry, atomic and molecular structure and spectra, solids, liquids, electrochemistry, chemical kinetics, and photochemistry.

599 Special Assignments (1-4 Cr)
P: consent of instructor. Every semester, on demand. Time arranged. Directed reading or special work not included in other courses.

621 Advanced Analytical Chemistry (3 Cr)
P: C310, C410. Equiv. IU C510. Spring, odd years, night.
A critical survey of recent developments in chemical and instrumental methods of analysis.

629 Chromatographic Methods of Analysis (2 Cr)
P: C410 or equivalent. Spring, night.
Principles and practice of modern gas and liquid chromatography are developed from an integrated point of view. Emphasis is placed on those features useful in practical analytical separations. Instrumentation is described and evaluated using chemical examples from recent literature. Although column techniques are emphasized, thin-layer chromatography and electrophoresis methods are also described.

634 Biochemistry: Structural Aspects (3 Cr)
P: C310, C342, C361 and C362 or equivalent. Fall, night.
Chemistry of materials of biochemical interest; carbohydrates, lipids, proteins, amino acids, nucleic acids, porphyrins, biochemistry of blood.

636 Biochemical Mechanisms (3 Cr)
P: 1 year of physical chemistry and CHEM 651. Spring, night.
The chemical basis of enzymatic catalysis with particular emphasis on catalytic interactions important in aqueous media.

641 Advanced Inorganic Chemistry (3 Cr)
P: C430 or CHEM 542 Equiv. IU C530. Spring, night.
Bonding in inorganic chemistry, symmetry and group theory, transition metal chemistry, spectra and magnetism, mechanisms of inorganic reactions, limited survey of periodic table.

651 Advanced Organic Chemistry (3 Cr)
P: C342 or equivalent. Equiv. IU C540, Fall, night.
Modern structural organic chemistry, including introductions to molecular orbital theory and reaction mechanisms.

652 Synthetic Organic Chemistry (3 Cr)
P: CHEM 651. Equiv. IU C543. Every third semester, night.
An advanced treatment of methods for preparing major types of organic functionalities and bonds, stressing stereochemical control and involving mechanisms for understanding the reactions employed.

657 Reaction Mechanisms (3 Cr)
P: CHEM 651. Every third semester, night.
Mechanisms of representative reactions and methods used in their investigation.

669 Theoretical Organic Chemistry (3 Cr)
P: CHEM 651. Every third semester, night.
Theoretical aspects of organic chemistry at the molecular level and its relationship to bonding and reactions.

672 Quantum Chemistry (3 Cr)
P: 1 year of physical chemistry. Equiv. IU C661. Fall, night.
Basic principles of classical and quantum mechanics; exact solutions for simple systems; approximation methods; atomic structure; spectroscopy; application of group theory; theory of molecular binding.

675 Chemical Kinetics (2 or 3 Cr)
P: 1 year of physical chemistry. Equiv. IU C673. Spring, odd years, night.
Experimental and theoretical considerations of chemical reaction rates and mechanisms.

679 Chemical Thermodynamics (3 Cr)
P: 1 year of physical chemistry. Equiv. IU C563. Spring, even years, night.
Advanced thermodynamics of chemical and phase equilibria, of electrolytic and nonelectrolytic solutions, and of imperfect gases.

695 Seminar (1 Cr)
For graduate students (may be repeated for credit).
Groups meeting for review and discussion of important current literature in analytical, biological, inorganic, organic, and physical chemistry. Each graduate student is required to attend the seminar of his/her major subject.

696 Special Topics in Chemistry (1-3 Cr)
On demand, night.
Lectures on selected topics of current interest.

698 Research. M.S. Thesis (Credit arranged)

Occasional courses of special interest are offered on the undergraduate level. For details see Special Programs, this bulletin.

Department of Computer and Information Science

Professors Crown, John Gersting, Judith Gersting, Huffman, Yovits

Assistant Professor Swart

Lecturers Lo, Richards

Departmental Counselors Lo, Richards, Swart

Graduate Counselors Crown, Gersting

The Department of Computer and Information Science offers the Bachelor of Science degree and the Master of Science degree. In addition, the Department offers service courses to acquaint students in other disciplines with computers and their applications.

Computer scientists study the processing, representation, and retrieval of information by computers. A student completing the undergraduate degree in Computer and Information Science may apply his or her knowledge to finding computerized solutions to problems arising in almost any area of endeavor, designing new computer architectures and systems, or applying techniques of system analysis and information handling to a variety of real world situations in business, industry, government, education, health sciences, etc. The student is also prepared to pursue graduate work in Computer and Information Science.

Bachelor of Science

Degree Requirements

See School of Science requirements for general degree requirements. Computer Science majors are admitted provisionally until they have completed Math 163 and CSCI 220 with grades of C or better.

Area I See Bachelor of Science requirements listed earlier in this bulletin.

Area II No foreign language required

Areas IIIA and IIIB Courses in other schools that are primarily mathematical may not be used to fulfill Area IIIA or IIIB requirements.

Area IIIC Certain School of Science courses do not count toward the degree program; see list in this bulletin, under General Requirements for the Baccalaureate Degree (item 10). Certain School of Science courses, such as Chemistry C101, C102; Physics 100, 200, 218, 219; Astronomy A100, A105; Geology G107, G115, G130, may not be used to fulfill Area IIIC requirements.

The following Engineering sequences may be applied toward Area IIIC requirements: EE 201 and EE 207; EE 261 and EE 267.

Area IV Major Requirements
Computer and Information Science courses below CSCI 220, Computer Technology courses below CPT 264, Mathematics courses below MATH 163, and Statistics courses below STAT 311 do not count toward the degree. Students must obtain a minimum GPA of 2.5 in MATH 163, 164, 261, and CSCI 220, 300, 320, 430.
Required courses:

1. The calculus sequence MATH 163, 164, 261
2. STAT 311 or STAT 511
3. The Computer and Information Science core CSCI 220, 320, 300, 430

4. Three of the following four two-course sequences:
   CSCI 402 CSCI 380 CSCI 482 MATH 262 (or, preferably, MATH 351 and 361)
   CSCI 403 CSCI 541 CSCI 484 CSCI 414
5. Two Computer and Information Science electives at the 400 level or above.
6. Each student must complete at least one 500 level Computer and Information Science course.

Computer and Information Science Sample Program

Freshman					
1	CSCI 220 (3) Programming I	MATH 163 (5) Calculus	ENGL W131 (3) Composition	Humanities or Soc. Science (3)	Free Elective (3)
2	CSCI 320 (3) Programming II	MATH 164 (5) Calculus	SPCH C110 (3) Speech	Humanities or Soc. Science (3)	Free Elective (3)
Sophomore					
3	CSCI 300 (3) Assembly Lang.	MATH 261 (4) Calculus	Laboratory Science (3-5)	Free Elective (3)	Free Elective (3)
4	CSCI 430 (3) Data Structures	STAT (3) * Stat Methods	Laboratory Science (3-5)	Free Elective (3)	Free Elective (3)
Junior					
5	CSCI Sequence A1 (3)	CSCI Sequence B1 (3)	Science Elective (3-5)	Free Elective (3)	Free Elective (3)
6	CSCI Sequence A2 (3)	CSCI Sequence B2 (3)	Science Elective (3-5)	Free Elective (3)	Free Elective (3)
Senior					
7	CSCI Sequence C1 (3)	Advanced CSCI Elective (3)	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)
8	CSCI Sequence C2 (3)	Advanced CSCI Elective (3)	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)

* Those taking the MATH 262—CSCI 414 sequence should take MATH 262 here and reschedule Statistics later in the program.

Master of Science

This program is authorized for the Indianapolis Campus by the Department of Computer Science of Purdue University, and it leads to a Purdue University degree. The program is designed to accommodate the part-time student, and all course offerings are normally offered on the IUPUI evening schedule. A student completing the Master's degree in Computer and Information Science should be prepared to enter the job market at a relatively high level of responsibility and expertise. He or she may work in systems analysis or systems programming, or be in charge of a large scale programming or research project. The student is also prepared to pursue further graduate work, or to teach in a two-year college or technical program.

Admission Requirements

Students entering the graduate program should have an undergraduate degree with an overall B average or better. Admission as a regular graduate student would normally require an undergraduate degree in computer science.

Students who do not have this background should have completed the following courses (or equivalents) before applying for the graduate program: MATH 163, 164, 261, and CSCI 220, 320, 300, 430. A minimum GPA of 3.0 in those courses taken, with at most one grade below B− and no grades below C−, is required for admission. These courses carry no credit toward the graduate degree, except that 1.5 credit hours from CSCI 430 may be applied toward the

degree (see item 3 under Departmental Degree Requirements below). After application, the student must then make up remaining deficiencies (400 level courses), for which some credit may be allowed toward the degree (see item 3 under Departmental Degree Requirements below).

Application for Admission

Regular graduate student application forms should be obtained from the Department of Computer and Information Science, IUPUI, (P.O. Box 647, Indianapolis, IN 46223.) The Graduate Record Exam is not required for admission, but international students are required to submit a TOEFL score. The student is also encouraged to talk to a graduate adviser in order to receive counseling and prepare an informal plan of study.

While the graduate application is being processed, the student may take courses as a temporary graduate student. No more than nine hours of credit earned as a temporary graduate student may be applied toward a graduate degree. (Lower level deficiency courses such as MATH 163, CSCI 220, etc., are not applied against the nine hours since these courses carry no credit toward the degree.) Students not seeking degrees who are taking courses for personal improvement may also do so as temporary graduate students. Temporary graduate student application forms may be obtained from the IUPUI Office of Graduate Programs.

Transfer Credit

A maximum of nine hours of graduate credit which are in excess of degree requirements from approved institutions can be accepted by transfer.

General Degree Requirements

The general requirements include admission to regular graduate status, completion of the English requirement, and satisfactory completion of an approved plan of study.

The English requirement for candidates whose native language is English is satisfied by having no undergraduate grades below B in composition or by scoring 600 or higher on the Verbal Aptitude Section of the Graduate Record Examination. Students who do not satisfy the English requirement by either of the above methods must take a written examination administered by the English department to demonstrate their proficiency.

The student's formal plan of study must be submitted and accepted by the graduate school *before* the semester in which the student expects to recieve the degree. The English requirement must be satisfied before the plan of study may be filed. No course in which the grade earned is below C may be accepted toward completion of the plan of study.

Departmental Degree Requirements

1. Completion of at least 30 credit hours with a grade average of at least B. The credit hours must include the courses required under 2 below. Not more than six credit hours of grade C can be included.
2. Required courses are:
   a. One of CSCI 514, 516, 520, 614, or 615
   b. One of CSCI 582 or 585 (CSCI 482 and CSCI 484 together may be used to satisfy this requirement if neither course was taken as part of a previous degree.)
   c. CSCI 502 and CSCI 503
3. The balance of the 30 hours must consist of Computer and Information Science courses numbered above 500, or a maximum of two courses (6 credit hours) in a related discipline, these courses to be approved in advance by the student's advisory committee. With the approval of the advisory committee, a student may take up to four undergraduate Computer and Information Science courses at the 400 level for half credit (1.5 credit hours for a nominally 3 credit hours course) toward the degree, except for CSCI 490 which may not be applied toward a graduate degree. In order to count for half credit, the grade received in a 400 level course must be A or B.

Courses in Computer and Information Science

Note: P—prerequisite; C—concurrent registration; R—recommended

CSCI 201 Introduction to Computers for the Humanities (3 Cr)
P: none.
An introduction to computers intended for students in the humanities and liberal arts. Some programming with emphasis on non-numerical programs. Computer applications which affect everyday life. The impact of computers on society, including both problems and benefits. Computer applications in the humanities.

CSCI 208 The Computer in Business (3 Cr)
P: MATH 118 or MATH 119 and Sophomore standing.
Introduction to computers and their use in business. Elements of computer organization and data storage. Programming in FORTRAN to solve business oriented problems; emphasis on structured programming. Developments in computing affecting business.

CSCI 220 Programming I (3 Cr)
P or C: MATH 163 or MATH 221.
An introduction to computer science. Emphasis on algorithm development and structured programming techniques. Programming in FORTRAN 77, including input/output, flow of control, arrays, subprograms. Program development and debugging. Fundamental concepts of computer organization, social issues in computing.

CSCI 300 Assembly Language Programming (3 Cr)
P: CSCI 220 or equivalent.
Assembly language programming and structure of a simple computer and a typical computer. Number and character representation. Pseudo operations, address structure, subroutines and macros. File I/O and buffering techniques. Interfacing with programs written in high level languages. One and two pass assemblers. Programming assignments on bit/byte manipulation, I/O buffering and interfacing with high level languages including parameter passing.

It is recommended that students do not take CSCI 300 and CSCI 320 concurrently.

CSCI 320 Programming II (3 Cr)
P: CSCI 220 or equivalent.
Further emphasis on structured programming using a block structured higher level language such as Pascal. Advanced programming concepts: data types, recursion, scope of identifiers, elementary data structures. Program development and testing. Programming project required.

CSCI 380 Introduction to Data Management (3 Cr)
P: CSCI 320.
Introduction to basic concepts of file organization and retrieval of data from secondary storage media; internal and external sorting techniques; illustrative problems from data processing and database management systems using either COBOL or PL/I.

CSCI 385 (MATH 385) Introduction to Logic (3 Cr)
P: MATH 261.
Propositional calculus and predicate calculus with applications to mathematical proofs, valid arguments, switching theory, and formal languages. Not open to students with credit in MATH 581.

CSCI 402 Architecture of Computers (3 Cr)
P: CSCI 430.
Basic logic design. Storage systems. Processor organization: instruction formats, addressing modes, subroutines, hardware and microprogramming implementation. Computer arithmetic, fixed and floating point operations. Properties of I/O devices and their controllers. Interrupt structure. Virtual memory structure; cache memory. Examination of architectures such as microcomputers, minicomputers, vector and array processors.

CSCI 403 Systems Programming (3 Cr)
P: CSCI 402. R: CSCI 461.
Fundamental concepts of programming language processors and operating systems. Design of assemblers, macro processors, relocatable and linking loaders. BNF grammars, parsing, syntactic and semantic phases, optimization. Operating systems: design of monitors, kernels, process management, virtual devices, memory management.

CSCI 414 Numerical Methods (3 Cr)
P: MATH 262, or MATH 351 and MATH 361, and CSCI 220 or equivalent.
Error analysis, solution of nonlinear equations, direct and iterative methods for solving linear systems, approximation of functions, numerical differentiation and integration, numerical solution of ordinary differential equations. Not open to students with credit in CSCI 512.

CSCI 430 Data Structures (3 Cr)
P: CSCI 320 and CSCI 300.
Specification, representation and manipulation of basic data structures, linked lists, arrays, stacks, queues, trees, strings. Symbol tables, Huffman codes, optimal search trees, pattern matching, priority queues, heaps, hash tables. Storage allocation, garbage collection, compaction, reference counts.

CSCI 450 Programming Methodology (3 Cr)
P: CSCI 320 and CSCI 482.
Tools and techniques used in software development. Lifecycle concepts applied to program specification, development and maintenance. Topics include: overall design principles in software development; the use of structured programming techniques in writing large programs; formal methods of program verification; techniques and software tools for program testing; maintenance and documentation.

CSCI 461 Programming III (3 Cr)
P: CSCI 430.
Study of the syntax, semantics, and implementation of high level languages. In addition, students are expected to learn several languages and write programs which illustrate their distinguishing features. Languages studied may include, but are not restricted to, Ada, APL, LISP, PL/I, SNOBOL.

CSCI 482 Discrete Computational Structures (3 Cr)
P: MATH 261.
Discrete mathematical structures and their relationship to computer science. Topics from sets, relations, functions, permutations, combinatorics, graphs, trees, group theory, boolean algebra, recurrence relations, switching circuits, finite-state automata, codes.

CSCI 484 Theory of Computation (3 Cr)
P: CSCI 482.
Techniques for analyzing and comparing algorithms are presented. Algorithms analyzed include those for sorting, searching, graph theory, combinatorics, computational geometry, matrices and other problems. Computational complexity, including Turing machines, NP-Completeness and effective computability.

CSCI 490 Topics in Computer Sciences for Undergraduates (1-5 Cr)
By arrangement.
Supervised reading and reports in various fields. Open to students only with the consent of the department.

Dual Level (Undergraduate-Graduate)

CSCI 501 Data and Storage Structures (3 Cr)
P: CSCI 430 and graduate standing.
Topics in advanced data structures.

CSCI 502 Compiling and Programming Systems (3 Cr)
P: CSCI 403 R: CSCI 461.
Basic principles of compilers and compiler design. Lexical and syntax analysis, runtime

storage and register management; optimization, and I/O processing; top-down and bottom-up strategies; syntax specification schemes.

CSCI 503 Operating Systems (3 Cr)
P: CSCI 403.
Resource management, task management, and data management; multiprogramming and virtual memory-based systems. Systems programming principles: composite design, systems programming languages, reliability considerations. Deadlock detection and prevention; synchronization among tasks and system components. Virtual machine systems, system security. Performance measurement tools and methods; system tuning. Distributed-processor systems.

CSCI 512 Numerical Methods for Engineers and Scientists (3 Cr)
P: MATH 262, or MATH 351 and MATH 361, and CSCI 220 or equivalent. Not open to students with credit in CSCI 414.
Error analysis, solution of nonlinear equations, direct and iterative methods for solving linear systems, eigenvalues, approximation of functions, interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations, numerical instability.

CSCI 514 Numerical Analysis (3 Cr)
P: CSCI 414 or CSCI 512 or equivalent.
Difference equations, spline theory, analysis of iterative methods for solving nonlinear equations, quotient-difference algorithm for solution of polynomial equations, numerical solution of ordinary differential equations, analysis of algorithms for stability and round-off error.

CSCI 515 Numerical Analysis of Linear Systems (3 Cr)
P: MATH 351 or MATH 511, and CSCI 220 or equivalent.
Computational aspects of linear algebra; linear equations and matrices, direct and iterative methods; eigenvalues and eigenvectors of matrices; error analysis.

CSCI 516 Computational Methods in Applied Mathematics (3 Cr)
P: CSCI 320, and MATH 510 or consent of instructor.
A study of techniques such as direct integration, shooting, finite difference, finite element, method of weighted residuals, methods of characteristics and others for solving problems in fluid mechanics, solid mechanics, dynamics and other fields of applied mathematics.

CSCI 520 Linear Systems and Mathematical Programming (3 Cr)
P: MATH 351 or MATH 511 or consent of instructor.
Systems of linear equations, Gauss-Jordan reduction and echelon form, systems of linear inequalities, linear programs, simplex method, duality, networks, mathematical modeling of problems in economics, management, urban administration, and the behavioral sciences.

