Purdue University
School of Science
Bulletin 1980-82

Indiana University
Purdue University
at Indianapolis

Science

Degree Programs
School of Science

BIOLOGY

Bachelor of Arts ..... (PU)
- Biology

Bachelor of Science ..... (PU)
- Biology

Master of Science ..... (PU)
- Biology
- Biology Teaching

CHEMISTRY

Bachelor of Arts ..... (PU)
- Preprofessional Chemistry Major
- Chemistry Major

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

Master of Science ..... (PU)
- Chemistry

GEOLOGY

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

Bachelor of Science ..... (IU)
- Geology

MATHEMATICAL SCIENCES

Bachelor of Science ..... (PU)
- Computer Science
- Mathematics
- Mathematics Teaching

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

Master of Arts ..... (PU)
- Teaching Mathematics

PHYSICS

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

PSYCHOLOGY

Bachelor of Arts ..... (PU)
- Psychology

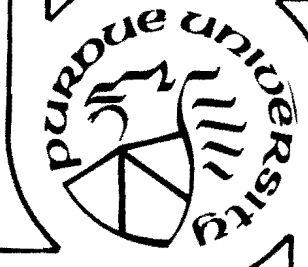
Bachelor of Science ..... (PU)
- Psychology

Master of Science ..... (PU)
- Applied Social Psychology/Program Evaluation
- Habilitation/Early Intervention (approval pending)
- Industrial/Organizational Psychology
- Rehabilitation Psychology

AGRICULTURE

Master of Science ..... (PU)
- Extension Education

Purdue University
SCHOOL OF SCIENCE
1980-82 Bulletin



While every effort is made to provide accurate and current information, Indiana University reserves the right to change without notice statements in the Bulletin series concerning rules, policies, fees, curricula, courses, or other matters.

IUPUI CALENDAR 1980-82

SUMMER SESSION 1980 (8 weeks)

Registration	Thurs-Fri	June 5-6
Classes begin	Mon	June 9
Late registration	Mon	June 9
Independence Day holiday	Fri	July 4
Classes end	Mon	Aug 4

FIRST SEMESTER 1980-81

Registration	Tues-Fri & Mon	Aug 19-25
Classes Begin	Wed	Aug 27
Labor Day recess	Sat-Mon	Aug 30-Sep 1
Thanksgiving recess	Tues	Nov 25
Classes resume	Mon	Dec 1
Classes end	Mon	Dec 15
Final exams	Tues-Fri & Mon	Dec 16-22

SECOND SEMESTER 1980-81

Registration	Mon-Fri	Jan 5-9
Classes begin	Mon	Jan 12
Spring recess	Sun	Mar 22
Classes resume	Mon	Mar 30
Classes end	Sun	May 3
Final exams	Mon-Sun	May 4-10

FIRST SEMESTER 1981-82

Registration	Tues-Fri & Mon	Aug 18-24
Classes begin	Wed	Aug 26
Labor Day recess	Sun-Mon	Sep 5-7
Thanksgiving recess	Tues	Nov 24
Classes resume	Mon	Nov 30
Classes end	Mon	Dec 14
Final exams	Tues-Fri & Mon	Dec 15-21

SECOND SEMESTER 1981-82

Registration	Mon-Fri	Jan 4-8
Classes begin	Mon	Jan 11
Spring recess	Sun	Mar 21
Classes resume	Mon	Mar 29
Classes end	Sun	May 2
Final exams	Mon-Sun	May 3-9

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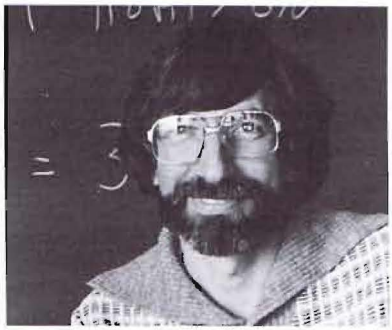
Marshall C. Yovits, Dean



