Purdue University School of Science

Indiana University-Purdue University at Indianapolis (IUPUI)

School of Science Bulletin 1977/78

Degree Programs
School of Science

BIOLOGY

Bachelor of Arts ..... (P.U.)
- Biology

Bachelor of Science ..... (P.U.)
- Biology

CHEMISTRY

Bachelor of Arts ..... (P.U.)
- Preprofessional Chemistry Major
- Chemistry Major

Bachelor of Science ..... (P.U.)
- Chemistry Major
- Chemistry Teaching
- Professional Chemistry Major-A.C.S. Certified

Master of Science ..... (P.U.)
- Chemistry

GEOLOGY

Bachelor of Arts ..... (I.U.)
- Geology
- Earth Science Teaching

Bachelor of Science ..... (I.U.)
- Geology

MATHEMATICAL SCIENCES

Bachelor of Science ..... (P.U.)
- Computer Science
- Mathematics
- Mathematics Teaching

Master of Science ..... (P.U.)
- Applied Computer Science
- Applied Mathematics
- Mathematics
- Mathematics (Option for Teachers)

Master of Arts ..... (P.U.)
- Teaching Mathematics

PHYSICS

Bachelor of Science ..... (P.U.)
- Physics
- Physics Teaching

PSYCHOLOGY

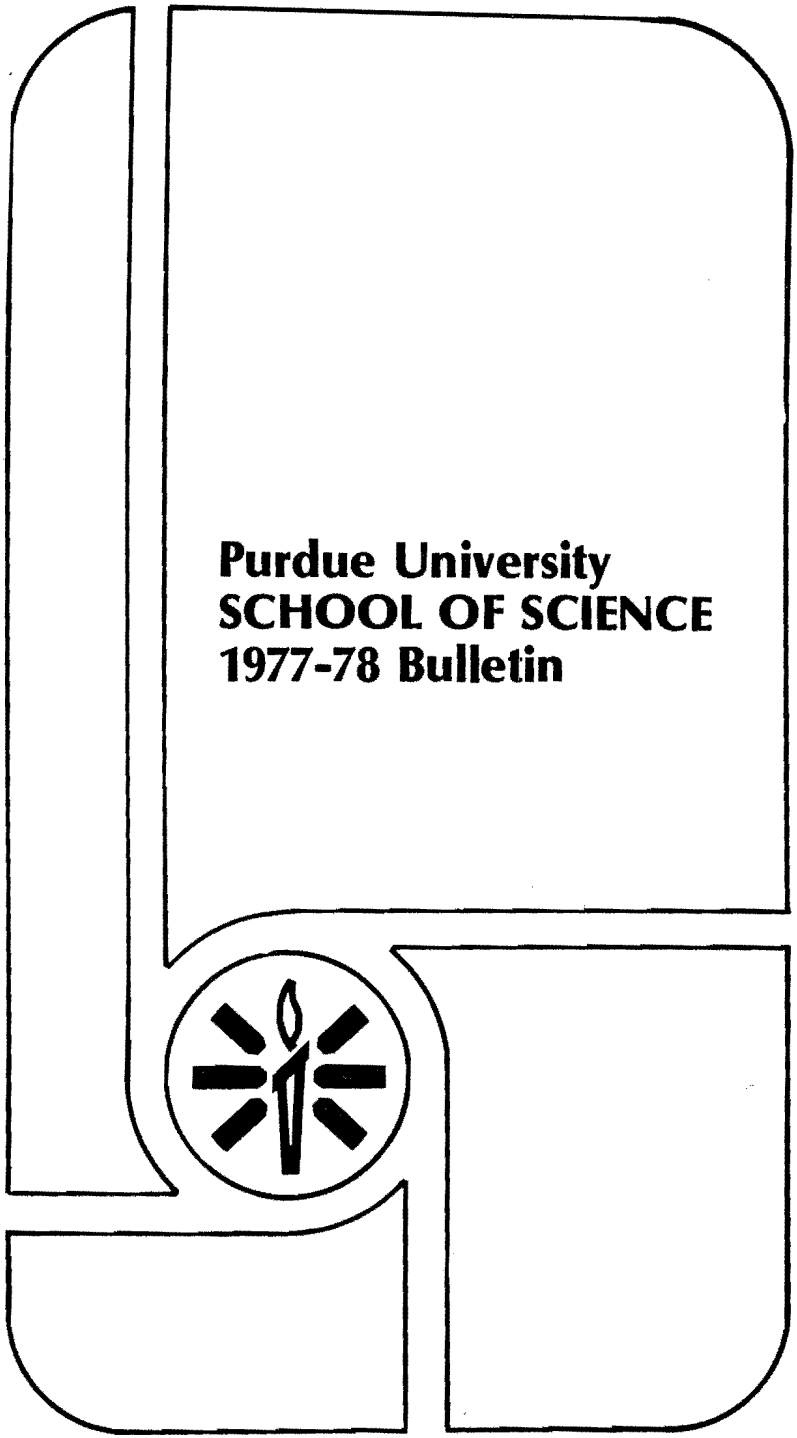
Bachelor of Arts ..... (P.U.)
- Psychology

Bachelor of Science ..... (P.U.)
- Psychology

Master of Science ..... (P.U.)

AGRICULTURE

Master of Science ..... (P.U.)
- Extension Education


Purdue University
SCHOOL OF SCIENCE
1977-78 Bulletin

IUPUI CALENDAR 1977-78

SUMMER SESSION I — 1977

Classes begin	W	May 11
Memorial Day Holiday	M	May 30
Last day to withdraw from class with W	T	May 31
Last day to withdraw from class	T	June 14
Classes end Summer Session I	W	June 22
Session ends	F	June 24

SUMMER SESSION II — 1977

Classes begin	M	June 27
July 4 Holiday	M	July 4
Last day to withdraw from class with W	Th	July 14
Last day to withdraw from class	Th	July 28
Classes end Summer Session II	M	Aug 8
Summer Session ends	W	Aug 10

FALL SEMESTER — 1977

Classes begin	W	Aug 24
Labor Day Holiday	M	Sept 5
Mid-term	S	Oct 15
Last day to withdraw from a class with W	W	Oct 19
Last day to withdraw from class with W or WF	W	Nov 16
Thanksgiving recess — first day	W	Nov 23
Classes resume	M	Nov 28
Classes end — last day	M	Dec 12
Exams end — last day	M	Dec 19
Semester ends	W	Dec 21

SPRING SEMESTER — 1978

Classes begin	M	Jan 9
Mid-term	F	Mar 3
Last day to withdraw from class with W	F	Mar 3
Spring recess	S	Mar 4
Classes resume	S	Mar 11
Last day to withdraw from class with W or WF	F	Apr 7
Classes end — last day	F	Apr 28
Exams begin	M	May 1
Exams end — last day	S	May 7
Semester ends	M	May 8
Commencement	S	May 14

SUMMER SESSION I — 1978

Classes begin	W	May 10
Memorial Day Holiday	M	May 29
Last day to withdraw from class with W	T	May 30
Last day to withdraw from class with W or WF	T	June 13
Classes end Summer Session I	W	June 21
Session ends	F	June 23

SUMMER SESSION II — 1978

Classes begin	M	June 26
Last day to withdraw from class with W	Th	July 13
Last day to withdraw from class with W or WF	Th	July 27
Classes end Summer Session II	M	Aug 7
Summer Session ends	W	Aug 9

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Professor L. KENT MORRISON

1976 Recipient

Loren T. Jones Award
as
Outstanding Science Teacher

Recipient chosen annually by the student Senior Cabinet from nominations received from students and faculty.

Former Recipients

1966 Loren T. Jones
1967 Herman Stoelk
1968 Theodore Thelander Jr.
1969 Sidney Houston
1970 B. Bruce Wagener
1971 Thomas Willison
1972 David Laverell
1973 None
1974 None
1975 Robert Crozier

Administrative Officers

INDIANA UNIVERSITY

John W. Ryan, Ph.D., President of the University

Herman B Wells, A.M., LL.D., Chancellor of the University

Lynne L. Merritt, Jr., Ph.D., Special Assistant to the President

W. George Pinnell, D.B.A., Executive Vice-President of the University

Glenn W. Irwin, Jr., M.D., Vice-President (Indianapolis)

Robert M. O'Neil, LL.B., Vice-President (Bloomington)

Edgar G. Williams, D.B.A., Vice-President for Administration

Thaddeus M. Bonus, M.S., Vice-President for University Relations

John D. Mulholland, M.B.A., Treasurer of the University

Paul E. Klinge, A.B., Assistant to the President

M. D. Scherer, University Registrar

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Felix Haas, Ph.D., Provost

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John G. Weihaupt, Ph.D., Assistant Dean of the Graduate School

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John C. Buhner, Ph.D., Vice Chancellor and Dean of the Faculties

Doris H. Merritt, M.D., Dean for Sponsored Programs

A. D. Lautzenheiser, B.S., Business Manager

Gerald C. Preusz, Ed.D., Dean for Student Services

John C. Krivacs, M.S., Director of Admissions

Neil E. Lantz, M.S., Registrar

Frank E. Nordby, M.S., Evening Administrator

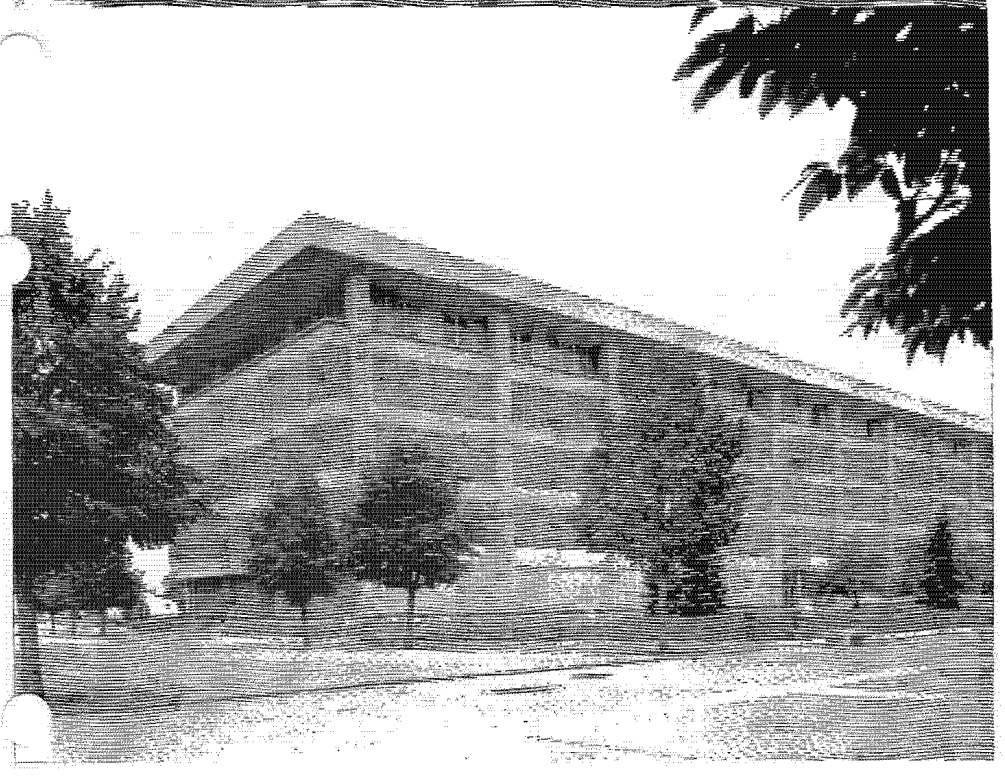
PURDUE UNIVERSITY SCHOOL OF SCIENCE AT IUPUI

William A. Nevill, Ph.D., Dean and Professor of Chemistry

John G. Weihaupt, Ph.D., Associate Dean for Academic Affairs and Professor of Geology

Scott E. Evenbeck, Ph.D., Assistant Dean for Administrative Affairs


INDIANA UNIVERSITY-PURDUE UNIVERSITY
AT INDIANAPOLIS
38th Street Campus
KRANNERT BUILDING



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 is concentrated at the University Quarter Campus on West Michigan Street. Work in the School of Engineering and Technology is centered at the University Quarter Campus while work in the School of Science is at both the 38th Street Campus and the University Quarter Campus.

Because IUPUI combines the arts and sciences and the professions, including engineering and technology, it is potentially 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.

IUPUI has an urban orientation. Most of its students commute, and many of its programs are directly related to metropolitan concerns and aspirations.

IUPUI divisions include the country's 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 service in the state, the country's oldest school of physical education, a law school with an urban emphasis, and a nationally recognized school of art. 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 and independently accredited by the North Central Association of Colleges and Secondary Schools. This assures the recognition of IUPUI credits, and graduates being able to study in virtually any school in the nation. However, because of the organization of the school, degrees are awarded by either Purdue University, or Indiana University, depending upon the course of study.

Indiana University has the primary responsibility for the management functions of IUPUI. The chief executive officer of all Indianapolis operations is the Vice President who reports solely to the President of Indiana University.

The School of Science

The efforts of the School of Science are first of all dedicated to the fundamental purpose of every university: to provide an intellectual climate favorable to the development of productive, creative and responsible citizens. A broad program at the undergraduate level is designed to prepare students for graduate work.

In addition, undergraduate training in one or several of the sciences is considered necessary for subsequent professional work in such fields as medicine and dentistry and an excellent background for business administration, law and those areas of the social sciences where quantitative methods are important.

The School of Science is very much interested in helping people whose goals are not careers 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 Applied Computer Science, Chemistry, Psychology, and Mathematics.

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 curriculums and courses, majors and minors, and campus residence. Advisors, directors, and deans will always help a student meet these requirements, but the student himself is responsible for fulfilling them. At the end of his course of study, the faculty and the Board of Trustees vote upon the conferring of the degree. If requirements have not been satisfied, the degree will be withheld pending adequate fulfillment. For this reason, it is important for each student to acquaint himself with all regulations and remain currently informed throughout his university career.

This Bulletin lists the requirements and regulations in effect for students who enter IUPUI in January 1977. Students who enter after this date may be subject to different requirements; students who enter prior to January 1977 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 advisors 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 advisor 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 advisors are obligated only to assist students in meeting this responsibility. If any student needs clarification of any of the requirements for the baccalaureate degree, he is urged to obtain this clarification from his faculty adviser or from the Office of the Dean of Science.

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. A copy of the code of student conduct may be obtained at any Student Services office.

Job Placement

The IUPUI Placement Office has the primary responsibility of assisting students and alumni in obtaining employment. The office maintains a library of company information, employment trends, occupational information, and provides career counseling to aid students with career planning and development.

Companies seeking college graduates interview students on campus during two recruitment periods: September through November and January through March. A list of firms and institutions which will visit the campus is published and circulated early in the Fall Semester. Students interested in interviewing with a company should register with the

Placement Office. The Placement Office also serves as a referral agent to many companies and organizations. In specific cases the local placement office works in coordination with the placement services located on the Bloomington and Lafayette campuses.

Summer and Part-Time Employment: Another function of the Placement Office is to provide information regarding part-time and summer employment opportunities for students. Part-time employment listings are posted on job bulletin boards located throughout the University. Students interested in summer employment should register early with the Placement Office.

Career Information

Information about employment in specific career fields is available from any of these locations: placement offices, dean's offices, and/or department chairmen.

Housing

Residential housing for IUPUI students is located at the University Quarter 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 the University Quarter. 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.

Information for Foreign Students

Foreign students attending IUPUI are required to register with the Division of International Programs as soon as possible after their arrival in Indianapolis. The Division of International Programs is officially appointed to represent the U.S. Immigration and Naturalization Service on the IUPUI campus, and it is therefore available to foreign students at all times to assist them with matters relating to their visas. In addition, the Division of International Programs is prepared to assist foreign students with any type of problem during their stay at IUPUI, or even prior to their arrival.

The address of the Division is:

Division of International Programs
Indiana University-Purdue University Indianapolis
Union Building — Suite 105
Indianapolis, Indiana 46202

Expenses And Financial Aid

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 is as follows:

	In-State	Out-of-State
Undergraduate	$21/credit hour	$42/credit hour
Graduate	$26/credit hour	$52/credit hour

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

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 $800 for fees, books and class supplies. Other expenses, such as transportation, food and entertainment, vary according to individual needs.

Refund Policy

Refunds are based upon the date of the official withdrawal application as stated below:

1. For withdrawal during the first week of classes or through Drop/Add Day — 100% refund.
2. For withdrawal during the second and third weeks of classes — 50% of all fees paid except $50, whichever is greater.
3. For withdrawal after the third week of classes — No refund.

To be eligible for a refund, students must notify the Registrar's Office at the time of withdrawal.

Special Examination Fees

With departmental approval, an admitted student, temporary student, or current student who has not paid full fees, may receive course credit by special examination. Fee per course is $10.

Health Care and Insurance

The Student-Employee Health Service (SEHS) is located at the Clinical Building at the Medical Center. All full-time IUPUI students are eligible for the program of health care provided by SEHS. There is no fee for the services of physicians, nurses, or specialty consultants. In addition, the clinic has available about 70 specialty clinics to which students may be referred. Certain in-patient benefits are also available to students, and prescriptions from SEHS cost a maximum of $3. The University has also arranged for an optional health insurance plan to supplement the services provided by the SEHS Clinic. All full-time students are eligible to participate in this program through a private insurance carrier. Information is available from any Student Services Office.

Notice of Fee Increase

IUPUI

Purdue University School of Science

The Trustees of Indiana University on June 17, 1977, voted to increase fees for all instruction at the campuses of Indiana University. The statement on fees on page 12 of this bulletin is not correct.

The new fee structure for the academic year 1977-78 is as follows:

	In-State	Out-of State
Undergraduate	$23/credit hour	$50/credit hour
Graduate	$32/credit hour	$71/credit hour

June 20, 1977

Financial Aids

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 counseling, 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
Room 303, Cavanaugh Hall
925 West Michigan Street
Indianapolis, Indiana 46202

Veterans' Benefits

Students who are eligible for Veterans' benefits may enroll under the following scale of benefits:

FALL/SPRING	BENEFITS	SUMMER (6 week session)
12 hours or more	Full benefits	4 hours
9 through 11 hours	¾ benefits	3 hours
6 through 8 hours	½ benefits	2 hours
Fewer than 6 hours	Tuition only	1 hour

For further information, including tutorial assistance availability, consult the Office of Veterans Affairs at 946 West Vermont Street, Indianapolis, 46202.

Admissions and Transfers

All students entering the School of Science must have been officially admitted to the university by the Office of Admissions, 925 W. Michigan St., Indianapolis 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. You may start a program of study with any regularly scheduled session. These begin in August, January, May and July. Admissions are open generally until registration for classes.

Beginning Students

When you are entering directly from high school, your application should be filed at the end of your junior year.

Your 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 you meet or exceed the minimum subject requirements is indicated below. For admission to the School of Science, your record should include:

Subjects	**Semesters**
English	6
History or social studies	2
Algebra*	3
Geometry*	2
Trigonometry or fourth semester Algebra*	1
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.*

You 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 your high school offers more than the above mathematics courses, you may benefit from taking analytic geometry (pre-calculus mathematics). It is advised that one semester of chemistry be included in your 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 you with your preplanning for admission.

3. Rank in High School class
   a. Residents of Indiana are expected to rank in the upper half of their high school graduating class. Agriculture students must rank in the upper two-thirds of their class. 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 you take the SAT in the spring of your junior year in high school.

5. Information provided by your high school counselor

If you declare a major at the time of your application for admission, you will be assigned an appropriate departmental advisor. If you have not selected a major field of study, you will be assigned to the University Division. It is recommended that your preplanning be directed toward a choice of major at the time of admission. Premedical and predental students should declare a chemistry or biology major at the time of admission.

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 you qualify for such advanced credit, consult your high school counselor and the Office of Admissions.

On the basis of departmental examinations, advanced credit and/or advanced placement may be awarded. To determine whether you qualify 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 you are admitted in this category, you may enroll in a maximum of 30 hours, after which you 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

If you are a student enrolled in another university, you may take 12 hours at IUPUI without consent of your own university. It is your responsibility as a transient student to determine whether credit so earned may be applied toward the degree you seek from your own university.

Transfers

FROM OTHER INDIANA UNIVERSITY CAMPUSES

If you are enrolled at another Indiana University campus and wish to enter the School of Science at Indianapolis for the first time, you must indicate this intention by formal notice to the Office of the Dean at the campus at which you are 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 sessions. You must have a 2.0 grade point average to transfer to the School of Science.

If you are a student in the School of Science at Indianapolis and wish to attend another Indiana University Campus, you must indicate this intention to the Office of the Recorder, School of Science, AD Building, 1201 E. 38th Street, to secure an inter-campus transfer.

FROM OTHER IUPUI SCHOOLS

If you wish to transfer to the School of Science from another IUPUI school, consult the department in which you wish to major. You are required to have a minimum, cumulative, grade-point average of 2.0 and the signature of the chairman of a School of Science department which approves your request, and the signature of the Associate Dean for Academic Affairs of the School of Science. Obtain a transfer form from your school recorder. Submit the completed form to the Office of the Recorder, School of Science, AD Building, 1201 E. 38th Street. 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 you have earned transfer credit for 12 semester hours and a cumulative grade-point average of 2.0 on a 4.0 scale (3.0 for non-residents of Indiana) in other institutions, you may be admitted to the School of Science as follows. Submit with your application for admission:

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

Foreign 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. The applicant must submit evidence of adequate English proficiency by means of the TOEFL Examination. Financial aids for new foreign students are not available.

Graduate Students

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

Application should normally be made at least eight weeks before the beginning of the session in which the student wishes to enroll. The applicant will be advised of action on his application by the Office of the Director of Graduate Studies.

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 Programs 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 Degrees

General Requirements

Listed below are the requirements related to degrees in the School of Science.

1. A minimum cumulative grade-point average of 2.0.
2. A minimum of 24 hours must be taken in a major subject area (see Departmental requirements). No grade below C will be acceptable in the major subject area.
3. Courses taken on the Pass/Fail option can be applied only as electives in meeting degree requirements.
4. Not more than 60 hours earned in accredited junior colleges may be applied toward a degree.
5. By special permission of the department, credit may be earned through independent study and/or by special credit examination. Ordinarily, students in residence in the university are not permitted to enroll concurrently in courses offered through the Independent Study Division.
6. The following School of Science courses do not count toward any degree program in the School of Science: AGR 101, MATH 001, 002, 111, 112, 123, 130, 131, 132.
7. An application for a degree must be filed by the student, in the Office of the Recorder, School of Science.
   a) All credit of candidates for degrees, except that of the current semester, must be on record at least six weeks prior to the conferring of degrees.
   b) The deadlines for filing degree applications for graduation in January, May, or August, is September 1st.
   c) Degrees are conferred in May and September, Commencement is held only in May. Candidates for degrees in August may participate in the May Commencement.
8. Students who fail to complete work for a degree within six years from the time of first registration may be required to pass comprehensive examinations on the subjects in their areas of concentration.
9. For requirements of a sequence of courses, sequence does not necessarily imply consecutive numbering.

In addition to the above requirements, students must meet the following requirements, depending upon whether the degree sought is granted by Purdue University or Indiana University.

Requirements For Purdue University Degrees

(Departments of Biology, Chemistry, Mathematical Sciences, Physics, and Psychology)

1. A minimum of 124 hours.

2. The completion, either by resident course work, by examination, or by credit accepted from another institution, of the plan of study underlying the degree. Deans of schools may refuse to accept as credit toward graduation any course which was completed ten or more years previously.
3. Resident study at IUPUI for at least two semesters and the completion during this period of at least 32 semester hours of work at the 300-400 (junior-senior) level. Students are normally expected to complete the senior year in residence; however, with the approval of the dean of the school concerned, students who have had at least four semesters of resident study may complete up to 20 semester hours of the senior year in another approved college or university. For the purpose of this rule, two summer sessions shall be considered as equivalent to one semester.

Requirements For Indiana University Degrees

(Department of Geology)

1. A minimum of 122 hours (124 for students also satisfying requirements for a teaching certificate). At least 112 hours must be in courses offered by the School of Liberal Arts, the School of Science, or those approved by the department. The remaining 10 hours may be taken in the above areas or in other units of the University, e.g., Business, Education, Herron, Normal College, or Engineering and Technology.
2. A minimum of 30 hours in courses at the 300-400 (junior-senior) level.
3. Not less than 26 credit hours of the work of the senior year must be completed at IUPUI. See departmental advisor for residency requirements in the major field of study.

Area Requirements

In an age of increasing specialization of functions and divisions of labor, it becomes more necessary than ever before that we maintain a broad base of general knowledge, ideas, skills, etc., that will insure at least a minimum level of general and humane learning. Such a broad base is necessary for an individual to function intelligently within it, to be aware of alternate possibilities open to him, and to learn how to pursue most effectively the goals selected from these possibilities. For this reason, areas I, II, and III (the divisional distribution requirements) are considered essential elements of the B.A. and B.S. programs.