CSCI 541 Database Systems (3 Cr)
P: CSCI 430 R: CSCI 380.
Introduction to database concept, query languages, data definitions, and manipulation languages. Relational data models, hierarchical data models, and CODASYL-DBTG network data model. Indexing techniques. Case studies of current database management systems. Systems evaluation and selection. Logical database design and restructuring. Data translation. Data security and integrity.

CSCI 543 Discrete System Simulation (3 Cr)
P: CSCI 320, and STAT 311 or STAT 511, or consent of the instructor.
Simulation and modeling of discrete, continuous or combined systems, Monte Carlo techniques; use of special simulation languages to simulate actual systems; generation of random numbers and stochastic variates; verification of simulation models; design of simulation experiments.

CSCI 547 Information Storage and Retrieval (3 Cr)
P: CSCI 430.
Automatic analysis of information content in natural language text for automatic retrieval. Construction of dictionaries; null, synonym, etc. Recall and precision. Interactive feedback.

CSCI 582 Automata, Formal Languages, and Computability I (3 Cr)
P: CSCI 484.
Formal grammars, with particular emphasis on context-free grammars. Computational complexity, LR(k) grammars, unsolvability questions.

CSCI 585 (MATH 585) Mathematical Logic I (3 Cr)
P: MATH 351.
Formal theories for propositional and predicate calculus with study of models, completeness, compactness. Formalization of elementary number theory; Turing machines, halting problem, and the undecidability of arithmetic.

CSCI 590 Topics in Computer Sciences (1-5 Cr)
By arrangement.
Directed study for students who wish to undertake individual reading and study on approved topics.

CSCI T590 Computer Science for Teachers (3 Cr)
An introduction to computer science intended for high school mathematics teachers. Fundamental concepts of computer organization and machine language. Programming in a high-level language. Applications include use of microcomputers in the school, computer-aided instruction, information storage and retrieval, and computer science teaching. Not open to computer science majors.

Graduate Level

CSCI 614 Numerical Solution of Ordinary Differential Equations (3 Cr)
P: CSCI 514 or consent of the instructor.
Numerical solution of initial-value problems by Runge-Kutta methods, general one-step methods, and multistep methods. Analysis of discretization error and rounding error. Stability of multistep methods. Numerical solution of boundary and eigen-value problems by initial-value techniques and finite difference methods.

CSCI 615 Numerical Solution of Partial Differential Equations (3 Cr)
P: CSCI 514 and MATH 523.
The numerical solution of hyperbolic, parabolic, and elliptic equations by finite difference methods; iterative methods (Gauss-Seidel, overrelaxation, alternating direction) for solving elliptic equations; discretization and round-off errors; explicit and implicit methods for parabolic and hyperbolic systems; the method of characteristics; the concept of stability for initial value problems.

CSCI 660 Design of Translating Systems (3 Cr)
P: CSCI 502 and CSCI 461.
Advanced topics in language processing, continuing the coverage of compilers in CSCI 502. Source-level logic optimization; compilers for small machines; debugging compilers. Formal properties of languages and their effects on syntax analysis; language specification methodologies. Extensible languages and nonprocedural languages. Compiler-compilers and decompilers.

CSCI 661 Formal Compiling Methods (3 Cr)
P: CSCI 484 and CSCI 502.
Application of theoretical concepts developed in formal language and automata theory to the design of programming languages and their processors. Syntactic and semantic notations for specifying programming languages. Theory of pushdown automata, precedence analysis, and bounded-context syntactic analysis as models of syntactic portion of translator design. Analysis of translators in terms of storage space and translation-time estimates. Algorithms for reducing compiler size and increasing the speed of compilation.

Department of Geology

Professor Mirsky (*Chairperson*)

Assistant Professors de Caprariis, Hall, McHone, Pachut, Rosenberg

Departmental Counselors Professors Mirsky and Hall.

Geology is the science of the earth—man's systematic attempt to understand the planet and the environment in which he dwells. Geology includes the location, extraction, and economic use of minerals, rocks, soils, water, coal, and petroleum. These natural resources compose the earth and make possible our modern technology and civilization. Geologists study the landforms produced by volcanoes, streams, winds, glaciers, and other surficial earth processes. They investigate the internal earth processes of earthquakes, mountain building, continental drift, and sea-floor spreading. Geology includes the fossils which record the development of life on the earth and also includes the investigation of the billions of years of earth history. Geology has recently expanded to include the study of the moon and the other planets in the solar system.

The Department of Geology furnishes training for (1) those who desire to become professional geologists and seek careers in industry, in research laboratories, in federal or state or local government, or in university or college teaching; (2) those who wish to teach earth science or geology at the secondary school level; and (3) those who seek a general knowledge of geology, its relationship to other sciences, and its importance to the environment of mankind.

The following degree options are offered in geology: Bachelor of Arts (B.A.) in Geology (with General Geology Option or Earth Science Secondary Teaching Certification Option), and Bachelor of Science (B.S.) in Geology. The choice of a particular degree option and proposed plan of study must be made in consultation with a departmental counselor.

Bachelor of Arts

(Granted by Indiana University)

GENERAL GEOLOGY OPTION

Degree Requirements

Area I See School of Science requirements. Geology G205 may partially satisfy this requirement in Area I, but the three credits cannot then also be counted as part of the Geology credits required in Area IV.

Area II Languages There is no requirement for a foreign language.

Area IIIA See School of Science requirements. First year of a foreign language does not apply towards satisfying this requirement.

Area IIIB See School of Science requirements.

Area IIIC Physical & Biological Sciences See School of Science requirements, but at least two of the four courses must include Chemistry C105-C106, and at least one of the four courses must be in Biological Sciences. No grade below C− will be accepted in Chemistry C106, or in the other two courses to satisfy Area IIIC.

Area IIID Mathematical Sciences MATH 147-148 or MATH 150. No grade below C− will be accepted in MATH 148 or MATH 150.

Area IV Geology Concentration Requirements 33 credits of Geology (including G109, G110, G205, G206, G221, G222, G303, G323, G334, G404, but not Geology G107, G115, or G130 which apply as electives towards the University-required total of 122 credits), and sufficient credits from related subjects to complete the concentration group. This program can provide a broad general education and often an adequate background for professional employment in geology.

Other Requirements

See School of Science General Requirements.

EARTH SCIENCE SECONDARY TEACHING CERTIFICATION OPTION

Degree Requirements

A. **Humanities** 18-24 credits
   Area I One course in English Composition, one course in Speech, and one additional course in English Composition or Speech. Geology G205 may partially satisfy this requirement, but the three credits cannot then also be counted as part of the Geology credits required in Area IV.
   Area II No foreign language requirement.
   Area IIIA See School of Science requirements. First year of a foreign language does not apply towards satisfying this requirement.
B. **Social and Behavioral Sciences** 9-15 credits
   Area IIIB See School of Science requirements.
C. **Life and Physical Sciences** 9-15 credits
   Area IIIC & D Same as under General Geology option above.
D. **Electives as needed to obtain a total of 40 credits**

Earth Science Requirements (Area IV)

51 credits of Geology and related subjects (including G109, G110, G205, G206, G221, G222, G303, G323, G334, G404), Chemistry C105-C106. No grade below C− will be accepted in Chemistry C106. The additional related subjects are chosen from among those courses listed in the certification requirements.

Certification Requirements

Because specific lists of courses depend on the student's Secondary Area, the student should consult with a Geology counselor to identify the specific list of courses to complete the certification requirements.

Professional Education Requirements

29 credits including H340 (3 Cr), P253 (3 Cr) with M201 (1 cr), M313 (3 Cr), M449 (4 Cr), M300 (3 Cr), M462
(3 Cr), and M480 (9 Cr). Every student who plans to obtain a teaching certificate must meet a minimum competence in a speech and hearing test and be formally admitted to the teacher education program. M449 must be taken one semester before student teaching. Also methods and student teaching must be taken on the same campus.

Other Requirements

See School of Science General Requirements, except electives to make a minimum of 124 credits, and an average of C or better for education courses (with at least a C in M449).

Bachelor of Science

(Granted by Indiana University)

Degree Requirements

Area I See School of Science requirements. Geology G205 may partially satisfy this requirement in Area I, but the three credits cannot then also be counted as part of the Geology credits required in Area IV.

Area II There is no requirement for a foreigh language.

Area IIIA See School of Science requirements. First year of a foreign language does not apply towards satisfying this requirement.

Area IIIB See School of Science requirements

Area IIIC Physical & Biological Sciences Chemistry C105-C106; Physics 218-219 or 152-251; and two courses in Biological Sciences, with Geology Department's approval. No grade below C− will be accepted in Chemistry C106, Physics 219, or Physics 251, or in the two courses in Biological Sciences.

Area IIID Mathematical Sciences Calculus MATH 163-MATH 164, and two courses in computers and/or statistics. (May include certain computer courses in School of Engineering and Technology, with Departmental approval.) No grade below C− will be accepted in MATH 164.

Area IV Geology Concentration Requirements Geology: 44 credits including G109, G110, G205, G206, G221, G222, G303, G323, G334, G429, and three courses from among 400-level or higher Geology electives (but note that G409 or G410 must total at least 3 credits). Geology G107, G115, and G130 do not count towards the Geology concentration of 44 credits, but may be applied as electives towards the University-required total of 122 credits.

General two courses at 300-400 level in one or more of the following departments: Biological Sciences, Chemistry, Mathematical Sciences, and Physics.

Other Requirements

See School of Science General Requirements.

Geology Sample Plans of Study

There is no single semester-by-semester plan of study for any of the three degree options, because of the flexibility encouraged within the program for each option. However, one possible sequence of courses for each option is given below; variations from these samples of plans of study should be made in consultation with a departmental counselor.

Bachelor of Arts, General Geology Option

Freshman						
1	G109 (4) Geology: Evolution of the Earth	MATH 147 (3) Algebra & Trig I	W131 (3) English Composition	Arts & Humanities (3)		
2	G110 (3) Geology: Earth's Environment	G206 (1) Physical Geology Laboratory	MATH 148 (3) Algebra & Trig II	N107 (4) Animal Biology	Arts & Humanities (3)	
Sophomore						
3	G221 (3) Mineralogy	C105 (5) Principles of Chemistry I	G205 (3) Reporting Skills in Geoscience	Arts & Humanities (3)		
4	G222 (3) Petrology	C106 (5) Principles of Chemistry II	Arts & Humanities (3)	Social & Behavioral Sciences (3)	Elective (3)	
Junior						
5	G303 (4) Maps & Air Photos	G323 (3) Structural Geology	Elective (3)	Elective (3)	Elective (3)	
6	G334 (3) Sedimentation & Stratigraphy	Social & Behavioral Sciences (3)	Social & Behavioral Sciences (3)	Elective (3)	Elective (3)	G410 (1) Undergraduate Research
Senior						
7	G404 (3) Geobiology	G410 (1) Research in Geobiology	G415 (4) Geomorphology	Social & Behavioral Sciences (3)	300-Level Elective (3)	Elective (3)
8	**G416 (3) Economics Geology**	**300-Level Elective (3)**	**300-Level Elective (3)**	**Elective (3)**		

Bachelor of Arts, Earth Science Secondary Teaching Certification Option

Freshman						
1	G109 (4) Geology: Evolution of the Earth	MATH 147 (3) Algebra & Trig I	W131 (3) English Composition	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
2	G110 (4) Geology: Earth's Environment	MATH 148 (3) Algebra & Trig II	N107 (4) Animal Biology	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
Sophomore						
3	G206 (1) Physical Geology Laboratory	G221 (3) Mineralogy	C105 (5) Principles of Chemistry I	G205 (3) Reporting Skills in Geoscience	H340 (3) Education	
4	G222 (3) Petrology	C106 (5) Principles of Chemistry II	P253 (3) Education	Arts & Humanities (3)	M201 (1) Education	
Junior						
5	G303 (4) Maps & Air Photos	G323 (3) Structural Geology	A100 (3) Astronomy	M300 (3) Education	Arts & Humanities (3)	
6	G115 (3) Oceanography	G334 (3) Sedimentation & Stratigraphy	M462 (3) Education	Social & Behavioral Sciences (3)	A105 (3) Astronomy	
Senior						
7	G404 (3) Geobiology	G410 (1) Research in Geobiology	G304 (3) Meteorology	M449 (3) Education	Social & Behavioral Sciences (3)	Elective (3)
8	T480 (3) Seminar in Earth Science	M480 (9) Education—Student Teach	Social & Behavioral Sciences (3)	G410 (1) Undergraduate Research		

Bachelor of Science

Freshman					
1	G109 (4) Geology: Evolution of the Earth	MATH 147 (3) Algebra & Trig I	W131 (3) English Composition	Arts & Humanities (3)	
2	G110 (3) Geology: Earth's Environment	G206 (1) Physical Geology Laboratory	MATH 148 (3) Algebra & Trig II	C105 (5) Principles of Chemistry I	Arts & Humanities (3)
Sophomore					
3	G221 (3) Mineralogy	G205 (3) Reporting Skills in Geoscience	MATH 163 (5) Calculus I	C106 (5) Principles of Chemistry II	
4	G222 (3) Petrology	MATH 164 (5) Calculus II	N107 (4) Animal Biology	Elective (3)	
Junior					
5	G303 (4) Maps & Air Photos	PHYS 218 (4) Physics I	G323 (3) Structural Geology	Elective (3) Computers or Statistics	
6	K101 (4) Botany	PHYS 219 (4) Physics II	Elective Area IV (3) 300-400 Level	Elective (3) Computers or Statistics	
Senior					
7	G404 (3) Geobiology	G410 (1) Research in Geobiology	Elective Area IV (3) 300-400 Level	Elective Area IV (3) 300-400 Level	Social & Behavioral Sciences (3)
8	G334 (3) Sedimentation & Stratigraphy	Elective Area IV (3) 300-400 Level	Elective (3)	G410 (2) Undergraduate Research	Social & Behavioral Sciences (3)
			G429—Summer Field Camp in Rockies—(8)		

Courses in Geology

Courses with numbers in the 100's and 200's are lower division undergraduate courses. Courses with numbers in the 300's and 400's are upper division undergraduate courses which may, in some cases, be used for graduate credit. Courses in the 300's, prefixed by G or T, may be used for graduate credit by MAT students and graduate students in Education but not by other students. The T prefix indicates that the course is especially designed for prospective teachers. Courses in the 400's may be taken for graduate credit by all graduate students.

Note: P—prerequisite; C—concurrent registration; R—recommended; Every—offered in both Fall and Spring Semesters and Summer Session; Fall—offered Fall Semester; Spring—offered Spring Semester; Summer—offered in the Summer Session; Day—offered as a daytime section; Night—offered as an evening section. For courses with no designed semester or section consult the *Schedule of Classes*. Equiv.—course is equivalent to the indicated course taught at Indiana University-Bloomington or the indicated course taught at Purdue University-West Lafayette.

G107 Geology, Resources, and Man (3 Cr)
P: None. Every.
An introduction to geology through discussion of geological topics that show the influence of geology on modern society. Topics include Mineral and Energy Resources, Land Use and Water Supplies, Geologic Hazards and Problems, Geology and Health, and New Geological Developments.

G109 Geology: Evolution of the Earth (4 Cr, 3 Cr without laboratory)
P: None. Every.
Basic principles of interpreting earth history: geologic time, stratigraphic analysis, reconstructing past environments. Physical development of the earth: its interior, mountainbuilding, continental drift, sea-floor spreading. Origin and development of life: evolution, the fossil record, With laboratory, 4 credits (equiv. IU G104, IU G112, and PU GEOS 112); without laboratory, 3 credits.

G110 Geology: the Earth's Environment (4 Cr, 3 Cr without laboratory)
P: None. Every.
Description, classification, and origin of minerals and rocks. Internal processes: earthquakes, rock deformation, origin of crustal structures. External processes: landslides, streams, glaciers, groundwater, man's geologic environment. With laboratory, 4 credits (equiv. IU G103, IU G111, and PU GEOS 111); without laboratory, 3 credits.

G115 Introduction to Oceanography (3 Cr)
P: None. Every.
Non-mathematical introduction to the history, geology, biology, and physical characteristics of the ocean. Includes volcanoes and earthquakes in the marine environment, currents of the world ocean, the life history of marine animals, and pollution of the marine ecosystem.

G130 Short Courses in Earth Science: Variable Title (1 Cr)
P: None.
Five-week short courses on a variety of topics in the earth sciences. Examples of topics include: Lunar and Planetary Geology; Geology of Indiana; Geology of National Parks; Geology of Africa; Geology of Cities; Geology of Gemstones; Energy; History of Geology; Earthquakes; Volcanoes; Prehistoric Life, Dinosaurs, Fossil Clocks and Changing Time. Each short course is one credit; no topic may be taken for credit more than once.

G205 Reporting Skills in Geoscience (3 Cr)
P: English W131, Geology G107 or G109 or G110. Fall.
Techniques of presenting written and oral reports from the geoscience approach. The written report: mechanics of format and illustrations, proper citation of geoscience literature, the abstract, proof-reading and editing. The oral report: effective presentation and response to audience questions, simulating a professional science meeting.

G206 Physical Geology Laboratory (1 Cr)
P or C: G110. Every.
The laboratory study of minerals, rocks, topographic maps and aerial photographs, landforms and landscapes, structural geology, and geologic maps.

G221 Introductory Mineralogy (3 Cr)
P: An introductory geology course or consent of instructor. Fall.
Crystallography: morphology, classes, symmetry. Mineral chemistry, physics, and genesis. Description, identification, association, occurrence, and use of common and important minerals.

G222 Introductory Petrology (3 Cr)
P: G221 and P or C: G206. Spring.
Igneous, sedimentary, and metamorphic rocks: composition, field occurrence, characteristics, classification, and origin, laboratory description and identification.

G300 Environmental and Urban Geology (3 Cr)
P: Geology G107, or G109 or G110 or Geography G107 or consent of instructor.
Significance of regional and local geologic features and geologic processes in land use planning; use of geologic data in areas of rapid urbanization to properly utilize mineral and water resources and to assess potential geologic hazards.

G303 Geologic Mapping and Air Photo Interpretation (4 Cr)
P: G206 or consent of instructor. Fall.
Techniques of mapping. Field use and interpretation of maps and aerial photographs. Pace-and-compass and plane-table mapping. Measuring stratigraphic sections. Interpretations of structural geology and surficial geology. Remote sensing.