Frederick Kleinhans

Terry Hall

Professor FREDERICK KLEINHANS
1978 Recipient
Loren T. Jones Award
as Outstanding Science Teacher

Professor TERRY HALL
1979 Recipient
Loren T. Jones Award
as Outstanding Science Teacher

Recipients 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 Wagner
1971 Thomas Willison
1972 David Laverell
1973 None
1974 None
1975 Robert Crozier
1976 L. Kent Morrison
1977 Gordon H. Fricke

Administrative Officers

INDIANA UNIVERSITY-PURDUE UNIVERSITY AT INDIANAPOLIS

Glenn W. Irwin, Jr., M.D., Vice President (Indianapolis)
Edward C. Moore, Ph.D., Executive Dean and Dean of the Faculties
Paul J. Nagy, Ph.D., Associate Dean of the Faculties
Wendell F. McBurney, Ed.D., Dean for Research and Sponsored Programs
William A. Nevill, Ph.D., Director of Graduate Programs
Neil E. Lantz, M.S., Director of Administrative Affairs
George R. Lindle, Director of Budgeting and Fiscal Affairs
Golam Mannan, Ph.D., Dean for Student Services
John C. Krivacs, M.S., Director of Admissions
Richard Slocum, Ph.D., Acting Registrar
Frank E. Nordby, M.A., Evening Administrator

PURDUE UNIVERSITY SCHOOL OF SCIENCE AT IUPUI

Marshall C. Yovits, Ph.D., Dean and Professor of Mathematical Sciences
Scott E. Evenbeck, Ph.D., Assistant Dean for Administrative Affairs and Associate Professor of Psychology
Peter C. Loh, Ph.D., Acting Assistant Dean and Associate Professor of Mathematical Sciences
Peter C. Loh, Cooperative Education Coordinator
Marian Franckhauser, Administrative Assistant to the Dean for Minority Affairs
Ann Gill, Administrative Assistant to the Dean for Administrative Affairs
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Wilmer K. Fife, Ph.D., Chairman, Chemistry
Arthur Mirsky, Ph.D., Chairman, Geology
Michael C. Gemignani, Ph.D., Chairman, Mathematical Sciences
Forrest T. Meiere, Ph.D., Chairman, Physics
Daniel Landis, Ph.D., Chairman, Psychology

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Felix Haas, Ph.D., Provost
Frederick N. Andrews, Ph.D., Vice President for Research and Dean of the Graduate School
R. Bruce Renda, Ph.D., Assistant Dean of the Graduate School
G. Walter Bergren, M.S.M.E., Administrative Dean for Regional Campuses
Marshall C. Yovits, Ph.D., Dean of Purdue School of Science at Indianapolis

INDIANA UNIVERSITY

John W. Ryan, Ph.D., President of the University
Herman B Wells, A.M., LL.D., Chancellor of the University
W. George Pinnell, D.B.A., Executive Vice President of the University
Glenn W. Irwin, Jr., M.D., Vice President Indianapolis
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

SCHOOL OF SCIENCE CAREER DAY

The School of Science held its first annual Career Day on October 4, 1979. IUPUI students, as well as area high school students, were invited to attend the event and discuss job opportunities with over 60 professionals in various career fields, from agriculture to zookeeping, and pharmacy to insurance. The six School of Science departments entertained visitors with lab tours, chemistry magic shows, mathematical games, slide presentations, and guest speakers.

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 has a growing enrollment that exceeds 20,000 students, 1,200 faculty, and a 4,300-member supporting staff. Professionals from business, industry, hospitals, and government agencies are often used as part-time lecturers so that their practical experiences provide students with additional educational insights. School of Science students have the opportunity to participate in a cooperative education programs with area industry.

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 work 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 that graduates are able to study in virtually any school in the nation. Because of the organization of the School of Science, all degrees awarded are Purdue University degrees, except those given in Geology which are Indiana University degrees.