The Faculty of the School of Science has adopted the following degree requirements for the Bachelor of Arts and Bachelor of Science degrees. Students must follow IUPUI, 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 listed under departmental listings. Students should consult with departmental counselors as listed under the various departments in planning their courses of study.

Students should note the following:

1. Check departmental course descriptions for courses which are considered repeats. Some courses may not be used to fulfill distributional requirements. Students should also check with their advisors.
2. Cross-listed courses may count only once in fulfilling requirements. Courses which do not carry Science credit (such as Mathematics M015, and M017) may not be used in the distribution.
3. English W115-117 may not be used to complete the distributional 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 W115-116-117 (these are 5-week segments) with a grade of S (satisfactory — no letter grades are given), or by exemption from one or more segments of this course and satisfactory completion of those segments he is required to take. The department of English places entering freshmen in W115, W116 or W117 on the basis of scores on a departmental proficiency examination administered during registration week each semester. Students may apply to take this examination if they have an SAT verbal score of 500 or higher, an ACT composite score of 22, or a record of A and B in high-school English. Students exempted from the entire course will receive three hours of S credit in W115-116-117. A $10 fee payment is required and is payable to the bursar's office before the special credit is given. Students exempted from W115-116 will receive credit after satisfactorily completing W117.

Area II

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

Area III

IIIA. Arts and Humanities. Four courses of at least 12 credits are required. There must be at least one two-course sequence (not necessarily consecutively numbered) in either IIIA or IIIB. History is cross-listed.

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

(Performing arts courses are not accepted as fulfilling Arts and Humanities requirements.)

IIIB. Social and Behavioral Sciences. Four courses of at least 12 credits are required. There must be at least one two-course sequence (not necessarily consecutively numbered) 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, N300, N302, and N320 as well as all agriculture courses.)

Biology	Geology
Chemistry	Physics (including Astronomy)

Cross-listed courses: GEOG G107 and G304 and the following courses in Psychology: B320, B324, B326, B423, B427, and B431.

IIID. Mathematical Sciences. No courses are required.

Computer Science	Mathematics
Statistics	

Area IV

Major Department. Consult the listing of the major department for courses required within 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. Note that the English composition requirement shall be satisfied by completing English W115-116-117 (these are 5-week segments) with a grade of S (satisfactory — no letter grades are given), or by exemption from one or more segments of this course and satisfactory completion of required segments. The Department of English places entering freshmen in W115, W116 or W117 on the basis of scores on a departmental proficiency examination administered during registration week each semester. Students may apply to take this examination if they have an SAT verbal score of 500 or higher, an ACT composite score of 22, or a record of A and B in high-school English. Students exempted from the entire course will receive three hours of S credit in W115-116-117. A $10 fee payment is required and is payable to the bursar's office before the special credit is given. Students exempted from W115-116 will receive credit after satisfactorily completing W117.

Area II

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

Area III

IIIA. Arts and Humanities. Two courses of at least six credits are required. There must be at least one two-course sequence (not necessarily consecutively numbered) in either IIIA or IIIB. History is cross-listed.

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

(Performing arts courses are not accepted as fulfilling Arts and Humanities requirements.)

IIIB. Social and Behavioral Sciences. Two courses of at least six credits are required. There must be one two-course sequence (not necessarily consecutively numbered) 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, N300, N302, and N320 as well as all agriculture courses.)

Biology
Chemistry
Geology
Physics (including Astronomy)

Cross-listed courses: GEOG G107 and G304 and the following courses in Psychology: B320, B324, B326, B423, B427, and B431.

IIID. Mathematical Sciences. At least two courses beyond algebra and trigonometry, totaling a minimum of six credits are required. (Purdue MA213 and MA 214, or their equivalents, are acceptable.)

Computer Science
Statistics
Mathematics

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 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 advisor. 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 masters degree. In any department the final examinations may be waived if the student

meets the minimum requirements of the departments of the department. In any event, a final examining committee is appointed for each candidate for the masters 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. Students who have previously earned a bachelor's degree may enroll in graduate courses without making formal application. 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 the following grade system:

A (4.0) Highest passing grade

B (3.0)

C (2.0)

D (1.0) Lowest passing grade

S Satisfactory

F (No credit) Failed the work in a course or failed to complete an official withdrawal

P Passed (See Pass-Fail Option)

F Failing (See Pass-Fail Option) (No credit)

FX Course failed, but since retaken for a new grade

P or F **Pass/Fail:** During the four years of his 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.

Grades of P and FX are not included in computing grade-point average; a grade of F is included. A grade of P cannot be changed subsequently to a grade of A, B, C, or D.

W or **Withdrawal, Failing:** 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 advisor; a grade of "W" shall be recorded on the final grade report. Students may withdraw from

classes during the third one-fourth of a semester or session if they secure the approval of their advisor and the instructor of the course; a grade of "W" will be assigned by the instructor of the affected course. The grade so assigned shall be recorded on the final grade report. Students may withdraw from classes during the last one-fourth of a semester or session if they secure the approval of their advisor, the instructor of the course, and the Dean; a grade of "W" will be assigned by the instructor of the affected course. The grade so assigned shall be recorded on the final grade report.

Students who alter their schedule, whether by personal incentive or by departmental directive, must follow withdrawal procedures. Students who do not follow these procedures are jeopardizing their record by the possibility of incurring a failing grade in a course not properly dropped and/or not receiving credit for work done in a course not 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 completed portion of a student's work in the course is 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 it 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.

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.

Course Audits

While auditing of courses is permitted under University policy, audited courses may not be retaken at a later date for academic credit.

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 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 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; and pass/fail option are available in the departmental offices or the registration 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

Dean's Honor List

The School of Science recognizes exceptional academic performance prior to graduation from the University by periodically publishing the Dean's Honor List. This is a list of the names of full-time students (carrying 12 or more credit hours per semester) who have achieved a GPA of 3.3 or higher during a given semester. Part-time students who are Juniors or Seniors, and who have a cumulative GPA of 3.3 or higher, also will be included on the Dean's Honor List. Students who have received an incompleted (I) during the given semester, or from whom no report (NR) has been made by an instructor outside of the School of Science will not be placed on the Dean's Honor List.

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 (index) is not less than a C (2.0), and their cumulative grade point average (graduation index) is not below this same level.

Second Bachelor's 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 Dean 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 26 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.

<table>
<tr><td>Degree</td><td></td><td></td></tr>
<tr><td>GPA</td><td>P.U.</td><td>I.U.</td></tr>
<tr><td>3.5500-3.7499</td><td>Distinction</td><td>Distinction</td></tr>
<tr><td>3.7500-3.8499</td><td rowspan="2">Highest Distinction</td><td>High Distinction</td></tr>
<tr><td>3.8500-4.0000</td><td>Highest Distinction</td></tr>
</table>

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 of 12 credits of consecutive enrollment or cumulative grade point average is below C (2.0).

Each student on academic probation will be so advised by letter from the Office of the Dean 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 Office of the Dean 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 of 15 credits of consecutive enrollment 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 of the School of Science.

Readmission

A student dismissed for the first time may immediately petition the Office of the Dean of the School of Science 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.

Each student who is readmitted will be so informed by letter from the Office of the Dean of the School of Science. They are informed of conditions and restrictions upon which his 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, Downtown Campus, Law School, Medical School, and 38th Street Campus. The Normal College 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 Downtown and 38th Street Campuses 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 and "A" buildings at the 38th Street Campus, and in Cavanaugh Hall on the University Quarter Campus. The centers provide a variety of audio-visual materials, equipment, and services for student and faculty use. Study carrels are equipped with cassette tape recorders and projectors (movie or slide) 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

An administrative office is open for the convenience of night students at each IUPUI location after 5 p.m. when general offices close.

KRANNERT BUILDING, 38th Street, Room 153, phone 923-1329, exts. 238, 260, 422.

This office provides all of the bulletins and brochures of the university, all of the forms for admission and registration, all Graduate School forms; processes advance registration cards, supplies information about classes and locations, and maintains a complete list of all students in the University and all faculty who teach at the 38th Street Campus. This Evening Administration Office is open Monday through Friday until 8:30 p.m. This office does NOT provide any parking services for the Safety and Security Division.

ENGINEERING/TECHNOLOGY BUILDING, 445 North Blake Street, Monday-Thursday 9 a.m. to 9 p.m., Friday to 5:30 p.m.

CAVANAUGH HALL, 925 West Michigan Street, Room 441, phone 264-7718.

This office provides services to all students in the School of Liberal Arts; Monday through Thursday until 8 p.m.

MAROTT BUILDING, 902 North Meridian Street, phone 264-3704.

The switchboard and main office is open to serve faculty and students in the Division of Education, Monday through Thursday until 8:30 p.m.

HERRON MAIN, 16th and Pennsylvania, phone 923-3651.

The office of the secretary to the dean is open to serve faculty and students Monday through Thursday until 9 p.m.

Students should contact the most appropriate office.

Computing Services

The Computing Services Division operates four computer facilities at IUPUI: The Research Computer Center, the Educational Computer Center, the Administrative Data Processing Center, and Hospital Data Processing Center. Of these, the student has access to the Research Computer Center and the Educational Computer Center.

The Educational Computer Center operates an IBM 360/44 devoted exclusively to the processing of student jobs. In addition, the Center also provides an IBM 1620 computer which the student is able to use in a hands-on environment. Unit record equipment, such as sorters and collators, are also available for student use.

The Research Computer Center operates a DEC-10 computer which supports terminal operation from remote terminals throughout the IUPUI campuses. Interactive computing (time sharing, computer assisted instruction) is provided to and for the student through this facility. The DEC-10 also provides a link to the CDC 6600 computer at the Indiana University-Bloomington Campus. A hybrid (analog-digital) computer is part of equipment available on a special projects basis at this facility.

"Clusters" of keyboard terminals located in the Union Building, Cavanaugh Hall, and the AD Building provide access to the DEC-10 as well as other computers in the Indiana University Network.

There are also a number of computer terminals, analog computers, and mini-computers located within the individual departments of the School of Engineering and Technology.

SPECIAL PROGRAMS

Secondary Teacher's 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 advisor or from the Division of Education, Marott Building, 902 N. Meridian Street.

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 advisor 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 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

50 credits as follows:

Humanities: 16-18 credits (for example English, Fine Arts, Folklore, Foreign Language, Philosophy, Speech & Theatre)

Social and Behavioral Sciences: 14-16 credits (for example Anthropology, Economics, Geography, History, Political Science, Psychology, Sociology)

Life and Physical Sciences: 14-16 credits (subject matter area meets this requirement; some departments specify lab sciences)

Electives as needed for a total of 50 credits

Professional Education

At least 18 or 21 credits.

IUPUI courses which meet this requirement are:

EDUC F200 — Introduction to Teaching (3 cr.)

EDUC P280 — Human Development and Learning (5 cr.)

EDUC M440-478 — Methods of Teaching High School Subjects (one course to be taken in each major area) (3 cr.)

EDUC M448 — Methods of Teaching High School Mathematics (offered only in fall of odd numbered years) (3 cr.)

EDUC M462 — Methods of Teaching High School Reading (3 cr.) (Required ONLY for Indiana University Degrees)

EDUC S485 — Principles of Secondary Education (3 cr.)

EDUC M480 — Student Teaching in the Secondary School (6-8 cr.)

Methods courses (M440-M478) must be taken at least one semester before student teaching (M480). Also, P280 must be taken before the methods courses. Application for student teaching should be filed in the Office of the Director of Laboratory Experiences during the first semester of the year immediately preceding that in which the student teaching is to be done. The application must be completed in personal conference with the faculty member in charge of student teaching in the area of the candidate's teaching major. Student teaching requires a full semester for one-half day. A student should take no more than two additional courses while student teaching.

Subject Matter Area

Major, 40 credits; minor, 24 credits (minor not required)

Program planning should be done in consultation with the student's advisor in the major department.

Pre-Pharmacy Program

IUPUI does not grant a degree in pharmacy. However, students may complete one year of pre-pharmacy instruction on this campus. The following program is specifically designed for students who expect to apply for admission to the School of Pharmacy and Pharmacal Sciences of Purdue University (West Lafayette Campus).

PRE-PHARMACY SAMPLE PROGRAM

FRESHMAN	1	BIOL N105 (4) Introduction to Botany	CHEM C105 (5) Principles of Chemistry I	MATH MA147 (3) or MA163 or MA221	ENGL W117 (3) English Composition	Elective (1)
	2	BIOL N107 (4) Introduction to Zoology	CHEM C106 (5) Principles of Chemistry II	MATH MA148 (3) or MA164 or MA222	ENGL W118 (1) Research and Report Writing	Elective (3)
SOPHOMORE TO SENIOR	3-8	TRANSFER TO SCHOOL OF PHARMACY AND PHARMACAL SCIENCES PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS The application for admission must be submitted to Purdue before February 1, to insure consideration for the Fall semester.				

Pre-Veterinary Program

IUPUI offers an organized, 4-semester curriculum meeting requirements for admission to the School of Veterinary Science and Medicine. This curriculum provides a strong program in the biological and physical sciences which may be used also as a basis for continued training in the School of Agriculture should the degree Bachelor of Science in Agriculture be desired.

The student who has successfully completed 2 years or more of pre-veterinary instruction at IUPUI is then eligible to apply for admission to the School of Veterinary Science and Medicine at Purdue University in Lafayette.

The requirements for admission to the pre-veterinary program are the same as those for students in the School of Agriculture. Consult the Department of Biology secretary for the current counselor.

PRE-VETERINARY SAMPLE PROGRAM

FRESHMAN	1	BIOL N105 (5) Introduction to Botany	AGRL 100 (1) Introducion to Agriculture	MATH MA147 (3) or MATH MA221	CHEM C105 (5) Principles of Chemistry I	ENGL W117 (3) English Composition	
	2	BIOL N107 (4) Introduction to Zoology	AN. Sc. 102* (3) Animal Agriculture	MATH MA148 (3) or Math MA222	CHEM C106 (5) Principles of Chemistry II	ENGL W118 (1) Research and Report Writing	Elective (3)
SOPHOMORE	3	BIOL N322 (3) Principles of Genetics	CHEM C341 (3) Organic Chemistry	CHEM C343 (2) Organic Chem. Laboratory	PHYS 218 (4) Physics	ECON E202 (3) Economics	Elective (3)
	4	ANSC 221 (3) Animal Nutrition	CHEM C342 (3) Organic Chemistry	CHEM C344 (2) Organic Chem. Laboratory	PHYS 219 (4) Physics	Elective (3)	
JUNIOR SENIOR	5-8	TRANSFER TO SCHOOL OF VETERINARY SCIENCE AND MEDICINE PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS					

*Offered every other year.

**Electives commonly selected from:

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

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 non-science 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 (Chemistry) and Ockerse (Biology)

Cooperative Education Program

A career in a science field requires one to have a knowledge of the mathematical and natural sciences, gained by study, experience and practice. The knowledge must be applied with judgment in order to utilize economically the materials and forces of nature for the benefit of mankind.

Cooperative education at IUPUI is an elective plan of education in which a student may alternate periods of academic study with periods of employment in business, government or industry. In addition, a parallel program of work and study may be set up.

The program contributes essential elements to the educational process and is directly related to one's career field of study. Work assignments provide varied experience with increasing difficulty and responsibility. These experiences cannot be acquired through college laboratory participation or limited work experience during summer vacations. Cooperative education is a formalized educational plan built into any one of many curriculums.

In the Chemistry Department, students may apply for the program following four semesters of chemistry. Students seeking information or guidance should contact the chemistry office.

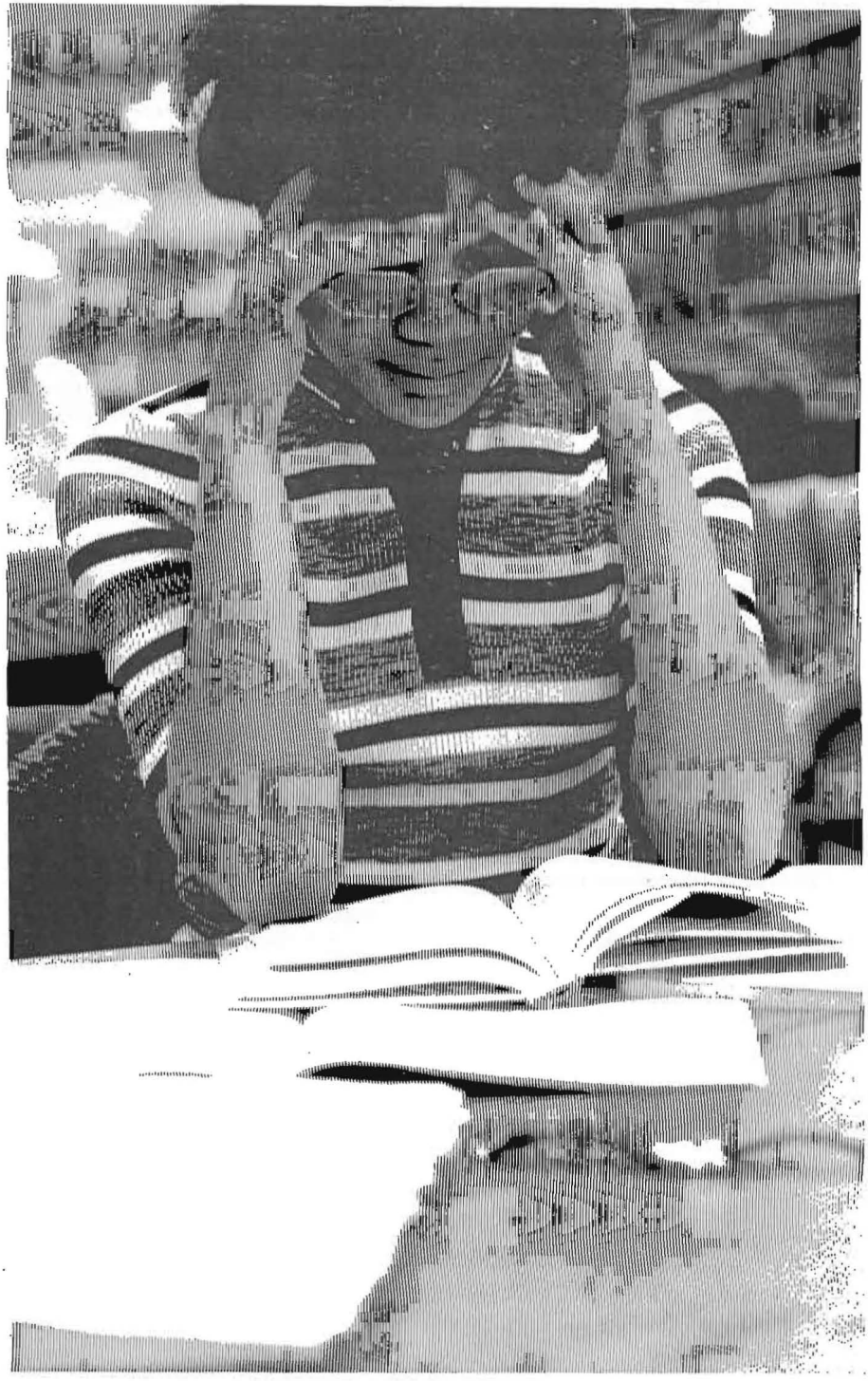
Once students have accepted cooperative employment with a company, they will be encouraged to continue with the company throughout the program. Students will not be permitted to change employers indiscriminately.

A student should apply directly to the cooperative education coordinator for information and specifics of program implementation.

Military Training Program

ROTC programs are offered (not required) by the Air Force, which offers courses which lead to a commission as an officer upon graduation. Military courses are pursued in conjunction with the academic curriculum and receive academic credit as elective courses.

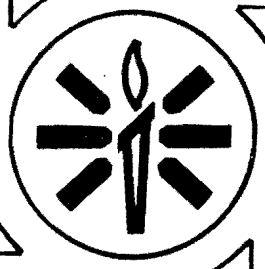
Men with evidence of honorable discharge or separation from active duty in the armed forces may apply for credit in basic armed forces training if they desire to use ROTC as an elective sequence.



Departmental Programs

KEY to Symbols In Departmental Course Lists

P: Prerequisite Course
C: Corequisite Course
R: Required Course
Equiv: Acceptable at IUPUI in lieu of the IUPUI course listed



Department of Biology

PROFESSORS: Ockerse (Chairman), Samuels, Sanborn; ASSOCIATE PROFESSOR: Pflanzer; ASSISTANT PROFESSORS: Bard, Courtis, Juillerat, Keck, Kirk, Lees, Stark; INSTRUCTOR: Russo.

DEPARTMENTAL COUNSELORS: PROFESSORS: Juillerat, Keck, Lees, Russo, Stark;

HEALTH PROFESSIONS COUNSELOR: PROFESSOR: Ockerse;

AGRICULTURAL PROGRAMS COUNSELOR: Contact Departmental Secretary.

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. Post-graduate 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.

BACHELOR OF ARTS

Degree Requirements

Area I. See School of Science requirements on page 20.

Fulfillment of the following is also strongly recommended: Two semester courses dealing with communication of data, to be selected in consultation with departmental advisor (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 on pages 20-21.

Area IIIC: Physical and Biological Sciences:

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

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: MA 118, MA 119, or STAT 301.

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

BACHELOR OF SCIENCE
Degree Requirements

Area I. See School of Science requirements on page 21.

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.

Areas IIIA and **IIIB:** See School of Science requirements on page 22.

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 departmental counselor.)

Area IIID:

Mathematics: Through two semesters of Calculus (MA 221-222 or MA 163-164). Starting point to be worked out with departmental advisor based on SAT scores and/or background history of 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

Biology Plans of Study

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.

BACHLOR OF ARTS SAMPLE PROGRAM

FRESHMAN	1	BIOL K101 (4) Concepts of Biology I	CHEM C105 (5) Inorganic Chemistry	MATH MA118 (3) Finite Math or STAT 301 Statistics	ENGL W117 (3) English Composition	
	2	BIOL K103 (4) Concepts of Biology II	CHEM C106 (5) Inorganic Chemistry	MATH MA119 (3) Survey of Calculus I	SPCH C110 (3) Speech	
SOPHOMORE	3	BIOLOGY (3-5) Program I-V Elective	CHEM C341 (3) Organic Chemistry	CHEM C343 (2) Organic Chem Laboratory	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	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	CHEM C105 (5) Principles of Chemistry I	MATH MA118 (3) Finite Math or Statistics 301	ENGL W117 (3) English Composition	
	2	BIOL K103 (4) Concepts of Biology II	CHEM C106 (5) Principles of Chemistry II	MATH MA119 (3) Introductory Calculus	SPCH C110 (3) Speech	
SOPHOMORE	3	BIOL K253 (4) Comparative Anatomy	CHEM C341 (3) Organic Chemistry	CHEM C343 (2) Organic Chem. Laboratory	PHYS 218 (4) Physics	Elective (3) Arts and Humanities
	4	BIOL K331 (4) Embryology	CHEM C342 (3) Organic Chemistry	CHEM C344 (2) Organic Chem Laboratory	PHYS 219 (4) Physics	Elective (3) Behavioral and Social Sciences
JUNIOR	5	BIOL K322 (3) Genetics	BIOL K323 (2) Genetics Laboratory	Elective (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences	Elective (3)
	6	Biology (3-5) Program I or IV Elective	Elective (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences	Elective	Elective
SENIOR	7	Biology (1-5) Elective Elective	Electives (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences	Elective	Elective
	8	Biology (1-5) Elective	Elective	Elective	Elective	Elective

BACHELOR OF ARTS WITH SECONDARY TEACHING CERTIFICATION* SAMPLE PROGRAM

FRESHMAN	1	BIOL K101 (4) Concepts of Biology I	CHEM C105 (5) Principles of Chemistry I	MATH MA118** (3) Finite Mathematics	ENGL W117 (3) English Composition		
	2	BIOL K103 (4) Concepts of Biology II	CHEM C106 (5) Principles of Chemistry II	Elective (3) Behavioral and Social Sciences	SPCH C110 (3) Speech		
SOPHOMORE	3	BIOL N212 (2) Human Biology	EDUC F200 (3) Introduction to Teaching	CHEM C341 (3) Organic Chemistry	CHEM C343 (2) Organic Chem. Laboratory	Elective (3) Behavioral and Social Science	Elective (3) Behavioral and Social Science
	4	BIOL N214 (2) Human Biology	BIOL K356 (3) Microbiology	BIOL K357 (2) Microbiology Laboratory	CHEM C342 (3) Organic Chemistry	Elective (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences
JUNIOR	5	BIOL K341 (5) Ecology	BIOL K322 (3) Genetics	BIOL K323 (2) Genetics Laboratory	PHYS 218 (4) Physics	Elective (3) Arts and Humanities	
	6	EDUC P280 (5) Human Development and Learning	FOR 582 (3) or GEOG G315 Conservation	Elective (3) Arts and Humanities	PHYS 219 (4) Physics		
SENIOR	7	Biology (3-5) Elective Program I or III	BIOL K493 (1-3) Independent Research	EDUC M449 (3) Methods of Teaching	Elective (3) Arts and Humanities	Elective (3) Behavioral and Social Sciences	
	8	EDUC M480 (8) Student Teaching	EDUC S485 (3) Principles of Secondary Ed.	EDUC M462*** (3) Methods of Teaching			

*The courses listed in this program would also qualify the student for an Indiana University Bachelor of Science in Education degree provided EDUC M462 is taken.
**STAT 301 or MA119 may be substituted for MA118.
***Required for Indiana University Degrees Only, others may substitute another Education course.