G309 Cooperative Education in Geology (1-3 Cr)
P: G206, G222, G303.
Industrial or government or similar experiences in geologically-oriented employment. Grade is determined on basis of a written student report, and a supervisor evaluation report. May be repeated for a maximum of 6 credits.

G323 Structural Geology (3 Cr)
P or C: G206 and G222. R: G303.
Nature and origin of primary and secondary structural features of the earth's crust, with emphasis on mechanics of deformation and origin. Laboratory consists of three-dimensional problems illustrating structural concepts. Field trips.

G334 Principles of Sedimentation and Stratigraphy (3 Cr)
P: G222 or consent of instructor. Spring.
Interrelationship of sedimentation and stratigraphy: processes and factors influencing genesis of sedimentary strata; provenance, depositional environment, sedimentary facies, paleoecology; analytical techniques, application of principles to interpretation of stratigraphic record.

G403 Optical Mineralogy and Petrology (3 Cr)
P: G222.
Description and identification of minerals and rocks in thin-section using principles of optical microscopy. Comparison with rock and mineral hand-specimen description. Applications to interpretation of rock genesis. Practical applications are considered. Survey of complementary techniques based on related physical principles (e.g. x-ray diffraction, electron microprobe).

G404 Geobiology (3 Cr)
P: Geology G109, or Biology K101 or K103, or consent of instructor. R: Biology 109 for non-Biology majors. Fall
Principles of paleontology. Application of biological principles and use of fossils in the study of earth history. Emphasis is on documentation of macroevolution and development of the basic theory of evolution. Laboratory exercises examine the form and ecology of major phyla with a fossil record. G410 (1 Cr) must be taken concurrently for field project by Geology majors; optional for non-majors.

G406 Introduction to Geochemistry (3 Cr)
P: G221, Chemistry C106 or consent of instructor.
Chemistry in the study of the earth employing elementary chemical thermodynamics, the phase rule, chemical equilibria, redox reactions, the radioactive decay law, and organic chemistry.

G409 Independent Study in Geology (1-3 Cr)
P: Consent of instructor. Every, day, night.
Supervised independent study of topics and techniques in geology that are not available in formal courses in the department.

G410 Undergraduate Research in Geology (1-6 Cr)
P: junior standing and consent of instructor. Every, day, night.
Field and laboratory research in selected problems in geology. May be repeated. Total of 6 credits may be applied toward the degree.

G413 Introduction to Earth Physics (3 Cr)
P: consent of instructor.
Physics in the study of the earth, its origins, history, and internal constitution. Exploration techniques.

G415 Principles of Geomorphology (4 Cr)
P: G222, G303. P or C: G323, G334.
Geomorphic processes, evolution, and classification of landforms. Laboratory: topographic maps; aerial photographs.

G416 Economic Geology (3 Cr)
P: G222 or consent of instructor.
Origin, geologic occurrence, distribution, use, and conservation of important geologic natural resources of the world. Metallic minerals; industrial minerals and rocks; coal, petroleum, natural gas, and other energy resources; water as a natural resource. Credit not given for both G416 and G316.

G420 Regional Geology Field Trip (1-2 Cr)
P: consent of instructor. Spring, day.
Seminar and field investigation of selected regions for study of mineralogic, lithologic, stratigraphic, structural, paleontologic, geomorphologic, or other geological relationships. Seminar held during the semester. Six to ten days in the field during or following the semester.

G429 Field Geology in the Rocky Mountains (6 or 8 Cr)
P: G221, G222, G303, G323, and G334. Summer.
Six or eight weeks at Geologic Field Station in Montana. Geologic reconnaissance, measurement of stratigraphic sections, mapping on aerial photographs, construction of structure sections. Regional geomorphology, stratigraphy, and structure through South Dakota, the Black Hills, Wyoming, Montana, Yellowstone Park, and Glacier Park. Students register through the Geology Department at Indiana University-Bloomington.

G430 Principles of Hydrology (4 Cr)
P: G110, MATH 148, introductory chemistry, physics, and biology.
Water as a natural resource, including both surface and subsurface water; investigation of physical, chemical, and biological properties of water; components of hydrologic cycle; environmental hydrology; includes field and laboratory study.

G451 Principles of Hydrogeology (3 Cr)
P: G110 or consent of instructor. R: G334.
Water resources; occurrence, regulation, and management of water; hydrologic cycle, water movement, water quality and pollution; surface and subsurface investigations; basin-wide development of water resources.

G490 Seminar in Geology (2-3 Cr)
P: junior or senior standing and consent of instructor.
Readings and discussion of selected topics. May be repeated, provided different topics are studied, for a maximum of 6 credits.

G499 Honors Research in Geology (3 Cr)
P: Approval of departmental Honors Committee.

G561 Paleoecology (3 Cr)
P: G334, G404, and consent of instructor.
Relationships between modern and fossil organisms and their physical, chemical, and biological environment; emphasis on techniques for interpreting past environmental conditions.

G700 Geologic Problems (1-5 Cr)
P: Consent of instructor.
Consideration of special geologic problems.

T309 Earth Science: Geologic Aspects I (4 Cr)
P: None.
Introductory course for advanced students. Basic principles of interpreting and reconstructing earth history; physical and biological evolution of the earth. May be used for graduate credit by students in education. Credit not given for both T309 and G109.

T310 Earth Science: Geologic Aspects II (4 Cr)
P: None.
Introductory course for advanced students. Geologic principles, minerals and rocks, internal and external geologic processes. May be taken for graduate credit by students in education. Credit not given for both T310 and G110.

T480 Seminar in Earth Science (3 Cr)
P: G107 or G109 or G110 or consent of instructor. Spring.
Selected topics in earth sciences. May be repeated, provided different topics are studied, for a maximum of 6 credits. May be used for graduate credit by students in education.

Department of Mathematical Sciences

Professors Aliprantis, Alton, Bittinger, Bodonyi, Burkinshaw, Crown, Kaminker, Kuczkowski, Ng, Rothman *(Chairperson)*

Professors Emeritus Bridges, Johnston, Suter, Sconce

Associate Professors Hutton, Kleyle, Loh, Luke, Morrel, Penna, Rigdon

Assistant Professors Miller (Columbus Campus), Patterson, Price, Sen

Departmental Counselors
(Subject to change; if necessary contact Mathematical Sciences Department)

Undergraduate Counselors
Pure Mathematics Option: Morrel (A-F), Kleyle (G-L), Patterson (M-R), Price (S-Z)
Applied Mathematics Option: Ng
Secondary School Teaching Option: Alton, Hutton
Transfers and special cases: Kuczkowski, Loh

Graduate Counselors
Master of Arts in Teaching: Kuczkowski
Master of Science: Kuczkowski
Master of Science (Applied Mathematics): Bodonyi

Degree Programs

The Department of Mathematical Sciences includes the areas of Pure Mathematics, Applied Mathematics, Mathematics Education, and Statistics.

The Department offers the Bachelor of Science degree in Mathematics with options in Pure Mathematics, Applied Mathematics, and Secondary School Teaching.

Graduate degrees offered are: Master of Arts in Teaching, Master of Science, and Master of Science (Applied Mathematics).

Bachelor of Science (Mathematics)

In order to receive proper counseling, a student is encouraged to declare a mathematics major in the freshman year. An average grade of 2.0 with no failing grades in mathematics courses through MATH 351 is a minimum indication of success in this major.

Degree Requirements

The Baccalaureate Degree General Requirements, the Area Requirements, and the Bachelor of Science Degree Requirements are listed earlier in this Bulletin. For a Bachelor of Science Degree in Mathematics the following additional requirements and restrictions apply:

Area I Pure Mathematics Option: No additional requirement. Applied Mathematics Option: No additional requirement. Secondary School Teaching Option: 3 additional hours of English composition and communication skills.

Area II Pure Mathematics Option: No foreign language requirement. Applied Mathematics Option: No foreign language requirement. Secondary School Teaching Option: One year (at least five semester hours) in a modern foreign language.

Area III (all options)

1. Mathematics courses below MATH 163 do not count toward the degree.
2. Courses that are primarily mathematical may not be used to fulfill the arts and humanities requirement, Area IIIA, or the social and behavioral science requirement, Area IIIB, of the School of Science. If in doubt about a particular course, the student should consult a mathematics department counselor.
3. Certain courses, such as Chemistry C101, C102; Physics 100, 200, 218, 219; Astronomy A100, A105; Geology G107; and Geography G107 may not be used to fulfill the Science requirement, Area IIIC, of the School of Science. If in doubt about a particular course, the student should consult a mathematics department counselor.

Area IV

1. Requirements related to the minor.
2. Requirements related to the major.

The Area IV minor and major requirements for the three degree options are described in the following sections. There is no single semester-by-semester plan of study for any of the options because flexibility is encouraged within the various programs. However, a sample program is given for each option that shows one possible sequence of courses. Variations from the sample program should be made in consultation with the student's counselor. Because of the complexity of the above requirements, and because certain courses are not offered every semester, it is important that each student consult the assigned counselor as soon as possible in order to proceed through a proper plan of study for the chosen degree program.

Area IV Minor Requirements

In order that each student acquire some depth of study in a subject outside of the major area, the Department of Mathematical Sciences requires the student to have a minor in an area outside of the Department. The minor consists of at least 18 hours and includes at least three courses beyond the introductory level. It is subject to the approval of the student's counselor. While a minor is usually in one department it may be from two or more if the counselor approves.

Courses may be used for the double purpose of fulfilling general requirements and also fulfilling the minor requirements of the Department of Mathematical Sciences. For students in the Pure Mathematics Option a minor in one of the physical sciences or in a subject which makes serious use of mathematics, such as computer science or economics, is desirable. Students in the Applied Mathematics Option are required to take a minor in science or engineering. Students in the Secondary School Teaching Option satisfy the requirements for a minor by the sequence of courses that they take to meet the professional education requirement.

Area IV Major Requirements

PURE MATHEMATICS OPTION

With this option you would be well prepared for graduate work in pure mathematics. However, students with undergraduate degrees in pure mathematics have also been successful with graduate studies in business administration, computer science, economics, engineering, educational research, law, medicine, operations research, psychology, statistics, and physics. Persons with advanced degrees in pure mathematics find careers primarily in college teaching, but careers in business, industry, or government service are also possible.

The Area IV major requirements are:

1. The calculus sequence MATH 163, 164, 261
2. Computer Science CSCI 220
3. Linear and Abstract Algebra MATH 351 (or MATH 511) and MATH 453
4. Analysis MATH 361 and MATH 441
5. Twelve additional hours selected from mathematics, computer science or statistics courses at the 300 level or higher, and approved by your academic adviser.

Pure Mathematics Option Sample Program

Freshman					
1	MATH 163 (5) Calculus	SPCH C110 (3) Speech	ENGL W131 (3) Composition	Laboratory Science (3-5)	Free Elective (3)
2	MATH 164 (5) Calculus	CSCI 220 (3) Programming I		Laboratory Science (3-5)	Free Elective (3-4)
Sophomore					
3	MATH 261 (4) Calculus	Free Elective (3)	Humanities or Soc. Science (3)	Science Elective (3-5)	Free Elective (3)
4	MATH 351 (3) Linear Algebra	MATH 361 (3) Differential Eq.	Humanities or Soc. Science (3)	Science Elective (3-5)	Free Elective (3)
Junior					
5	MATH 441 (3) Analysis	STAT 311 (3) MATH or CSCI Elective	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)
6	MATH 453 (3) Algebra I	Free Elective (3)	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)
Senior					
7	MATH, STAT or CSCI Elective (3)	MATH, STAT or CSCI Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)
8	MATH, STAT or CSCI Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)

APPLIED MATHEMATICS OPTION

Graduates with training in applied mathematics are employed in business, industry, and government. You would probably work as part of a team and often would need to communicate mathematical ideas to persons trained in other subjects. In many instances, you would need to formulate problems for solution on a computer and then interpret the answers. Thus, besides a fundamental knowledge of mathematics, a knowledge of what computers can do is essential. This option is also a good preparation for graduate study in applied mathematics, computer science, statistics, and engineering.

The Area IV major requirements are:

1. The calculus sequence MATH 163, 164, 261
2. Computer Science CSCI 220, CSCI 320
3. Linear Algebra MATH 511 (or MATH 351)
4. Analysis MATH 361 and MATH 414 (or CSCI 512)
5. Mathematical Modeling MATH 500, MATH 517 or CSCI 520
6. Statistics STAT 311
7. Six additional hours, three of which must be in applied mathematics, selected from mathematics, computer science or statistics courses at the 300 level or higher, and approved by your academic adviser.

Applied Mathematics Option Sample Program

Freshman					
1	MATH 163 (5) Calculus	Free Elective (3)	ENGL W131 (3) Composition	Humanities or Soc. Science (3)	Free Elective (3)
2	MATH 164 (5) Calculus	CSCI 220 (3) Programming I	SPCH C110 (3) Speech	Humanities or Soc. Science (3)	
Sophomore					
3	MATH 261 (4) Calculus	CSCI 320 (3) Programming II	PHYS 152 (4) Mechanics	Free Elective (3)	Free Elective (3)
4	MATH 361 (3) Differential Eq.	Free Elective (3)	PHYS 251 (5) Heat, Electricity	Free Elective (3)	Free Elective (3)
Junior					
5	MATH 511 (3) Linear Analysis	Advanced CSCI Elective (3)	PHYS 342 (4) Modern Physics	Humanities or Soc. Science (3)	Free Elective (3)
6	STAT 311 (3) Probability	Free Elective (3)	PHYS 310 (3) Mechanics	Humanities or Soc. Science (3)	Free Elective (3)
Senior					
7	MATH 414 or CSCI 512 (3) Numerical Methods	Advanced MATH Elective (3)	PHYS 322 (3) Oscillations and Waves	Free Elective (3)	Free Elective (3)
8	MATH 517 or CSCI 520 (3) Mathematical Modeling	Free Elective (3)	PHYS 330 (3) Electricity and Magnetism	Free Elective (3)	Free Elective (3)

SECONDARY SCHOOL TEACHING OPTION

To teach in secondary schools, you must meet the requirements for teacher certification in the state in which you expect to teach. You can obtain these requirements by writing to the Department of Public Instruction, Certification Office, in the capital city of any state.

According to Indiana state law, a student should have 40 semester hours in general education courses and a specified core of professional education courses as part of the requirement for a teaching license. You should be sure to see an adviser to ensure that these hours are properly distributed and that the professional education requirements are met. The secondary teaching program here which has been approved by the State of Indiana requires the completion of at least 38 semester hours of mathematics courses. The general requirements for this option differ from the other options in that an additional three hours of English composition and communication skills is required under Area I and one year (at least five semester hours) in a modern foreign language is required under Area II.

The Area IV major requirements are:

1. The calculus sequence MATH 163, 164, 261
2. Computer Science CSCI 220
3. Linear and Abstract Algebra MATH 351 (or MATH 511) and MATH 453
4. Analysis MATH 361 and MATH 300
5. Geometry MATH 563 (or MATH 561)
6. Probability and Statistics STAT 311 (or MATH 519)
7. Three hours selected from a mathematics, computer science, or statistics course at the 300 level or higher.

Secondary School Teaching Option Sample Program

Freshman					
1	MATH 163 (5) Calculus	Free Elective (3)	ENGL W131 (3) Composition	Laboratory Science (3-5)	Humanities or Soc. Science (3)
2	MATH 164 (5) Calculus	PSY B104 or B105 (3) Psychology	ENGL W132 (3) Composition	Laboratory Science (3-5)	Free Elective (3)
Sophomore					
3	MATH 261 (4) Calculus	CSCI 220 (3) Programming I	EDUC H340 (3) Ed. & Am. Culture	Laboratory Science (3-5)	SPCH C110 (3) Speech
4	MATH 351 (3) Linear Algebra	MATH 361 (3) Differential Eq.	EDUC P253 (3) Ed. Psychology	Laboratory Science (3-5)	Free Elective (3)
Junior					
5	STAT 311 (3) Probability	MATH STAT or CSCI Elective (3)	EDUC M300 (3) Intro. Teaching	Foreign Language (5)	Free Elective (3)
6	MATH 453 (3) Algebra I	MATH 300* (3) Number Systems	EDUC M462 (3) Methods, Reading	Humanities or Soc. Science (3)	Free Elective (3)
Senior					
7	MATH 563* (3) Advanced Geometry	Free Elective (3)	EDUC M448* (4) Methods, Math	Humanities or Soc. Science (3)	Free Elective (3)
8	Free Elective (3)	EDUC M480—Student Teaching for 9 weeks—(9)			Free Elective (3)

*MATH 563 is offered only in the fall of even numbered years, EDUC M448 only in the fall of odd numbered years, and MATH 300 only in the spring of even numbered years.

Graduate Programs

The Department of Mathematical Sciences offers complete programs leading to the following Purdue master's degrees: Master of Arts in Teaching, Master of Science, and Master of Science (Applied Mathematics). These programs are designed for the part-time student, and all course offerings are normally offered on the IUPUI evening schedule.

Admission Requirements

Students entering a graduate program in mathematics should have completed an undergraduate program containing as many courses in abstract algebra, linear algebra, advanced calculus, differential equations, logic and foundations, and probability as is possible.

Students entering the graduate program in applied mathematics should have completed an undergraduate program in mathematics, or an undergraduate program in engineering or physical sciences that is highly mathematics oriented.

Application for Admission

The student who wishes to pursue an advanced degree in the Department of Mathematical Sciences should see a graduate adviser in order to receive counseling, prepare an informal plan of study, and obtain a regular graduate student application form. While this application is being processed the student may enter IUPUI as a temporary graduate student. Not more than nine hours of credit earned under this classification may be applied towards an advanced degree. Those who do not want to pursue an advanced degree, but desire to take graduate courses for personal improvement, may also take courses under the temporary graduate student classification.

Transfer Credit

The Department of Mathematical Sciences will accept by transfer a maximum of nine hours of graduate credit which are in excess of undergraduate degree requirements from approved institutions.

General Degree Requirements

The general requirements include admission to regular graduate status, completion of the English requirement, and satisfactory completion of an approved plan of study.

The English requirement for candidates whose native language is English is satisfied by having no undergraduate grades below B in composition or by scoring 600 or higher on the Verbal Aptitude Section of the Graduate Record Examination. Students who do not satisfy the English requirement by either of the above methods may take a written examination administered by the English department to demonstrate their proficiency.

The student's formal plan of study should be submitted and accepted by the graduate school before the semester in which the student expects to receive the degree. The English requirement must be satisfied before the plan of study may be filed. No course in which the grade earned is below C, and normally no more than six hours of courses with a grade of C, may be accepted toward completion of the plan of study.