The School of Science

The School of Science offers many undergraduate and graduate programs that will prepare students for a variety of careers now open to scientists. Scientists are encouraged by society to pursue new avenues of research, either as individuals, or as part of research teams employing many scientists. Needed to design computers and computer programs, locate and analyze natural resources, and help find ways to protect our environment, scientists can apply research findings to industrial and human problems. They are wanted as administrators for governmental organizations using other scientists, and as salesmen and managers by companies with science-based products.

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

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

The School of Science offers Bachelor of Arts degrees in Biology, Chemistry, Geology, and Psychology. Bachelor of Science degrees are offered in Biology, Chemistry, Computer Science, Geology, Mathematics, Physics, and Psychology. Master of Science degrees are offered in Applied Computer Science, Biology, Chemistry, Psychology, and Mathematics. All degrees awarded are Purdue University degrees, except those given in Geology which are Indiana University degrees.

Student Welfare and Responsibility

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

This Bulletin lists the requirements and regulations in effect for students who enter IUPUI in January 1980. Students who enter after this date may be subject to different requirements; students who enter prior to January 1980 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 degree program, he is urged to obtain this clarification from his faculty advisor or from the Office of the Dean of Science.

Confidentiality of Student Records

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

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.

Career Counseling and Placement

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

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

Recruiting companies interview graduating students on campus during the fall and spring semesters. Students may take advantage of this opportunity by registering with the office located in the Union Building, 1300 West Michigan Street, Room G025M.

In addition to the Office of Career Counseling and Placement, information about specific career fields is also available in the Office of the Dean and departmental chairmen's offices.

Housing

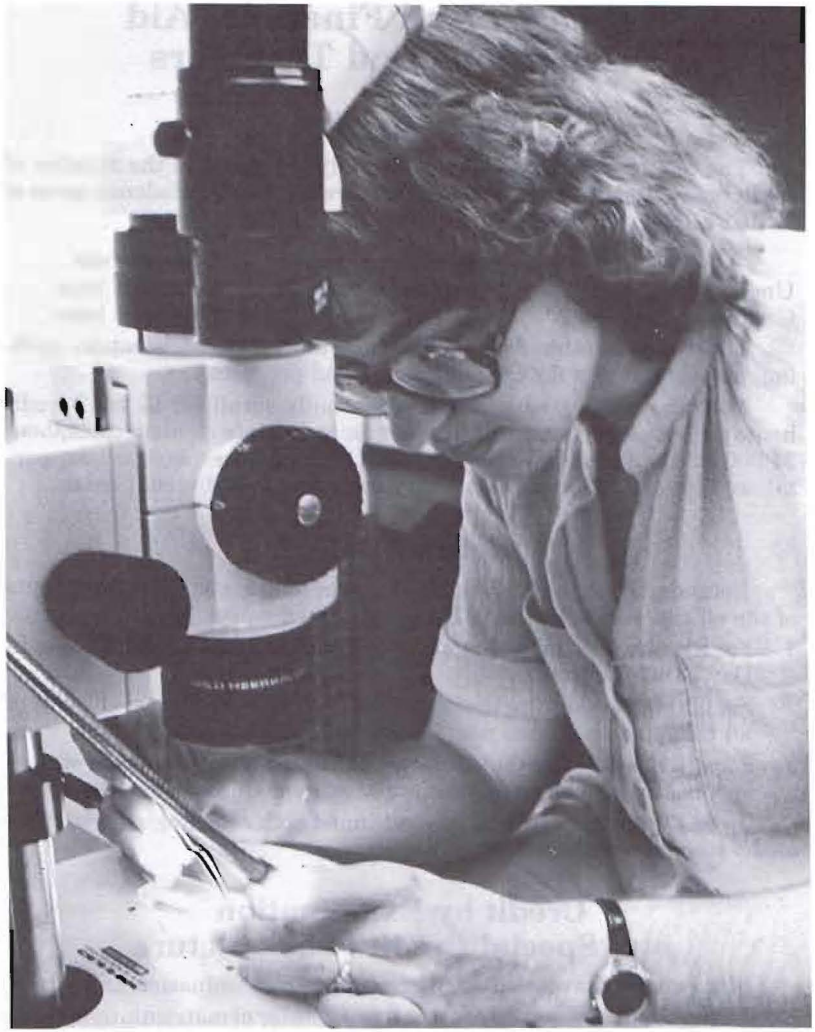
Residential housing for IUPUI students is located at the University Quarter Campus with approximately 600 accommodations for single students and 160 apartments for married students. Facilities are available to students from all divisions of IUPUI on a first-come basis. Residential housing is managed 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 International Students