BACHELOR OF SCIENCE SAMPLE PROGRAM

FRESHMAN	1	BIOL K101 (4) Concepts of Biology I	CHEM C105 (5) Inorganic Chemistry	MATH MA221 (3) or MA163 (5) Calculus	ENGL W117 (3) English Composition	
	2	BIOL K103 (4) Concepts of Biology II	CHEM C106 (5) Inorganic Chemistry	MATH MA222 (3) or MA 164 (5) Calculus	SPCH C110 (3) Speech	
SOPHOMORE	3	Biology (3-5) Program I-V Elective	CHEM C341 (3) Organic Chemistry	CHEM C343 (2) Organic Chemistry Laboratory	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	CHEM C344 (2) Organic Chemistry Laboratory	PHYS 219 (4) or PHYS 251 (5) Physics	Elective (3) Humanities or Foreign Language
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 Language
	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	Elective
	8	Biology (1-5) Elective	Biology (2-5) Elective	Elective	Elective	Elective

COURSES IN BIOLOGY

All courses designed for the Biology major are identified by the letter prefix K of the course number. 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/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. For courses with no designated 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.

K101 CONCEPTS OF BIOLOGY I (4 Cr.)
P: High School or college chemistry. Fall; 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 (4 Cr.)
P: K101. 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

K410 GENERAL ENDOCRINOLOGY
P: K512 or K253, CHEM C341. Spring; day.
Endocrinology as a physiological regulatory field. Endocrinology of osmotic, ionic, metabolic, sexual effector functions. Comparative vertebrate and invertebrate hormones and endocrine glands.

K412 CELL PHYSIOLOGY (3 Cr.)
P: K103, CHEM C343. Spring; day.
A study of cells at the physiological level including the structure and function of organelles and membrane, enzymology, energy relationships and metabolic control, response to radiations, excitability and contractility, and the regulation of cell growth and differentiation.

K413 CELL PHYSIOLOGY LABORATORY (2 C.)
P or C: K412. Spring; day.
Experimental laboratory work in cell physiology including enzymology, membrane physiology, metabolic activities, and biosynthesis, growth regulation, and tissue culture.

K414 PLANT PHYSIOLOGY (3 Cr.)
P: K101 or N105, CHEM C343. Spring; day, night.
Functional aspects of higher plants including water relations, photosynthesis, energetics, transport, nutrition, stress, growth and development at membrane and whole plant levels of organization.

K415 PLANT PHYSIOLOGY LABORATORY (2 Cr.)
P or C: K414. Spring; day, night.
The laboratory is designed to develop expertise in instrumentation and techniques related to quatitative studies of whole plants, excised organs, isolated organelles, and metabolism.

K416 NEUROBIOLOGY (3 Cr.)
P: K412 or K512. Fall of even numbered years; day.
An introduction to the basic principles of neurobiology. The organization, function, and development of the nervous system of representative animals will be considered.

K418 BACTERIAL PHYSIOLOGY (2 Cr.)
P: K356, CHEM C342. Fall; day.
Selected topics in bacterial physiology: cell division, chemotaxis, bacterial plastids, and sporulation.

K512 COMPARATIVE ANIMAL PHYSIOLOGY (3 Cr.)
P: K103, CHEM C342, PHYS 219, Calculus. Fall; day.
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.

K513 COMPARATIVE ANIMAL PHYSIOLOGY LABORATORY (2 Cr.)
P or C: K512. Fall; day.
Laboratory to accompany BIOL K512.

K514 TOPICS IN PLANT PHYSIOLOGY (1-3 Cr.)
P: Consent of instructor. On demand.
An in depth treatment of published research in selected topics in plant physiology.

K516 TOPICS IN ANIMAL PHYSIOLOGY (1-3 Cr.)
P: Consent of instructor. On demand.
Lectures on selected topics of current interest in animal physiology in addition to directed study and reports for students who wish to undertake individual reading and study on approved topics.

K518 TOPICS IN CELL BIOLOGY (1-3 Cr.)
P: Consent of instructor. On demand.
Readings and discussions of selected topics in cell biology.

K572 MOLECULAR BIOLOGY (2 Cr.)
P: K103, CHEM C342. Equiv. BIOL 420/520 Cell Biology. Fall; day.
Composition, structure, heredity, and growth of cells. Analysis of the cell concept in biological terms.

K573 MOLECULAR BIOLOGY LABORATORY (2 Cr.)
P or C: K572. Equiv. BIOL 421/521. Fall; day.
Laboratory to accompany BIOL K572.

II. PROGRAM IN GENETICS

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.

K524 MICROBIAL GENETICS (2 Cr.)
P: K323, K356. Spring; day.
Lecture, literature analysis, and student seminar presentations with regard to genetics and biochemistry of viruses, bacteria, and fungi. Emphasis on mechanisms of genetic control.

K526 TOPICS IN GENETICS (1-3 Cr.)
P: Consent of instructor. On demand.
An in depth treatment of published research in selected topics in genetics.

III. PROGRAM IN DEVELOPMENTAL BIOLOGY

K331 EMBRYOLOGY (4 Cr.)
P: K103 or N107. Spring; day, night.
The development of animal morphology through differentiation of cells, tissues, organs, and organ systems will be examined. (Replaces Developmental Anatomy Z215).

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.

K532 DEVELOPMENTAL BIOLOGY (2 Cr.)
P: K331 or K332. Spring; day, night.
Principles of development of plants and animals.

K533 DEVELOPMENTAL BIOLOGY LABORATORY (2 Cr.)
P or C: K532. Spring; day, night.
Descriptive and experimental study of the development of plants and animals.

K534 TOPICS IN DEVELOPMENTAL BIOLOGY (1-3 Cr.)
Consent of instructor: On demand.
An in depth treatment of published research in selected topics in developmental biology.

IV. PROGRAM IN ENVIRONMENTAL BIOLOGY

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.

K442 POPULATION BIOLOGY (3 Cr.)
P: K341, MA222 or MA164. Spring; day, night.
A consideration of the structure, dynamics and processes affecting single species populations. A mathematical approach is used to examine theories of population growth and regulation. Continuous and discrete computer models are used to test the effects of competition and predation on various population parameters.

K544 TOPICS IN ECOLOGY (1-3 Cr.)
P: Consent of instructor. On demand.
An in depth treatment of current research in selected topics in ecology.

V. PROGRAM IN ORGANISMAL BIOLOGY

K253 COMPARATIVE VERTEBRATE ANATOMY (4 Cr.)
P: K103 or N107. Fall; day, night.
An examination of representative chordates to investigate the principles of chordate evolution and the functional basis for structural change.

K255 INVERTEBRATE ZOOLOGY (4 Cr.)
P: K103 or N107. Fall of even numbered years; day.
Biology of major invertebrate groups including classification, structure, function, development, economic importance, and their role in nature.

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 or N107. 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; night.
Introduction to microorganisms: sytology, nutrition, physiology, ecology, genetics, and life history. Importance of microorganisms in applied fields including infectious disease.

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

K550 PROTOZOOLOGY (3 Cr.)
P: K413 or K357 or K573. Fall; day.
Study of protozoan structure, taxonomy, physiology, metabolism, asexual reproduction, morphogenesis and genetics.

K551 PROTOZOOLOGY LABORATORY (2 Cr.)
P or C: K550. Fall; day.
Laboratory experience in collecting and identifying protozoa and methods of experimental study.

K552 VIROLOGY (3 Cr.)
P: K356. CHEM C342. Fall; day.
Detection, titration, and chemistry of viruses. Viral host interactions: Bacteriophage-bacterium, animal virus-animal cell, plant virus-plant cell. Tumor viruses; infection and transformation.

ADDITIONAL COURSES FOR THE MAJOR

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.

K314 MAMMALIAN PHYSIOLOGY (3 Cr.)
P: K103 or N107, CHEM C341, PHYS 219. Fall; day.
Lectures, literature analysis, and student seminar presentations with regard to cellular and neurophysiology, circulation, respiration, gastrointestinal physiology, metabolism, temperature regulation, renal physiology, body water, electrolyte and acid-base balance, and endocrine control mechanisms.

K315 MAMMALIAN PHYSIOLOGY LABORATORY (2 Cr.)
P or C: K314. Fall; day.
Laboratory experimentation with regard to cellular and neurophysiology circulation, respiration, gastrointestinal physiology, metabolism, temperature regulation, renal physiology, body water, electrolyte and acid-base balance, and endocrine control mechanisms.

K395 PROSEMINAR(1 Cr.)
P: Upper division standing, consent of instructor. On demand.
Guided individual presentations on topics in an area of current importance not covered in other courses.

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

COURSES FOR THE NON-MAJOR

N100 CONTEMPORARY BIOLOGY (3 Cr.)
P: None. Equiv. BIOL L-111. 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. P.U. 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. P.U. BIOL 109, I.U. Z103. 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.

N212 HUMAN BIOLOGY (2 Cr.)
P: None. Equiv. P.U. 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. P.U. BIOL 203. Fall; day.
Accompanying laboratory for N212.

N214 HUMAN BIOLOGY (2 Cr.)
P: N212. Equiv. P.U. BIOL 202. Spring; day.
Continuation of N212.

N215 HUMAN BIOLOGY LABORATORY (1 Cr.)
P or C: N214. Equiv. P.U. BIOL 204. Spring; day.
Accompanying laboratory for N214.

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

N251 INTRODUCTION TO MICROBIOLOGY (3-4 Cr.)
P: One semester general chemistry or one semester life science. Equiv. BIOL 220 (3 Cr.) and BIOL 221 (4 Cr.) 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. I.U. ANAT A210. Fall, Spring, Summer; day.
Lecture and laboratory studies of the histology and gross morphology of the human form, utilizing a cell-tissue-organ system-body approach.

N300 ROLE OF BIOLOGY IN SOCIETY (2 Cr.)
P: N100 or consent of instructor. Equiv. I.U. ZOOL Z270. Fall; night.
The principles of ecology are studied as they relate to pollution. Student reports of local problems and action.

N302 ROLE OF BIOLOGY IN SOCIETY (2 Cr.)
P: N100 or consent of instructor. Equiv. I.U. ZOOL Z271. Spring; night.
The principles of ecology are studied as they relate to population dynamics and control. Student reports in interdisciplinary problem solving approaches.

N320 HEREDITY, EVOLUTION AND SOCIETY (3 Cr.)
P: N100 or consent of instructor. Equiv. I.U. Z369, Spring; day.
Basic concepts and principles of evolution genetics, and development. Problems of the individual and society raised by current genetic knowledge and technology. Cannot be taken for credit by those who have credit in K322 or N322.

N322 INTRODUCTORY PRINCIPLES OF GENETICS (3 Cr.)
P: N105 or N107 or K101. Equiv. P.U. 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.

Department of Chemistry

PROFESSORS: Fife (Chairman), Nevill, Rabideau and Welcher; ASSOCIATE PROFESSORS: Boaz, Boschmann, Cady, Cutshall, Fricke, Metz, and Wyma; ASSISTANT PROFESSORS: Lipkowitz, O'Donnell, Raichart, and Wilson.

DEPARTMENTAL COUNSELORS: PROFESSORS: Boaz, Fife, Fricke, and Raichart;
GRADUATE COUNSELOR: PROFESSOR: Wilson;
HEALTH PROFESSIONS COUNSELOR: PROFESSOR: Boaz.

The Department of Chemistry provides instruction that leads to degrees in chemical technology, an associate degree (for details, see the Bulletin of the School of Engineering and Technology), and in chemistry: Bachelor of Arts degree, Bachelor of Science degree, and Master of Science degree. One Bachelor of Science degree option carries certification by the American Chemical Society Committee on Professional Training (see pages 50 and 52).

The Department of Chemistry offers special courses in cooperation with the Continuing Education Department which can be taken either on a credit or non-credit 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 knowledge and background, and the student presently working toward a degree may enrich his educational program with a "special topic" course or an interdisciplinary course.

C101 is elected by students in IU programs which require only one semester of chemistry (e.g., degree requirement in physical science, 3-year nursing, education). Students required to complete two semesters of chemistry take the sequence C101-C102 (e.g., 4-year nursing). C105-C106 is required for students pursuing advanced work in scientific fields (e.g., chemistry, biology, geology). 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.

Purdue students expecting to major in Biology, Chemistry or Physics should take the sequence C105-C106. Students in Engineering should take C111-C112 or C105-C106, if qualified. Students in Home Economics take C101-C102, those in Pre-Pharmacy C105-C106, and students in Agriculture C105-C106. C101-C102 is designed for students who do not need Chemistry as a tool subject.

The following degrees in Chemistry are offered.* 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 university granting the degree. 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 on pages 20-21.

Area II: Foreign Language: No language required.

Area IIIC: Physical and Biological Sciences: Physics 218 and 219. Recommended Physics 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: MA 221 and MA 222 Recommended MA 163 and MA 164.

Area IV: Chemistry Concentration Requirements: C 105, C 106, C 224, C 225, C341, C 342, C 343 (1 credit), C 344 (1 credit), C 360 (recommended C 361). Recommended C 207 or C 483, C 301 or C 302.

CHEMISTRY MAJOR

For students who plan to become professional chemists. 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 on pages 20-21.

Area II: Foreign Language: German G 095 and G 096.

Area IIIC: Physical and Biological Sciences: Physics 218 and 219, (Recommended 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: MA 163 and MA 164.

Area IV: Chemistry Concentration Requirements: C 105, C 106, C 310, C 311, C 315, C 341, C 342, C 343 (1 credit), C 344 (1 credit), C 361, C 362, and at least one of the following — C 430, C 483, or C 410 and C 316.

BACHELOR OF SCIENCE

CHEMISTRY MAJOR

Recommended to students who plan to be professional chemists, secondary school teachers, and those who plan non-research 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 on pages 21 and 22.

Area II: Foreign Language: No language required.

Area IIIC: Physical and Biological Sciences: Physics 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: MA 163, MA 164, and MA 261 (recommended CSCI 220).

Area IV: Chemistry Concentration Requirements: C 105, C 106, C 310, C 311, C 315, C 341, C 342, C 343 (2 credits), C 344 (2 credits), C 361, C 362, and at least one of the following — C 430, C 483, or C 410 and C 316. 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	A 201 Introduction to Management Accounting I A 202 Introduction to Management Accounting II L 302 Commercial Law I L 303 Commercial Law II
Economics	E 201 Principles of Economics I E 202 Principles of Economics II
Engineering	109 Introduction to Computer Programming 190 Elementary Engineering Design B 195 Engineering Problem Solving I

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 on pages 21 and 22.

Area II: Foreign Language: German G 095 and G096.

Area IIIC: Physical and Biological Sciences: Physics 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: MA 163, MA 164, MA 261, MA 262, and CSCI 220.

Area IV: Chemistry Concentration Requirements: C 105, C106, C 301 (or C 302 or C 400), C 310, C 311, C 315, C 316, C 341, C 342, C 343 (2 credits), C 344 (2 credits), C 361, C 362, C 409 (3 credits), C 410, and C 430.

CHEMISTRY PLANS OF STUDY
Bachelor of Arts — Preprofessional Chemistry Major

FRESHMAN	1	C 105 (5) Principles of Chem. I	MA 221 (3) Calculus	W117 (3) Composition	Speech (3)	ENG 185 (1)
	2	C 106 (5) Principles of Chem. II	MA 222 (3) Calculus	PHYS 218 (4) Gen. Physics	Elective (3)	
SOPHOMORE	3	C 341 (3) Organic Chem. I	C 343 (1) Organic Chem. Lab. I	PHYS 219 (4) Gen. Physics	Electives (6)	
	4	C 342 (3) Organic Chem. II	C 344 (1) Organic Chem. Lab. II	Electives (12)		
JUNIOR	5	C 224 (4) Quantitative Analysis	Electives (12)			
	6	C 225 (4) Quantitative Anal./Inst.	C 360 (3) Elem. Physical Chemistry	Electives (9)		
SENIOR	7	C 301 (1) Chemistry Seminar	Electives (15)			
	8	C 483 (3) Biological Chemistry	C 302 (1) Chemistry Seminar	Electives (12)		

Bachelor of Arts — Chemistry Major

FRESHMAN	1	C 105 (5) Principles of Chem. I	MA 163 (5) Calculus I	W117 (3) Composition	Elective (3)	
	2	C 106 (5) Principles of Chem. II	MA 164 (5) Calculus II	PHYS 152 (4) Mechanics	Elective (3)	
SOPHOMORE	3	C 341 (3) Organic Chem. I	C 343 (2) Organic Chem. Lab I	PHYS 251 (5) Heat, Elect., Optics	Speech (3)	Elective (3)
	4	C 342 (3) Organic Chem. II	C 344 (2) Organic Chem. Lab II	Electives (12)		
JUNIOR	5	C 310 (3) Analytical Chemistry	C 311 (2) Anal. Chem. Lab.	C 361 (3) Phys. Chem. I	G 095 (3) German I	Elective (3)
	6	C 362 (3) Phys. Chem. II	C 315 (3) Chem. Meas. Lab. I	G 096 (3) German II	Elective (5)	
SENIOR	7	Chemistry Electives (3-5)	Electives (12)			
	8	Electives (15)				

Bachelor of Science — Chemistry Major

FRESHMAN	1	C 105 (5) Principles of Chem. I	MA 163 (5) Calculus I	W117 (3) Composition	Elective (3)	
	2	C 106 (5) Principles of Chem. II	MA 164 (5) Calculus II	PHYS 152 (4) Mechanics	Elective (3)	
SOPHOMORE	3	C 341 (3) Organic Chem. I	C 343 (2) Organic Chem. Lab. I	MA 261 (4) Multivar. Calculus	PHYS 251 (5) Heat, Elect., Optics	Elective (3)
	4	C 342 (3) Organic Chem. II	C 344 (2) Organic Chem. Lab. II	Speech (3)	Electives (9)	
JUNIOR	5	C 310 (3) Analytical Chemistry	C 311 (2) Anal. Chem. Lab.	C 361 (3) Phys. Chem. I	Electives (9)	
	6	C 362 (3) Phys. Chem. II	C 315 (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

1	C 105 (5) Principles of Chem. I	MA 163 (5) Calculus I	W117 (3) Composition	Speech (3)	
2	C 106 (5) Principles of Chem. II	MA 164 (5) Calculus II	PHYS 152 (4) Mechanics	Elective (3)	
3	C 341 (3) Organic Chem. I	C 343 (2) Organic Chem. Lab. I	MA 261 (4) Multivar. Calculus	PHYS 251 (5) Heat, Elec., Optics	Elective (3)
4	C 342 (3) Organic Chem. II	C 344 (2) Organic Chem. Lab. II	MA 262 (4) Lin. Algebra Diff. Eq.	PHYS 342 (3) Modern Physics	Elective (3)
5	C 310 (3) Analytical Chemistry	C 311 (2) Anal. Chem. Lab.	C 361 (3) Phys. Chem. I	G 095 (3) German I	CSCI 220 (3) Computer Programming
6	C 362 (3) Phys. Chem. II	C 315 (3) Chem. Meas. Lab. I	C 410 (3) Instrumental Methods	G 096 (3) German II	Elective (3)
7	C 430 (3) Inorganic Chemistry	C 316 (3) Chem. Meas. Lab. II	Area IIIC Elective (3)	Electives (6)	
8	C 409 (3) Chemical Research	C 302 (1) Chemistry Seminar	Electives (11)		

MASTER OF SCIENCE

The complete course and research work for the M.S. (Purdue) 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.

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. Usually 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.

An informal plan of study should be drawn up by the student and the graduate advisor in advance of registration for the first semester of graduate work. The formal plan of study should be submitted as soon as possible and before the final semester. 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

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.

Departmental placement examinations in analytical, inorganic, organic, and physical chemistry are given each fall to incoming regular graduate students to determine deficiencies which must be removed before the completion of the graduate program. The remedial courses are considered to be CHM 525 for analytical, CHM 542 for inorganic, undergraduate organic courses (no graduate credit) for organic, and CHM 573 and/or CHM 574 for physical.

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 CHM 600-level and 9 hours must be in a declared major. Courses from three of the following areas must be taken: biochemistry, CHM 533 (I.U. C483); organic, CHM 561 (I.U. C443); analytical, CHM 621 (I.U. C510); inorganic, CHM 641 (I.U. C530); and physical, CHM 671 (I.U. C561), CHM 672 (I.U. C661), CHM 675 (I.U. C673) or CHM 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 tuition-refund assistantships and associate faculty positions on a very limited basis.

COURSES IN CHEMISTRY

C101 ELEMENTARY CHEMISTRY I (5 Cr, 3 Cr without laboratory)
P: At least 1 semester high school algebra. Equiv. PU CHM 113. Fall, day and night; Spring, day and night; Summer, day.
Essential principles of chemistry. Lectures, 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 program.

C102 ELEMENTARY CHEMISTRY II (5 Cr, 3 Cr without laboratory)
P: C101. Continuation of C101. Equiv. PU CHM 251. Fall, night; Spring, day and night; Summer, day.
Introduction to organic and biochemistry; organic compounds and their reactions. Lectures, recitation, laboratory.

C105 PRINCIPLES OF CHEMISTRY I (5 Cr, 3 Cr without laboratory)
P: Two years of high school algebra, one year of high school chemistry. Equiv. PU CHM 117. Fall, day, night; Spring, day, night; Summer, day, night.
Basic concepts and nomenclature, atomic structure, nuclear chemistry, chemical bonding, stiochiometry, oxidation-reduction, the states of matter, solutions, colloids. Lectures, recitation, laboratory.

C106 PRINCIPLES OF CHEMISTRY II (5 Cr, 3 Cr without laboratory)
P: C105. Equiv. PU CHM 126. Fall, night; Spring, day, night; Summer, day.
Thermodynamics, electrochemistry, chemical equilibrium, kinetics, descriptive and environmental chemistry. Lectures, recitation, laboratory.

C111 CHEMICAL SCIENCE FOR ENGINEERS (4 Cr)
Equiv. PU CHM 101. Fall, day, night; Summer, day, night.
A non-laboratory course for engineers who do not expect to take more than one year of chemistry. Lectures, recitations.

C112 CHEMICAL SCIENCE FOR ENGINEERS (3 Cr)
P: C111. Equiv. PU CHM 102. Fall, day; Spring, day, night; Summer, day.
Continuation of C111. Lectures, recitation.

C207 BIOCHEMISTRY (4 Cr)
P: C102. Equiv. PU BCHM 207. Spring, night.
Introduction to Biochemistry presents the fundamental concepts of biochemistry to students who are more interested in the application of science than in the pursuit of science itself. Major emphasis is given to the chemical characteristics of biomolecules and to the interrelationships of the metabolic pathways common to all living organisms. Lectures, laboratory.

C209 SPECIAL PROBLEMS (1-2 Cr)

P: Two semesters of college chemistry and consent of instructor. Equiv. PU CHM 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 CHM 224. Fall, night.

Introduction to the major methods of chemical analysis and separation for the chemical technician, non-chemistry major, or preprofessional chemistry major.

C225 QUANTITATIVE ANALYSIS/INSTRUMENTS (4 Cr)

P: C106. Equiv. PU CHT 225. Spring, night.

Instrumental methods of chemical analysis for the chemical technician, non-chemistry major, or preprofessional chemistry major.

C301 CHEMISTRY SEMINAR I (1 Cr)

P: C341 and junior standing. Fall, night.

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, night.

Content same as C301.

C309 COOPERATIVE EDUCATION IN CHEMISTRY (1 Cr)

P: general and organic chemistry and consent of department chairman. 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 CHM 321. Fall, night.

Fundamental analytical processes including solution equilibria, theory and applications of electrochemistry and spectrophotometry, chemical methods of separation and measurement.

C311 ANALYTICAL CHEMISTRY LABORATORY (2 Cr)

C: C310. Fall, night.

Laboratory instruction in the fundamental analytical techniques discussed in C310. This course must be taken concurrently with C310.

C315 CHEMICAL MEASUREMENTS LABORATORY I (3 Cr)

P: C310, C361. Spring

Experimental work in related areas of chemical analysis, instrumentation, and elementary physical chemistry. Topics: thermodynamics, kinetics, solutions, electrochemistry, chemical separations, statistical analysis.

C316 CHEMICAL MEASUREMENTS LABORATORY II (3 Cr)

P: C410, C362. Fall

Experimental techniques in analytical, inorganic, and physical chemistry. Topics: synthetic inorganic chemistry, vacuum techniques, chemical analysis, spectroscopy, structural analysis.

C341 ORGANIC CHEMISTRY (3 Cr)

P: C106. Equiv. PU CHM 261. Fall, day, night; Spring, night; Summer, day.