MASTER OF ARTS IN TEACHING

This program is open only to students who are (or are preparing to be) secondary school teachers and whose mathematics background is not sufficient to permit candidacy to any of the M.S. degree programs.

This nonthesis program requires a minimum of 33 credits. A plan of study will normally include six semester hours in algebra, six semester hours in geometry, six semester hours in analysis, and one course in mathematics, computer sciences, or statistics to be selected with the approval of the advisory committee. Courses which meet these requirements include MATH 547, 548, 550, 511, 561, 562, and 563. A student who has completed a course equivalent to any of these as an undergraduate must substitute a more advanced course unless it is determined by the advisory committee not to be feasible. The student must complete 12 additional hours. These may be in related areas.

MASTER OF SCIENCE

This Master of Science is a strong terminal master's degree with emphasis in pure mathematics. The program normally requires 30 hours of course work. Required courses are MATH 525, 544, 545, 553, 554, 571, and either one course for which some of these are prerequisites, or MATH 585. Nine hours of electives are to be selected by the student and his advisory committee.

MASTER OF SCIENCE (APPLIED MATHEMATICS)

This program is authorized for Indianapolis by the Department of Mathematics of Purdue University. It leads to a Purdue University degree.

Under this program, candidates must complete at least 30 credit hours with at least a B average and normally no more than two courses with grade C will be acceptable in a plan of study. Normally no more than nine credits can be transferred from another institution. The program consists of:

A. Core requirements
   1. Partial Differential Equations: MATH 520 and MATH 523.
   2. Qualitative Theory of Ordinary Differential Equations: MATH 522.
   3. Complex Analysis: MATH 525 or MATH 530.
   4. Real Analysis: MATH 544.
   5. Numerical Methods: CSCI 614 and CSCI 615.

B. Options: Nine hours to be chosen from the following:
   Mathematical Modelling of Physical Processes: MATH 626 and MATH 627.
   Perturbation Methods: MATH 536.
   Methods of Applied Mathematics: MATH 611, MATH 612.
   Real Analysis: MATH 545.
   Other appropriate graduate level courses subject to the approval of the student's graduate committee.

DOCTOR OF PHILOSOPHY

Qualified students can pursue the Ph.D. degree in Applied Mathematics at IUPUI by a special arrangement with the Mathematics Department at Purdue University, West Lafayette, Indiana. Please contact the Mathematical Sciences Department at IUPUI for further details.

Courses In Mathematical Sciences

Note: Statistics courses follow MATH listings. P—prerequisite; C—concurrent registration; R—recommended. Equiv.—course is equivalent to the indicated course taught at Indiana University-Bloomington or the indicated course taught at Purdue University-West Lafayette.

SPECIAL SERVICE COURSES

MATH 001 Remedial Algebra (3 Cr)
P: Eighth Grade Mathematics
Covers the material in the first year of high school algebra. Numbers and algebra, integers, rational numbers, equations, polynomials, graphs, systems of equations, inequalities, radicals. Credit does not apply toward any degree.

MATH 002 Plane Geometry (3 Cr)
P: MATH 001 or one year of high school algebra.
Covers the material in a year of high school geometry. Sets and real numbers, coordinate systems, loci, lines, circles, angles, triangles, constructions, area and perimeter, surface area and volume. Credit does not apply toward any degree.

UNDERGRADUATE LEVEL

Lower-Division Courses

MATH 111 Algebra (3 Cr)
P: MATH 001 or one year of high school algebra.
Real numbers, linear equations and inequalities, systems of equations, polynomials, exponents, logarithmic functions. Covers material in the second year of high school algebra.

MATH M118 Finite Mathematics I (3 Cr)
P: MATH 111 or equivalent. Equiv. PU MATH 213.
Set theory, vectors, matrices, permutations, combinations, simple probability, conditional probability, Markov chains, linear programming, graphical and simplex methods, duality theorem.

MATH M119 Brief Survey of Calculus I (3 Cr)
P: MATH 111 or two years of high school algebra.
Sets, limits, derivatives and applications, integrals and applications, functions of several variables.

MATH 123 Elementary Concepts of Mathematics (3 Cr)
P: None.
Mathematics for liberal arts students; experiments and activities which provide an introduction to inductive and deductive reasoning, number sequences, functions and curves, probability, statistics, topology, metric measurement, and computers.

MATH 130 Mathematics for Elementary Teachers I (3 Cr)
P: MATH 001 or one year of high school algebra. MATH 002 or one year of high school geometry. Equiv. IU MATH T101. The sequence MATH 130, 131, 132 fulfills the mathematics requirements for elementary education majors.
Numeration systems, mathematical reasoning, natural numbers, whole numbers, properties, algorithms, sets, sentences, logic.

MATH 131 Mathematics for Elementary Teachers II (3 Cr)
P: MATH 130. Equiv. IU MATH T102.
Number systems: numbers of arithmetic, integers, rationals, reals, mathematical systems, decimal and fractional notations; probability, simple and compound events, algebra review.

MATH 132 Mathematics for Elementary Teachers III (3 Cr)
P: MATH 131. Equiv. IU MATH T103.
Metric and nonmetric properties of geometric figures, measurement; introduction to the foundations of euclidean geometry; coordinate geometry.

MATH 147 Algebra and Trigonometry for Technology I (3 Cr)
P: 3 semesters of high school algebra.
MATH 147-148 is a two semester version of MATH 150. MATH 147 covers algebra.

MATH 148 Algebra and Trigonometry for Technology II (3 Cr)
P: 4 semesters of high school algebra. Equiv. IU MATH M107.
MATH 147-148 is a two semester version of MATH 150. MATH 148 covers trigonometry.

MATH 150 Mathematics for Technology (5 Cr)
P: 3 semesters of high school algebra. Equiv. IU MATH M015.
MATH 147-148 is a two semester version of MATH 150. Fundamental laws of algebra, functions and graphs, trigonometric functions, linear equations, factoring, exponents, vectors, complex numbers, logarithms, ratio, proportion, variation.

MATH 163 Integrated Calculus and Analytic Geometry I (5 Cr)
P: 2 years of high school algebra, one semester of trigonometry, one year of geometry. Equiv. IU MATH M215.
The Cartesian plane, functions, limits, differentiation and applications, mean value theorem, definite integral and applications.

MATH 164 Integrated Calculus and Analytic Geometry II (5 Cr)
P: MATH 163. Equiv. IU MATH M216.
Transcendental functions, methods of integration, conics, polar coordinates, parametric equations, vectors, improper integrals.

MATH 214 Finite Mathematics II (3 Cr)
P: MATH M118.
Vectors, matrices, systems of linear equations, linear programming, game theory.

MATH 221 Calculus for Technology I (3 Cr)
P: MATH 150 or equivalent.
Analytic geometry, the derivative and applications, the integral and applications.

MATH 222 Calculus for Technology II (3 Cr)
P: MATH 221.
Differentiation of transcendental functions, methods of integration, power series, Fourier series, differential equations.

MATH 261 Multivariate Calculus (4 Cr)
P: MATH 164. Equiv. IU MATH M311.
Partial differentiation, multiple integration, vector functions and vector analysis, infinite series.

MATH 262 Linear Algebra and Differential Equations (4 Cr)
P: MATH 261.
Vector spaces, bases, orthogonality, determinants, differential equations, first order equations, applications, second order equations.

Upper-Division Courses

MATH 300 Logic and the Foundations of Algebra (3 Cr)
P: MATH 163.
Logic and the principles of reasoning. Applications to the study of the integers, rational, real and complex numbers, and polynomials. Bridges the gap between elementary and advanced courses. Recommended for prospective high school teachers.

MATH 351 Elementary Linear Algebra (3 Cr)
P: MATH 261. Not open to students with credit in MATH 511.
Systems of linear equations, matrices, vector spaces, linear transformations, determinants, inner product spaces, eigenvalues, applications.

MATH 361 Introduction to Ordinary Differential Equations (3 Cr)
P: MATH 261.
First order equations, the method of separation of variables, existence theorems, second order linear equations, initial and boundary value problems, power series solutions, systems of first order equations, stability for linear systems, Laplace transforms, applications.

MATH 375 Theory of Interest (3 Cr)
P: MATH 261.
An introduction to the theory of finance including such topics as compound interest, annuities certain, amortization schedules, sinking funds, bonds and related securities.

MATH 385 (CSCI 385) Introduction to Logic (3 Cr)
P: MATH 261.
Propositional calculus and predicate calculus with applications to mathematical proofs, valid arguments, switching theory, and formal languages. Not open to students with credit in MATH 581.

MATH 414 (CSCI 414) Numerical Methods (3 Cr)
P: MATH 262 or MATH 361, CSCI 220 or equivalent.
Error analysis, solution of nonlinear equations, direct and iterative methods for solving linear systems, approximation of functions, numerical differentiation and integration, numerical solution of ordinary differential equations. Not open to students with credit in CSCI 512.

MATH 441 Foundations of Analysis (3 Cr)
P: MATH 261.
Topology of Cartesian spaces, sequences, continuity, differentiation, Reimann-Stieltjes integral.

MATH 442 Multivariate Analysis (3 Cr)
P: MATH 351 and 441.
Euclidean spaces, differentiation, vector valued functions, measure and integration, exterior algebra, differential calculus, integration on manifolds.

MATH 453 Algebra I (3 Cr)
P: MATH 351 or consent of the instructor.
Fundamental properties of groups, rings, and fields with emphasis on structure, morphisms, quotients, fundamental homomorphism theorems.

MATH 490 Topics in Mathematics for Undergraduates (1-5 Cr)
By arrangement.
Supervised reading and reports in various fields. Open only to students with the consent of the department.

MATH S490 Senior Seminar (3 Cr)

DUAL LEVEL COURSES
Undergraduate — Graduate

MATH 500 Introduction to Applied Mathematics and Modelling (3 Cr)
P: MATH 262 or 361.
Introduction to problems and methods in applied mathematics and modelling. Formulation of models for phenomena in science and engineering, their solution, and physical interpretation of results. Examples chosen from solid and fluid mechanics, mechanical systems, diffusion phenomena, traffic flow, and biological processes.

MATH 501 Techniques of Applied Mathematics I (3 Cr)
P: MATH 262.
This is a methods course primarily for graduate students in engineering or physical science with minimal background in undergraduate mathematics. An introduction to mathematical techniques useful in the analysis of physical and engineering problems.
Power series solutions of differential equations, Laplace transforms, Fourier series and integrals, partial differential equations, vector analysis.

MATH 502 Techniques of Applied Mathematics II (3 Cr)
P: MATH 501.
Objective of the course as described in MATH 501. Matrices and determinants, complex analytic functions, conformal mapping, complex integrals, sequences and series, calculus of residues, potential theory.

MATH 510 Vector Calculus (3 Cr)
P: MATH 262.
Calculus of functions of several variables and of vector fields in orthogonal coordinate systems. Optimization problems, implicit function theorem, Green's theorem, Stokes' theorem, divergence theorems, applications to engineering and the physical sciences.

MATH 511 Linear Analysis (3 Cr)
P: MATH 261. Not open to students with credit in MATH 351.
Matrices, rank and inverse of a matrix, linear programming, simplex method, eigenvectors, unitary and similarity transformations on matrices.

MATH 514 (CSCI 514) Numerical Analysis (3 Cr)
P: MATH 414 or CSCI 512 or equivalent.
Difference equations, spline theory, analysis of iterative methods for solving nonlinear equations, quotient-difference algorithm for solution of polynomial equations, numerical solution of ordinary differential equations, analysis of algorithms for stability and round-off error.

MATH 515 (CSCI 515) Numerical Analysis of Linear Systems (3 Cr)
P: MATH 351 or 511, CSCI 220 or equivalent.
Computational aspects of linear algebra; linear equations and matrices, direct and iterative methods; eigenvalues and eigenvectors of matrices; error analysis.

MATH 517 Linear Programming (3 Cr)
P: MATH 262, MATH 351, or MATH 511 (or consent of instructor).
Linear programming; mathematical modelling of problems in economics, management, urban administration, and the behavioral sciences.

MATH 519 Introduction to Probability (3 Cr)
P: MATH 510.
Algebra of sets, sample spaces, combinatorial problems, conditional probability, independence, random variables, distribution functions, characteristic functions, special distributions, limit theorems.

MATH 520 Boundary Value Problems of Differential Equations (3 Cr)
P: MATH 262, 361. Recommended P or C: MATH 510.
Sturm-Liouville theory; singular boundary conditions, orthogonal expansions, separation of variables in partial differential equations; spherical harmonics.

MATH 522 Qualitative Theory of Differential Equations (3 Cr)
P: MATH 262 or both 351, 361.
Laplace transforms, systems of linear and nonlinear ordinary differential equations, brief introduction to stability theory, approximation methods, other topics.

MATH 523 Introduction to Partial Differential Equations (3 Cr)
P: MATH 262 and 361. Recommended P or C: MATH 510.
Method of characteristics for quasilinear first-order equations; complete integral; Cauchy-Kowalewsky theory; classification of second-order equations in two variables; canonical forms; difference methods for hyperbolic and parabolic equations; Poisson integral method for elliptic equations.

MATH 525 Introduction to Complex Analysis (3 Cr)
P: MATH 510.
Complex numbers and complex-valued functions: differentiation of complex functions; power series, uniform convergence; integration, contour integrals; elementary conformal mapping.

MATH 529 Operational Calculus (3 Cr)
P: MATH 525.
Oriented towards solving problems in engineering. Generalized functions, two-sided operational calculus. Applications to initial value problems, steady-state solutions, partial differential equations.

MATH 530 Functions of a Complex Variable I (3 Cr)
P: Must be preceded or accompanied by MATH 544.
Complex numbers, holomorphic functions, harmonic functions, linear transformations. Power series, elementary functions, Riemann surfaces, contour integration, Cauchy's theorem, Taylor and Laurent series, residues. Maximum and argument principles. Special topics.

MATH 532 Elements of Stochastic Processes (3 Cr)
P: MATH 519, 525.
A basic course in stochastic processes including normal processes, covariance processes, Poisson processes, renewal processes, and Markov processes.

MATH 534 Advanced Analysis for Engineers and Scientists (3 Cr)
P: MATH 510 or consent of instructor.
Metric spaces, convergence and uniform convergence, Banach and Hilbert spaces.

MATH 536 Perturbation and Asymptotic Analysis (3 Cr)
P: MATH 525 (or 530) and MATH 523.
Matched asymptotic expansions, inner and outer expansions, strained coordinates and multiple scales, turning point analysis.

MATH 544 Real Analysis and Measure Theory (3 Cr)
P: MATH 441 or consent of instructor.
Algebras of sets, real number system, Lebesgue measure, measurable functions, Lebesgue integration, differentiation, absolute continuity, Banach Spaces, Metric Spaces, general measure and integration theory, Riesz representation theorem.

MATH 545 Principles of Analysis II (3 Cr)
P: MATH 544.
Continues the study of measure theory begun in MATH 544.

MATH 546 Introduction to Functional Analysis (3 Cr)
P: MATH 545. By arrangement.
Banach spaces, Hahn-Banach theorem, uniform boundedness principle, closed graph theorem, open mapping theorem, Hilbert spaces.

MATH 547 Analysis for Teachers I (3 Cr)
P: MATH 261.
Set theory, logic, relations, functions, Cauchy's inequality, metric spaces, neighborhoods, Cauchy sequences.

MATH 548 Analysis for Teachers II (3 Cr)
P: MATH 547.
Functions on a metric space, continuity, uniform continuity, derivative, chain rule, Riemann integral, fundamental theorem of calculus, double integrals.

MATH 550 Algebra for Teachers I (3 Cr)
P: MATH 351.
Definitions and elementary properties of groups, rings, integral domains, fields. Intended for secondary school teachers.

MATH 551 Algebra for Teachers II (3 Cr)
P: MATH 550.
Polynomial rings, fields, vector spaces, matrices.

MATH 553 Introduction to Abstract Algebra (3 Cr)
P: MATH 453.
Basic properties of groups, rings, integral domains, fields, polynomials, solvable groups, finitely generated abelian groups. Algebraic and transcendental field extensions. Separable extensions. Normal extensions. Galois theory.

MATH 554 Linear Algebra (3 Cr)
P: MATH 351.
Review of linear equations, matrices, vector spaces, linear transformations. Dual spaces. Inner product spaces, quadratic and bilinear forms, orthogonal reduction of symmetric matrices. Direct sum decompositions, characteristic values, diagonalizable and nilpotent transformations, Jordan normal form.

MATH 556 Introduction to the Theory of Numbers (3 Cr)
P: MATH 261.
Divisibility, congruences, quadratic residues, Diophantine equations, the sequence of primes.

MATH 561 Projective Geometry (3 Cr)
P: MATH 261
Projective invariants, Desargues' theorem, cross-ratio, axiomatic foundation, duality, consistency, independence, coordinates, conics.

MATH 562 Introduction to Differential Geometry and Topology (3 Cr)
P: MATH 351.
Linear Algebra and Calculus, curves and surfaces in three dimensions, Frenet formulas, fundamental form, curvature. Applications are made to physical science and elementary geometry: classical vector analysis and differential equations of mathematical physics in the language of differential forms; minimal surfaces and soap films, models for non-Euclidean geometry.

MATH 563 Advanced Geometry (3 Cr)
Analysis of axiomatic systems, finite geometries, critique of Euclid, axiomatic development, incidence, existence, betweenness, congruence, non-Euclidean geometry. Parallel postulate, Hilbert's geometry, hyperbolic geometry, models.

MATH 571 Elementary Topology (3 Cr)
P: MATH 441.
Topological spaces, metric spaces, continuity, compactness, connectedness, separation axioms, nets, function spaces.

MATH 581 Introduction to Logic for Teachers (3 Cr)
P: MATH 351.
Logical connectives, rules of sentential inference, quantifiers, bound and free variables, rules of inference, interpretations and validity, theorems in group theory, introduction to set theory. Not open to students with credit in MATH 385.

Math 583 History of Elementary Mathematics (3 Cr)
P: MATH 261.
A survey and treatment of the content of major developments of mathematics through the 18th century, with selected topics from more recent mathematics, including non-Euclidean geometry and the axiomatic method.

MATH 585 (CSCI 585) Mathematical Logic I (3 Cr)
P: MATH 351.
Formal theories for propositional and predicate calculus with study of models, completeness, compactness. Formalization of elementary number theory; Turing machines, halting problem, and the undecidability of arithmetic.