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

The address is:

Office of International Programs and Services
Indiana University-Purdue University at Indianapolis
Allied Health Building—Room 228
Indianapolis, Indiana 46202



Rose Funkhouser examines larvae for an ongoing mosquito ecology research program.

Expenses And Financial Aid Admissions and Transfers

Costs and Fees

The cost of attending IUPUI generally is related to the number of credit hours students take. The fee structure for general academic areas of IUPUI as of January 1980 is as follows:

	In-State	Out-of-State
Undergraduate	$26/credit hour	$59/credit hour
Graduate	$40/credit hour	$96/credit hour

There may be other fees, such as laboratory, 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 $1,000 for fees, books and class supplies. Other expenses, such as transportation, food and entertainment, vary according to individual needs.

Refund Policy

Refunds during the Fall and Spring semesters 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 or all fees paid except $50, whichever is greater.
3. For withdrawal after the third week of fall and spring semester classes or after the second week of summer session classes—no refund.

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

Credit by Examination and Special Credit Fee Structure

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

a. during the first or second consecutive semester of matriculation, there is no charge;

b the student is a first semester *transfer* student, there is a $5.00 per credit hour charge; or

c. the student is neither a. nor b., then the student will pay the standard per semester fee at the appropriate resident or nonresident rate.

If the credit is the result of experience or credentials, the student will be charged $5.00 per credit hour with a maximum charge of $25.00 per course.

Health Care and Insurance

The Student Employee Health Service (SEHS) is located in Robert Long Hospital at the Medical Center. All full-time IUPUI students are eligible for the program of outpatient health care provided by SEHS.

There is no charge for the services of physicians, nurses, or specialty consultants. In addition, the SEHS clinic has available about 70 specialty clinics to which students may be referred. 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 students are eligible for this program through a private insurance carrier. Part-time students may be treated in the Student Employee Health Service on a fee for service basis. Information is available at registration and at SEHS (telephone: 317-264-8214).

Financial 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 scholarships, grants, and participation in the work-study program.

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

Office of Scholarships & Financial Aids
The Berkey Building
920 West Michigan Street
Indianapolis, Indiana 46202
(telephone: 317-264-4162)

Veterans' Benefits

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

BENEFITS	UNDERGRADUATE		GRADUATE	
	Fall/Spring	Summer (8 weeks)	Fall/Spring	Summer (8 weeks)
FULL TIME	12 hrs or more	6 hrs or more	9 hrs or more	6 hrs or more
¾ TIME	9-11 hrs	4-5 hrs	7-8 hrs	4-5 hrs
½ TIME	6-8 hrs	3 hrs	5-6 hrs	3 hrs
TUITION ONLY	less than 6 hrs	less than 3 hrs	less than 5 hrs	less than 3 hrs

For further information including VA paid tutorial assistance and work/study opportunities consult the Office of Veterans Affairs at 946 West Vermont Street, Indianapolis 46202 (317-264-7425).

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, Indiana 46202. Further information and application forms are obtainable at this address. All applications for admission must

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

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

Beginning Students

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

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

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

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

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

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

3. Rank in High School class

a. Residents of Indiana must rank in the upper half of their high school graduating class or have a combined verbal-math SAT of 950. Agriculture students must rank in the upper two-thirds of their class or have a combined verbal-math SAT of 950. A marginal applicant may be granted admission, admitted on probation, or have admission denied.

b. Out-of-state applicants must rank in the top third of their high school graduating class.

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

If one declares a major at the time of application for admission, a departmental advisor will be assigned. It is recommended that preplanning be directed toward a choice of major at the time of admission. Premedical and pre-dental students should declare a chemistry or biology major at the time of admission.