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 (3 Cr)
P: C341. Equiv. PU CHM 262. 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 (1 or 2 Cr)
P or C: C341. Equiv. PU CHM 255L (1 Cr), CHM 263L (1 Cr), CHM 265L (2 Cr). Fall, day, night; Spring, night; Summer, day.
Fundamental laboratory techniques of organic chemistry and general synthetic methods.

C344 ORGANIC CHEMISTRY LABORATORY (1 or 2 Cr)
P or C: C342. P: C343. Equiv. PU CHM 256L (1 Cr), CHM264L (1 Cr), CHM 266L (2 Cr). Spring, day, night; Summer, day.
Preparation, isolation and identification of organic compounds; emphasis on modern research methods.

C360 ELEMENTARY PHYSICAL CHEMISTRY (3 Cr)
P: C106, Mathematics MA M119, Physics 218. Spring.
Chemical thermodynamics, chemical equilibria, solutions, phase equilibria, electrochemistry, and kinetics. For students not intending to specialize in physical sciences.

C361 PHYSICAL CHEMISTRY I (3 Cr)
P: C106, Mathematics MA 164, Physics 219 or 251. Equiv. PU CHM 373. Fall, day and night.
Order of taking C361 and C362 optional. Kinetic-molecular theory, gases, chemical thermodynamics, electrochemistry, solutions, phase and chemical equilibria, introduction to statistical thermodynamics.

C362 PHYSICAL CHEMISTRY II (3 Cr)
P: C106, C361 or Mathematics MA 261 and Physics 251. Equiv. PU CHM 374. Spring, day and night.
Order of taking C361 and C362 optional. Introduction to quantum chemistry, symmetry, atomic and molecular structure and spectra, solids, liquids, chemical kinetics and photochemistry.

C400 CHEMICAL DOCUMENTATION (1 Cr)
P: C341. Equiv. PU CHM 513. Spring, night.
Lectures and library problems on classical and computer techniques of searching and evaluating chemical literature — reference books, periodicals, patents, etc.

C409 CHEMICAL RESEARCH (1-5 Cr)
P: junior or senior standing and consent of instructor. Equiv. PU CHM 499. Every semester. Time arranged.
Chemical or literature research with a report. Can be elected only after consultation with research advisor and approval of a program. May be taken for a total of 10 credit hours which count toward graduation.

C410 INSTRUMENTAL METHODS OF ANALYSIS (3 Cr)
P: 1 year of physical chemistry, C310. Equiv. PU CHM 424. Spring, night.
Theory and practice of modern analytical methods, including electroanalytical techniques, quantitative spectrophotometry, chromatography and radiochemical methods. Lectures.

C430 INORGANIC CHEMISTRY (3 Cr)
P: 1 year of physical chemistry. Equiv. PU CHM 342. Fall, night.
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)
P or C: C224 or C310, C342. Equiv. PU CHM 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. P or C: second semester physical chemistry. Not open to students with credit in CHM 424. Equiv. I.U. C520. Spring, night.
Survey of chemical and instrumental methods of analysis.

542 INORGANIC CHEMISTRY (3 Cr)
P: 1 year of physical chemistry. Equiv. I.U. C430. Fall, night.
An introduction to the principles of inorganic chemistry with emphasis on the chemistry of the nontransition elements.

542L INORGANIC CHEMISTRY LABORATORY (1 Cr)
Laboratory work to accompany 542.

561 FUNDAMENTAL ORGANIC CHEMISTRY (3 Cr)
P: C342. Equiv. I.U. C443. Fall, night.
A general survey of synthetic organic chemistry including some discussion of current organic theory.

573 PHYSICAL CHEMISTRY (3 Cr)
P: C106, Mathematics MA164, Physics 219 or 251. Fall, day and night.
Order of taking 573 and 574 optional. Kinetic-molecular theory, gases, chemical thermodynamics, electrochemistry, solutions, phase and chemical equilibria, introduction to statistical thermodynamics.

574 PHYSICAL CHEMISTRY (3 Cr)
P: C106, Mathematics MA261 and Physics 251. Spring, day and night.
Order of taking 573 and 574 optional. Introduction to quantum chemistry, symmetry, atomic and molecular structure and spectra, solids, liquids, 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. I.U. C510. Spring, odd years, night.
A critical survey of recent chemical and instrumental methods of analysis.

626 ON LINE COMPUTER TECHNIQUES IN CHEMICAL INSTRUMENTATION (2 Cr)
P: 621. Spring, odd years, night.
Introduction to the basics of digital instrumentation and the incorporation of digital computers in the chemical laboratory. About one-third of the course will be devoted to discussion of the hardware and logic of digital electronics, and the principles and techniques for implementation in chemical instrumentation. Another third of the course will develop the skills of machine-language computer programming, oriented towards applications in chemistry. The last third will combine the digital logic and programming principles for on-line computer applications in chemical experimentation.

626L ON LINE COMPUTER TECHNIQUES IN CHEMICAL INSTRUMENTATION LABORATORY (1 Cr)
Laboratory to accompany 626. A sequence of progressively more difficult laboratory projects to develop the capability for designing and interfacing systems for on-line communication between the digital computer and chemical instrumentation.

636 BIOCHEMICAL MECHANISMS (3 Cr)
P: 1 year of physical chemistry and 651. Fall, 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 542. Equiv. I.U. 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: 561. Equiv. I.U. C540. Spring, odd years, night.
A survey of advanced organic chemistry.

652 SYNTHETIC ORGANIC CHEMISTRY (3 Cr)
P: 651. Equiv. I.U. C543. Fall, odd years, night.
Continuation of 651, with special emphasis on synthetic organic chemistry.

668 PHYSICAL ORGANIC CHEMISTRY (3 Cr)
P: 561. Equiv. I.U. C644. Spring, even years, night.
A consideration of organic reactions employing modern theories.

671 ADVANCED PHYSICAL CHEMISTRY (3 Cr)
P: 1 year of physical chemistry. Equiv. I.U. C561. Fall, even years, night.
Selected topics, including atomic and molecular structure and modern theories underlying thermodynamics and chemical kinetics.

672 QUANTUM CHEMISTRY (3 Cr)
P: 1 year of physical chemistry. Equiv. I.U. C661. Spring, odd years, night.
Basic principles of classical and quantum mechanics; exact solutions for simple systems; approximation methods; atomic structure; spectoscopy; application of group theory; theory of molecular binding.

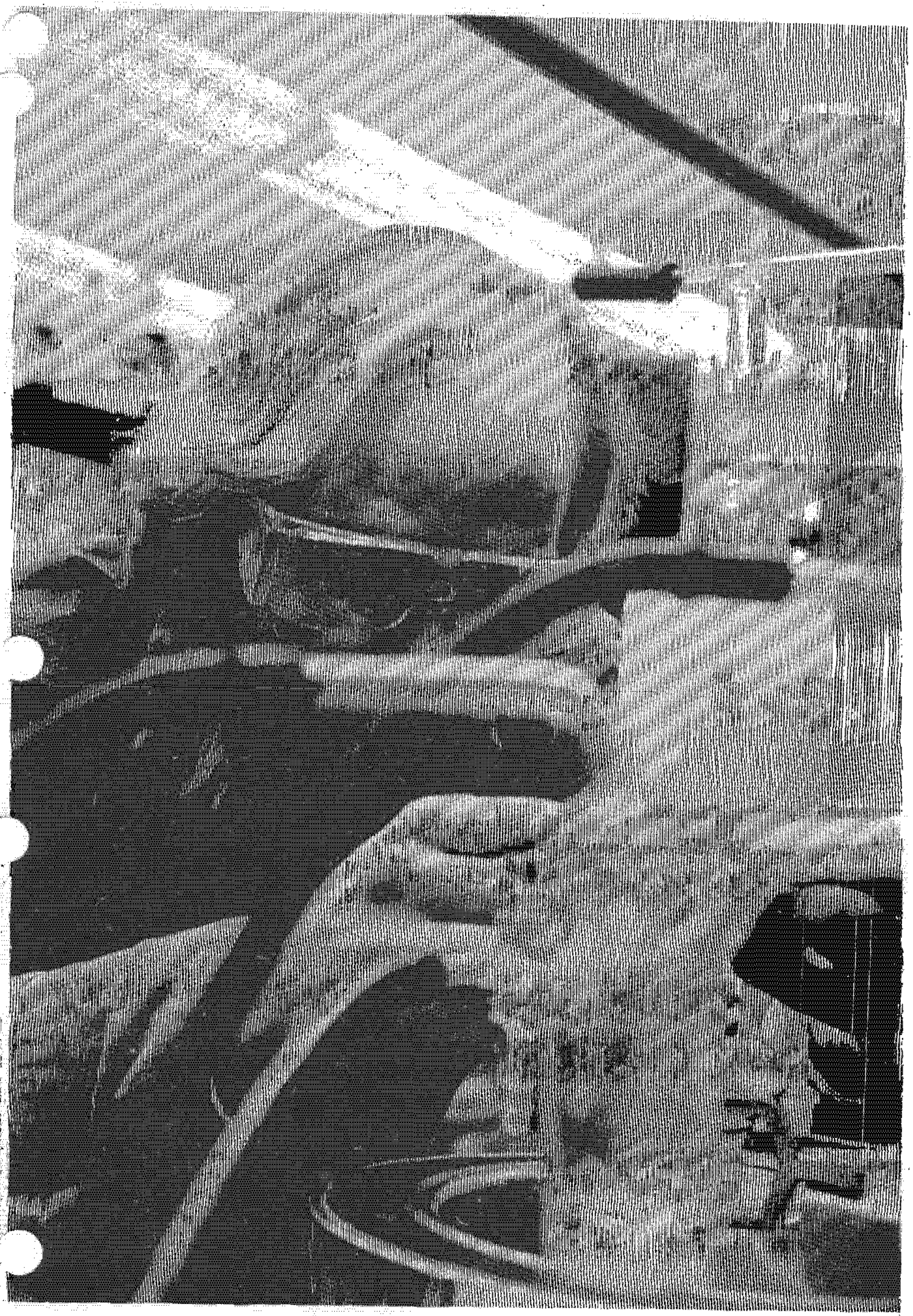
675 CHEMICAL KINETICS (2 or 3 Cr)
P: 1 year of physical chemistry. Equiv. I.U. C673. Fall, odd years, night.
Experimental and theoretical considerations of chemical reaction rates and mechanisms.

679 CHEMICAL THERMODYNAMICS (3 Cr)
P: 1 year of physical chemistry. Equiv. I.U. C563. Spring, even years, night.
Advanced thermodynamics of chemical and phase equilibria, of electrolyte and nonelectrolytic solutions, and of imperfect gases.

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 and graduate level. For details see Special Programs, this bulletin.



Department of Geology

PROFESSOR: Mirsky (Chairman), Weihaupt; ASSOCIATE PROFESSOR: Banaszak; ASSISTANT PROFESSOR: Graham, Hall, L. Younker.

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, wind, glaciers, and other surficial earth processes. Geologists 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 earth-like planets.

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 (with General Geology Option or Environmental and Urban Geology Option). 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.

Area II: Languages: There is no requirement for a foreign language. However, those planning to continue with graduate studies, especially toward the doctorate, normally are urged to take a modern foreign language through at least the first-year level. Those planning to obtain only the B.A. degree, particularly in such specialties as Secondary Earth Science Teaching, Environmental Geology, or Applied Geology may find it more

advantageous to substitute other electives for a modern foreign language. Each student should consult his departmental counselor to determine his foreign language needs.

Area IIIA: See School of Science requirements. First year of a foreign language does not apply towards satisfying this requirement, but is an elective.

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 C101-C102 or C105-C106, and at least one of the four courses must be in Biological Sciences.

Area IIID: Mathematical Sciences: Entrance requirement for School of Science fulfills this requirement.

Area IV: Geology Concentration Requirements

30 credits of Geology (including G109, G110, G205, G221, G222, G323, G334, G404, but not Geology G107 which applies as an elective), and sufficient credits from related subjects to complete the concentration group. This program can provide, in addition to a broad general education, an adequate background for professional employment and advanced study in geology.

Other Requirements

See School of Science General Requirements.

EARTH SCIENCE SECONDARY TEACHING CERTIFICATION OPTION

Degree Requirements

A. **Humanities:** 16-18 credits

Area I; See School of Science requirements. Geology G205 may partially satisfy this requirement.

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, but is an elective.

B. **Social and Behavioral Sciences:** 14-16 credits

Area IIIB: See School of Science requirements.

C. **Life and Physical Sciences:** 14-16 credits

Area IIIC & D: Same as under General Geology option above.

D. **Electives as needed to obtain a total of 50 credits**

Earth Science Requirements (Area IV)

40 credits of Geology and related subjects (including G109, G110, G205, G221, G222, G323, G334, G404), 10 credits of Chemistry. The additional related subjects are listed below:

Certification Requirements

Astronomy, A100 or A105—3 credits
Physical Geography, G107—3 credits
Meteorology, G304—3 credits
Conservation, G316 or G416 or T480—3 credits
Regional Geography, G300 or G326 or G329 or G415—3 credits
Field Techniques or Cartography, G303 or G429—3 credits
Physical Anthropology, A303—3 credits

Professional Education Requirements

25 credits including F200, P280, M449, M462, M480, and S485. 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)

GENERAL GEOLOGY OPTION

Degree Requirements

Area I: See School of Science requirements. Geology G205 may partially satisfy this requirement.

Area II: Same as in B.A. degree.

Area IIIA: See School of Science requirements. First year of a foreign language does not apply towards satisfying this requirement, but is an elective.

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.

Area IIID: Mathematical Sciences: Calculus MA163-MA164, and two courses in computers and/or statistics. (May include certain computer courses in School of Engineering/Technology, with Departmental approval.)

Area IV: Geology Concentration Requirements

Geology: 30 credits, including G109, G110, G205, G221, G222, G323, G334, G404, G429 (but not Geology G107 which applies as an elective).

General: four courses at 300-400 level in two or more of the following Departments: Biological Sciences, Chemistry, Geology, Mathematical Sciences, Physics, with at least two courses outside of Geology.

Other Requirements

See School of Science General Requirements.

ENVIRONMENTAL AND URBAN GEOLOGY OPTION

Degree Requirements

Areas I, II, and III are the same as those for the B.S. in Geology (General Geology Option).

Area IV: Geology Concentration Requirements

Generally the same as those noted under the B.S. in Geology (General Geology Option), except that Geology G300, G415, and G430 are required. One of these three courses may, with the approval of the Departmental counselor, substitute for G205 or G404 among the Geology requirements, and the other two courses will be included among the four courses in the General requirements.

Other Requirements

Same as those noted under the B.S. in Geology (General Geology Option), except that certain specific courses in other Departments are preferred for inclusion among the electives to make the minimum of 122 credits. The identification of these recommended courses depends on the specific objectives of the student as expressed in consultation with his Departmental counselor.

GEOLOGY PLANS OF STUDY

There is no single semester-by-semester plan of study for any of the four 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 (3) Geology: Evolution of the Earth	MA147 (3) Algebra & Trig I	W117 (3) English Composition	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
	2	G110 (3) Geology: Earth's Environment	MA148 (3) Algebra & Trig II	N107 (4) Animal Biology	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
SOPHOMORE	3	G221 (3) Mineralogy	C105 (5) Chemistry I	G205 (3) Reporting Skills in Geoscience	Arts & Humanities (3)		
	4	G222 (3) Petrology	C106 (5) Chemistry II	Arts & Humanities (3)	Elective (3)		
JUNIOR	5	G303 (3) Maps & Air Photos	Social & Behavioral Sciences (3)	Elective (3)	Elective (3)	Elective (3)	
	6	G300 (3) Environmental & Urban Geol	G323 (3) Structural Geology	Social & Behavioral Sciences (3)	Elective (3)	Elective (3)	
SENIOR	7	G404 (3) Geobiology	G410 (1) Research in Geobiology	G415 (3) Geomorphology	300-Level Elective (3)	Elective (3)	Elective (3)
	8	G334 (3) Sedimentation & Stratigraphy	T480 (3) Seminar in Earth Science	G410 (2) Research in Paleontology	300-Level Elective (3)	300-Level Elective (3)	Elective (3)

Bachelor of Arts, Earth Science Secondary Teaching Certification Option

FRESHMAN	1	G109 (3) Geology: Evolution of the Earth	MA147 (3) Algebra & Trig I	W117 (3) English Composition	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
	2	G110 (3) Geology: Earth's Environment	MA148 (3) Algebra & Trig II	N 107 (4) Animal Biology	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
SOPHOMORE	3	G221 (3) Mineralogy	C105 (5) Chemistry I	G205 (3) Reporting Skills in Geoscience	F200 (3) Education		
	4	G222 (3) Petrology	C106 (5) Chemistry II	P280 (5) Education	Arts & Humanities (3)		
JUNIOR	5	G303 (3) Maps & Air Photos	A303 (3) Physical Anthropology	A100 (3) Astronomy	G107 (3) Physical Geography	Arts & Humanities (3)	Social & Behavioral Sciences (3)
	6	G300 (3) Environmental & Urban Geol	G323 (3) Structural Geology	G334 (3) Sedimentation & Stratigraphy	M462 (3) Education	Social & Behavioral Sciences (3)	
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 (8) Education — Student Teach	S485 (3) Education			

Bachelor of Science, General Geology Option

FRESHMAN	1	G109 (3) Geology: Evolution of the Earth	MA147 (3) Algebra & Trig I	W117 (3) English Composition	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
	2	G110 (3) Geology: Earth's Environment	MA148 (3) Algebra & Trig II	C105 (5) Chemistry I	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
SOPHOMORE	3	G221 (3) Mineralogy	MA163 (5) Calculus I	C106 (5) Chemistry II	G205 (3) Reporting Skills in Geoscience		
	4	G222 (3) Petrology	MA164 (5) Calculus II	N107 (4) Animal Biology	Elective (3)		
JUNIOR	5	G303 (3) Maps & Air Photos	PHYS 218 (4) Physics I	N105 (4) Botany	Elective (3) Computers or Statistics		
	6	G323 (3) Structural Geology	PHYS 219 (4) Physics II	Elective Area IV (3) 300-400 Level	Elective (3) Computers or Statistics	Elective (3)	
SENIOR	7	G404 (3) Geobiology	G410 (1) Research in Geobiology	Elective Area IV (3) 300-400 Level	Elective Area IV (3) 300-400 Level	Elective (3)	
	8	G334 (3) Sedimentation & Stratigraphy	Elective Area IV (3) 300-400 Level	Elective (3)			
G429 — Summer Field Camp in Rockies — (8)							

Bachelor of Science, Environmental & Urban Geology Option

FRESHMAN	1	G109 (3) Geology: Evolution of the Earth	MA147 (3) Algebra & Trig I	W117 (3) English Composition	Arts & Humanities (3)	Social & Behavioral Sciences (3)	
	2	G110 (3) Geology: Earth's Environment	MA148 (3) Algebra & Trig II	C105 (5) Chemistry I	Arts & Humanities (3)		
SOPHOMORE	3	G221 (3) Mineralogy	MA163 (5) Calculus I	C106 (5) Chemistry II	G205 (3) Reporting Skills in Geoscience		
	4	G222 (3) Petrology	MA164 (5) Calculus II	N107 (4) Animal Biology	Elective (3)		
JUNIOR	5	G303 (3) Maps & Air Photos	PHYS 218 (4) Physics I	N105 (4) Botany	Elective (3) Computers or Statistics		
	6	G323 (3) Structural Geology	G300 (3) Environmental & Urban Geol	PHYS 219 (4) Physics II	Elective (3) Computers or Statistics	Elective (3)	
SENIOR	7	G415 (3) Geomorphology	G406 (3) Geochemistry	Elective Area IV (3) 300-400 Level	Elective (3)		
	8	G334 (3) Sedimentation & Stratigraphy	G430 (4) Geology of Water	Elective Area IV (3) 300-400 Level	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 M.A.T. 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 one or both of the Summer Sessions; Day — offered as a daytime section; Night — offered as an evening section. For courses with no designated 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 (3 Cr, 2 Cr without laboratory)
P: None. Every, day; Fall, night.
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, 3 credits (equiv. I.U. G104, I.U. G112, and P.U. GEOS112); without laboratory, 2 credits. Credit not given for both G109 and G100 or G105.

G110 GEOLOGY: THE EARTH'S ENVIRONMENT (3 Cr, 2 Cr without laboratory)
P: None. Every, day; Spring, night.
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, 3 credits (equiv. I.U. G103, I.U. G111, and P.U. GEOS111); without laboratory, 2 credits. Credit not given for both G110 and G100 or G105.

G205 REPORTING SKILLS IN GEOSCIENCE (3 Cr)
P: English W117, Geology G107 or G109 or G110. Fall, day.
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.

G221 INTRODUCTORY MINERALOGY (3 Cr)
P: An introductory geology course or consent of instructor. Fall.
Crystallography: morphology, classes, twinning, habit. Mineral chemistry, physics, and genesis. Description, identification, association, occurrence, and use of common and important minerals. Credit not given for both G221 and G106 or T306.

G222 INTRODUCTORY PETROLOGY (3 Cr)
P: G221. Spring.
Igneous, sedimentary, and metamorphic rocks: composition, field occurrence, characteristics, classification, and origin, laboratory description and identification. Credit not given for both G222 and G106 or T306.

G300 ENVIRONMENTAL AND URBAN GEOLOGY (3 Cr)
P: Geology G107, or G109 or G110 or Geography G107 or consent of instructor. Spring.
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 GEOLOGY: MAPS AND AIR PHOTOS (3 Cr)
P: G109 or G110, or Geography G107 and consent of instructor. Fall.
Field use and interpretation of maps and aerial photographs. Planimetric, topographic, geologic, and soils maps; vertical and oblique air photos and photo mosaics. Introduction to remote sensing: infrared and radar imagery.

G323 STRUCTURAL GEOLOGY (3 Cr)
P or C: G222. R: G303. Spring.
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.

G401 OPTICAL MINERALOGY (3 Cr)
P: G222. Fall in Alternate Years, day.
Principles of optical crystallography applied to identification of minerals by immersion and thin-section methods. Solid solution series and chemical relations within the rock-forming minerals.

G402 PETROGRAPHY AND ADVANCED PETROLOGY (3 Cr)
P: G401. Spring in Alternate Years, day.
Identification, description, and classification of igneous, sedimentary, and metamorphic rocks using the petrographic microscope. Textures, structures, mineralogical, and chemical classification; petrogenesis including field relations, physical and chemical aspects of rock systems, with emphasis on phase relations.

G404 GEOBIOLOGY (3 Cr)
P: Geology G109, or Biology K101 or K103, or consent of instructor. R: Biology N107 for non-Biology majors. Fall.
Principles of paleontology. Application of biological principles and use of fossils in the study of earth history. Emphsis is on documentation of macroevolution and development of the basic theory of evolution. 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.

G410 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. Fall.
Physics in the study of the earth, its origins, history, and internal constitution.

G415 PRINCIPLES OF GEOMORPHOLOGY (3 Cr)
P: G110 and consent of instructor. Fall.
Geomorphic processes, evolution, and classification of landforms. Laboratory: topographic maps; aerial photographs.

G416 ECONOMIC GEOLOGY (3 Cr)
P: G222 or consent of instructor. Fall.
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, 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 GEOLOGY OF WATER (4 Cr)
P: G110. R; G300, MA164, introductory chemistry, introductory 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.