MATH 587 General Set Theory (3 Cr)
P: MATH 351.
Informal axiomatization of set theory, cardinal numbers, countable sets, cardinal arithmetic, order types, well ordered sets and ordinal numbers, axiom of choice and equivalences, paradoxes of intuitive set theory, Zermelo-Fraenkel axioms.

MATH 592 Mathematical Modeling of Transport Process in the Lower Atmosphere (3 Cr)
P: MATH 361 or consent of instructor.
Derivation of the governing differential equations. Transport equations in turbulent flow. Application of the governing differential equations to planetary boundary layer. Mechanics of turbulence. Profiles of velocity and temperature in lower atmosphere. Magnitude of turbulent fluctuations. Diffusion and estimation of diffusion from meteorological data.

MATH 598 Topics in Mathematics (1-5 Cr)
By arrangement.
Directed study and reports for students who wish to undertake individual reading and study on approved topics.

MATH T501 Remedial Mathematics for the Middle School — Junior High School Teacher (3 Cr)
Set theory, systems of numeration, operations on whole numbers, mathematical sentences, integers, rational numbers, real numbers.

MATH T502 Geometry for Middle School — Junior High School Teachers (3 Cr)
Rational numbers, real numbers, measurement, geometry.

MATH T503 Mathematics for Middle School — Junior High School Teachers (3 Cr)
Additional topics not covered in MATH T501 or MATH T502.

GRADUATE LEVEL

MATH 611 Methods of Applied Mathematics I (3 Cr)
Introduction to Banach and Hilbert spaces, linear integral equations with Hilbert-Schmidt kernels, eigenfunction expansions and Fourier transforms.

MATH 612 Methods of Applied Mathematics II (3 Cr)
P: MATH 611 and accompanied by MATH 542.
Continuation of theory of linear integral equations; Sturm-Liouville and Weyl theory for second order differential operators, distributions in n dimensions, and Fourier transforms.

MATH 614 (CSCI 614) Numerical Solution of Ordinary Differential Equations (3 Cr)
P: MATH 514 or consent of instructor. By arrangement.
Numerical solution of initial-value problems by Runge-Kutta methods, general one-step methods, and multistep methods. Analysis of discretization error and rounding error. Stability of multistep methods. Numerical solution of boundary- and eigen-value problems by initial-value techniques and finite difference methods.

MATH 615 (CSCI 615) Numerical Solution of Partial Differential Equations (3 Cr)
P: MATH 514, MATH 523. By arrangement.
The numerical solution of hyperbolic, parabolic, and elliptic equations by finite difference methods; iterative methods (Gauss-Seidel, overrelaxation, alternating direction) for solving elliptic equations; discretization and round-off errors; explicit and implicit methods for parabolic and hyperbolic systems; the method of characteristics; the concept of stability for initial value problems.

MATH 626 Mathematical Formulation of Physical Problems I (3 Cr)
P: Graduate standing and consent of instructor.
Topics to be chosen from the following: Tensor formulation of the field equations in continuum mechanics, fluid dynamics, hydrodynamic stability, wave propagation, and theoretical mechanics.

MATH 627 Mathematical Formulation of Physical Problems II (3 Cr)
P: MATH 626.
Continuation of MATH 626.

Courses in Statistics

UNDERGRADUATE LEVEL
Upper-Division Courses

STAT 301 Elementary Statistical Methods I (3 Cr)
P: College algebra. Not open to students in the Department of Mathematical Sciences.
A basic introductory statistics course with applications shown to various fields and emphasis placed on assumptions, applicability, and interpretations of various statistical techniques. Subject matter includes frequency distribution, descriptive statistics, elementary probability, normal distribution, applications, sampling distribution, estimation, hypothesis testing, and linear regression.

STAT 302 Elementary Statistical Methods II (3 Cr)
P: STAT 301 or equivalent. Continuation of STAT 301.
Multiple regression and analysis of variance, with emphasis on statistical inference and applications to various fields.

STAT 311 Introductory Probability (3 Cr)
P: MATH 261 or equivalent.
Formulation of probability problems, discrete and continuous random variables, expectation,

standard distributions, applications to statistical problems and problems in the physical sciences.

STAT 490 Topics in Statistics for Undergraduates (1-5 Cr)
Supervised reading and reports in various fields.

DUAL LEVEL
Undergraduate-Graduate

STAT 511 Statistical Methods I (3 Cr)
P: MATH 164.
Descriptive statistics; elementary probability; normal, binomial, Poisson, hypergeometric distributions; sampling distributions; testing hypotheses, and estimation; one-way analysis of variance; chi-square test; correlation and regression.

STAT 512 Statistical Methods II (3 Cr)
P: STAT 511.
Linear and multiple regression; non-linear regression; analysis of variance; random, fixed, mixed models, nested factorial, expected mean squares, pooling, modifications under relaxed assumptions, multiple comparisons, variance of estimates; analysis of covariance.

STAT 513 Applications of Statistics in Industry (3 Cr)
P: STAT 511.
Control charts and acceptance sampling, continuous sampling plans, sequential analysis, statistics of combinations, and some non-parametric methods.

STAT 514 Design of Experiments (3 Cr)
P: STAT 512.
Fundamentals, completely randomized design, randomized complete blocks; Latin square; multiclassification; factorial; incomplete blocks and fractional replications; confounding; lattice design; general mixed factorials; split plot; analysis of variance to regression models; optimum design.

STAT 516 Basic Probability and Applications (3 Cr)
P: MATH 164 or equivalent. MATH 261 desirable.
A first course in probability intended to serve as a foundation for statistics and other applications. Intuitive background; sample spaces and random variables; joint, conditional, and marginal distributions; special distributions of statistical importance; moments and moment generating functions; statement and application of limit theorems; Markov chains.

STAT 517 Statistical Inference (3 Cr)
P: STAT 516 or equivalent.
Sampling Distribution, Estimation including unbiased, maximum likelihood, and moment estimation, testing hypotheses for standard distributions and contingency tables; confidence intervals and regions; introduction to nonparametric inference and tests of goodness of fit; introduction to multivariate analysis.

STAT 519 Introduction to Probability
See MATH 519.

STAT 528 Foundations and Methods of Statistics I (3 Cr)
P: MATH 519.
Distribution of the mean and variance in normal samples, sampling distribution derived from the normal distribution, chi-square, t, and F. Distribution of statistics based on ordered samples. Asymptotic sampling, distributions. Introduction to multivariate normal distribution and linear models. Maximum likelihood, least squares, linear estimation, other methods of point estimation, and discussion of their properties. Cramer-Rao inequality and Rao-Blackwell theorem. Tests of statistical hypotheses, simple and composite hypotheses, likelihood ratio tests, power of tests.

STAT 532 Elements of Stochastic Processes
See MATH 532.

Department of Physics

Professors Kaplan, Meiere, Rao, Vasavada

Associate Professors Kemple, Kleinhans, Novak, Paik, Seubert, Thatcher

Assistant Professor Granot

Departmental Counselors Professors Meiere and Seubert

The Department of Physics offers a program leading to a Bachelor of Science Degree. In addition the department provides service courses in physics and astronomy.

Members of the department conduct research in several disciplines of physics and participate in joint projects with a number of other research groups such as ICFAR or the IU School of Medicine. Student participation in these projects is welcomed and encouraged.

The department offers graduate courses but no graduate degrees. Members of the department participate in guiding students pursuing a master's or doctorate program in other departments or schools of IUPUI.

Bachelor of Science

Areas I, II, III Minimum requirements for the School of Science are given in this bulletin. The Department of Physics has the following additional requirements:

Area IIIC Physical and Biological Sciences Courses must include Chemistry C105 and C106 with lab or their approved equivalent.

AREA IIID Mathematical Sciences 24 hours. Courses must include MATH 163, MATH 164, MATH 261 and MATH 262 or equivalent plus six more hours approved by the Physics Department. (MATH 351 and MATH 361 replace MATH 262 for dual Math-Physics majors.)

Area IV Concentration A concentration program in Physics must include Physics 152, 251, 310, 322, 330, 342, 342L, 350, 351, 515, 550 plus at least one approved course above the 300 level.

The Department of Physics recommends the following program leading to the degree of Bachelor of Science.

For the secondary school teaching option the Physics Department may substitute other Science courses for the 500-level courses and recommend education courses in order to meet teacher certification requirements.

Electives should be chosen to satisfy the General Requirements for a Bachelor of Science degree from Purdue University. They also may be chosen to satisfy requirements for certification as a high school teacher.

Guide to Service Courses

Each student should consult an adviser in the department in which a degree is sought to determine which service course is appropriate. A general guide to the Schools and Divisions served by these courses is:

100: Allied Health, Business, and Liberal Arts (a traditional survey course).

200: Education, SPEA, and Liberal Arts (a nontraditional course).

218-219: Liberal Arts and Technology (designed for preprofessional or technology students and others requiring a noncalculus sequence).

152-251-342: Science and Engineering (for students requiring a calculus based sequence).

Bachelor of Science in Physics

Freshman				
1	MATH 163 (5) Calculus	CHEM C105 (5) Principles of Chemistry I	ENG W131 (3) English Composition	Elective
2	MATH 164 (5) Calculus	CHEM C106 (5) Principles of Chemistry II	PHYS 152 (4) Mechanics	Elective
Sophomore				
3	MATH 261 (4) Calculus	PHYS 251 (5) Heat, Electricity and Optics	Elective	
4	MATH 262 (4) Linear Algebra and Diff. Equations	PHYS 342 (3) Modern Physics	PHYS 342L (1) Modern Physics Lab	Elective
Junior				
5	PHYS 310 (4) Intermediate Mechanics	PHYS 322 (3) Oscillations and Waves	PHYS 350 (2) Intermediate Lab I	Electives
6	PHYS 330 (3) Electricity and Magnetism	PHYS 351 (2) Intermediate Lab II	Electives	
Senior				
7	PHYS 550 (3) Quantum Mechanics	PHYS 490 (1-3) Research	Electives	
8	PHYS 515 (3) Thermodynamics	PHYS 490 (1-3) Research	Electives	

Courses in Physics

Note: P — prerequisite; C — concurrent registration; Equiv. — course is equivalent to the indicated course taught at Indiana University Bloomington or the indicated course taught at Purdue University West Lafayette.

100 Physics in the Modern World (5 Cr)
P: Introductory high school mathematics. Fall, Spring, Summer; day, night. Ideas, language, methods, and impact of physics today.

200 Our Physical Environment (3 Cr)
P: None. Fall, Spring.
A nonmathematical introduction to physical concepts and methods by means of examples from daily life and current technological applications.

218 General Physics (4 Cr)
P: MATH 150 or equivalent. Equiv. IU P201. Fall, Spring, Summer; day, night.
Mechanics, conservation laws, gravitation; simple harmonic motion and waves; kinetic theory, heat and thermodynamics for students not specializing in physics.

219 General Physics (4 Cr)
P: PHYS 218. Equiv. IU P202. Fall, Spring, Summer; day, night.
Electricity, light and modern physics for students not specializing in physics.

152 Mechanics (4 Cr)
P or C: MATH 164. Equiv. IU P221. Fall, Spring, Summer; day, night.
Statics, uniform and accelerated motion; Newton's laws; circular motion; energy, momentum,

and conservation principles; dynamics of rotation; gravitation and planetary motion; properties of matter; simple harmonic and wave motion.

251 Heat, Electricity, and Optics (5 Cr)
P: PHYS 152. Equiv. IU P222. Fall, Spring; day, night.
Heat, kinetic theory, elementary thermodynamics, heat transfer. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Geometrical and physical optics.

310 Intermediate Mechanics (4 Cr)
P: MATH 261 and two terms of general physics. Fall.
For students familiar with calculus. Elements of vector algebra; statics of particles and rigid bodies; theory of couples; principle of virtual work; kinematics; dynamics of particles and rigid bodies; work, power, and energy; elements of hydro-mechanics and elasticity.

322 Oscillations and Waves (3 Cr)
P: PHYS 251. Fall.
Modes of vibration of a system; emission and absorption of waves; properties of sound, electromagnetic and particle waves including phenomena of refraction, reflection, dispersion, diffraction, interference, polarization, and double refraction; lasers and holography.

330 Intermediate Electricity and Magnetism (3 Cr)
P: PHYS 251; P or C: MATH 262. Spring.
Electrostatics; electric currents; magnetostatics; electromagnetic induction; Maxwell's equations; electromagnetic waves.

342 Modern Physics (3 Cr)
P: PHYS 251. Equiv. IU P301. Fall, Spring.
A survey of basic concepts and phenomena in atomic, nuclear, and solid state physics.

342L. Modern Physics Laboratory (1 Cr)
Laboratory experiments to accompany PHYS 342.

350 Intermediate Laboratory I (2 Cr)
P or C: PHYS 322.
Lectures on geometrical optics; instructor demonstrations and student experiments involving mechanical and electromagnetic wave and oscillation phenomena.

351 Intermediate Laboratory II (2 Cr)
P or C: PHYS 330. Spring.
Lectures on AC circuit theory; instructor demonstrations and student experiments involving particle diffraction, wave polarization, double refraction, AC circuits, and meters.

470 Reading in Special Topics (1-3 Cr)

490 Undergraduate Reading and Research (1-3 Cr)
Independent study for undergraduates.

501 Physical Science (3 Cr)
P: None. Fall, Spring.
Survey of the physical sciences with emphasis on methods of presentation appropriate to the elementary school. Graduate credit is extended only for elementary school teacher programs.

515 Thermodynamics (3 Cr)
P: PHYS 310 and 330 and a course in differential equations or advanced calculus. Fall.
Fundamental concepts of heat; theory and practice of heat measurements; first and second laws of thermodynamics, with applications; kinetic theory.

520 Mathematical Physics (3 Cr)
P: PHYS 310, 322, 330 or consent of instructor.
Vectors and vector operators, tensors, infinite series, analytic functions and the calculus of residues, partial differential equations, special functions of mathematical physics. When interests and preparation of students permit calculus of variations and/or group theory are covered.

545 Solid State Physics (3 Cr)
P: Any undergraduate course in modern physics. Spring.
Crystal structure; lattice vibrations; free electron theory of solids; band theory of solids; semiconductors; superconductivity; magnetism; magnetic resonance.

550 Introduction to Quantum Mechanics (3 Cr)
P: Should be preceded by PHYS 342 and at least one other junior-level course in each of mathematics and physics or equivalent. Fall.
Brief historical survey; waves in classical physics; wavepackets; uncertainty principle; operators and wave functions; Schrodinger equation and application to one-dimensional problems; the hydrogen atom; electron spin; multi-electron atoms; periodic table; molecules; periodic potentials; Bloch wave functions.

556 Introductory Nuclear Physics (3 Cr)
P: PHYS 550 or equivalent. Spring.
Theory of relativity; brief survey of systematics of nuclei and elementary particles; structure of stable nuclei, radioactivity; interaction of nuclear radiation with matter; nuclear reactions; particle accelerators; nuclear instruments; fission; nuclear reactors.

570 Selected Topics in Physics (3 Cr)
Specialized topics in physics selected from time to time.

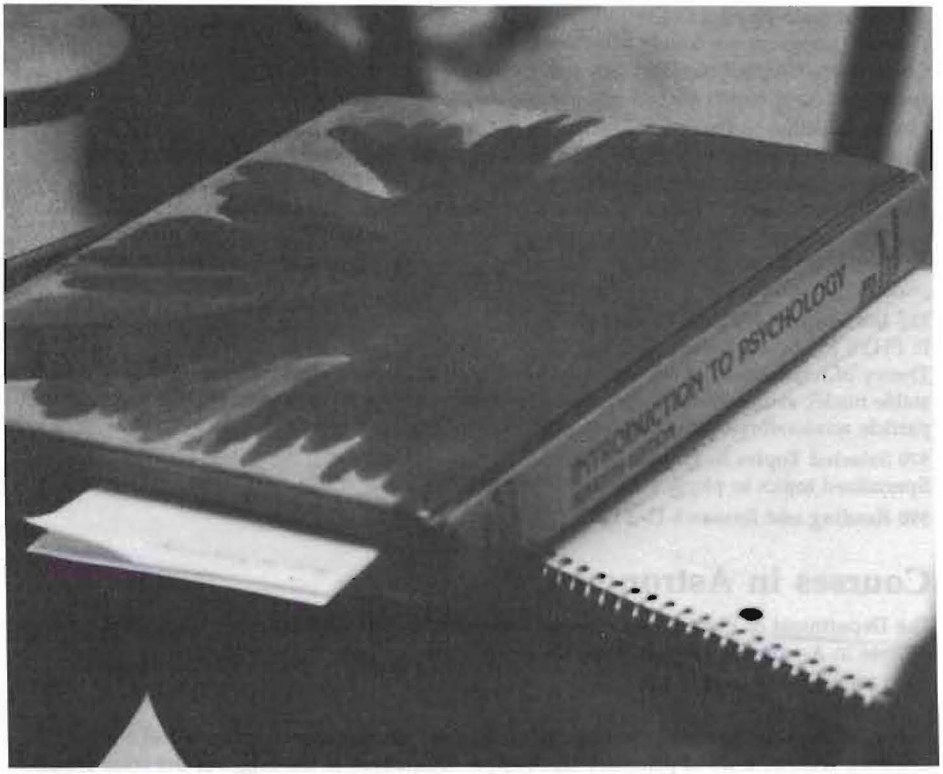
590 Reading and Research (1-3 Cr)

Courses in Astronomy

The Department of Physics has academic, counseling, and administrative responsibility for the courses in Astronomy offered at IUPUI.

A100 The Solar System (3 Cr)
P: None. Fall.
Survey of the solar system including the earth, sun, moon, eclipses, planets and their satellites, comets, laws of planetary motion, etc. Discussion of the origin of the solar system, life on earth, and the possibilities of extraterrestrial life. Also astronomical instruments and celestial coordinates.

A105 Stellar Astronomy (3 Cr)
P: None. Spring.
Survey of the universe beyond the solar system including stars, pulsars, black holes, principles of spectroscopy and the H-R diagram, nebula, the Milky Way, other galaxies, quasars, expanding universe, cosmology, and extraterrestrial life.


INTRODUCTION TO PSYCHOLOGY

Department of Psychology

Professors Davis, Hanford, Landis (*Chairperson*), Levitt (Adjunct), Long, McBride (Adjunct), Morris, Neel, Tzeng

Associate Professors Bell (Adjunct), Bringle, Evenbeck, Fleener, Fortier, Goldberg, Hart (Adjunct), Hazer, Kremer, Lauer, Lynch, Mannan (Adjunct), Rajecki, Rytting (Columbus Campus), Svanum, Ware

Assistant Professors Aeschleman, Block, Busemeyer, Clodfelter (Adjunct), Nitsch

Instructors Wakefield (Adjunct)

Psychology is the science that studies the behavior of man and other animals. Traditionally, the discipline has been described as having both experimental and applied approaches. In experimental work, research is often conducted with human or animal subjects where regularities of behavior are investigated. Clinical psychology, a major applied area, is concerned with the professional therapeutic role of psychology in dealing with mental and nervous disorders. Other applied areas of psychology include counseling psychology, social psychology, industrial psychology, and engineering psychology.