Advanced Academic Standing

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

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

Adult Non-Degree Students

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

Transient Students

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

Transfers

FROM OTHER INDIANA UNIVERSITY CAMPUSES

If a student is enrolled at another Indiana University campus and wishes to enter the School of Science at Indianapolis for the first time, the student must indicate this intention by formal notice to the Office of the Dean at the campus at which enrolled. This notice must be received no

later than June 15 for the fall semester. December 5 for the spring semester or April 15 for the summer session. One must have a 2.0 grade point average to transfer to the School of Science.

If one is a student in the School of Science at Indianapolis and wishes to attend another Indiana University campus, one must indicate this intention to the Student Affairs Office, School of Science, to secure an inter-campus transfer.

FROM OTHER IUPUI SCHOOLS

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

FROM OTHER PURDUE UNIVERSITY CAMPUSES

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

FROM OTHER COLLEGES AND UNIVERSITIES

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

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

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

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

TRANSFER CREDIT: Acceptability of transfer credits from another college or university is determined by the student's major depart-

ment. However, transfer credit will be allowed for the master's degree only after one semester of satisfactory work in residence at IUPUI.

FROM IUPUI TO OTHER INDIANA UNIVERSITY AND PURDUE UNIVERSITY CAMPUSES

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

International Students

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

Graduate Students

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

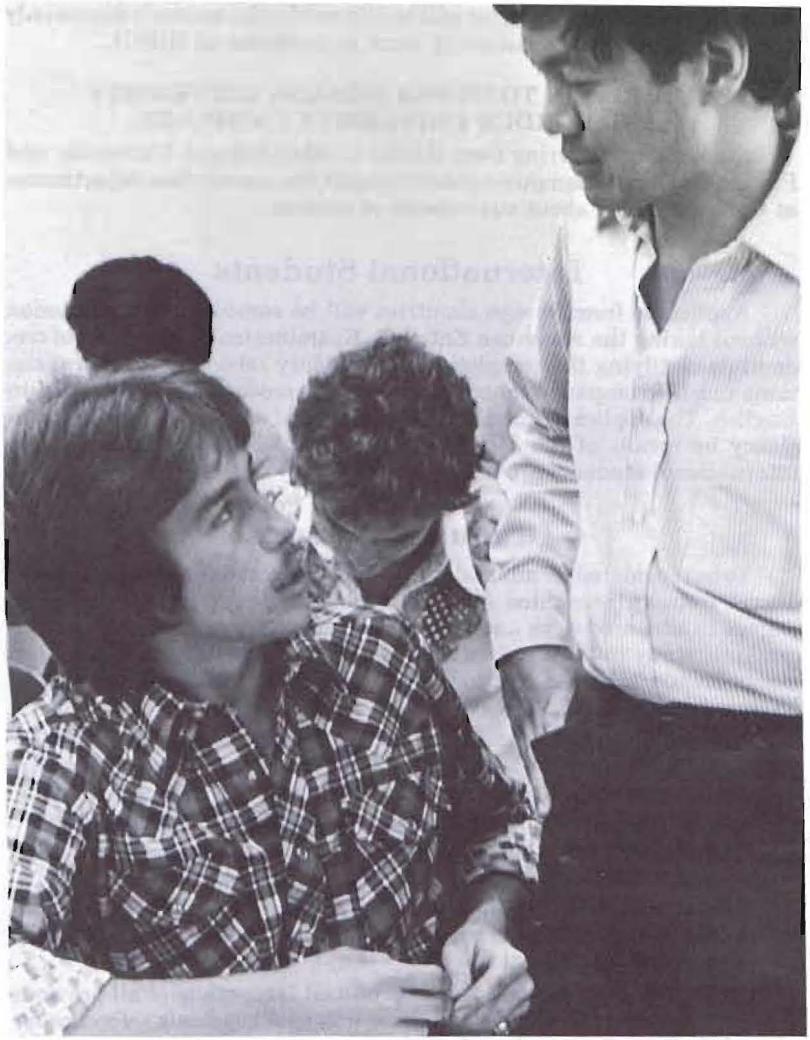
Application should normally be made at least three months before the beginning of the session in which the student wishes to enroll. However, late applications will also be accepted. The applicant will be advised of action on his application by the Office of the Director of Graduate Studies.