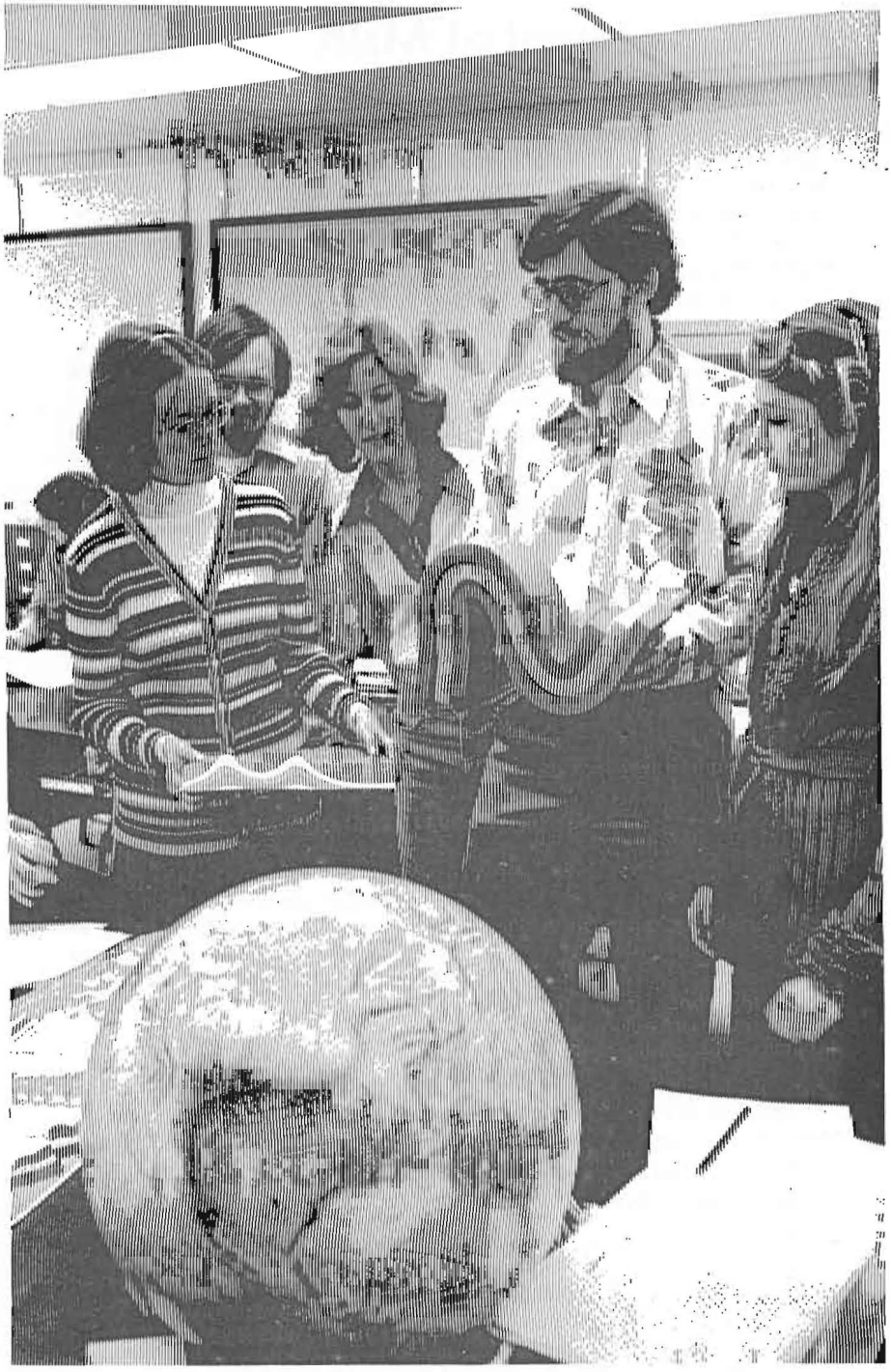
G451 PRINCIPLES OF HYDROGEOLOGY (3 Cr)
P: G109, G110 or consent of instructor. R: G334. Spring.
Water resources; occurrence, regulation, and management of water; hydrologic cycle, water movement, water quality and pollution; surface and subsurface investigations; basin-wide development of water resources.

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

T309 EARTH SCIENCE: GEOLOGIC ASPECTS I (3 Cr)
P: None, Fall, night.
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 (3 Cr)
P: None. Spring, night.
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: 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: Crown, Gemignani (Chairman), Kuczkowski, Huffman; PROFESSORS EMERITUS: Johnston, Suer, Scone; ASSOCIATE PROFESSORS: Alton, Bittinger, John Gersting, Judith Gersting, Kaminker, Kleyle, Loh; ASSISTANT PROFESSORS: Aliprantis, Beeson, Bodonyi, Burkinshaw, Duncan, Haering, Hunter, Hutton, Luke, Ng, Patterson, Penna, Rigdon, Rigo;

DEPARTMENTAL COUNSELOR: Loh;

GRADUATE COUNSELOR: Kuczkowski.

The Department of Mathematical Sciences includes the areas of Computer Science, Mathematics, and Statistics.

The department offers the Bachelor of Science degree with major in Mathematics and provides electives leading to specialization in any one of five optional areas: pure mathematics, applied mathematics, computer science, statistics, and secondary school teaching.

The department offers the Bachelor of Science degree in Computer Science.

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

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE (MATHEMATICS)

Although students may declare a mathematics major in the freshman year, they are not officially admitted to the department as a major in mathematics until completion of MA351 or its equivalent. An average grade of 2.0 with no failing grades in mathematics courses through MA351 is a minimum indication of success in this major.

Degree Requirements

The requirements for the Bachelor of Science degree with major in Mathematics in any optional area except secondary school teaching are:

1. Those general requirements under Area I and III of the University and the School of Science, see pages 21 and 22, except that
   a. Mathematics courses below MA163 do not count toward the degree.
   b. Courses in other schools that are primarily mathematical may not be used to fulfill Area III A & B, humanities and social science requirement of the School of Science. If in doubt about a particular course, the student should consult his advisor.

c. Certain courses, such as Chemistry C101, C102; Physics 100, 200, 218, 219; Astronomy A100, A105; and Geography G107 may not be used to fulfill the Science requirement, Area III C, of the School of Science. If in doubt about a particular course, the student should consult an advisor.

d. AREA II: No foreign language requirement.

2. Those relating to the minor.

3. Those relating to the major.

Minor Requirements

In order that students should acquire some depth of study in a subject outside the major area, they are required to have a minor in the natural sciences, the social sciences, the behavioral sciences, or the humanities. For this minor they need 18 hours including at least three courses beyond the introductory level. While a minor is usually in one department it may be from two or more, if the student's advisor approves. Courses may be used for the double purpose of fulfilling general requirements and the minor requirements of the Department of Mathematical Sciences. Physics is a good choice of minor for students in this department.

Major Requirements

Area IV: Pure Mathematics Option

With this option you would be well prepared for graduate work in pure mathematics. However students who are interested in 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. A minor in one of the physical sciences or in a subject which makes serious use of mathematics, such as economics, is desirable.

The 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 advisor.
6. A graduation index of at least 2.0 in these courses used to fulfill the requirements listed under 3, 4, and 5 above.

Area IV: 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.

With this option a minor in physics or engineering is required.

The 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 CSCI 414 (or CSCI 512)
5. Mathematical Modeling 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 advisor.
8. A graduation index of 2.0 or higher in those courses (not counting CSCI 220) used to fulfill the requirements listed under 2, 3, 4, 5, 6, and 7 above.

The student whose primary interest is in applied mathematics, computer science, pure mathematics, statistics, or secondary school teaching should see the advisor for suggestions concerning a plan of study.

SECONDARY SCHOOL TEACHING OPTION

To teach in secondary schools, you must meet the requirements for teacher certification in the state you expect to teach. You can find out 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 50 semester hours in general education courses and at least 18 semester hours of professional education courses as part of the requirement for a teaching license. You should be sure to see an advisor to ensure that these hours are properly distributed and that the professional education requirements are met. The State of Indiana also requires high school mathematics teachers to have at least 40 semester hours of mathematics courses. The general requirements for this option differ from the other options in that four hours of English composition is required under AREA I and one year (at least five semester hours) in a modern foreign language is required under AREA II. Your minor is satisfied by the courses that you take to meet the professional education requirement.

Major Requirements

The requirements in AREA IV are:

1. The calulus 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 (or 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.
8. Two additional hours of electives in Mathematics, Computer Science, or Statistics. This requirement may also be met by courses that are basically mathematical in nature in Physics or Engineering.
9. A grade point average of at least 2.0 in all Mathematics, Computer Science and Statistics courses at the 300 level or higher used to fulfill the requirements of 3, 4, 5, 6, 7, and 8 above.

According to Indiana state law, a student should have fifty semester hours in general education courses as part of the requirement for a teaching license. Students should be sure to see an advisor to ensure that these hours are properly distributed and that the professional education requirements are met.

BACHELOR OF SCIENCE (COMPUTER SCIENCES)

Degree Requirements

Those general requirements under AREA I and III of the University and the School of Science, see pages 18-22, except that Mathematics courses below MA163 and Computer Science courses below CSC1220 do not count toward the degree. There is no foreign language requirement under AREA II.

AREA IV: Major Requirements

1. The calculus sequence MA163, 164, 261.
2. One year of algebra MA351 and either CSCI482 or MA453.
3. One year of analysis MA361 and CSCI414.
4. CSCI220, 300, 320, 402, 484.
5. STAT511 or 516.
6. At least three additional computer science courses at the 400 level or above of which at least one is a 500 level course.

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 (Option for Teachers), Master of Science, Master of Science (Applied Mathematics), and Master of Science (Applied

Computer Science). 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.

Students entering the program in applied computer science should have an undergraduate degree and a background in computer programming and mathematics with an overall B average or better. All applicants should have completed the following courses (or equivalents) which if taken as deficiency courses carry no credit: CSCI220, CSCI300, CSCI320, MA163, MA164, MA261, and MA351.

Application for Admission

The student who wishes to pursue an advanced degree in the Department of Mathematical Sciences should see a graduate advisor 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 for the M.S. (Option for Teachers) degree. It is a flexible program designed to provide certificated secondary school teachers with an additional year of training.

This non-thesis program requires a minimum of 33 credits. Not more than six hours of courses with a grade of C may be counted. Required courses are MA547, 548, 550, 511, 561, 563. In addition the student selects one, three-hour course in mathematics, computer science or statistics and twelve hours of electives which must be approved by his advisory committee.

MASTER OF SCIENCE (OPTION FOR TEACHERS)

Secondary school Mathematics teachers who wish to have a stronger program in mathematics will meet the requirements of the M.S. (Option for Teachers). This program normally requires 33 hours of course work. Required courses are MA571 or MA544, MA525, MA553, MA554, MA519, one course in geometry selected from MA561, MA562 and MA563, and one additional graduate level course in the mathematical sciences. The remaining hours of electives are to be selected by students and their advisory committees.

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.

Requirements for students in applied mathematics terminating with the M.S. degree are:

a) Complex Analysis: MA525 or MA530
Real Analysis: MA534 or MA544
Linear Algebra: MA511 or MA554
Partial Differential Equations: MA523
Applied Mathematics: MA611
Computer Science, Probability: CSCI512, or 514, or 515, or 516, or 520, or MA519

b) Two of the remaining courses required should provide depth in a specific area. These courses must be approved by the students advisory committee, and they are not restricted to courses within Mathematical Sciences provided they deal with mathematical applications.

c) Three to six credit hours of the student's plan of study must be devoted to an applied mathematics research project on a topic approved by the student's advisory committee. A formal written report on the project will be submitted to the advisory committee for approval.

MASTER OF SCIENCE

This Master of Science is a strong terminal masters degree with emphasis in pure mathematics. The program normally requires 30 hours of course work. Required courses are MA525, 544, 553, 554, 571, and either one course for which some of these are prerequisites, or MA585. Twelve hours of electives are to be selected by the student and his advisory committee.

MASTER OF SCIENCE (APPLIED COMPUTER 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 MS(ACS) is a strong terminal masters degree with emphasis on applications.

The requirements for the MS(ACS) degree are:

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 and 3 below. Not more than six credit hours of grade C can be included, and no credits for grades below C can be included. Not more than 9 credit hours can be transferred from another institution.
2. Completion of one of the following major options:
   a. Numerical analysis — CSCI514, CSCI520, and either CSCI614 or CSCI615.

      In addition to the general admission requirements, students entering the numerical analysis option should also have completed MA 262 (or 361), and CSCI 414, or the equivalent.

   b. Systems programming — CSCI501, CSCI502, CSCI503, and CSCI660.

      In addition to the general admission requirements, students entering the systems programming option should also have completed CSCI402, CSCI403, CSCI461, or the equivalent.
3. Completion of at least one course from each of the following categories:
   a. Numerical analysis above CSCI512.
   b. Systems programming — CSCI501 or CSCI502.

c. Logic and automata theory — CSCI582 (CSCI482 and CSCI484 together count as one course in Logic and Automata theory).

d. Mathematics above MA511.

4. Courses not required under 2 and 3 above must be Computer Science courses numbered above 500, or approved Mathematics courses. With the approval of the candidate's advisory committee, the following undergraduate courses may be counted for half credit (1½ credits for a nominally 3 credit course) toward the degree: CSCI402, CSCI403, CSCI461, CSCI482, CSCI484.

MATHEMATICS PLANS OF STUDY

There is no single semester-by-semester plan of study for any of the four 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.

PURE MATHEMATICS OPTION SAMPLE PROGRAM

FRESHMAN	1	MA 163 (5) Calculus	SPCH C110 (3) Speech	ENGL W117 (3) Composition	Laboratory Science (3-5)	Free Elective (3)
	2	MA 164 (5) Calculus	CSCI 220 (3) Programming I	ENGL W118 (1) Composition	Laboratory Science (3-5)	Free Elective (3)
SOPHOMORE	3	MA 261 (4) Calculus	Free Elective (3)	Humanities or Soc Science (3)	Science Elective (3-5)	Free Elective (3)
	4	MA 351 (3) Linear Algebra	MA 361 (3) Advanced Calculus	Humanities or Soc Science (3)	Science Elective (3-5)	Free Elective (3)
JUNIOR	5	MA 441 (3) Analysis	STAT 311 MA or CS Elective	Humanities or Soc Science (3)	Free Elective (3)	Free Elective (3)
	6	MA 453 (3) Algebra I	Free Elective (3)	Humanities or Soc Science (3)	Free Elective (3)	Free Elective (3)
SENIOR	7	MA STAT or CS Elective (3)	MA STAT or CS Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)
	8	MA STAT or CS Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)

APPLIED MATHEMATICS OPTION SAMPLE PROGRAM

FRESHMAN	1	MA 163 (5) Calculus	Free Elective (3)	ENGL W117 (3) Composition	Humanities or Soc. Science (3)	Free Elective (3)
	2	MA 164 (5) Calculus	CSCI 220 (3) Programming I	ENGL W118 (1) Composition	Humanities or Soc. Science (3)	SPCH C110 (3) Speech
SOPHOMORE	3	MA 261 (4) Calculus	CSCI 320 (3) Programming II	PHYS 152 (4) Mechanics	Free Elective (3)	Free Elective (3)
	4	MA 361 (3) Advanced Calculus	Free Elective (3)	PHYS 251 (5) Heat, Electricity	Free Elective (3)	Free Elective (3)
JUNIOR	5	MA 511 (3) Linear Analysis	Advanced CS 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	CSCI 414 or 512 (3) Numerical Method	Advanced Math Elective (3)	PHYS 322 (3) Oscillations and Waves	Free Elective (3)	Free Elective (3)
	8	MA517 or CSCI 520 (3) Mathematical Modeling	Free Elective (3)	PHYS 330 (3) Electricity and Magnetism	Free Elective (3)	Free Elective (3)

MATHEMATICS TEACHING MAJOR SAMPLE PROGRAM

FRESHMAN	1	MA 163 (5) Calculus	Free Elective (3)	ENGL W117 (3) Composition	Laboratory Science (3-5)	Humanities or Soc. Science (3)
	2	MA 164 (5) Calculus	PSY B104 or B105 (3) Psychology	ENGL W118 (1) Composition	Laboratory Science (3-5)	Free Elective (3)
SOPHOMORE	3	MA 261 (4) Calculus	CS 220 (3) Programming I	ED F200 (3) Introduction to Teaching	Laboratory Science (3-5)	SPCH C110 (3) Speech
	4	MA 351 (3) Linear Algebra	MA 361 (3) Advanced Calculus	ED P280 (5) Ed. Psychology	Laboratory Science (3-5)	Free Elective (3)
JUNIOR	5	STAT 311 (3) Probability	MA 441 (3) Analysis	ED S485 (3) Teaching Prin.	Foreign Language (5)	Free Elective (3)
	6	MA 453 (3) Algebra I	MA STAT or CS Elective (3)	Free Elective (3)	Humanities or Soc. Science (3)	Free Elective (3)
SENIOR	7	MA 563 (1) (3) Advanced Geometry	MA STAT or CS or PHYS Elective (3)	Ed M 448 (1) (3) Methods	Humanities or Soc. Science (3)	Free Elective (3)
	8	Free Elective (3)	ED M 480 — Student Teaching for 8 weeks — (8).			Free Elective (3)

1. MA563 is offered only in the fall of even numbered years, and ED448 is offered only in the fall of odd numbered years.

COMPUTER SCIENCE SAMPLE PROGRAM

FRESHMAN	1	CSCI 220 (3) Programming I	MA 163 (5) Calculus	ENGL W117 (3) Composition	Humanities or Soc. Science (3)	Free Elective (3)
	2	CSCI 300 (3) Assembly Language	MA 164 (5) Calculus	ENGL W118 (1) Composition	Humanities or Soc. Science (3)	SPCH C110 (3) Speech
SOPHOMORE	3	CSCI 320 (3) Programming II	MA 261 (4) Calculus	Free Elective (3)	Laboratory Science (3-5)	Free Elective (3)
	4	CSCI 402 (3) Architecture of Computers	MA 351 (3) Linear Algebra	Free Elective (3)	Laboratory Science (3-5)	Free Elective (3)
JUNIOR	5	Advanced CS Elective (3)	MA 361 (3) Advanced Calculus	Free Elective (3)	Science Elective (3-5)	Free Elective (3)
	6	CSCI 482 (3) Discrete Structures	Advanced CS Elective (3)	Free Elective (3)	Science Elective (3-5)	Free Elective (3)
SENIOR	7	CSCI 414 (3) Numerical Methods	CSCI 484 (3) Theory of Computation	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)
	8	Advanced CS Elective (3)	Stat 511 (3) Stat Methods	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)

Courses In Mathematical Sciences

Information pertaining to time of offering is intended only as a guide for the student. Schedules are sometimes very tentative. For this reason very little summer session information has been included.

NOTE: P — prerequisite; C — concurrent registration; R — recommended; Ever — offered in both Fall and Spring Semesters and Summer Session; 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. For courses with no designated 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.

Computer Sciences

UNDERGRADUATE LEVEL

Lower-Division Courses

CSCI201 INTRODUCTION TO COMPUTERS FOR THE HUMANITIES (3 Cr)
P: None.
An introduction to computers intended for students in the humanities and liberal arts. FORTRAN 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.

CSCI208 THE COMPUTER IN BUSINESS (3 Cr)
P: MA111 or equivalent.
Introduction to digital computers and illustrations of their use in business: stored program concept, types of programming languages, computer experience using the FORTRAN language to solve business oriented problems.

CSCI220 PROGRAMMING I (3 Cr)
P or C: One semester of mathematics beyond MA150. Not open to students with credit in CSCI208.
An introduction to computer programming intended for students in the natural and social sciences. Basic concepts of computer organization and machine language. Programming in a high-level language (FORTRAN). Program development and debugging.

Upper-Division Courses

CSCI300 ASSEMBLY LANGUAGE PROGRAMMING (3 Cr)
P: CSCI220.
Assembly language programming, pseudo-operations, macros, and buffering. Interfacing with programs written in a higher-level language, parameter passing, and common storage. Components of digital computers. Number and character representation.

CSCI320 PROGRAMMING II (3 Cr)
P: CSCI208 or CSCI 220 or ENGR109 or equivalent.
Continuation of higher-level language (FORTRAN) programming. Program organization and data structure. User's view of operating system concepts and facilities. Program development and testing.

CSCI385 INTRODUCTION TO LOGIC
See MA385.

CSCI402 ARCHITECTURE OF COMPUTERS (3 Cr)
P: CSCI300 and CSCI320 or equivalent.
Introduction to computer hardware organization and operation. Instruction forms and execution. Addressing modes. Computer arithmetic; fixed and floating-point operations. Hardwired and microprogrammed control. Memory organization and technology. Boolean algebra and logic design.

CSCI403 SYSTEMS PROGRAMMING (3 Cr)
P: CSCI300, CSCI320 or equivalents. R: CSCI402.
Principles of software design with emphasis on language processors. Symbol tables, sorting, and searching. Assemblers: one-pass and two-pass assembly, macro expansion, object code generation. Relocatable and linking loaders. Interpreters. Introduction to compiler and operating system software.

CSCI414 NUMERICAL METHODS (3 Cr)
P: MA262 or MA361, CSCI220 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.

CSCI461 PROGRAMMING III (3 Cr)
P: CSCI300 and CSCI320 or equivalent.
Syntax and semantics of ALGOL, COBOL and PL/1. Students are expected to write, debug, and run programs in the languages discussed.

CSCI482 DISCRETE COMPUTATIONAL STRUCTURES (3 Cr)
P: MA351.
Discrete mathematical structures and their applications to computer science. Sets, relations, functions, binary operations. Groups, cosets, group homomorphisms, applications of group theory to computer design, error detection and error correction codes. Semigroups, monoids, finite-state machines, regular expressions.

CSCI484 THEORY OF COMPUTATION (3 Cr)
P: CSCI482 or MA453.
Introduction to effective computability. Informal study of effective procedures, recursive and partial recursive functions. Turing machines, Church's thesis, halting problem. Equivalence of Turing machine computability with computability by S-rudimentary predicates. Introduction to formal language theory.

CSCI490 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

CSCI501 DATA AND STORAGE STRUCTURES (3 Cr)
P: CSCI300 and CSCI320 or equivalent. R: CSCI461.
Methods of organizing and linking together information. Representation of discrete events, data files, polynomials, etc. in lists and tree structures. Searching of lists and trees. Storage allocation and reclamation. Applications to compiler and operating system design, information storage and retrieval, and simulation.

CSCI502 COMPILING AND PROGRAMMING SYSTEMS (3 Cr)
P: CSCI402, CSCI403, CSCI461 or equivalents. R: CSCI501.
Basic principles of compilers. Lexical and syntax analysis, runtime storage and register management, optimization, and I/O processing; top-down and bottom-up strategies; syntax specification schemes.

CSCI503 OPERATING SYSTEMS (3 Cr)
P: CSCI502. R: CSCI501.
Resource management, task management, and data management; multi-programming and virtual memory-based systems; control languages. 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.

CSCI512 NUMERICAL METHODS FOR ENGINEERS AND SCIENTISTS (3 Cr)
P: MA262 or MA361, CSCI220 or equivalent. Not open to students with credit in CSCI414.
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.

CSCI514 NUMERICAL ANALYSIS (3 Cr)
P: CSCI414 or CSCI512 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.

CSCI515 NUMERICAL ANALYSIS OF LINEAR SYSTEMS (3 Cr)
P: MA351 or 511, CSCI220 or equivalent.
Computational aspects of linear algebra; linear equations and matrices, direct and iterative methods; eigenvalues and eigenvectors of matrices; error analysis.

CSCI516 COMPUTATIONAL METHODS IN APPLIED MATHEMATICS
P: CSCI320 or equivalent, MA510 or consent of instructor.
A study of techniques such as direct integration, shooting, finite difference, finite element, method of weighted residuals, method of characteristics and others for solving problems in fluid mechanics, solid mechanics, dynamics and other fields of applied mathematics.

CSCI520 LINEAR SYSTEMS AND MATHEMATICAL PROGRAMMING (3 Cr)
P: MA351 or MA511.
Systems of linear equations, Gauss-Jordan reduction and echelon form, systems of linear inequalities, convex sets, linear programming, simplex method, duality, parametric programming, integer programming, networks.

CSCI542 DESIGN OF DATA PROCESSING SYSTEMS (3 Cr)
P: CSCI402 or consent of the instructor.
Structuring of data processing systems and computer organization as it affects those systems. File organization, file maintenance routines; sorting, retrieval algorithms. Evaluation and analysis of batch processing, real time, and time share systems and the related problems of feasibility and implementation. The total systems concept in the design of integrated information systems.

CSCI543 DISCRETE SYSTEM SIMULATION (3 Cr)
P: MA M119, CSCI208 or 220, STAT311 or 511, or consent of the instructor. R: CSCI F490.
Simulation and modeling. 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.

CSCI582 AUTOMATA, FORMAL LANGUAGES, AND COMPUTABILITY I (3 Cr)
P: CSCI484. By arrangement.
Formal grammars, with particular emphasis on context-free grammars. Computational complexity, LR(k) grammars, unsolvability questions.

CSCI585 MATHEMATICAL LOGIC I
(See MA585)

CSCI590 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. Basic concepts of computer organization and machine language. Programming in a high-level language (FORTRAN). Applications including computer-aided instruction, information storage and retrieval, and computer science teaching.

GRADUATE LEVEL

CSCI614 NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (3 Cr)
P: CSCI514 or consent of the 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.

CSCI615 NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (3 Cr)
P: CSCI514, MA523. 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.

CSCI660 DESIGN OF TRANSLATING SYSTEMS (3 Cr)
P: CSCI502. R: CSCI501.
Advanced topics in language processing, continuing the coverage of compilers in CSCI502. 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.

Mathematics

SPECIAL SERVICE COURSES

MA001 HIGH SCHOOL ALGEBRA (0 Cr one unit for admission)
P: Eighth Grade Math.
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.

MA002 PLANE GEOMETRY (0 Cr)
P: MA001 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.

UNDERGRADUATE LEVEL
Lower-Division Courses

MA111 ALGEBRA (3 Cr)
P: MA001 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.

MA112 TRIGONOMETRY (3 Cr)
P: MA111 or 3 semesters of high school algebra. Not open to students with credit in MA151 or 153.
Real numbers, factoring, functions, exponents, trigonometric functions, tables, identities, complex numbers.

MA M118 FINITE MATHEMATICS I (3 Cr)
P: MA111 or equivalent. Equiv. PU MA213.
Set theory, vectors, matrices, permutations, combinations, simple probability, conditional probability, Markov chains, linear programming, graphical and simplex methods, duality theorem.

MA M119 BRIEF SURVEY OF CALCULUS I (3 Cr)
P: MA111 or two years of high school algebra.
Sets, limits, derivatives and applications, integrals and applications, functions of several variables.