The two introductory courses give surveys of these two general approaches, although both emphasize the use of experimental methods in investigating behavior. Psychology B104 covers clinical psychology as well as other social aspects of the discipline including social psychology, developmental psychology, tests and measurements, psycholinguistics, and human aspects of emotion and motivation. Psychology B105 includes treatment of the various experimental areas of psychology including learning and memory, physiological psychology, sensation, and perception.

The Department of Psychology provides curricula that lead to Bachelor of Arts, Bachelor of Science, Master of Science, and Doctor of Philosophy degrees. Besides this professional and preprofessional training, the department serves the needs of students in many other fields by providing an introduction to psychology.

The choice of a particular program for majors should be made in consultation with one of the academic counselors. The department strongly recommends that students include a practicum (B362, B372, B382, or B472) and independent research experience (B492) in their curricula.

Undergraduate Program in Psychology

Undergraduate Degree Requirements

Bachelor of Arts

The degree requirements for a Bachelor of Arts degree are listed in this bulletin.

Area I See School of Science requirements.

Area II There is no requirement for a foreign language.

Area III See School of Science requirements.

Area IV See description below, "Requirements for Psychology Major."

Bachelor of Science

The degree requirements for a Bachelor of Science degree are listed in this bulletin.

Area I See School of Science requirements.

Area II There is no requirement for a foreign language.

Area III See School of Science requirements.

Area IV See description below, "Requirements for Psychology Major."

Area IV: Requirements for Psychology Major (B.A. or B.S.)
The Department of Psychology at IUPUI has a program for majors requiring 24 hours of selected courses. The two semester Introductory Psychology course sequence (B104 & B105) is required of all majors. The chart below lists the remaining requirements for Psychology courses under the major.

Option	Content Courses	Methods Courses	Practica	Electives
Standard Major (24 Hours)	9 hours of courses above the 100 level which end in even numbers (excluding those ending in the digit 2).	9 hours of courses above the 100 level which end in odd numbers	None required	None required

Counseling Suggestions

The Department of Psychology offers counseling suggestions for students interested in completing course work that will help prepare them for graduate school, or appropriate employment after graduation. These programs are known informally as the Graduate School Option, the Psychological Services Option, and the Personnel-Industrial Option. Each of these options outlines 36 hours of selected courses as specified below:

Option	Content Courses	Method Courses	Practica	Electives
Graduate School Preparation (36 Hours)	2 courses from Cluster A[1] 2 courses from Cluster B[2] Either: B492-Readings *or* B499-Honors Research	B211-Intro. Lab B305-Statistics B307-Tests & Measurement One additional lab course	None required	Any one Psychology course
Psychological Services (36 Hours)	1 course from Cluster A[1] 1 course from Cluster B[2] 2 courses from Cluster C[3]	B211-Intro. Lab B305-Statistics B307-Tests & Measurement	2 Practica chosen from departmental offerings	Any one Psychology course
Personnel-Industrial (36 Hours)	1 course from Cluster A[1] 1 course from Cluster B[2] B366-Organizational Psych B368-Personnel Psych	B211-Intro. Lab B305-Statistics B307-Tests & Measurement One additional lab or computer science course	B372-Industrial Practicum	One course (see counselor for approved electives)

[1]Cluster A	[2]Cluster B	[3]Cluster C
B320 Physiological Psych	B360 Child & Adolescent Psych	B320 Physiological Psychology
B324 Psychophysiology of the Senses	B364 Community Psychology	B364 Community Psychology
B326 Comparative Psych	B366 Organizational Psychology	B462 Behavior Management
B334 Perception	B368 Personnel Psychology	549 Intro to Vocational Rehab*
B344 Learning	B370 Social Psychology	550 Intro to Clinical Psych
B356 Motivation	B374 Group Dynamics	552 Counseling Theory and Practice in Rehabilitation
B462 Behavior Management	B376 Psychology of Women	557 Psychology of the Urban Environment
B464 Psych of Language	B424 Personality	

*Note: 500-level courses do not necessarily satisfy the requirements for the Psychology Major. See your adviser.

The Graduate School Option is designed to help students acquire an appropriate background, particularly in research areas, prior to applying to graduate programs. The Psychological Services Option is designed to help students acquire an appropriate background in order to improve chances of obtaining employment in public and private agencies dealing with human and social problems. The Personnel-Industrial Option is designed to help students acquire the appropriate background to improve chances of obtaining employment in a variety of business settings.

However, it should be noted that the Department cannot guarantee entrance to graduate school, or employment.

Psychology Plans of Study

There is no single semester-by-semester plan of study for any of the degrees offered by the Department of Psychology. However, one possible sequence of courses for the B.A. degree and one for the B.S. degree is given below.

Bachelor of Arts Sample Program

Freshman					
1	PSY B104 (3)	ENG W131 (3)	SPCH C110 (3)	AREA IIIA (3)	Elective (3)
2	PSY B105 (3)	AREA IIIA (3)	AREA IIIB (3)	Electives (6)	
Sophomore					
3	PSY B211 (3)	AREA IIIC (3-5)	AREA IIIA (3)	AREA IIIB (3)	Elective (1-3)
4	PSY B305 (3)	AREA IIIC (3-5)	AREA IIIA (3)	AREA IIIB (3)	Elective (1-3)
Junior					
5	PSY Content (3)	PSY Elective (3)	PSY Methods (3)	AREA IIIC (3-5)	AREA IIIB (3)
6	PSY Content (3)	PSY Elective (3)	AREA IIIC (3-5)	Electives (4-6)	
Senior					
7	PSY Content (3)	PSY Elective (3)	Elective (11)		
8	PSY Elective (3)	Electives (12-14)			

Undergraduate Honors Program in Psychology

Psychology majors admitted to the IUPUI Honors Program will be eligible to participate in all Psychology honors courses and to graduate "With Honors in Psychology." Students who are not in the IUPUI Honors Program but who meet the minimum GPA criterion will be able to participate in honors courses but will not receive honors credit. For currently enrolled students (who have completed at least 12 credit hours), the GPA criterion for admission to the Honors Program is 3.30. For new students, the criteria for admission are SAT scores of 1200 or graduation in the top 10 percent of the high school class.

To graduate with honors, students must earn at least 24 hours of honors credit, 6 of which must be in Psychology and 6 of which must be outside of Psychology (the remaining 12 can be either). At least 3 hours of this credit must be from PSY B499 Honors Research, which should culminate in an honors thesis. Only grades of A or B will count for honors credit. To graduate with honors, the student must have an overall GPA of 3.30, with at least 3.50 in honors courses and at least 3.50 in Psychology courses.

For additional information, contact the Director of the IUPUI Honors Program or the Psychology Honors Advisor.

Psi Chi Honorary Society

To become a member of the Psi Chi Honorary Society the undergraduate student must have an overall GPA of 3.0, and a GPA of 3.5 in Psychology. The fee for membership is $20.00 for life. Interested students should submit an application to the Psi Chi faculty adviser.

Bachelor of Science Sample Program

Freshman					
1	PSY B104 (3)	ENG W131 (3)	SPCH C110 (3)	AREA IIID (3-5)	Elective (1-3)
2	PSY B105 (3)	AREA IIIA (3)	AREA IIIB (3)	AREA IIID (3-5)	Elective (1-3)
Sophomore					
3	PSY B211 (3)	AREA IIIA (3)	AREA IIIB (3)	AREA IIIC (3-5)	Elective (1-3)
4	PSY B305 (3)	AREA IIIC (3-5)	Electives (7-9)		
Junior					
5	PSY Content (3)	PSY Elective (3)	PSY Methods (3)	AREA IIIC (3-5)	Elective (1-3)
6	PSY Content (3)	PSY Elective (3)	AREA IIIC (3-5)	Electives (4-6)	
Senior					
7	PSY Content (3)	PSY Elective (3)	Electives (11)		
8	PSY Elective (3)	Electives (14)			

Graduate Programs in Psychology

The Department offers Masters (M.S.) and doctoral (Ph.D.) programs. At the M.S. level courses are offered in Industrial/Organizational Psychology, Applied Social Psychology, Rehabilitation Psychology and Habilitation of the Severely Impaired Child and Adolescent. At the Doctoral level, the Ph.D. is offered with an emphasis on Rehabilitation Psychology. The M.S. degree may be completed on a part-time basis which normally takes two to three years to complete; the Ph.D. program requires full-time study, including the completion of a research project each year with a faculty member. The research training requirement is seen as a vital part of doctoral level training and involves a variable amount of time commitment which depends upon the nature of the project and the particular faculty member involved. The basic purpose of this assignment is to develop in the student the kinds of research skills which will be necessary upon his or her completion of the program. At the M.S. level, the students are advised to complete a research thesis if they intend to continue on toward the doctorate. Students for whom the M.S. is to be the terminal degree, may in most programs elect a nonthesis option. Progress beyond the M.S. degree is based upon a recommendation of the student's committee upon completion of the thesis.

The M.S. program requires, in most cases, a minimum of 36 hours which includes departmental core, area core and electives, if any. At the doctoral level, a minimum of 93 course credits (post baccalaureate) and at least 24 research equivalent credits are required. The course credits cover a broad area of psychology, including a psychology core, statistics and measurements, courses in Rehabilitation Psychology, electives, inside or outside minor,

internships and practicum and the M.S. thesis and doctoral dissertation. Considerable discretion however, is left to the student's advisory committee in developing the final plan of study. While there is no foreign language requirement at this time, students are strongly advised to gain reading competency in at least one language or take 12 hours of course work in research methodologies.

Industrial/Organizational This program is designed to train graduates to assume positions in personnel and related functions in business and industry through a study of appropriate psychological theories and techniques and to prepare students for further graduate work in Industrial Psychology and related areas.

Rehabilitation Area of Concentration Traditionally, training programs in rehabilitation counseling have focused on helping people adjust to their immediate environment, community, or society in general through individual and/or group counseling. While retaining essential elements of the conventional approach, the concentration in Rehabilitation provides training directed at the development of the student as an agent of social change. Toward that end, institutional structures and dynamics are examined to help students understand how these systems impinge upon and affect the lives of all people in general and minority groups in particular. At the master's level, the rehabilitation counselor is a key member of the rehabilitation team which may include a physician, psychologist, social worker, physical therapist, occupational therapist, special teacher, and/or other professional personnel. Typically, the counselor is responsible for the coordination and integration of services provided by these people. The counselor provides continuing counseling services throughout the rehabilitation process to the end that the disabled person is restored to the fullest physical, mental, social, vocational, and economic usefulness possible.

Applied Social Psychology The Applied Social Psychology area offers two concentrations: program planning and evaluation; and intercultural research and training. In the program planning option, the individual is prepared to conduct program evaluation and social research in natural settings. Such training becomes increasingly important as accountability is demanded in most areas of endeavor. This concentration includes a solid background and methodology with a broad foundation and theoretical issues.

In regard to intercultural training and research, the individual is prepared to develop training programs and conduct research in a cross-cultural setting. Increasingly, organizations and government are finding that the current intercultural training programs for personnel are not effective or have not been suitably evaluated. The student concentrating in this area would be prepared to perform these services.

Habilitation The primary objective of this concentration is a preparation of master's level leadership personnel who can: 1) create early intervention/habilitation programs in communities and agencies where such programs do not exist, and/or 2) successfully manage such programs once they have been initiated. There are four major training foci in this option: a strong grounding in the principal empirical findings of developmental psychology; 2) a relatively thorough knowledge and experience in early intervention practices (with an emphasis on applied behavioral analysis and individual program design); 3) an understanding of systemic issues related to the delivery of human services, and; 4) at least journeyman expertise in research design and analysis.

Ph.D. in Psychology This program is designed to train leaders in the field of Rehabilitation Psychology. Graduates of the program will be qualified to assume positions as executives, direct service providers, planners, academicians, trainers, evaluators, researchers, and consult at the highest government and private agency levels. The emphasis of the program is on rigorous academic training, combined with practical application in a wide variety of rehabilitation centers available in Indianapolis and elsewhere. Students may specialize in program design and evaluation, direct services, or research methodology. However, no matter what their specialization, all students are expected to gain a basic understanding of all three areas.

Financial support Financial support for eligible graduate students at both the M.S. and Ph.D. levels is available through teaching and research assistantships. All assistantships require a minimum of 20 hours work per week and include tuition remission in addition to salary.

Admission Requirements Students must have a Bachelor's degree from an accredited college or university. In addition, admission to the Ph.D. program requires the completion of a Master's degree in Rehabilitation Psychology equivalent to that offered by this Department. Doctoral applicants who have not completed such a degree will be required to complete master's level courses within this Department. Undergraduate training in mathematics and the physical sciences is highly desirable, though not required. Applicants should have had at least one undergraduate course in statistics, as well as tests and measurements. If those courses have not been completed, the student will be required to complete them as prerequisites for admission to the program. All applicants are required to take the Graduate Record Aptitude Test Section (Verbal and Quantitative) of the Graduate Record Examination. Arrangements to take this examination can be made by writing to the Educational Testing Services, Box 995, Princeton, New Jersey 08540.

Admissions Information Students interested in information on admission in this Department should write directly to the Graduate Secretary, Department of Psychology, Purdue University School of Science, 1201 E. 38th Street, P.O. Box 647, Indianapolis, IN 46223.

Research Facilities The Psychology Department has extensive laboratory and computer facilities to support faculty and student research. These facilities include more than 5000 square feet of newly renovated space including research cubicles and counseling offices. These facilities are computer controlled and equipped with closed circuit videotape recording capability. Animal facilities are also available. Computer support includes several microcomputers within the Department, a DEC 10 and CDC 6600 with cieber available through terminals within the Psychology Department. Internship and practicum sites are available at such centers as Hook Rehabilitation Center of Community Hospital, Crossroads Rehabilitation Center, the Indiana University Medical Center, and other facilities in the metropolitan Indianapolis area. With the approval of the student's advisory committee an internship may be completed outside of the Indianapolis metropolitan area.

Transfer Credit The Department of Psychology will accept by transfer a maximum of nine hours of appropriate graduate credit from approved institutions which are in excess of undergraduate degree requirements.

Temporary Student Status Students may enroll in courses of the graduate program without making formal application after making application as temporary graduate students. Not more than nine hours of credit may be applied to an advanced degree program if an individual is later admitted as a regular graduate student. However, if an application to a regular degree program is approved during the session in which a person is enrolled for the ninth credit hour as a nondegree registrant, then all credits taken prior to and during that term will be eligible for inclusion on a plan of study for a degree program, providing the courses are appropriate to the degree program and acceptable to the department and the Graduate School. No course in which a grade of less than "B" has been received will be permitted on a plan of study if the course was taken while enrolled as a nondegree registrant. Nondegree registrants may be required to secure consent from each of the departments in which they would like to register for courses.

Research Interests of Faculty Major research interests of faculty include the following: applied behavior analysis, applied experimental psychology, applied social psychology, biofeedback, cross cultural investigations, environmental psychology, habilitation and early intervention, human factors, industrial/organizational psychology, quantitative psychology, measurement theory and development, physiological psychology, program planning and

evaluation, rehabilitation psychology, and vocational and prevocational training of handicapped persons. A current and more detailed listing of faculty research interests is available from the Department.

Undergraduate Courses

Note: P—prerequisite; C—concurrent registration; Every—offered in both Fall and Spring semesters and Summer Session; Fall—offered Fall semester; Spring—offered Spring semester; Summer—offered during the Summer Session. For courses with no designated semester, consult the *Schedule of Classes*. Equiv.—course is equivalent to the indicated course taught at Indiana University Bloomington or the indicated course taught at Purdue University West Lafayette.

B104 Psychology as a Social Science (3 Cr)
Equiv. to IU P102 and PU 120. Every.
Introduction to scientific method, individual differences, personality, developmental, abnormal, social, and industrial psychology.

B105 Psychology as a Biological Science (3 Cr)
Equiv. to IU P101 and PU 120. Every.
Research methods and content areas of learning, sensation-perception, psychophysiology, motivation, emotions, and statistics.

B125 Cognitive and Behavioral Self-Control (1 Cr)
Students will be introduced to the basic principles of cognitive and behavioral self-control and will design and carry out a self-control program.

B211 Introductory Laboratory in Psychology (3 Cr)
P: PSY B105. Equiv. to IU P111, P211 and PU 200. Fall, Spring.
Introductory laboratory in psychology experimental methods, statistical treatment of data, in several areas of psychology; introduction to experimental report writing.

B292 Readings and Research in Psychology (1-3 Cr)
P: Consent of instructor. Independent readings and research on psychology problems. For freshman and sophomore students only.

B305 Statistics (3 Cr)
P: PSY B105 and one year of high school algebra or equivalent. Equiv. to IU P354, K300, K310 and PU 301. Every.
Introduction to basic statistical concepts; descriptive statistics and inferential statistics.

B307 Tests and Measurement (3 Cr)
P: 3 hours of psychology and B305. Equiv. to IU P336 and PU 302. Every.
An introduction to psychological measurement, including psychophysics, scaling techniques, psychological testing, and individual differences.

B320 Physiological Psychology (3 Cr)
P: PSY B105. Equiv. to IU P326 and PU 329. Fall, Spring.
Review of necessary background in neurophysiology and neuroanatomy followed by the relationship of physiology to sensory processes, motivation, and learning. Emphasis on research with animals.

B324 Psychophysiology of the Senses (3 Cr)
P: PSY B105. Equiv. to IU P329 and PU 328. Spring.
This course will consider vision, audition, taste, smell, touch, temperature sensitivity, and the vestibular and kinesthetic senses and their relation to behavior.

B326 Comparative Psychology (3 Cr)
P: PSY B105. Fall.
An introduction to the psychological and ethological accounts of behavior development. Emphasis on the application of the comparative method to the study of behavior of organisms.

B334 Perception (3 Cr)
P: PSY B105. Equiv. to IU P329 and PU 310. Fall. Consideration of the concepts and research in perception. Relation of sense organ systems to human behavior. Some attention to social and cultural factors.

B344 Learning (3 Cr)
P: 3 hours of psychology. Equiv. to IU P325 and PU 311. Every.
History, theory, and research involving human and animal learning and cognitive processes.