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

REGULAR GRADUATE STUDENT APPLICATION: Application forms for admission as a regular graduate student may be obtained from the major department.

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

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



Math professor Dr. Jose Ingojo answers questions during class.

GRADUATION REQUIREMENTS

Baccalaureate Degree

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) with a minimum average of 2.0. 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: BIOL N100, N120, AGR 101, CHEM C100, 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) Degrees are conferred in May, August, and December; Commencement is held only in May. Candidates for degrees in August may participate in 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.
10. Departments may have further restrictions on which courses outside the School of Science and School of Liberal Arts will count toward their degree. See your major advisor for details.
11. Some Departments may not allow their majors to receive credit for both of two overlapping courses. See your major advisor for details.

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 in courses regularly open to third- or fourth-year students. 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.

Requirements for Indiana University Degrees

(Department of Geology)

1. A minimum of 122 hours (124 for students also satisfying requirements for a teaching certificate).
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.
3. English W131 may not be used to complete the area III requirements.
4. It is recommended that a student who intends to pursue graduate studies should plan to take the Graduate Record Examination at the beginning of the senior year.

BACHELOR OF ARTS DEGREE

Area I

English Composition and Communicative Skills. One course in English composition of at least three credits and one course in speech skills of at least three credits are required. The English composition requirement is satisfied by completing English W131 with a grade of C or better. All students who wish credit for English W131 must first enroll in the course. During the first week of classes placement testing will be done. On the basis of the results of these tests the following options are available.

a) The student may receive an exemption from the course. If it is the first year of his enrollment at IUPUI his fees will be refunded and the exemption will appear on his official transcript. If it is past his first year at IUPUI, his fees will not be refunded, but the exemption will appear on his transcript.

b) The student may be placed in Eng W001 and will need to successfully complete that course before being allowed to enroll in W131.

c) The student may stay in W131 and complete the course.

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 outside the major department 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
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 and N120 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 subject as well as courses required by the major department in other areas.

BACHELOR OF SCIENCE DEGREE

Area I

English Composition and Communicative Skills. One course in English composition of at least three credits and one course in speech skills of at least three credits are required. The English composition requirement shall be satisfied by completing English W131 with a grade of C or better. All students who wish credit for English W131 must first enroll in the course. During the first week of classes placement testing will be done. On the basis of the results of these tests the following options are available:

a) The student may receive an exemption from the course. If it is the first year of his enrollment at IUPUI his fees will be refunded and the exemption will appear on his official transcript. If it is past his first year at IUPUI, his fees will not be refunded, but the exemption will appear on his transcript.

b) The student may be placed in English W001 and will need to successfully complete that course before being allowed to enroll in English W131.

c) The student may stay in English W131 and complete the course.

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	German
English	History
Fine Arts	Journalism
Folklore	Music
French	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 and N120 as well as all agriculture courses.)

Biology
Chemistry
Geology
Physics

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 MATH 213 and MATH 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.