MA123 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.

MA130 MATHEMATICS FOR ELEMENTARY TEACHERS I (3 Cr)
P: MA001 or one year of high school algebra, MA002 or one year of high school geometry. Equiv. IU MA T101. The sequence MA130, 131, 132 fulfills the mathematics requirements for elementary education majors.
Numeration systems, mathematical reasoning, natural numbers, whole numbers, properties, algorithms, sets, sentences, logic.

MA131 MATHEMATICS FOR ELEMENTARY TEACHERS II (3 Cr)
P: MA130. Equiv. IU MA T102.
Number systems: numbers of arithmetic, integers, rationals, reals, mathematical systems, decimal and fractional notations; probability, simple and compound events, algebra review.

MA132 MATHEMATICS FOR ELEMENTARY TEACHERS III (3 Cr)
P: MA131. Equiv. IU MA T103.
Metric and nonmetric properties of geometric figures, measurement; introduction to the foundations of euclidean geometry; coordinate geometry.

MA147 ALGEBRA AND TRIGONOMETRY FOR TECHNOLOGY I (3 Cr)
P: 3 semesters of high school algebra.
MA147-148 is a two semester version of MA150. MA147 covers Algebra.

MA148 ALGEBRA AND TRIGONOMETRY FOR TECHNOLOGY II (3 Cr)
P: 4 semesters of high school algebra. Equiv. IU MA M017.
MA147-148 is a two semester version of MA150. MA148 covers Trigonometry.

MA150 MATHEMATICS FOR TECHNOLOGY (5 Cr)
P: 3 semesters of high school algebra. Equiv. IU MA M015.
MA147-148 is a two semester version of MA150. Fundamental laws of algebra, functions and graphs, trigonometric functions, linear equations, factoring, exponents, vectors, complex numbers, logarithms, ratio, proportion, variation.

MA163 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 MA M215.
The Cartesian plane, functions, limits, differentiation and applications, mean value theorem, definite integral and applications.

MA164 INTEGRATED CALCULUS AND ANALYTIC GEOMETRY II (5 Cr)
P: MA163. Equiv. IU MA M216.
Transcendental functions, methods of integration, conics, polar coordinates, parametric equations, vectors, improper integrals.

MA214 FINITE MATHEMATICS II (3 Cr)
P: MA M118.
Vectors, matrices, systems of linear equations, linear programming, game theory.

MA221 CALCULUS FOR TECHNOLOGY I (3 Cr)
P: MA150 or equivalent.
Analytic geometry, the derivative and applications, the integral and applications.

MA222 CALCULUS FOR TECHNOLOGY II (3 Cr)
P: MA221.
Differentiation of transcendental functions, methods of integration, power series, Fourier series, differential equations.

MA261 MULTIVARIATE CALCULUS (4 Cr)
P: MA164. Equiv. IU MA M311.
Partial differentiation, multiple integration, vector functions and vector analysis, infinite series.

MA262 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS (4 Cr)
P: MA261.
Vector spaces, bases, orthogonality, determinants, differential equations, first order equations, applications, second order equations.

Upper-Division Courses

MA300 FOUNDATION OF THE NUMBER SYSTEMS (3 Cr)
P: MA163. Equiv. IU MA M391.
Logic, sets, functions, relations, groups, natural numbers, rational numbers,

real numbers. The notion of proof is emphasized. Suggested for prospective high school teachers.

MA351 ELEMENTARY LINEAR ALGEBRA (3 Cr)
P: MA261.
Vector spaces, bases, linear transformations, scalar products, triangulation, spectral theorem.

MA361 ADVANCED CALCULUS AND DIFFERENTIAL EQUATIONS (3 Cr)
P: MA261.
Uniform convergence, Fourier series, linear differential equations, existence and uniqueness of solutions of first order equations.

MA362 TOPICS IN ADVANCED CALCULUS (3 Cr)
P: MA261.
Multivariate calculus, partial differentiation, implicit function theorems, line and surface integrals, vector fields, theorems of Gauss, Green, Stokes.

MA385 INTRODUCTION TO LOGIC
P: MA261.
Propositional calculus and predicate calculus with applications to mathematical proofs, valid arguments, switching theory, and formal languages.

MA441 FOUNDATIONS OF ANALYSIS (3 Cr)
P: MA261.
Topology of Cartesian spaces, sequences, continuity, differentiation, Riemann-Stieltjes integral.

MA442 MULTIVARIATE ANALYSIS (3 Cr)
P: MA351 and 441.
Euclidean spaces, differentiation, vector valued functions, measure and integration, exterior algebra, differential calculus, integration on manifolds.

MA453 ALGEBRA I (3 Cr)
P: MA351 or consent of the instructor.
Fundamental properties of groups, rings, and fields with emphasis on structure, morphisms, quotients, fundamental homomorphism theorems.

MA454 ALGEBRA II (3 Cr)
P: MA453.
Rings of polynomials, extension fields, automorphisms of fields, finite fields, Galois theory.

MA471 INTRODUCTION TO TOPOLOGY (3 Cr)
P: MA261.
Topological spaces, metric spaces, sequences, completeness, connectedness, compactness. Emphasis on the topological properties of the real line.

MA490 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.

MA S490 SENIOR SEMINAR (3 Cr)

DUAL LEVEL COURSES
Undergraduate — Graduate

MA510 ADVANCED CALCULUS (3 Cr)
P: MA262.
Functions of several variables, partial derivatives, differentials, chain rules, extreme, gradient fields, divergence, curl, Laplacians, multiple integration, line integrals, Green's theorem, surface integrals, divergence theorem, Stoke's theorem, change of variable.

MA511 LINEAR ANALYSIS (3 Cr)
P or C: MA510.
Matrices, rank and inverse of a matrix, linear programming, simplex method, eigenvectors, unitary and similarity transformations on matrices.

MA 517 MATHEMATICAL MODELING (3 Cr)
P: MA262, MA351, MA511, MA551, or MA554.
Linear programming; game theory, mathematical modeling of problems in economics, politics, psychology, sociology.

MA519 INTRODUCTION TO PROBABILITY (3 Cr)
P: MA362 or 510.
Algebra of sets, sample spaces, combinatorial problems, conditional probability, independence, random variables, distribution functions, characteristic functions, special distributions, limit theorems.

MA520 BOUNDARY VALUE PROBLEMS OF DIFFERENTIAL EQUATIONS (3 Cr)
P: MA261, 361. Recommended P or C: MA362 or 510.
Sturm-Liouville theory; singular boundary conditions, orthogonal expansions, separation of variables in partial differential equations; spherical harmonics.

MA522 QUALITATIVE THEORY OF DIFFERENTIAL EQUATIONS (3 Cr)
P: MA262 or both 351, 361.
Laplace transforms, systems of linear and nonlinear ordinary differential equations, brief introduction to stability theory, approximation methods, other topics.

MA523 INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS (3 Cr)
P: MA261 and 361. Recommended P or C: MA362 or 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.

MA525 INTRODUCTION TO COMPLEX ANALYSIS (3 Cr)
P: MA510.
Complex numbers and complex-valued functions: differentiation of complex functions; power series, uniform convergence; integration, contour integrals; elementary conformal mapping.

MA529 OPERATIONAL CALCULUS (3 Cr)
P: MA525.
Laplace and Fourier transforms; Heaviside-Mikusinski calculus; generalized functions; asymptotic evaluation of Fourier integrals.

MA532 ELEMENTS OF STOCHASTIC PROCESSES (3 Cr)
P: MA519, 525.
A basic course in stochastic processes including normal processes, covariance processes, Poisson processes, renewal processes, and Markov processes.

MA534 ADVANCED ANALSIS FOR ENGINEERS AND SCIENTISTS (3 Cr)
P: MA510 or consent of instructor.
Metric spaces, convergence and uniform convergence, Banach and Hilbert spaces.

MA540 ANALYSIS I (3 Cr)
P: MA361.
Continuity, differentiation, functions of bounded variation, Riemann-Stieltjes integral.

MA541 ANALYSIS II (3 Cr)
P: MA540.
Multiple integrals, line integrals, infinite series, sequences of functions, Fourier series and integrals.

MA544 REAL ANALYSIS AND MEASURE THEORY (4 Cr)
P: MA441 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.

MA546 INTRODUCTION TO FUNCTIONAL ANALYSIS (3 Cr)
P: MA545. By arrangement.
Banach spaces, Hahn-Banach theorem, uniform boundedness principle, closed graph theorem, open mapping theorem, Hilbert spaces.

MA547 ANALYSIS FOR TEACHERS I (3 Cr)
P: MA261.
Set theory, logic, relations, functions, Cauchy's inequality, metric spaces, neighborhoods, Cauchy sequences.

MA548 ANALYSIS FOR TEACHERS II (3 Cr)
P: MA547.
Functions on a metric space, continuity, uniform continuity, derivative, chain rule, Riemann integral, fundamental theorem of calculus, double integrals.

MA550 ALGEBRA FOR TEACHERS I (3 Cr)
P: MA351.
Definitions and elementary properties of groups, rings, integral domains, fields. Intended for secondary school teachers.

MA551 ALGEBRA FOR TEACHERS II (3 Cr)
P: MA550.
Polynomial rings, fields, vector spaces, matrices.

MA553 INTRODUCTION TO ABSTRACT ALGEBRA (3 Cr)
P: MA453.
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.

MA554 LINEAR ALGEBRA (3 Cr)
P: MA453.
Vector spaces, matrices and linear transformations, eigenvalues, similarity, duality, bilinear forms, quadratic forms, inner products, orthogonal bases, adjoint, applications.

MA556 INTRODUCTION TO THE THEORY OF NUMBERS (3 Cr)
P: MA261.
Divisibility, congruences, quadratic residues, Diophantine equations, the sequence of primes.

MA561 PROJECTIVE GEOMETRY (3 Cr)
P: MA261. Summer.
Projective invariants, Desargues' theorem, cross-ratio, axiomatic foundation, duality, consistency, independence, coordinates, conics.

MA562 INTRODUCTION TO DIFFERENTIAL GEOMETRY AND TOPOLOGY (3 Cr)
P: MA351.
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.

MA563 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.

MA571 ELEMENTARY TOPOLOGY (3 Cr)
P: MA441.
Topological spaces, metric spaces, continuity, compactness, connectedness, separation axioms, nets, function spaces.

MA581 INTRODUCTION TO LOGIC FOR TEACHERS (3 Cr)
P: MA351.
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.

MA583 HISTORY OF ELEMENTARY MATHEMATICS (3 Cr)
P: MA261.
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.

MA585 MATHEMATICAL LOGIC I (3 Cr)
P: MA351.
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.

MA587 GENERAL SET THEORY (3 Cr)
P: MA351.
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.

MA592 MATHEMATICAL MODELING OF TRANSPORT PROCESS IN THE LOWER ATMOSPHERE (3 Cr)
P: MA361 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.

MA598 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.

MA A598 ARITHMETIC FOR ELEMENTARY SCHOOL TEACHERS (3 Cr)
Set theory, systems of numeration, operations on whole numbers, mathematical sentences, integers, rational numbers, real numbers.

MA B598 GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS (3 Cr)
Rational numbers, real numbers, measurement, geometry.

MA C598 MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS (3 Cr)
Additional topics not covered in A598 or B598.

GRADUATE LEVEL

MA611 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.

MA624 PERTURBATION AND ASYMPTOTIC ANALYSIS (3 Cr)
P: MA520, 525 and some background in partial differential equations.
Matched asymptotic expansions, inner and other expansion, strained coordinates and multiple scales, turning point problems.

MA626 MATHEMATICAL FORMULATION OF PHYSICAL PROBLEMS I (3 Cr)
P: Graduate standing and consent of instructor.
Nature of applied mathematics, deterministic systems and ordinary differential equations, random processes and partial differential equations, Fourier analysis, dimensional analysis and scaling.

MA627 MATHEMATICAL FORMULATION OF PHYSICAL PROBLEMS II (3 Cr)
P: MA626.
Theories of continuous fields, continuous medium, field equations of continuum mechanics, inviscid fluid flow, viscous flow, turbulence.

Statistics

UNDERGRADUATE LEVEL
Upper-Division Courses

STAT301 ELEMENTARY STATISTICAL METHODS I (3 Cr)
P: College algebra. Not open to students in the Division of Mathematical Science and Schools of Engineering.
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.

STAT302 ELEMENTARY STATISTICAL METHODS II (3 Cr)
P: STAT301 or equivalent. Continuation of STAT301.
Multiple regression and analysis of variance, with emphasis on statistical inference and applications to various fields.

STAT311 INTRODUCTORY PROBABILITY (3 Cr)
P: MA261 or equivalent.
Formulation of probability problems, discrete and continuous random variables, expectation, standard distributions, applications to statistical problems and problems in the physical sciences.

STAT490 TOPICS IN STATISTICS FOR UNDERGRADUATES (1-5 Cr)
Supervised reading and reports in various fields.

DUAL LEVEL
Undergraduate-Graduate

STAT511 STATISTICAL METHODS I (3 Cr)
P: MA163.
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.

STAT512 STATISTICAL METHODS II (3 Cr)
P: STAT511.
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.

STAT513 APPLICATIONS OF STATISTICS IN INDUSTRY (3 Cr)
P: STAT511.
Control charts and acceptance sampling, continuous sampling plans, sequential analysis, statistics of combinations, and some non-parametric methods.

STAT514 DESIGN OF EXPERIMENTS (3 Cr)
P: STAT512.
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.

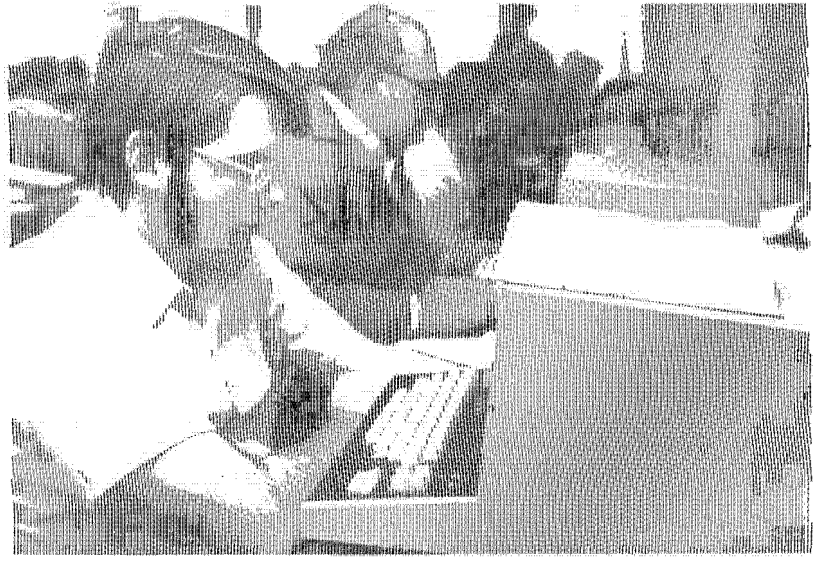
STAT516 BASIC PROBABILITY AND APPLICATIONS (3 Cr)
P: MA164 or equivalent. MA261 desirable.
A first course in probability intended to serve as a foundatin for statistics and other applications. Intuitive background; sample spaces and random variables; joint, conditional, and marginal distributions; special distributions of statistical importance; moments and moment generating functions; statement and application of limit theorems; Markov chains.

STAT517 STATISTICAL INFERENCE (3 Cr)
P: STAT516 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.

STAT519 INTRODUCTION TO PROBABILITY
See MA519.

STAT528 FOUNDATIONS AND METHODS OF STATISTICS I (3 Cr)
P: MA519.
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.

STAT532 ELEMENTS OF STOCHASTIC PROCESSES
See MA532.



Department of Physics

PROFESSORS: Flake, Kaplan, Meiere (Chairman), Vasavada; ASSOCIATE PROFESSORS: Novak, Seubert, Yen; ASSISTANT PROFESSORS: Kleinhans, Morrison, Paik, Thatcher.

DEPARTMENTAL COUNSELORS: Professors Kleinhans, Meiere, Morrison, Seubert, Thatcher.

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 welcome and encouraged.

The department offers graduate courses but no graduate degrees. Members of the department participate in guiding students pursuing a master 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 on pages 21-22. The Department of Physics has the following additional requirements.:

Area II: Foreign Language
A two course sequence which includes a significant cultural component. With the approval of the Physics Department two Humanities courses with a significant component of foreign culture may be substituted. This is in addition to AREA IIIA requirements.

Area IIIC: Physical and Biological Sciences
Courses must include Chemistry C105 and C106 with lab or their approved equivalent. Certain Engineering courses or Computer courses may be substituted for the other Science courses with the approval of the Physics Department.

Area IIID: Mathematical Sciences
24 hours. Courses must include Mathematics MA 163, MA 164, MA 261 and MA 262 or equivalent plus six more hours approved by the Physics Department.

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 of the courses 520, 545, 556, 570, or 590.

SAMPLE PLANS OF STUDY

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.

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

BACHELOR OF SCIENCE IN PHYSICS

FRESHMAN	1	MA 263 (5) Calculus	CHM C105 (5) Chemistry	ENG W117 (3) English Composition	Elective	
	2	MA 164 (5) Calculus	CHM C106 (5) Chemistry	PHYS 152 (4) Mechanics	Elective	
SOPHOMORE	3	MA 261 (4) Calculus	PHYS 251 (5) Heat, Electricity and Optics	Language	Elective	
	4	MA 262 (4) Linear Algebra and Diff. Equations	PHYS 342 (3) Modern Physics	PHYS 342L (1) Lab	Language	Elective
JUNIOR	5	PHYS 310 (4) Intermediate Mechanics	PHYS 322 (3) Oscillations and Waves	PHYS 350 (2) Lab I	Electives	
	6	PHYS 330 (3) Electricity and Magnetism	PHYS 351 (2) Lab II	Electives		
SENIOR	7	PHYS 550 (3) Quantum Mechanics	PHYS 515 (3) Thermodynamics	PHYS 590 (1-3) Research	Electives	
	8	PHYS 545 (3) Solid State and/or	PHYS 556 (3) Nuclear Physics	Electives		

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 advisor 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 non-traditional course).

218-219: Liberal Arts and Technology (designed for pre-professional or technology students and others requiring a non-calculus sequence).

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

The Department of Physics also participates in offering the interdisciplinary course SCI 201, Citizen and Science. Please refer to the interdisciplinary Course listing SCI 201 for the course description.

COURSES IN PHYSICS

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 non-mathematical introduction to physical concepts and methods by means of examples from daily life and current technological applications.

218 GENERAL PHYSICS (4 Cr)
P: MA 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: MA 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: MA 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 hydromechanics 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: MA 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)

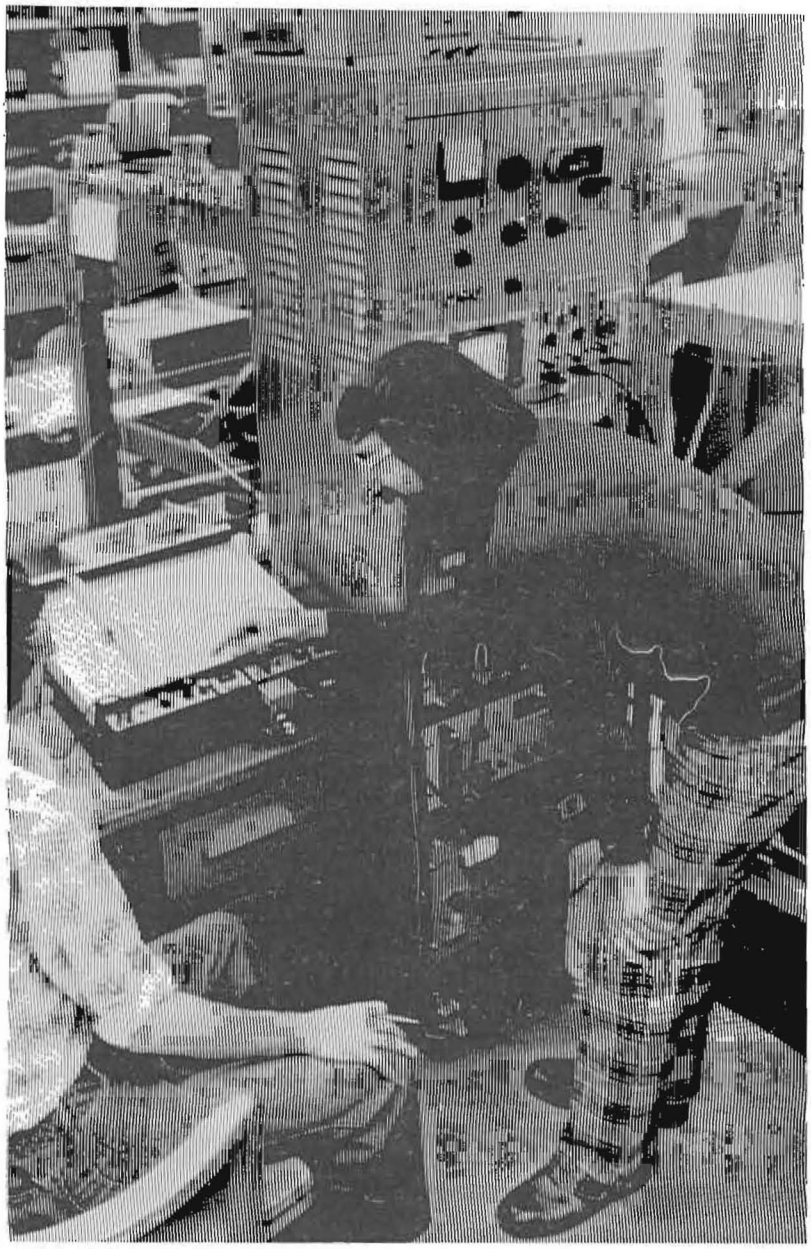
ASTRONOMY

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.
Celestial sphere and constellations, measurement of time, astronomical instruments, earth as a planet, moon, eclipses, planets and their satellites, comets, meteors, theories of origin of solar system.

A105 STELLAR ASTRONOMY (3 Cr)
P: None. Spring.

The sun as a star, physical properties of stars, principles of spectroscopy as applied to astronomy, double stars, variable stars, star clusters, gaseous nebulae, stellar motions and distributions, Milky Way system, external galaxies, expanding universe, cosmic time scale.



Department of Psychology

PROFESSORS: Hanford, Landis (Chairman), Laube (Adjunct), Levitt (Adjunct), Long, Morris, Neel; ASSOCIATE PROFESSORS: Davis, Evenbeck (Assistant Chairman), Fleener, Fortier, Ware; ASSISTANT PROFESSORS: Bringle, Goldberg, Hall, Hazer, Kremer, Lauer, Rytting, Sha'ked, Svanum, Tzeng; LECTURER: Flynn.

DEPARTMENTAL COUNSELORS: PROFESSORS Evenbeck and Long
GRADUATE COUNSELORS:
APPLIED SOCIAL CONCENTRATION: PROFESSOR Bringle
REHABILITATION CONCENTRATION: PROFESSOR Davis;
APPLIED EXPERIMENTAL CONCENTRATION: PROFESSOR Long;
INDUSTRIAL CONCENTRATION: PROFESSOR Neel.

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 often is conducted with 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, 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, and Master of Science degrees. Besides this professional and preprofessional training, the department serves the needs of students in many other fields in providing an introduction to psychology.

The following degrees in psychology are offered. The choice of a particular program should be made in consultation with one of the academic counselors. The department strongly recommends that students include a practicum (B362, B372, or B382) and independent research experience (B492) in their curricula. Those planning graduate work in psychology should include B305. Those planning graduate work in clinical psychology should also include B360, B380, B424, and B307. Those planning careers in personnel work should also take B424 and B307 in addition to B370 and B378.

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 each possible plan of study is given below; variations from these examples should be made in consultation with a departmental counselor.

BACHELOR OF ARTS

The degree of requirements for a Bachelor of Arts degree are listed on pages 20-21 of this bulletin.

Area I: See School of Science requirements.

Area II: Languages: There is no requirement for a foreign language. However, those planning to continue with graduate studies, especially toward the doctorate, normally are urged to take a modern foreign language through at least the first-year level.

Area III: See School of Science requirements.

Area IV: Psychology B104, Psychology B105, 9 hours of Methodology courses (courses above 100 level ending in odd numbers), and 9 hours of Content courses (courses above 100 level ending in even numbers, except courses ending with the digit 2). TOTAL of 24 hours in Psychology.

BACHELOR OF SCIENCE

The degree requirements for a Bachelor of Science degree are listed on pages 18 and 19 of this bulletin.

Area I: See School of Science requirements.

Area II: There is no requirement for a foreign language. However, those planning to continue with graduate studies, especially toward the doctorate, normally are urged to take a modern foreign language through at least the first-year level.

Area III: See School of Science requirements.

Area IV: Psychology B104, Psychology B105, 9 hours of Methodology courses (courses above 100 level ending in odd numbers), and 9 hours of Content courses (courses above 100 level ending in even numbers, except courses ending with the digit 2). TOTAL of 24 hours in Psychology.