B356 Motivation (3 Cr)
P: 3 hours of psychology. Equiv. to IU P327 and PU 333. Every.
Study of motivational processes in human and animal behavior, how needs and incentives influence behavior, and how motives change and develop.

B360 Child and Adolescent Psychology (3 Cr)
P: 3 hours of psychology. Equiv. to IU P316 and PU 235. Every.
Development of behavior in infancy, childhood and adolescence including sensory and motor development and processes such as learning, motivation, and socialization.

B362 Practicum in Child Psychology (3 Cr)
P: PSY B360. Fall, Spring.
Experience in working with children in field settings. May be repeated once.

B364 Introduction to Community Psychology (3 Cr)
Begins with historical and conceptual underpinnings, community mental health practices, and alternative conceptions of deviance. Models of social intervention, including rational planning, organizational development, alternative institutions, community organizing, and experimental reform are discussed in the context of public education, mental health, criminal justice, and urban housing. Also included are community research, evaluation, and training issues for the helping professions.

B366 Introduction to Organizational Psychology in Business and Industry (3 Cr)
The study of organizational psychology as applied to business and industry. Brief coverage of historical development of organizational theory through current theories. Theory weaknesses and strengths. Special problems for business and industry and the methodology for scientific research on these problems will be presented. Some areas or problems to be discussed are organizational structure and climate, leadership and management, communication, motivation, morale, and productivity.

B368 Introduction to Personnel Psychology in Business and Industry (3 Cr)
Psychological methods of assessment in personnel selection and placement, evaluation, and training. Methods and problems of psychological measurement, occupational analysis, human factors engineering, job evaluation, and wages and salary administration.

B370 Social Psychology (3 Cr)
P: 3 hours of psychology. Equiv. to IU P420 and PU 340. Every.
Study of the individual in social situations including socialization, social perception, social motivation, attitudes, social roles, and small group behavior.

B372 Practicum in Industrial Psychology (3 Cr)
P: PSY B366, B368, B378 or equivalent.
This course will provide students with work experience, one day per week, in local organizations. Practice will be obtained in using the applied skills of Industrial Psychology to solve actual organizational problems.

B374 Group Dynamics, Theory and Research (3 Cr)
P: PSY B370.
An intensive survey of research and theory on the behavior of small groups and the research methods by which groups are studied.

B376 The Psychology of Women (3 Cr)
P: 3 hours of psychology. Equiv. to IU P460. Fall, Spring.
A survey of topics in psychology as related to the biological, social, and psychological development of women in modern society.

B380 Abnormal Psychology (3 Cr)
P: 3 hours of psychology. Equiv. to IU P324 and PU 350. Every.
Various forms of mental disorders with emphasis on cause, development, treatment, prevention, and interpretation.

B382 Practicum in Community Psychology (3 Cr)
P or C: PSY B364, B370 or B380 and consent of instructor. Fall, Spring.
Experience in working with individuals who may have a wide range of psychological problems. Focus is upon both the individual and helping agency as factors in the community.

B388 Human Sexuality (3 Cr)
P: One introductory course in psychology.
A survey of human sexuality to increase knowledge and comfort regarding sexuality in a variety of aspects; i.e., sexual behavior and response, influences of culture and environmental factors, psychological issues, disability effects on sexuality, sexual research, anatomy and physiology.

B420 Humanistic Psychology (3 Cr)
A comprehensive survey of the field of humanistic psychology. The course will explore human experience as a focal point in the study of psychology. The instructor will utilize didactic and experimental teaching methods.

B423 Laboratory in Physiological Psychology (3 Cr)
P: PSY B320. Equiv. to IU P426, PU 427. Spring.
Experiments and demonstrations in physiological psychology.

B424 Theories of Personality (3 Cr)
P: 9 hours of psychology. Equiv. to IU P319 and PU 423. Fall.
Methods and results of the scientific study of personality including the development, structure, and functioning of the normal personality.

B425 Laboratory in Personality (3 Cr)
P: PSY B211 and PSY B424 and PSY B305. Equiv. to PU 424. Spring.
Demonstrations and experiments in personality research.

B427 Advanced Laboratory in Physiological Psychology (3 Cr)
P: B423. Spring.
Experiments and demonstrations in physiological psychology.

B431 Laboratory in Sensation and Perception (3 Cr)
P: PSY B211, B305, and either B324 or B334. Equiv. to IU P424 and PU 312.
Experiments and demonstrations in sensation and perception with an emphasis on their physiological basis.

B445 Laboratory in Learning (3 Cr)
P: PSY B211 and PSY B344. Equiv. to IU P436 and PU 312. Fall.
Experiments and demonstrations involving learning and cognitive processes.

B452 Seminar in Psychology (1, 2, or 3 Cr)
Topics in psychology and interdisciplinary applications. May be repeated, provided different topics are studied, for a maximum of 6 credits.

B457 Laboratory in Motivation (3 Cr)
P: PSY B211 and PSY B356. Equiv. to IU P436 and PU 312. Fall.
Experiments and demonstrations in motivation.

B461 Laboratory in Developmental Psychology (3 Cr)
P: PSY B211, PSY B305, and PSY B360. Equiv. to IU P429. Fall.
Principal research methods in developmental psychology and their application to selected problems.

B462 Behavior Management (3 Cr)
P: Consent of instructor. Equiv. to IU P468. Spring.
Conducted as a seminar and a practicum for psychology majors and teachers in the principles and methods of behavior management.

B464 Psychology of Language (3 Cr)
P: 9 hours of psychology, or permission of instructor. Fall.
Survey of important topics in the psychology of language. Included are historical treatments, generative grammar, development of language, experimental psycholinguistics, and semantics.

B466 Seminar in Child Psychology (3 Cr)
P: B360 or equivalent.
Integration of practical experience with relevant psychological literature.

B471 Laboratory in Social Psychology (3 Cr)
P: PSY B211 and PSY B305 and P or C: PSY B370. Equiv. to IU P421 and PU 346. Spring.
Observational, correlational, and experimental studies in social psychology.

B472 Practicum in Group Dynamics (3 Cr)
P: 6 hours of psychology and consent of instructor. Equiv. to IU P321 and PU 348. Fall, Spring.
Application in the field of group dynamics through experience as a participant in group sensitivity training.

B492 Readings and Research in Psychology (1-3 Cr)
P: Consent of instructor. Equiv. to IU P495 and PU 498. Every.
Independent readings and research on psychological problems.

B499 Honors Research (credit arranged)
P: Consent of departmental honors committee. Equiv. to IU P499 and PU 499. Every.
Independent readings and research resulting in a research paper.

Graduate Courses

(500 level courses also open to Seniors)

500 Statistical Methods Applied to Psychology, Education, and Sociology (3 Cr)
P: PSY B105 and one year of high school algebra or equivalent.
Descriptive statistics and introduction to sampling statistics. Applied to psychological, sociological, and educational data.

505 Mental Measurement (3 Cr)
P: 6 hours of psychology, including PSY 500 or equivalent.
Introduction to the general area of mental measurement. Theory and content of measuring devices in the fields of intelligence, interests, personality, and special aptitudes.

518 Memory and Cognition (3 Cr)
A survey of theories and research concerned with processes in the acquisition, storage, and retrieval of information, as well as selected additional topics in cognitive psychology.

I521 Introduction to Applied Behavior Analysis (3 Cr)
P: Consent of instructor.
The course is designed to provide an advanced introduction to the philosophy, principles, and procedures of applied behavior analysis and a review of selected research. Practical, ethical, and legal constraints on behavior interventions will be considered. Research conducted in institutional, educational, and home settings will be emphasized.

523 Introduction to Theories of Psychotherapy (3 Cr)
A survey of the major approaches to psychotherapy, including their theories of illness and cure. Three traditions are represented: psychoanalytical (e.g., Freud, Adler, Jung), behavioral (e.g., Miller and Dollard, Wolpe, Stampfl) and cognitive-phenomenological (e.g., Rogers, Kelley, Binswanger).

526 Psycholinguistics (3 Cr)
P: Consent of instructor.
An introduction to the descriptive devices, central issues, and varying methodologies of psycholinguistics.

535 Psychology of Death and Dying (3 Cr)
An examination of psychological research and theory related to death and the dying process. Topics include death concepts, attitudes, and fears, psychosocial predictors of death, effects of death on survivors, psychosocial factors related to individual differences and normative dying behaviors, stages of dying, effects of pain and drugs, and managing the dying process.

540 History of Psychology (3 Cr)
A review of the philosophical, theoretical, and methodological issues which entered into the development of modern psychology. Emphasis is placed on historical themes which continue to be active in the science and profession of psychology.

I549 Introduction to Vocational Rehabilitation (3 Cr)
P: 9 hours of psychology.
Philosophy, procedures, and practices underlying the vocational rehabilitation movement, including the historical, social, cultural, and economic factors and recent legislation that have contributed to its rapid development.

550 Introduction to Clinical Psychology (3 Cr)
P: 12 hours of psychology.
The case-study method, including a discussion of the importance of historical information, the contribution of clinical tests to diagnosis, and a general survey of prevention and treatment techniques.

I552 Psychological Counseling Theory and Practice in Rehabilitation (3 Cr)
P: 9 hours of psychology.
Theories of counseling and their applicability to the individual counselor and his prospective counseling situation. The use of various tools in counseling.

I553 Introduction to Community Resources for Vocational Rehabilitation (3 Cr)
P: Consent of instructor.
Survey of rehabilitation and rehabilitation-related agencies and services in Indiana and the issues involved in their utilization. Includes site visits.

I554 Psychosocial Aspects of Disability (3 Cr)
P; 9 hours of psychology.
An examination of the effect of the socio-emotional impact of traumatic injury or chronic illness on human functioning and its role in the rehabilitation process.

I555 Medical Aspects of Disability (3 Cr)
P: 9 hours of psychology including PSY 549.
Provides medical information for rehabilitation counselors and introduces students to medical terminology. Includes knowledge of the etiology, prognosis, methods of treatment, effects of disabling conditions, and implications for the rehabilitation counselor. Counselor relationships with other health related personnel are emphasized.

I557 Psychology of the Urban Environment (3 Cr)
P: PSY 500 or equivalent.
Introductory course on the effects of the urban environment on human behavior. Theories and empirical studies concerning environmental stresses in urban settings will be discussed with a major emphasis given to field studies. Implications of theory and research findings for urban planning will be specified.

565 Interpersonal Relations (3 Cr)
P: 9 hours of psychology.
Review of major current theoretical formulations of the interpersonal relationship, including a discussion of some of the more prominent research. Focus is primarily upon two-person interpersonal relations.

570 Industrial Psychology(3 Cr)
Survey of the applications of psychological principles and of research methodology to the various human problems in the industry, such as: personnel selection and appraisal, the organizational and social context of human work, the job and work situation, human errors and accidents, and psychological aspects of consumer behavior.

572 Organizational Psychology (3 Cr)
A survey of basic behavioral science research and thinking as these contribute to the understanding of individual, dyadic, group, intergroup, and other large organization behavioral phenomena. The topics covered include motivation, perception, attitudes and morale, communication, leadership, conflict, problem solving, behavior change, and organizational effectiveness.

574 Psychology of Industrial Training (3 Cr)
P: 3 hours of psychology.
Utilization of psychological measurement techniques in assessing training needs and evaluating training effectiveness and the application of learning research and theory to industrial training.

577 Human Factors in Engineering (3 Cr)
Survey of human factors in engineering with particular reference to human functions in man-machine systems, and consideration of human abilities and limitations in relation to design of equipment and work environments.

578 Occupational Analysis (3 Cr)
P: PSY 570.
Survey of systematic study of human work, including techniques of analysis of jobs and occupations for personnel and related purposes. Survey of occupational research and related topics. Practice in job analysis.

585 Psychological Foundations of Consumer Behavior (3 Cr)
P: 3 hours of psychology.
A survey of the concepts and methods of psychology as they apply to the study of consumer behavior.

590 Individual Research Problems (1, 2, or 3 Cr)
P: 12 hours of psychology and the consent of the instructor.
Opportunity for students to study particular problems in any field of psychology or initiate themselves into research techniques under the guidance of a member of the staff.

593 Ethology (3 Cr)
P: Consent of instructor.
Animal behavior is analyzed in natural and experimental situations. Emphasis is on the observation of wild and domesticated animals. The effects of early experience, motivation, physiological mechanisms, adaptiveness, and the evolution of behavior are considered.

594 Special Topics in Ethology (3 Cr)
P: PSY 593 or equivalent.
Special topics such as imprinting, human ethology, territoriality, orientation, communication, ethology of mammals, etc. will be critically examined in the light of current research findings. One selected topic at a time will be covered in each semester when the course is offered.

595 Seminar in Teaching Psychology (0 Cr)
P: Consent of the Department of Psychology.
A problem-solving approach to teaching psychology at IUPUI. Planning the course; anticipating problems; dealing with ongoing teaching problems. Current faculty members will present their innovative techniques. Participants will evaluate each other's classroom performance.

600 Statistical Inference (3 Cr)
P: PSY 500 or equivalent.
Emphasis is given to principles underlying both parametric and nonparametric inference.

601 Correlation and Experimental Design (3 Cr)
P: PSY 600.
Continuation of PSY 600 with emphasis upon the design and analysis of experiments.

605 Applied Multivariate Analysis (3 Cr)
P: PSY 600.
A survey of the most frequently employed multivariate research techniques, such as multivariate generalizations of univariate tests and analysis of variance, principal components, canonical analysis, and discriminant analysis. A central theme of the course is the general linear model, both univariate and multivariate. A multipurpose program for this model provides the student with practical experience in conducting multivariate research.

606 Special Topics in Quantitative Psychology (3 Cr)
P: Consent of instructor.
A seminar covering such topics as linear models, statistical decision making, multidimensional scaling.

607 Scaling and Measurement (3 Cr)
An introduction to the theory of measurement and a survey of modern scaling methods (unidimensional and multidimensional, metric and nonmetric) within the framework of the modern theory of measurement.

608 Advanced Technology of Tests and Measurements (3 Cr)
P: PSY 600 and PSY 505 or equivalent. (Formerly numbered PSY 610).
Theory and technique relating to the construction and utilization of measuring devices such as intelligence, special aptitude, interest, achievement, and personality tests.

I610 Dynamic Modeling of Rehabilitation and Health Systems (3 Cr)
P: Consent of instructor.
An introduction to System Dynamics as a method for computer modeling of rehabilitation and health systems. Includes weekly modeling exercises, and a simulation experiment using an already existing model.

611 Factor Analysis (3 Cr)
P: PSY 600.
Theory and applications of factors analysis in psychological research.

612 Advanced Test Theory (3 Cr)
P: PSY 608 or consent of instructor.
Item Sampling and latent ability theories of test scores, together with related problems and possible solutions. Developments by Lord, Cronbach, Rasch, and Birnbaum will be covered.

I612 Deinstitutionalization and the Planning of Community-Based Rehabilitation Service Systems (3 Cr)
P: Graduate standing.
An overview of the successes and failures of the deinstitutionalization movement in developmental disabilities and psychiatric disability. Covers principles of conceptualizing, planning, and implementing community-based residential, vocational, and social skills training programs.

615 Introduction to Psychobiology (3 Cr)
A survey of the integrated neurosciences for nonconcentrators emphasizing human physiological psychology. Neural processes of sensory and motor function, arousal and sleep, motivation, learning and memory, language function, and personality disorders will be presented with selected coverage of neuroanatomy, neurophysiology, neuropharmacology, and neuroendocrinology. Both normal and pathological functions will be covered.

624 Human Learning and Memory (3 Cr)
P: Consent of instructor. (Formerly numbered PSY 630.)
Theory of and experimental findings in human learning and memory.

628 Perceptual Processes (3 Cr)
P: PSY B334 or equivalent.
General review of basic concepts and findings in the area of perception.

633 Seminar in Experimental Psychology (3 Cr)
P: Consent of instructor.
Critical analysis of current problems in experimental psychology. Emphasis upon reviewing literature, preparing, and presenting papers.

640 Survey of Social-Personality Psychology I (3 Cr)
P: PSY B370 or equivalent.
An extensive survey of methods, research, and theory in social-personality psychology.

641 Survey of Social-Personality Psychology II (3 Cr)
P or C: PSY 600.
An extensive survey of methods, research, and theory in social-personality psychology.

I642 Cross-Cultural Social Psychology (3 Cr)
P: PSY 600, PSY 640.
A survey of methodology and findings from cross-cultural analysis of social behavior. Findings are applied to the development of techniques for cross-cultural training.

I643 Field Methods and Experimentation (3 Cr)
P: PSY 600.
The course will cover methods appropriate for field experimentation and program evaluation. Topics will include quasi-experimental designs, sampling procedures, and issues associated with program evaluation.

646 Seminar in Social Psychology (3 cr)
P: Consent of instructor.
A seminar covering such topics as attitudes, attitude change, small group behavior, psychological bases of group structure, and social interaction.

I648 Practicum in Applied Social Psychology (3 Cr)
P: Consent of instructor.
Students will participate in applied research and/or program evaluation in a community agency. The field experience, combined with a seminar, will provide on-site training and skill development under the supervision of the Psychology Department and agency personnel.

I649 Internship in Applied Social Psychology (0 Cr)
P: Consent of instructor.
Open only to Applied Social Psychology students in approved internship facilities. Provides opportunity for application of knowledge of program evaluation and/or social research under supervision of the agency and monitored by the Department of Psychology.

650 Developmental Psychology (3 Cr)
Major concepts, principles, and facts concerning the biological and environmental influences on behavioral and psychological development. Particular emphasis given to essential principles of ontogenetic development (life span) emerging from current research in genetics and psychology.

655 Cognitive Development (3 Cr)
P: Consent of instructor.
An analysis of research findings and current theories relevant to the development of cognitive processes. Emphasis is placed upon the changing characteristics of some fundamental cognitive processes. Special attention is given to verbal behavior and language.

657 Language Acquisition (3 Cr)
An examination of research and theory dealing with language acquisition in children. A linguistic framework is used to describe developing language. Topics considered include speech perception, grammatical development, meaning, language in non-modal populations. Supervised laboratory experience.

I679 Practicum in Industrial Psychology (3 Cr)
P: PSY 570, 572 and consent of instructor.
This course will give students the opportunity to spend 8 hours per week within local business organizations in order to gain experience in the skills of industrial psychology. A student will be placed in the organization best matching his or her interests.

R679 Practicum in Counseling Psychology — Rehabilitation (3 Cr)
P: Consent of instructor.
Supervised practice of counseling procedures in a rehabilitation setting.