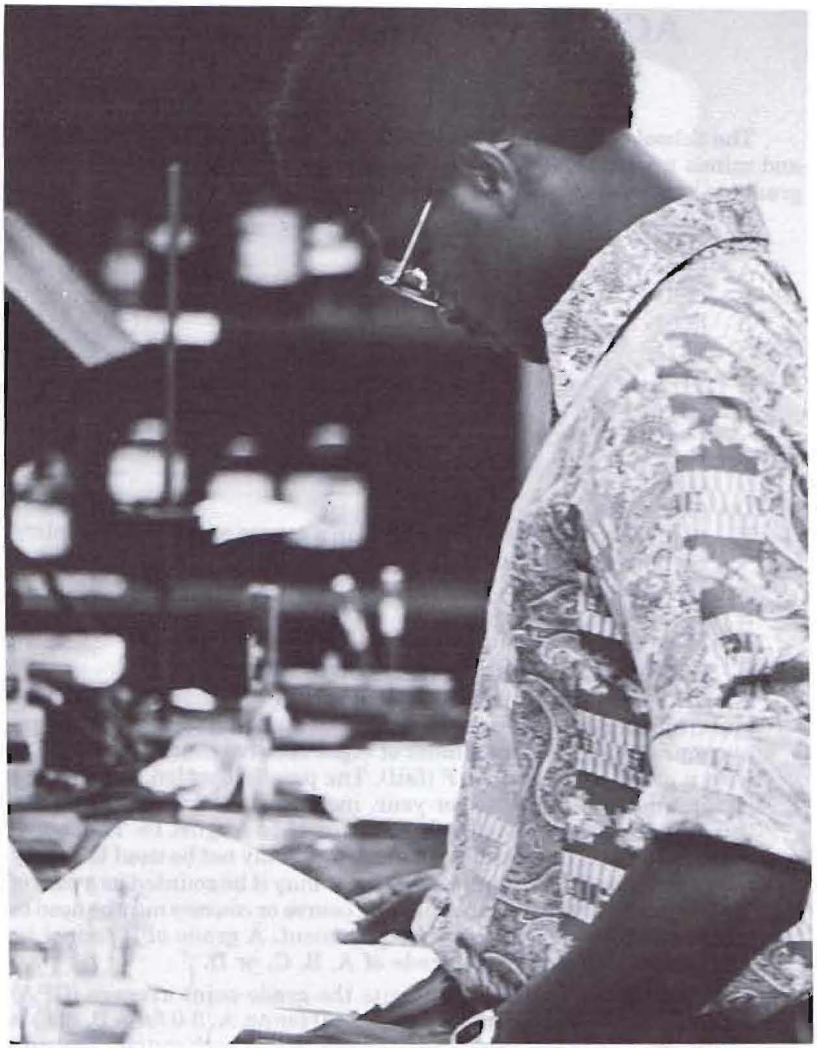
General Requirements

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 must write a test paper for the Committee on Standards in English and are held for further writing if the test paper is not acceptable. Students so held are expected to work toward satisfying the requirement without delay. The student should make certain that the Committee on Standards in English sends the Graduate School notice of satisfaction when completed. See the secretary in the graduate counselor's office for the person to contact for clearance in this manner.

3. Plan of study — The plan of study shall include a primary area and a related area or areas which are chosen on the basis of the student's interests and needs. A tentative plan of study should be drawn up in advance of registration for the first semester of graduate work. This should be done by the student and the individual graduate 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 master's degree. In any department the final examinations may be waived if the student meets the minimum requirements of the department. In any event, a final examining committee is appointed for each candidate for the master's degree. The committee must certify to the Graduate School either that the student has passed the required examinations of the department in which the major graduate study has been taken or that the committee is satisfied with the accomplishment of the student as based on a committee conference.
7. 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.



Theodore Manuel identifies an unknown compound in an Organic Chemistry laboratory.

ACADEMIC REGULATIONS

Grades

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

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

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. A grade of P cannot be changed subsequently to a grade of A, B, C, or D.

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

W or Withdrawal: Students may officially withdraw from classes without penalty during the first one-half of a semester or session if they secure the approval of their 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 will be allowed to withdraw from class during the last quarter of the semester only under extenuating circumstances. A written justification from a doctor, clergyman, advisor, etc., must be presented.

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

Incomplete: The grade of I (Incomplete) indicates that the work is satisfactory as of the end of the semester, but has not been completed. The grade of Incomplete may be given only when the 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 is given. An Incomplete grade which has not been removed by the end of one year will be converted by the Registrar's Office to the grade of F. The Dean may authorize adjustment of the one year period in exceptional circumstances.