PSYCHOLOGY PLANS OF STUDY
BACHELOR OF ARTS SAMPLE PROGRAM

FRESHMAN	1	PSY B104 (3)	ENG W117 (3)	SPCH C110 (3)	AREA IIIA (3)	Elective (3)
	2	PSY B105 (3)	AREA IIIA (3)	AREA IIIB (3)	Elective (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)	Elective (4-6)	
SENIOR	7	PSY Content (3)	PSY Elective (3)	Elective (11)		
	8	PSY Elective (3)	Elective (12-14)			

PSYCHOLOGY PLANS OF STUDY
BACHELOR OF SCIENCE SAMPLE PROGRAM

FRESHMAN	1	PSY B104 (3)	ENG W117 (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)	Elective (7-9)		
JUNIOR	6	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)	Elective (4-6)	
SENIOR	7	PSY Content (3)	PSY Elective (3)	Elective (11)		
	8	PSY Elective (3)	Elective (14)			

MASTER OF SCIENCE

The Department of Psychology provides course work leading to the degree Master of Science. Depending on the area of concentration selected by the student, the thesis or nonthesis option may be pursued. Areas of concentration are provided in Applied Social Psychology, Applied Experimental Psychology, Industrial Psychology, and Rehabilitation Psychology.

Since only one degree with the options of thesis and nonthesis is offered, admission requirements and other such criteria are identical regardless of the area of concentration elected by the student. Listed below are the requirements common to all areas of concentration followed by a brief description of each area of concentration.

Admission Requirements

All applicants must have a Bachelor's degree from an accredited institution, must meet minimal grade point average criteria, and must achieve minimal scores on the Aptitude Test section of the Graduate Record Examination for admission as regular graduate students. In addition, students must complete Psychology B305, 500, or equivalent and Psychology B307, 505, or equivalent. Students admitted without these courses will be required to complete them, and they will not fulfill credit toward the degree.

An undergraduate major in psychology is not required. All interested individuals are invited to apply regardless of undergraduate major. Applicants not meeting regular admission requirements and/or standards may be admitted on a probationary basis. Prospective students should contact the Department of Psychology for the appropriate forms needed in application.

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. Only nine hours of courses completed as a temporary student may be used in completing the requirements of the degree.

Financial Assistance

Positions as Associate Instructors are available to selected students. In addition, students may apply for graduate stipends as Research Assistants.

Degree Requirements

Two degree options are offered within the department: a thesis option and a non-thesis option. The thesis option requires that the student complete 27 hours in addition to the thesis; the non-thesis option requires that the student complete 36 hours. The thesis option requires a student to make two presentations to a faculty committee: a presentation of a research proposal, and then a presentation of the final report of the completed research project. The non-thesis option requires a student to make one presentation to a faculty committee: a presentation of a research proposal (which may include a pilot project). Core courses for both degree options include the following: Psychology 540, History of Psychology; Psychology 600, Statistical Inference; and Psychology 601, Correlation and Experimental Design. Other requirements are listed under the areas of concentration.

It should be noted that the plans of study given for the areas of concentration are for full-time students completing requirements in two years. Generally, students begin the work toward a degree only in the fall semester. Most courses are scheduled in the evening so that part-time students can expect to complete requirements in two to three years depending upon the course load each semester.

APPLIED SOCIAL AREA OF CONCENTRATION

The Applied Social area of concentration is designed to prepare students to conduct program evaluation and social research in natural settings. With an increase in accountability in most areas of endeavor, the training of persons qualified to conduct research in the field has become increasingly important. The area of concentration includes a solid grounding in methodology with a broad foundation in theoretical issues. Both thesis and non-thesis options are available within this area. Besides the core courses, the following are required:

Thesis Option

698 — Thesis
640 — Survey of Social-Personality Psychology I
650 — Developmental Psychology
646 — Special Topics in Social-Personality Psychology
643 — Field Methods and Experimentation
S679 — Practicum in Applied Social Psychology
S697 — Internship in Applied Social Psychology

ONE OF THE FOLLOWING:
572 — Organization Psychology
557 — Psychology of the Urban Environment
605 — Applied Multivariate Analysis
608 — Advanced Technology of Tests and Measurements
642 — Cross-cultural Social Psychology
641 — Survey of Social-Personality Psychology II

Non-Thesis Option

590 — Individual Research Problems
640 — Survey of Social-Personality Psychology I
650 — Developmental Psychology
646 — Special Topics in Social-Personality Psychology
643 — Field Methods and Experimentation
S679 — Practicum in Applied Social Psychology
S697 — Internship in Applied Social Psychology

TWO OF THE FOLLOWING:
572 — Organization Psychology
557 — Psychology of the Urban Environment
605 — Applied Multivariate Analysis
608 — Advanced Technology of Tests and Measurements
642 — Cross-cultural Social Psychology
641 — Survey of Social-Personality Psychology II

ONE ELECTIVE WITH ADVISOR'S APPROVAL

APPLIED EXPERIMENTAL AREA OF CONCENTRATION

The Applied Experimental area of concentration provides training in the experimental areas of the discipline. Though course work lending itself to application is included, the primary purpose of this area is to prepare students with a firm background in psychology suited for later study at the doctoral level. Only a thesis option is provided within this area of concentration. Besides the core courses, the following are required:

590 — Individual Research Problems
633 — Seminar in Experimental Psychology
698 — Thesis

ONE OF THE FOLLOWING:
615 — Introduction of Psychobiology
624 — Human Learning and Memory
628 — Perceptual Processes

ONE OF THE FOLLOWING:
605 — Applied Multivariate Analysis
606 — Special Topics in Quantitative Psychology
607 — Scaling and Measurement
608 — Advanced Technology of Tests and Measurements

611 — Factor Analysis
612 — Advanced Test Theory

ONE OF THE FOLLOWING:
577 — Human Factors in Engineering
594 — Special Topics in Ethology
640 — Survey of Social-Personality Psychology I
650 — Developmental Psychology

ONE APPROVED ELECTIVE.

INDUSTRIAL AREA OF CONCENTRATION

The purposes of the Industrial area of concentration are to prepare individuals for employment 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.

Both thesis and non-thesis options are offered with requirements beyond the core courses listed below:

Thesis Option

570 — Industrial Psychology
572 — Organization Psychology
608 — Advanced Technology of Tests and Measurements
680 — Analysis of Published Research in Industrial Psychology
681 — Seminar in Industrial Psychology
698 — Thesis

ONE OF THE FOLLOWING:

605 — Applied Multivariate Analysis
I679 — Practicum in Industrial
683 — Seminar in Industrial-Social Psychology

Non-Thesis Option

570 — Industrial Psychology
572 — Organization Psychology
608 — Advanced Technology of Tests and Measurements
680 — Analysis of Published Research in Industrial Psychology
681 — Seminar in Industrial Psychology

TWO OF THE FOLLOWING:

605 — Applied Multivariate Analysis
I679 — Practicum in Industrial
683 — Seminar in Industrial-Social Psychology

TWO APPROVED ELECTIVES

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 service throughout the rehabilitation process to the end that the disabled person is restored to the fullest physical, mental, social, vocational, and economic usefulness possible.

Both thesis and non-thesis options are offered within the Rehabilitation area of concentration. Listed below are required courses in addition to the core courses:

Thesis Option

549 — Introduction to Vocational Rehabilitation
552 — Psychological Counseling: Theory and Practice in Rehabilitation
554 — Psychosocial Aspects of Disability
555 — Medical Aspects of Disability
690 — Career Development, Selection, and Placement in Rehabilitation
R679 — Practicum in Rehabilitation
R697 — Internship in Rehabilitation
698 — Thesis

Non-Thesis Option

549 — Introduction to Vocational Rehabilitation
552 — Psychological Counseling: Theory and Practice in Rehabilitation
554 — Psychosocial Aspects of Disability
555 — Medical Aspects of Disability
690 — Career Development, Selection, and Placement in Rehabilitation
R679 — Practicum in Rehabilitation
R697 — Internship in Rehabilitation
691 — Seminar in Rehabilitation Counseling

TWO OF THE FOLLOWING:
547 — Dynamic Modeling of Social and Human Service Systems
546 — Planning of Rehabilitation Service Systems
565 — Interpersonal Relations
578 — Occupational Analysis
646 — Special Topics in Social-Personality Psychology
688 — Human Sexuality in the Rehabilitation Process

Applied Social Area of Concentration
Sample Program, Thesis Option

FIRST YEAR	1	PSY 600	PSY 540	PSY 640	PSY 650
	2	PSY 601	PSY 572, 557, 605, 608, 641, or 642	PSY 643	PSY S679
SECOND YEAR	3	PSY 646	PSY S697		PSY 698
	4	PSY S697	PSY S697		

Applied Social Area of Concentration
Sample Program, Non-Thesis Option

FIRST YEAR	1	PSY 600	PSY 540	PSY 640	PSY 650
	2	PSY 601	PSY 572, 557, 605, 608, 641, or 642	PSY 643	PSY S679
SECOND YEAR	3	PSY 646	PSY S697	PSY 572, 557, 605, 608, 641, or 642	
	4	PSY 590*		Approved Elective	PSY S697

Applied Experimental Area of Concentration
Sample Program, Thesis Option Only

FIRST YEAR	1	PSY 540	PSY 600	PSY 633	
	2	PSY 601	PSY 624, 628, or 615	PSY 590	
SECOND YEAR	3	PSY 698	PSY 605, 606, 607, 608, 611, or 612	PSY 577, 594, 640, or 650.	
	4	PSY 698	Approved Elective		

Industrial Area of Concentration
Sample Program, Thesis Option

FIRST YEAR	1	PSY 540	PSY 570	PSY 600	
	2	PSY 572	PSY 601	PSY 608	
SECOND YEAR	3	PSY 605 or PSY 1679 or PSY 683	PSY 680	PSY 698	
	4	PSY 681	PSY 698		

Industrial Area of Concentration
Sample Program, Non-Thesis Option

FIRST YEAR	1	PSY 540	PSY 570	PSY 600	
	2	PSY 572	PSY 601	PSY 608	
SECOND YEAR	3	2 from: PSY 605, 1679, 683	PSY 680		
	4	PSY 681	Approved Elective	Approved Elective	

Rehabilitation Area of Concentration
Sample Program, Thesis Option*

FIRST YEAR	1	PSY 549	PSY 540	PSY 600	
	2	PSY 601	PSY 552	PSY 554	
SECOND YEAR	3	PSY 555	PSY 690	PSY R679	
	4	PSY 698	PSY R697		

*The courses should be taken sequentially, beginning with PSY 549, as listed by semester.

Rehabilitation Area of Concentration
Sample Program, Non-Thesis Option*

FIRST YEAR	1	PSY 549	PSY 540	PSY 600	
	2	PSY 601	PSY 552	PSY 554	
SECOND YEAR	3	PSY 555	PSY 690	PSY R679	
	4	2 from: PSY 547, 546, 688, 565, 578, 646	PSY 691	PSY R697	

*The courses should be taken sequentially, beginning with PSY 549, as listed by semester.

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 in one or both of the Summer Sessions. 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, psycho-physiology, 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.

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.
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 or equivalent. 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. Spring.
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 and consent of Psychology Department. 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 P326 and PU 311. 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 ADOLESCENCE (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.

B370 SOCIAL (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 B270 or equivalent. Fall, Spring.
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. Spring.
An intensive survey of research and theory on the behavior of small groups and the research methods by which groups are studied.

B376 PSYCHOLOGY OF WOMEN (3 Cr)
P: 3 hours of psychology. Fall, Spring.
A survey of topics in psychology as related to the biological, social and psychological development of women in modern society.

B378 INTRODUCTION TO INDUSTRIAL PSYCHOLOGY (3 Cr)
P: 3 hours of psychology. Equiv. to IU P233. Fall.
Applications of psychological principles and research methods to personnel and industrial problems includng selection, performance evaluation, motivation, morale, supervision, and union-management relations.

B380 ABNORMAL (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 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.

B423 LABORATORY IN PHYSIOLOGICAL PSYCHOLOGY (3 Cr)
P: PSY B211 and PSY B320. Equiv. to IU P426. Fall, 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, Spring.
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. Fall, Spring.
Demonstrations and experiments in personality research.

B427 ADVANCED LABORATORY IN PHYSIOLOGICAL PSYCHOLOGY (3 Cr)
P: B423. Fall, 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)
P: Consent of instructor.
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, Spring.
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. Fall, 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. Spring.
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 and one of the following as P or C: PSY B362, B382 (with major focus upon children), B461, B462, or permission of instructor.
Integration of practical experience with relevant psychological literature.

B471 LABORATORY IN SOCIAL (3 Cr)
P: PSY B211 and PSY B305 and P or C: PSY B370. Equiv. to IU P421 and PU 346. Fall, 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 open to Seniors also)

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 an 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.

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.

547 DYNAMIC MODELING OF SOCIAL AND HUMAN SERVICE SYSTEMS (3 Cr)

P: Graduate standing and permission of instructor.

This course is an introduction to Systems Dynamics as an approach to the analysis and dynamic modeling of complex, information-feedback social and human service systems. Systems to be studied include urban, health, rehabilitation, education, and mental health application.

546 PLANNING OF REHABILITATION SERVICE SYSTEMS (3 Cr)

P: Graduate standing or consent of instructor.

Coverage of principles of planning and implementive change agentry, as they apply to the planning of comprehensive rehabilitation service systems (residential, vocational, family supportive). Major illustrations are drawn from current experiences in fields of mental retardation; aging; and mental health.

549 INTRODUCTION TO VOCATIONAL REHABILITATION (3 Cr)

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.

552 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.

553 INTRODUCTION TO COMMUNITY RESOURCES FOR VOCATIONAL REHABILITATION (3 Cr)

P: Consent of instructor.

Survey of rehabilitation-related agencies and services in Indiana and the issues involved in their utilization. Includes site visits.

554 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.

555 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.

557 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.

560 HUMANISTIC PSYCHOLOGY (3 Cr)
P: 12 hours of Psychology and consent of instructor.
A comprehensive survey of the field of humanistic psychology. The course will explore human experience as a focal point in the study of psychology.

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)
Fall and Spring.
Survey of the applications of psychological principles and of research methodology to the various human problems in 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.

571 TRANSACTIONAL ANALYSIS (3 Cr)
P: 12 hours of psychology and consent of instructor.
Basic course in Transactional Analysis. Emphasis is given to concept and principles of Transactional Analysis with exploration of their use in counseling, education, and business.

572 ORGANIZATION 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: PSY570.
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 (1-3 Cr)
P: 12 hours of psychology and the consent of the instructor. Every.
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: PSY594 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.

600 STATISTICAL INFERENCE (3 Cr)
P: PSY500 or equivalent.
Emphasis is given to principles underlying both parametric and nonparametric inference.

601 CORRELATION AND EXPERIMENTAL DESIGN (3 Cr)
P: PSY600.
Continuation of PSY600 with emphasis upon the design and analysis of experiments.

605 APPLIED MULTIVARIATE ANALYSIS (3 Cr)
P: PSY600.
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: PSY600 and PSY505 or equivalent. (Formerly numbered PSY610.)
Theory and technique relating to the construction and utilization of measuring devices such as intelligence, special aptitude, interest, achievement, and personality tests.

611 FACTOR ANALYSIS (3 Cr)
P: PSY600.
Theory and applications of factor analysis in psychological research.

612 ADVANCED TEST THEORY (3 Cr)
P: PSY608 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.

615 INTRODUCTION OF 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 PSY630.)
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: PSY600.
An extensive survey of methods, research, and theory in social-personality psychology.

642 CROSS-CULTURAL SOCIAL PSYCHOLOGY (3 Cr)
P: PSY600, PSY640.
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.

643 FIELD METHODS AND EXPERIMENTATION (3 Cr)
P: PSY600.
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 SPECIAL TOPICS IN SOCIAL-PERSONALITY 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.

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.

I679 PRACTICUM IN INDUSTRIAL PSYCHOLOGY (3 Cr)
P: PSY570, 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.

S679 PRACTICUM IN APPLIED SOCIAL PSYCHOLOGY (3 Cr)

P: Consent of instructor.

Provides opportunity for on-site training and skill development under supervision of the Department of Psychology and agency.

680 ANALYSIS OF PUBLISHED RESEARCH IN INDUSTRIAL PSYCHOLOGY (3 Cr)

P: PSY570, 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: PSY570, 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: PSY570, PSY572, 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: PSY505, 549, and 578 and consent of instructor.

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 reports and group discussions.

695 SEMINAR IN TEACHING PSYCHOLOGY (2 Cr)

P: Consent of the Department of Psychology.

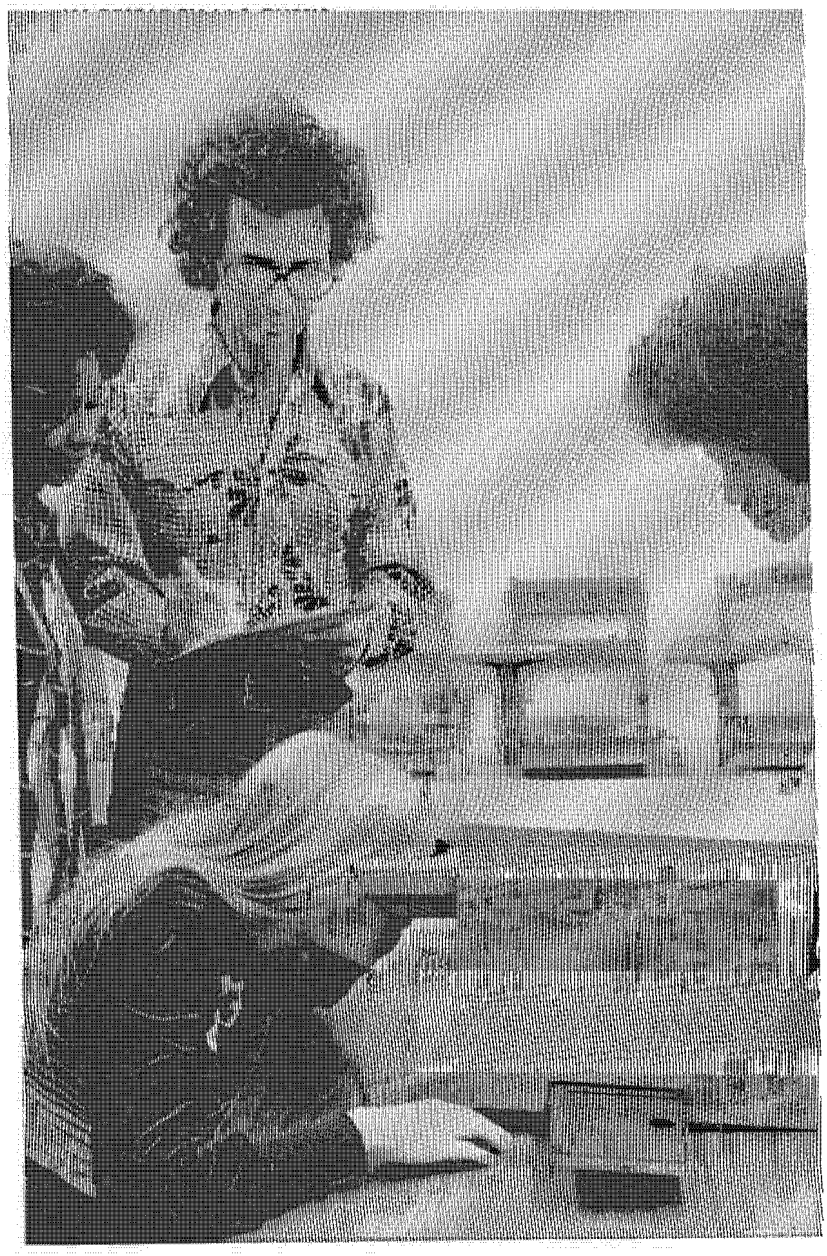
A problem-solving approach to teaching psychology at IUPUI. Planning the course; anticipating problems; dealing with ongoing teaching problems. Current faculty members will present their innovative techniques. Participants will evaluate each others' classroom performance. Must be taken for full year to receive credit.

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.

S697 INTERNSHIP IN APPLIED SOCIAL PSYCHOLOGY (0 Cr)
P: Consent of instructor and PSY S679.
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.



RELATED DEPARTMENTAL PROGRAMS AND COURSES

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 complete requirements for graduation in either Agriculture or Forestry at the West Lafayette campus. The Department of Biology has academic, counseling and administrative responsibility for all agricultural courses offered at IUPUI.

The first two years of training are based upon a solid foundation of mathematics, chemistry, biology, 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. An effort is made during the freshman year to familiarize the students with the opportunities throughout Agriculture and Forestry. Electives are permitted to enable students to explore the various options in which they may choose to concentrate efforts during the remaining years.

At the sophomore level, students are asked to select an option 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 main areas of interest or permit a broad choice in liberal arts or general education.

Students should contact the Agricultural Program counselor in the Biology Department soon after admission to IUPUI to formulate a tentative sequence of courses for the first year to two. Consult the Department of Biology secretary for the current counselor.

101 AGRICULTURAL LECTURES
To acquaint new students in agriculture with the important problems and opportunities in the various fields of agriculture.

Agricultural Economics

100 INTRODUCTORY AGRICULTURAL BUSINESS AND ECONOMICS
The role and characteristics of farm and off-farm agricultural business in our economy; introductory economic and business principles involved in successful organization, operation, and management.

330 MANAGEMENT METHODS FOR AGRICULTURAL BUSINESS
Management of the nonfarm firm, with emphasis on businesses selling to farmers and handling their products; topics deal primarily with tools for management decisions and the decision-making process. Major areas of study include: principles of decision making, legal forms of business organization, basics of financial analysis, inventory and quality control, short and long range planning, and other tools for management decision.

Agronomy

105 CROP PRODUCTION

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

P: One year college chemistry.

Differences in soils; soils 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

102 ANIMAL AGRICULTURE

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

P: CHM C101 or equiv.

Classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, and formulation of diets for domestic animals.

Biochemistry

207 BIOCHEMISTRY

P: CHM C102 or equivalent.

Introduction to the chemistry, function, and metabolism of compounds found in the living organism.

Forestry And Conservation

103 INTRODUCTION TO NATURAL RESOURCE CONSERVATION

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.

582 CONSERVATION OF NATURAL RESOURCES

P: At least junior standing.

Classroom and laboratory instruction in natural resource conservation. Designed for teachers of vocational agriculture, biological sciences, general sciences, home economics, and social studies.

Horticulture

101 FUNDAMENTALS OF HORTICULTURE

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.

Agriculture Sample Plan of Study

FRESHMAN	1	AGRL 101 (1) Introduction to Agriculture	ENGL W117 (3) English Composition	BIOL N105 (4) Introduction to Botany	CHEM C101 (5) Elementary Chemistry	MATH MA147 (3) Algebra and Trigonometry	
	2	Agronomy or (3) Animal Science Elective**	BIOL N107 (4) Introduction to Zoology	MATH MA148 (3) Algebra and Trigonometry	ENGL W118 (1) Research and Report Writing	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	AN SC 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 AN SC 102.

Forestry, Wildlife, and Conservation Sample Plan of Study

FRESHMAN	1	AGRL 101 (1) Introduction to Agriculture	FOR 103* (2) Introduction to Conservation	BIOL N105 (4) Introduction to Botany	CHEM C101 (5) Elementary Chemistry	MATH MA147 (3) Algebra and Trigonometry	ENGL W117 (3) English Composition
	2	BIOL N107 (4) Introduction to Zoology	CHEM C102 (5) Elementary Chemistry	MATH MA148 (3) Algebra and Trigonometry	ENGL W118 (1) Research and Report Writing	Elective (3)	
SOPHOMORE	3	FOR 225 (3) Dendrology	CET 104 (3) (for AG Eng 212)	EG 110 (3) (for AG ENG 211)	ECON E201 (3) Economics	BIOL K341 (5) Ecology	MATH MA221 (3) Calculus
	4	AGRY 255* (3) (for AGRY 260 or 270)	ECON E202 (3) Economics	SPCH C110 (3) Speech	Humanities (3) Elective	Elective (3)	
JUNIOR SENIOR	5-8	TRANSFER TO SCHOOL OF AGRICULTURE PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS					

*Offered every other year.
**Other courses commonly taken as electives
BIOL N322 (for AGRY 430)
GEOL G109 (for GEOS 112)
GEOL G110 (for GEOS 111)
STAT 301
PHYS 100 (for PHYS 205)

AGRICULTURE — M.S.

(Extension Education)

These programs are administered by an interdisciplinary committee on the West Lafayette campus. The committee is chaired by A. R. Hilst (Associate Dean, School of Agriculture).

Admission to graduate programs with a primary area in extension education leading to the degree of Master of Science will be approved and

the program coordinated at the West Lafayette campus. These programs are developed on an individual basis for persons engaged in or anticipating participation in development of human, community, or natural resources, such as extension agents, members of extension or community policy boards, personnel of social and welfare agencies, and those engaged in continuing adult education.