680 Analysis of Published Research in Industrial Psychology (3 Cr)
P: PSY 570, 572, 601 or consent of instructor.
A survey of the various areas of industrial psychology (personnel, social-industrial, human factors, and consumer) with particular reference to current research as reflected in current journals and texts. Course provides opportunity for critical evaluation of research investigations, familiarity with sources of material, and experience in the preparation of manuscripts.

681 Seminar in Industrial Psychology (3 Cr)
P: PSY 570, 572, 601, 608 or consent of instructor.
Intensive analysis of application of various research and statistical methods to human problems in industry.

683 Seminar in Industrial-Social Psychology (3 Cr)
P: PSY 570, PSY 572, or equivalent.
Study of research and theory emphasizing social perception, attitudes, supervisory behavior, employee participation, motivation, and organizational structure.

688 Human Sexuality in the Rehabilitation Process (3 Cr)
P: Graduate standing in Rehabilitation Psychology or consent of instructor.
The course provides updated knowledge regarding attitudes and practice related to biological, psychosocial, and attitudinal aspects of human sexuality. A special emphasis is given to sexual concerns experienced by the physically disabled and to increasing students' ability to conduct effective clinical discussion of sexual issues with rehabilitation clients.

690 Career Development, Selection, and Placement in Rehabilitation (3 Cr)
P: 9 hours of psychology.
A survey of current methods and criteria used in job development, selective placement, and follow-up of handicapped and deprived individuals.

691 Seminar in Rehabilitation Counseling (3 Cr)
P: Consent of instructor.
Current trends, problems, and developments in rehabilitation. Students pursue a special interest and mutually share information and experience with the group. Individual report and group discussions.

R697 Internship in Vocational Rehabilitation Counseling (0 Cr)
P: Permission of instructor.
Opportunities for application of theory in practice of rehabilitation counseling and case management in a rehabilitation setting under supervision of the Psychology Department and Agency.

698 Research M.S. Thesis (3 Cr)

I699 Research Ph.D. Dissertation (0 to 12 Cr)

Resident Faculty

AESCHLEMAN, STAN *Assistant Professor of Psychology (1978); B.A., 1968, Western Illinois University; M.A., 1973, Ph.D., 1977, University of Kentucky.* Specialties: Applied Behavioral Analysis, Learning in Developmentally Delayed Children, and Computer Data Systems to Store and Report Child Performance on Educational Programs.

ALIPRANTIS, C.D. *Professor of Mathematics (1975); B.S., 1968, University of Athens; M.S., 1971; Ph.D., 1973, California Institute of Technology.* Specialty: Functional Analysis, Applied Mathematics.

ALTON, ELAINE V. *Professor of Mathematics-Education (1964); A.B., 1946, State University of New York at Albany; M.Ed., 1951, St. Lawrence University; M.A., 1958, University of Michigan; Ph.D., 1965, Michigan State University.* Specialty: Mathematics Education.

BARD, MARTIN *Associate Professor of Biology (1975); B.S., 1965, City College of New York; Ph.D., 1971, University of California, Berkeley.* Specialty: Biochemical Genetics.

BAYER, SHIRLEY A., *Associate Professor of Biology (1982); B.A., 1963, St. Mary-of-the-Woods; M.A., 1969, California State University, Fullerton; Ph.D., 1974, Purdue University.* Specialty: Neurobiology.

BELL, D. BRUCE *Adjunct Associate Professor of Psychology (1981); B.A., 1963, M.A., 1964, University of Texas-Austin; Ph.D., 1969, Texas Tech University.* Specialty: Industrial Psychology.

BITTINGER, MARVIN *Professor of Mathematics-Education, (1968); B.S., 1963, Manchester College; M.S., 1965, Ohio State University; Ph.D., 1968, Purdue University.* Specialty: Mathematics Education.

BLOCK, ANDREW R. *Assistant Professor of Psychology (1981); B.A., 1974, Haverford College, Ph.D., 1980, Dartmouth College.* Specialties: Assessment of Chronic Pain & Illness, Psychophysiology, Rehabilitation Psychology.

BOAZ, PATRICIA A. *Assistant Dean for Academic Affairs and Associate Professor of Chemistry (1967); B.S., 1944, Vassar; Ph.D., 1951, State University of Iowa.* Specialties: General Chemistry, Physical Chemistry, and Geochemistry.

BODONYI, RICHARD *Professor of Mathematics (1976); B.S., 1966, Ohio State University; Ph.D., 1973, Ohio State University.* Specialty: Applied Mathematics.

BOSCHMANN, ERWIN *Professor of Chemistry (1968); B.A., 1963, Bethel College (Kansas); M.S., 1965, Ph.D., 1968, University of Colorado.* Specialties: General Chemistry, Inorganic Chemistry, and Bioinorganic Chemistry.

BRINGLE, ROBERT GORDON *Associate Professor of Psychology (1974); B.A., 1969, Hanover College; M.S., 1972, Ph.D., 1974, University of Massachusetts.* Specialties: Social Psychology, Program Evaluation, Methodology.

BURKINSHAW, OWEN *Professor of Mathematics (1972); B.S., 1966, M.S., 1968, Ohio University-Athens; Ph.D., 1972, Purdue University.* Specialty: Functional Analysis.

BUSEMEYER, JEROME R. *Assistant Professor of Psychology (1981); B.S., 1973, University of Cincinnati; M.A., 1976, Ph.D., 1979, University of South Carolina.* Specialties: Field Research and Evaluation, Mathematical Psychology, Decision and Motivation.

CARROLL, ALAN *Assistant Professor of Biology (1980); B.S., 1969, University of Michigan, M.S., 1971, Wayne State University; Ph.D., 1978, Michigan State University.* Specialties: Developmental Biology, Reproductive Physiology.

CLODFELTER, CONSTANCE S. *Associate Director and Counselor, Student Services, and Adjunct Assistant Professor of Psychology (1979); B.A., 1968, M.S., 1971, Ph.D., 1975, University of North Dakota.* Specialties: Individual Counseling and Psychotherapy.

CROWN, J. CONRAD *Professor of Mathematical Sciences and Computer and Information Science (1969); B.S., 1943, Polytechnic Institute of Brooklyn; M.S., 1962, Ph.D., 1965, University of Connecticut.* Specialty: Numerical Analysis.

CUTSHALL, THEODORE W. *Associate Professor of Chemistry (1961); B.S.Ch.E., 1949, Purdue University; M.S., 1959, Ph.D., 1964, Northwestern University.* Specialty: Organic Chemistry.

DAVIS, ROBERT *Professor of Psychology (1976); B.S., 1958, Salisbury State College; M.Ed., 1962, Pennsylvania State University; Ed.D., 1968, University of Maryland.* Specialties: Rehabilitation Psychology, Counseling.

DE CAPRARIIS, PASCAL *Assistant Professor of Geology (1978); B.S., 1964, M.S., 1967, Boston College; Ph.D., 1973, Rensselaer Polytechnic Institute.* Specialties: Geophysics, Environmental Systems, Analysis.

DUBIN, PAUL *Assistant Professor of Chemistry (1981); B.S., 1962, C.U.N.Y.; Ph.D., 1970, Rutgers University.* Specialties: Analytical Chemistry, Polymer Chemistry.

EVENBECK, SCOTT *Associate Director of Administrative Affairs and Associate Professor of Psychology (1972); A.B., 1968, Indiana University; M.A., 1971, Ph.D., 1972, University of North Carolina.* Specialties: Social Psychology, Program Evaluation, Methodology.

FIFE, WILMER K. *Professor of Chemistry (1971); B.S., 1955, Case Institute of Technology; Ph.D., 1960, Ohio State University.* Specialties: General Chemistry, Organic Chemistry, and Biochemistry.

FLEENER, DON E. *Associate Professor of Psychology (1966); B.S. (Ed.), 1949, Indiana Central University; Ph.D., 1967, Indiana University.* Specialties: Infancy, Child Development.

FORTIER, ROBERT H. *Associate Professor of Psychology (1966); B.S., 1947, Ph.D., 1952, Western Reserve University.* Specialties: Child Psychology, Personality.

FRICKE, GORDON H. *Associate Professor of Chemistry (1972); B.A., 1964, Goshen College; M.S., 1966, State University of New York at Binghamton, N.Y.; Ph.D., 1970, Clarkson College of Technology.* Specialties: General Chemistry and Analytical Chemistry.

FROEHLKE, KRISTIN *Adjunct Lecturer of Computer and Information Science (1981); B.A., 1968, Marion College; M.S., 1970, Purdue University.* Specialty: Computer Science.

GERSTING, JOHN M., JR. *Professor of Engineering Science and Computer and Information Science (1970); B.S., 1962, Purdue University; M.S., 1964, Ph.D., 1970, Arizona State University.* Specialties: Database Systems and Computational Methods.

GERSTING, JUDITH L. *Acting Chairperson and Professor of Computer and Information Science (1970); B.S., 1962, Stetson University; M.A., 1964, Ph.D., 1969, Arizona State University.* Specialty: Logic.

GOLDBERG, CARLOS L. *Associate Professor of Psychology, (1969); B.A., 1961, Brooklyn College; M.A., 1964, Ph.D., 1969, The City University of New York.* Specialties: Social Psychology, Urban Psychology.

GRANOT, JOSEPH *Assistant Professor of Physics (1981); B.S., 1968, Tel-Aviv University; M.S., 1970, Tel-Aviv University, Ph.D., 1978, The Weizmann Institute of Science.* Specialty: Biological Magnetic Resonance.

HALL, ROBERT D. *Assistant Professor of Geology (1974); B.S., 1963, Purdue University; M.S., 1966, University of Colorado; Ph.D., 1973, Indiana University.* Specialties: Geomorphology, Environmental Geology, Hydrology, Physical Geology.

HANFORD, PETER VANCE *Professor of Psychology, School of Science and Adjunct Professor of Psychology, School of Medicine (1960); B.S., 1952, M.S., 1953, Ph.D., 1958, Pennsylvania State University.* Specialties: Experimental Analysis of Behavior, Motivation.

HART, STUART, N. *Adjunct Associate Professor of Psychology (1980), B.A., 1960, M.A., 1965, Long Beach State College; Ph.D., 1972, Indiana State University.* Specialty: Social and School Psychology.

HAZER, JOHN T. *Associate Professor of Psychology (1975); B.A., 1970, Miami University; M.A., 1974, Ph.D., 1976, Bowling Green State University.* Specialties: Industrial and Organizational Psychology, Selection and Placement.

HUFFMAN, DAVID G. *Professor of Computer and Information Science (1975); B. Eng. Sci., 1962, Marshall University; M.S., 1966, Ph.D., 1968, Ohio State University.* Specialty: Applied Mathematics.

HUTTON, LUCREDA *Associate Professor of Mathematics (1975); B.S., 1967, Butler University; M.S., 1972, Purdue University; Ed.D., 1975, Indiana University.* Specialty: Mathematics Education.

JACKSON, BILLY G. *Adjunct Associate Professor of Chemistry (1971); B.S., 1953, Ph.D., 1957, Iowa State University.* Specialty: Organic Chemistry.

JARRETT, HARRY W. III, *Assistant Professor of Biology (1982); B.S., 1972, University of South Carolina; Ph.D., 1976, University of North Carolina.* Specialty: Biochemistry.

JUILLERAT, FLORENCE *Assistant Professor of Biology (1966); B.S., 1962, M.S., 1967, Ph.D., 1974, Purdue University.* Specialties: Cell Biology, Biology for Teachers, Biology for Non-Majors.

KAMINKER, JEROME ALVIN *Professor of Mathematics (1973); B.A., 1963, University of California, Berkeley; M.A., 1965, Ph.D., 1968, University of California at Los Angeles.* Specialty: Algebraic Topology.

KAPLAN, JEROME I. *Professor of Physics (1974); B.S., 1950, University of Michigan (Ann Arbor); Ph.D., 1954, University of California, Berkeley.* Specialty: Solid State Physics.

KECK, ROBERT WILLIAM *Assistant Dean for Administrative Affairs, and Associate Professor of Biology (1972); B.A., 1962, M.S., 1964, University of Iowa; Ph.D., 1968, Ohio State University.* Specialty: Plant Physiology.

KEMPLE, MARVIN D. *Associate Professor of Physics (1977); B.S., 1964, Purdue University; M.S., 1965, Ph.D., 1971, University of Illinois Champaign-Urbana.* Specialties: Solid State Physics, Chemical Physics, Biophysics.

KIRK, RONALD *Assistant Professor of Biology (1968); A.S., 1955, Vincennes University; B.S., 1958, M.S., 1959, Ph.D., 1966, Purdue University.* Specialties: Invertebrate Zoology, Entomology, Ecology.

KLEINHANS, FREDERICK W. *Associate Professor of Physics and Adjunct Associate Professor of Biophysics, School of Medicine (1972); B.S., 1965, University of Michigan; Ph.D., 1971, Ohio State University.* Specialties: Solid State Physics, Biophysics.

KLEYLE, ROBERT M. *Associate Professor of Mathematics and Statistics (1973); B.A., 1960, Duquesne University, Pittsburgh; M.S., 1962, University of Pittsburgh; Ph.D., 1968, Harvard University.* Specialty: Statistics.

KREMER, JOHN F. *Associate Professor of Psychology, School of Science and Adjunct Assistant Professor of Psychology, School of Medicine, (1975); B.A., 1966, St. Meinrad College; M.S., 1969, University of Notre Dame; Ph.D., 1975, Loyola University.* Specialties: Clinical Psychology, Social Psychology, Program Evaluation.

KUCZKOWSKI, JOSEPH E. *Professor of Mathematics (1966); B.S., 1961, Canisius College; M.S., 1963, Ph.D., 1968, Purdue University.* Specialty: Semigroup Theory.

LANDIS, DAN *Chairperson and Professor of Psychology, School of Science; Adjunct Professor of Psychology, School of Medicine; Adjunct Professor, School of Nursing (1976); B.S., 1957, Arizona State University; M.A., 1960, Temple University; Ph.D., 1963, Wayne State University.* Specialties: Cross-cultural Social Psychology, Sensation and Perception, Evaluation Research.

LAUER, JOAN B. *Associate Professor of Psychology (1973); A.B., 1964, Ph.D., 1973, Indiana University.* Specialties: Physiological Psychology, Learning.

LEES, NORMAN DOUGLAS *Associate Professor of Biology (1973); A.B., 1967, Providence College, Providence, R.I.; Ph.D., 1973, Northwestern University.* Specialties: Microbiology, Molecular Biology.

LEVITT, EUGENE *Professor of Clinical Psychology and Director of the Section of Clinical Psychology, Department of Psychiatry, School of Medicine, and Adjunct Professor of Psychology (1976); B.A., 1948, City University of New York; M.A., 1950, Ph.D., 1952, Columbia University.* Specialty: Clinical Psychology.

LIPKOWITZ, KENNETH B. *Associate Professor of Chemistry (1976); B.S., 1972, State University of New York at Geneseo; Ph.D., 1975, Montana State University.* Specialties: Theoretical and Synthetic Organic Chemistry.

LOH, PETER C. *Associate Professor of Mathematics (1968); B.S., 1963, Purdue University; Ph.D., 1968, Stanford University.* Specialty: Differential Equations.

LONG, ROBERT IRVIN *Professor of Psychology (1956); A.B., 1950, Indiana University; M.S., 1955, Ph.D., 1956, Tulane University.* Specialties: Learning, Individual Differences.

LUKE, JON *Associate Professor of Mathematics (1975); B.S., 1962, M.S., 1963, Massachusetts Institute of Technology; Ph.D., 1966, California Institute of Technology.* Specialty: Applied Mathematics.

LYNCH, KEVIN P. *Associate Professor of Psychology (1978); B.A., 1965, M.A., 1967, Ph.D., 1973, Ohio State University.* Specialties: Rehabilitation Psychology, Teaching Complex Social and Vocational Skills to Severely Handicapped Children and Adults by Operant and Imitative Methods.

MALIK, DAVID J. *Assistant Professor of Chemistry (1980); B.S., 1968; M.S., 1969, California State University; Ph.D., 1976, University of California at San Diego.* Specialties: Theoretical Physical Chemistry, Chemical Physics.

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Degree Checklist for School of Science Bachelor of Arts Degree

The School requirements are listed. Departmental requirements may include additional courses in all areas.

Area I ENGLISH COMPOSITION AND COMMUNICATIVE SKILLS

Composition _____ Speech _____

Area II FOREIGN LANGUAGE. No required courses by the School.

_____ _____

AREA IIIA ARTS AND HUMANITIES. Four courses totaling at least twelve credits.*

_____ _____

_____ _____

AREA IIIB SOCIAL AND BEHAVIORAL SCIENCES. Four courses totaling at least twelve credits.*

_____ _____

_____ _____

AREA IIIC PHYSICAL AND BIOLOGICAL SCIENCES. At least four science courses totaling a minimum of twelve credits outside the major department. (At least one of the above must be a laboratory course).**

_____ _____

_____ _____

AREA IIID MATHEMATICAL SCIENCES. No required courses at school level.

_____ _____

AREA IV MAJOR. Consult departmental listing for courses required in major as well as courses required in other areas by the department.

_____ _____ _____

_____ _____ _____

_____ _____ _____

*There must be at least two courses in one discipline in either III A or III B.
**Courses not acceptable for III C include BIOL N100, N120, N200, all agriculture courses, and CHEM C100.

Degree Checklist for School of Science Bachelor of Science Degree

The School requirements are listed. Departmental requirements may include additional courses in all areas.

Area I ENGLISH COMPOSITION AND COMMUNICATIVE SKILLS

Composition _____ Speech _____

AREA II FOREIGN LANGUAGE. No required courses by the School.

_____ _____

AREA IIIA ARTS AND HUMANITIES. Two courses totaling at least six credits.*

_____ _____

AREA IIIB SOCIAL AND BEHAVIORAL SCIENCE. Two courses totaling at least six credits.*

_____ _____

AREA IIIC PHYSICAL AND BIOLOGICAL SCIENCES. At least four science courses totaling a minimum of twelve credits outside the major department. (At least one of the above must be a laboratory course).**

_____ _____

_____ _____

AREA IIID MATHEMATICAL SCIENCES. At least two courses beyond algebra and trigonometry, totaling a minimum of six credits.

_____ _____

_____ _____

AREA IV MAJOR. Consult departmental listing for courses required in major as well as courses required in other areas by the department.

_____ _____ _____

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*There must be two courses in one discipline in either III A or III B.
**Courses not acceptable for IIIC include BIOL N100, N120, N200, all agriculture courses, and CHEM C100.

Index

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