The curriculum is under the general supervision of an interdisciplinary committee and is broadly selective from a wide range of courses offered in the areas of agriculture, home economics, industrial management, social sciences, education, and civil engineering. After initial counselling by members of the interdisciplinary committee, members of the advisory and examining committees for students in the program will be selected from departments within which the student selects his courses.

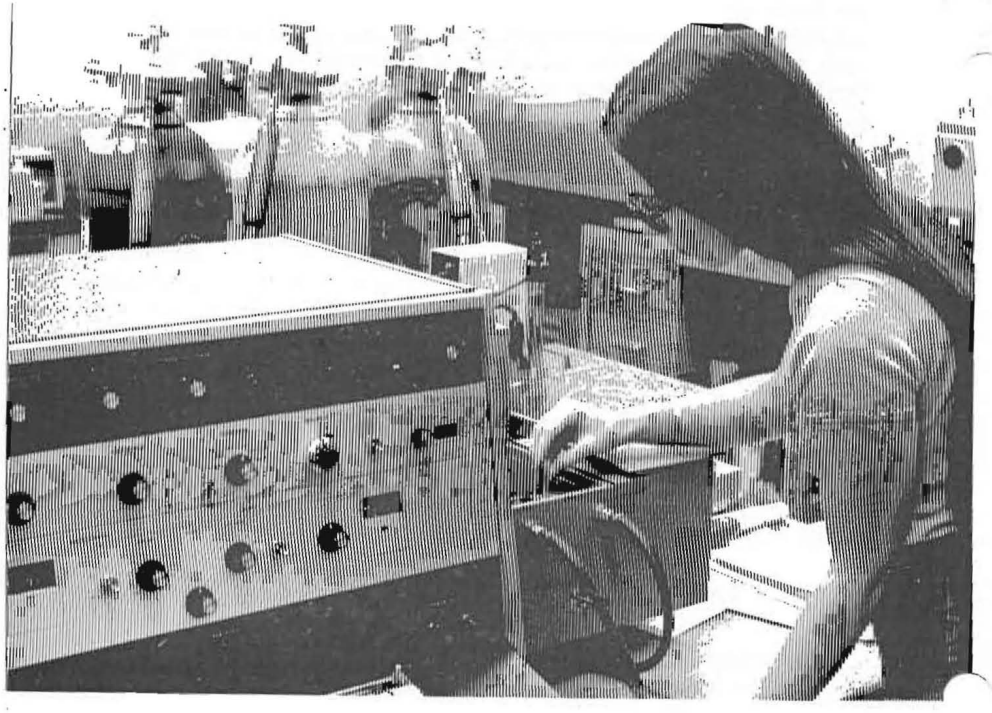
For further information concerning the program, contact Professor Hilst in West Lafayette (729-2402).

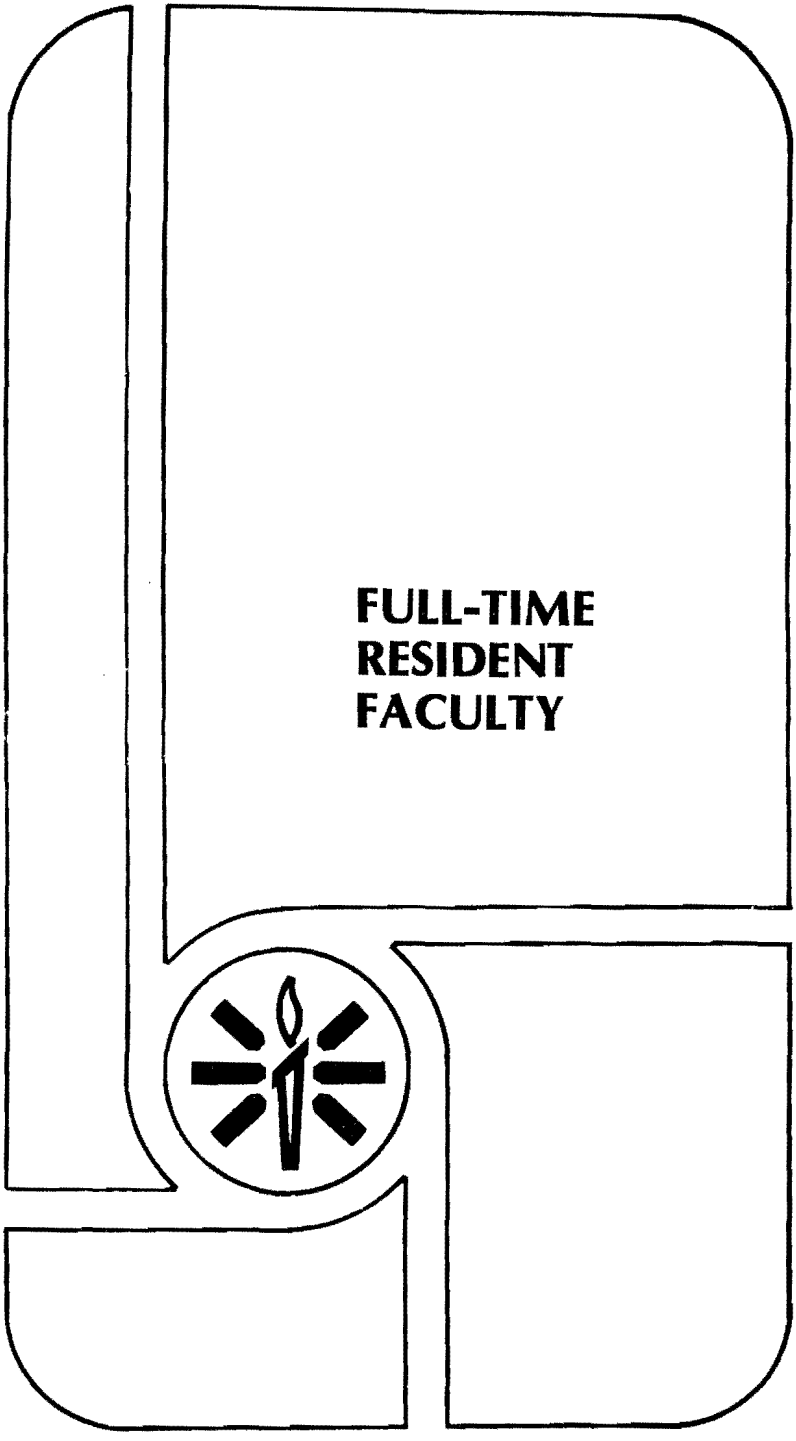
ASTRONOMY

The Department of Physics has academic, counselling, and administrative responsibility for the courses in Astronomy offered at IUPUI. Course listings are included with the Department of Physics.

INTERDISCIPLINARY COURSES

SCI201 CITIZEN AND SCIENCE (3 Cr)
P: None. Spring.
This course deals with science as an institution, the relation of science to technology and the influence of science on society. These topics are treated through examples taken from the life sciences and from the physical sciences.




FULL-TIME
RESIDENT
FACULTY

RESIDENT FACULTY

ALIPRANTIS, C. D., Assistant Professor of Mathematics (1975); B.S., 1968, University of Athens; M.S., 1971; Ph.D., 1973, California Institute of Technology. Specialty: Functional Analysis.

ALTON, ELAINE V., Associate Professor of Mathematics-Education (1964); A.B., 1946, New York State; M.Ed., 1951, St. Lawrence University; M.A., 1958, University of Michigan; Ph.D., 1965, Michigan State University. Specialty: Mathematics Education.

BANASZAK, KONRAD J., Associate Professor of Geology (1977); B.S., 1966, Beloit College; M.S., 1969, Ph.D., 1975, Northwestern University. Specialties: Low-Temperature Geochemistry, Environmental Hydrology, Economic Geology, Physical Geology.

BARD, MARTIN, Assistant Professor of Biology (1975); B.S., 1968, City College of New York; Ph.D., 1971, University of California, Berkeley. Specialty: Biochemical Genetics.

BEESON, DONALD, Assistant Professor of Mathematics (1975); B.S., 1963, Indiana Institute of Technology; M.A., 1966, Wayne State University; Ph.D., 1974, University of Illinois. Specialty: Applied Mathematics.

BITTINGER, MARVIN, Associate Professor of Mathematics-Education, (1968); B.S., 1963, Manchester College; M.S., 1965, Ohio State University; Ph.D., 1968, Purdue University. Specialty: Mathematics Education.

BOAZ, PATRICIA A., 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, Assistant Professor of Mathematics (1976); B.S., 1966, Ohio State University; Ph.D., 1973, Ohio State University. Specialty: Applied Mathematics.

BOSCHMANN, ERWIN, Associate 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.

BRIDGES, HARRY B., Assistant Professor of Mathematics (1966); B.S.Ed., 1931, South East Missouri State University; M.S., 1935, University of Illinois; B.S.E.E., 1939, Missouri School of Mines. Specialty: Applied Mathematics.

BRINGLE, ROBERT GORDON, Assistant 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, Assistant Professor of Mathematics (1972); B.S., 1966, M.S., 1968, Ohio University-Athens; Ph.D., 1972, Purdue University. Specialty: Functional Analysis.

CADY, WAYNE ALLEN, Associate Professor of Chemistry (1972); B.S., 1966, Calvin College, Michigan; Ph.D., 1972, University of Illinois. Specialties: General Chemistry and Physical Chemistry.

COURTIS, WILLIAM, Assistant Professor of Biology (1971); B.S., 1960, M.S., 1964, University of Miami, Coral Gables; Ph.D., 1972, Southern Illinois University. Specialties: Microtechnique, Cytology, Quantitative Cytochemistry.

CROWN, J. CONRAD, Professor of Mathematical Sciences (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, Associate 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.

DUNCAN, ARTHUR, Assistant Professor of Mathematics (1976); B.A., 1963, M.S., 1965, Ph.D., 1970, University of California at Los Angeles, Ph.D., 1976, University of California, Irvine. Specialty: Program Verification.

EVENBECK, SCOTT EDWARD, Assistant and Dean for Administrative Affairs; Associate Professor of Psychology (972); A.B., 1968, Indiana University; M.A., 1971, Ph.D., 1972, University of North Carolina. Specialties: Social Psychology, Program Evaluation, Methodology.

FIFE, WILMER K., Chairman and Professor of Chemistry (1971); B.S., 1955, Case Institute of Technology; Ph.D., 1960, Ohio State University. Specialties: General Chemistry, Organic Chemistry, and Biochemistry.

FLAKE, GOLDEN A., Professor of Physics (1947); B.Ed., 1933, Eastern Illinois University; M.S., 1946, Northwestern University. Specialty: Physics Teaching.

FLYNN, ROBERT, Lecturer in Psychology (1976). B.A., 1963, Ottawa University; B.Th., 1966, Gregorian University; M.A., 1970, Carleton University. Specialties: Rehabilitation Psychology, Study of Human Service Systems.

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.

GEMIGNANI, MICHAEL C., Chairman, Department of Mathematical Sciences, Professor of Mathematics (1972); B.A., 1962, University of Rochester; M.S., 1964, Ph.D., 1965, University of Notre Dame. Specialty: Topology.

GERSTING, JOHN M., JR., Associate Professor of Engineering Science and Computer Science (1970); B.S., 1962, Purdue University; M.S., 1964, Ph.D., 1970, Arizona State University. Specialty: Computer Programming.

GERSTING, JUDITH L., Associate Professor of Mathematics (1970); B.S., 1962, Stetson University; M.A., 1964, Ph.D., 1969, Arizona State University. Specialty: Logic.

GOLDBERG, CARLOS I., Assistant 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.

GRAHAM, RUSSELL W., Assistant Professor of Geology (1977); B.S., 1969, M.S. 1972, University of Iowa; Ph.D., 1976, University of Texas at Austin. Specialties: Vertebrate Paleontology, Geobiology, Biometrics, Evolution of the Earth.

HAERING, GEORGE, Assistant Professor of Mathematics (1976); B.S., 1962, State University of New York at Buffalo, Ph.D., 1968, Ohio State University. Specialty: Applied Mathematics.

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.

HALL, TERRY, Assistant Professor of Psychology (1975); A.A., 1966, Skagit Valley College; B.A., 1968, M.S., 1970, Western Washington State College; Ph.D., 1976, University of North Carolina. Specialties: Developmental Psychology, Comparative Psychology.

HANFORD, PETER VANCE, Professor of Psychology and Psychiatry (1960); B.S., 1952, M.S., 1953, Ph.D., 1958, Pennsylvania State University. Specialties: Experimental Analysis of Behavior, Motivation.

HAZER, JOHN T., Assistant Professor of Psychology (1975); B.A., 1970, Miami University; M.A., 1974, Ph.D., 1976, Bowling Green State University. Specialties: Industrial Psychology, Selection and Placement.

HUFFMAN, DAVID G., Professor of Mathematics (1975); B. Eng. Sci., 1962, Marshall University; M.S., 1966, Ph.D., 1968, Ohio State University. Specialty: Applied Mathematics.

HUNTER, LAWRENCE W., Assistant Professor of Mathematics and Computer Sciences (1973); B.S., 1965, Stanford University; Ph.D., 1971, University of Wisconsin, Madison. Specialty: Computer Science.

HUTTON, LUCREDA, Assistant Professor of Mathematics (1975); B.S., 1967, Butler University; M.S., 1972, Purdue University; Ed.D., 1975, Indiana University. Specialty: Mathematics Education.

JOHNSTON, ERNEST R., Professor of Mathematics (1955); B.Ed., 1938, M.S., 1939, Illinois State University; Ph.D., 1954, University of Minnesota. Specialty: Complex Analysis.

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, Associate Professor of Mathematics (1973); B.A., 1963, University of California, Berkeley; M.A., 1965, Ph.D., 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 Professor of Biology (1972); B.A., 1962, M.S., 1964, University of Iowa; Ph.D., 1968, Ohio State University. Specialty: Plant Physiology.

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., Assistant Professor of Physics (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., Assistant Professor of Psychology (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., Chairman and Professor of Psychology (1976); B.S., 1957, Arizona State University; A.M., 1960, Temple University; Ph.D., 1963, Wayne State University. Specialties: Cross-cultural Social Psychology, Sensation and Perception, Evaluation Research.

LAUBE, JERRI., Adjunct Professor of Psychology (1976); R.N., Methodist Hospital School of Nursing, Memphis; B.S.N., 1961, University of Tennessee; M.S., 1969, University of Colorado; Ph.D., 1974, Texas Women's University. Specialty: Clinical Psychology.

LAUER, JOAN B., Assistant Professor of Psychology (1973); A.B., 1964, Ph.D., 1973, Indiana University. Specialties: Physiological Psychology, Learning.

LEES, NORMAN DOUGLAS, Assistant Professor of Biology (1973); A.B., 1967, Providence College, Providence, R.I., Ph.D., 1973, Northwestern University. Specialties: Microbiology, Molecular Biology.

LEVITT, EUGENE E., Adjunct Professor of Psychology (1976); B.A., 1948, Brooklyn College of the City University of New York; M.A., 1950, Ph.D., 1952, Columbia University. Specialty: Clinical Psychology.

LIPKOWITZ, KENNETH B., Assistant 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, Assistant Professor of Mathematics (1975); B.S., 1962, M.S., 1963, M.I.T.; Ph.D., 1966, California Institute of Technology. Specialty: Applied Mathematics.

MEIERE, FORREST T., Chairman and Professor of Physics (1969); B.S., (Physics) and B.S. (Math), 1959, Carnegie-Mellon University; Ph.D., 1964, Massachusetts Institute of Technology. Specialty: High Energy Physics.

METZ, CLYDE R., Associate Professor of Chemistry (1966); B.S., 1962, Rose-Hulman Institute of Technology; Ph.D., 1966, Indiana University. Specialties: General Chemistry and Physical Chemistry.

MIRSKY, ARTHUR, Chairman and Professor of Geology (1967); B.A., 1950, University of California at Los Angeles; M.S., 1955, University of Arizona; Ph.D., 1960, Ohio State University. Specialties: Urban Geology, History of Applied Geology, Paleontology-Stratigraphy, Geowriting, Evolution of the Earth.

MORRIS, BARNETT B., Professor of Psychology (1965); B.A., 1948, Brooklyn College; M.A., 1951, University of Nebraska; Ph.D., 1959, University of Oklahoma. Specialties: Sensation, Perception, Statistics, Testing.

MORRISON, L. KENT, Assistant Professor of Physics (1970); B.S., 1962, Highlands University; M.S., 1964; Ph.D., 1967, University of Washington. Specialty: Elementary Particle Physics.

NEEL, ROBERT G., Professor of Psychology (1964); B.A., 1948, M.S., 1949, University of Denver; Ph.D., 1962, University of Michigan. Specialties: Personnel and Industrial Psychology.

NEVILL, WILLIAM A., Dean of the School of Science, Professor of Chemistry (1967); B.S., 1951, Butler University; Ph.D., 1954, California Institute of Technology. Specialty: Organic Chemistry.

NG, BART, Assistant Professor of Mathematics (1975); B.S., 1968, St. Joseph College; M.S., 1970, Ph.D., 1973, University of Chicago. Specialty: Applied Mathematics.

NOVAK, GREGOR M., Associate Professor of Physics (1964); M.S., 1964, University of Chicago; Ph.D., 1975, Indiana University. Specialty: Mathematical Foundations of Physical Theories.

OCKERSE, RALPH, Chairman and Professor of Biology (1976); B.A., 1956, State Teachers College, Netherlands; B.S., 1962, Baldwin Wallace College; Ph.D., 1966, Yale University. Specialties: Plant Physiology, Cellular Biochemistry.

O'DONNELL, MARTIN J., Assistant Professor of Chemistry (1975); B.S., 1968, University of Iowa; Ph.D., 1973, Yale University. Specialty: Organic Chemistry.

PAIK, HAN WON, Assistant Professor of Physics (1962); B.S., 1956, M.S., 1958, Yonsei University, Seoul, Korea; M.S., 1962, Northwestern University; Ph.D., 1970, Indiana University. Specialty: High Energy Physics.

PATTERSON, RICHARD R., Assistant Professor of Mathematical Sciences (1974); B.A., 1961, DePauw University; Ph.D., 1966, University of California, Berkeley. Specialty: Algebraic Topology.

PENNA, MICHAEL A., Assistant Professor of Mathematics (1973); B.A., 1967, Union College, Schenectady, N.Y.; A.M., 1968, Ph.D., 1973, University of Illinois, Urbana. Specialty: Differential Geometry.

PFLANZER, RICHARD GARY, Associate Professor of Anatomy and Physiology (1969); A.B., 1964, Ph.D., 1969, Indiana University. Specialty: Medical Physiology.

RABIDEAU, PETER W., Professor of Chemistry (1970); B.S., Loyola University, 1964; M.S., Case Institute of Technology, 1967; Ph.D., Case Western Reserve University, 1968. Specialty: Organic Chemistry.

RAICHART, DENNIS WAYNE, Assistant Professor of Chemistry (1972); B.A., 1968, Wabash College; Ph.D., 1972, Stanford University. Specialties: General Chemistry, Inorganic Chemistry, and Environmental Chemistry.

RIGDON, ROBERT, Assistant Professor of Mathematics (1975); A.B., 1965, Princeton; Ph.D., 1970, University of California, Berkeley. Specialty: Algebraic Topology.

RIGO, THOMAS, Assistant Professor of Mathematical Sciences (1970); B.S., 1961, Canisius College; M.S., 1963, Purdue University; Ph.D., 1974, Purdue University. Specialty: Computer Programming.

RUSSO, RAYMOND J., Assistant Professor of Biology (1976); B.S., 1966, Southeast Missouri State University; M.S., 1971, Northeast Missouri State University; Ph.D., 1977, University of Notre Dame. Specialties: Ecology, Population Dynamics of Medically Important Insects.

RYTTING, MARVIN, Assistant Professor of Psychology (1975); B.S., 1971, Brigham Young University; M.S., 1973, Ph.D., 1975, Purdue University. Specialties: Personality, Social Psychology, Sociology of the Family.

SAMUELS, ROBERT, Professor of Biology (1967); B.A., 1938, M.S., 1940, University of Pennsylvania; Ph.D., 1952, University of California. Specialties: Cell Biology, Protozoology.

SANBORN, RICHARD D., Professor of Biology (1957); A.B., 1943, M.A., 1948, Ph.D., 1950, Harvard University. Specialties: Comparative Physiology, Insect Physiology, Endocrinology.

SEUBERT, JAMES W., Associate Professor of Physics (1968); A.B., 1958, Washington University; M.S., 1964, Ph.D., 1968, Indiana University. Specialty: Nuclear Physics.

SHA'KED, AMI, Assistant Professor of Psychology (1975); B.A., 1971, Bar-Ilan University; M.S., 1973, Ph.D., 1974, University of Wisconsin-Madison. Specialties: Rehabilitation Counseling, Human Sexuality.

STARK, ROBERT J., Assistant Professor of Biology (1974); B.S., 1967, Westminister College; Ph.D., Temple University. Specialties: Developmental Biology, Neurobiology.

SUER, LORAZE B., Instructor in Mathematics (1961); A.B., 1937, University of Evansville; A.M., 1945, Indiana University. Specialty: Finite Mathematics.

SVANUM, SOREN, Assistant Professor of Psychology (1976); A.B., 1971, San Francisco State University; M.A., 1973, Ph.D., 1976, University of Montana. Specialties: Clinical Psychology, Social Psychology, Personality.

THATCHER, FREDERICK C., Assistant Professor of Physics (1970); B.S., 1961, University of Chicago; M.S., 1964, DePaul University; Ph.D., 1969, University of California, Riverside. Specialty: Solid State Physics.

TZENG, OLIVER C.S., Assistant Professor of Psychology (1976); B.Ed., 1966, National Taiwan Normal University; M.S., 1969, University of Wisconsin-Stout; Ph.D., 1972, University of Illinois. Specialties: Quantitative Psychology; Cross-cultural Social Psychology, Social Psychology.

VASAVADA, K. V., Professor of Physics (1970); B.S., 1958, University of Baroda, India; M.S., 1960, University of Delhi, India; Ph.D., 1964, University of Maryland. Specialties: Elementary Particle Physics, Theoretical Physics.

WARE, JOSEPH ROGER, Associate Professor of Psychology (1972); B.S., 1957, M.S., 1961, University of Louisville; Ph.D., 1972, University of Kentucky. Specialties: Human Factors, Group Dynamics.

WEIHAUPT, JOHN G., Associate Dean for Academic Affairs (IUPUI), Assistant Dean of the Graduate School (Purdue University), Professor of Geology (1973), and Professor of Geosciences (Purdue University); B.S., 1952, M.S., 1953, M.S., 1971, Ph.D., 1973, University of Wisconsin. Specialties: Geophysics, Oceanography, Planetology, Physical Geology.

WELCHER, FRANK J., Professor of Chemistry, (1949); A.B., 1929, M.A., 1930, Ph.D., 1932, Indiana University. Specialties: General Chemistry and Analytical Chemistry.

WILSON, CLAUDE E., Assistant Professor of Chemistry (1971); B.A., 1960, Harpur College, State University of New York; M.A., 1961, Ph.D., 1966, Columbia University, New York. Specialties: General Chemistry and Analytical Chemistry.

WYMA, RICHARD J., Associate Professor of Chemistry (1969); A.B., 1958, Hope College; M.S., 1960, Ph.D., 1964, University of Michigan. Specialties: General Chemistry and Physical Chemistry.

YEN, WEN LIANG, Associate Professor of Physics (1968); B.A., 1960, National Taiwan; M.S., 1962, National Tsing Hua; Ph.D., 1968, Purdue University. Specialty: High Energy Physics.

YOUNKER, LELAND W., Assistant Professor of Geology (1975); B.A., 1968, M.S., 1971, Ph.D., 1974, Michigan State University. Specialties: Petrology, Tectonics, Geophysics, Physical Geology.

INDEX

Degree Checklist for School of Science Bachelor of Arts Degree. Mentioned are requirements at the school level. Departmental requirements may include additional courses in all areas.

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.

Composition _____

Speech _____

AREA II. FOREIGN LANGUAGE. No required courses at school level.

_____ _____

AREA IIIA. ARTS AND HUMANITIES. Four courses of at least twelve credits.*

_____ _____

_____ _____

AREA IIIB. SOCIAL AND BEHAVIORAL SCIENCES. Four courses of 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 one two-course sequence (not necessarily consecutively numbered) in either III A or III B.

**Courses not acceptable for IIIC include BIOL N100, N300, N302, and N320 as well as all agriculture courses.

Degree Checklist for School of Science Bachelor of Science Degree. Mentioned are requirements at the school level. Departmental requirements may include additional courses in all areas.

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.

Composition_____

Speech_____

AREA II. FOREIGN LANGUAGE. No required courses at school level.

_____ _____

AREA IIIA. ARTS AND HUMANITIES. Two courses of at least six credits.*

_____ _____

AREA IIIB. SOCIAL AND BEHAVIORAL SCIENCE. Two courses of 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.

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

*There must be at least one two-course sequence (not necessarily consecutively numbered) in either III A or III B.

**Courses not acceptable for IIIC include BIOL N100, N300, N302, and N320 as well as all agriculture courses.

Indiana University
Purdue University
at Indianapolis