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

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

Courses Repeated

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

Credit by Examination and Special Credit

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

Course Audits

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

Petition for Grade Change

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

1. Faculty petition: A faculty member may request a change of grade for the student. This request can be honored only after approval of the Department Chairman and the 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; pass/fail option; and FX option are available in the departmental offices, the Dean's Office, or the Registrar's Office.

Class Standing

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

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

Science Scholars and Dean's Honor Lists

The School of Science recognizes exceptional academic performance prior to graduation from the University by periodically publishing the Science Scholars List and the Dean's Honor List. The Science Scholars List is a list of names of full-time or part-time students who have completed at

least 26 hours of coursework at IUPUI and who have a semester GPA of at least 3.75 and a cumulative GPA of at least 3.75. The Dean's Honor List is a list of the names of the 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 Incomplete (I) or a deferred grade (R) during the given semester, or from whom no report (NR) has been made by an instructor outside the School of Science will not be placed on the Science Scholars List or 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 is not less than a C (2.0), and their cumulative grade point average is not below this same level.

Second Baccalaureate Degree

Normally the holder of a baccalaureate degree who wishes to pursue a further educational goal is encouraged to become qualified for admission to a graduate degree program. In certain cases, however, the 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.

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

Academic Standing

Academic Probation

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

Readmission

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

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

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

Dr. Gary Rosenberg, Geology, interjects some humor into his explanation of why certain minerals possess distinctive characteristics while Don Collins, Roger Dellinger, and Nancy Coons, three students in the mineralogy lab, show an appropriate response.

SPECIAL FACILITIES AND SERVICES

Libraries

The IUPUI Library system is composed of six separate libraries which are open to all students enrolled at the University. These are located at the Dental School, Herron School of Art, University Quarter Campus, Law School, Medical School, and 38th Street Campus. The School of Physical Education also maintains a reference room of professional physical education materials. The Dental, Herron, Law, and Medical libraries contain specialized collections reflecting their respective curricula. The collections at the University Quarter 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 Administration building 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 slide projectors provide convenient facilities for individual study of recorded course and reference material. Equipment available for classroom and laboratory use includes audio and video tape recorders, closed-circuit TV, and various projectors (overhead, movie and slide).

Evening Administration

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

Krannert Science Building, 38th Street, Room 153, phone 923-1321, exts. 238, 260, and 264-3552.

Nursing Building, 1100 W. Michigan Street, Room 105, phone 264-4228.

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

Cavanaugh Hall, 925 W. 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 N. Meridian Street, phone 264-3704.

The switchboard and main office are kept open by Evening Administration for 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 8 p.m.

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

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

Computing Services

Computing Services provides computer assistance to the faculty, staff, and students of IUPUI and the other campuses of Indiana University. With two computer centers at IUPUI, Computing Services has a large DEC-10 timesharing facility available, as well as an IBM 370/125. The primary responsibility of Computing Services is in support of academic computing requirements. Technical assistance for faculty and other researchers is offered through consultation on programming problems, statistical analysis, acquisition and use of computer software and hardware, including mini and micro computers, and other computing-related problem areas. Programs can be designed and written for faculty by Computing Services personnel. Also, consultants are present at all Computing Services locations to assist students and faculty with programming problems. For more information, contact the Director, Computing Services, Krannert Science Building Suite 155, 1125 E. 38th Street (telephone: 317-923-1321, ext. 376).

Carol Singleton, a Biology laboratory technician, measures the rate of photosynthesis in soybean leaves.

Professor Kathryn Wilson, Biology, explains the anatomy of a fetal pig to student Kathy Shackelford.

SPECIAL PROGRAMS

Secondary Teachers' Certificate

With careful planning, a student may earn a baccalaureate degree in the School of Science and may receive a provisional secondary teacher's certificate, completing the requirements for both in four years. The Secondary School Teacher Certificate, Provisional, qualifies the holder to teach in the subject-matter fields for which it is endorsed in any public secondary school in Indiana. It is granted upon completion of a baccalaureate degree based upon a program of teacher education and the recommendation of the graduating institution. It is valid for five years from the date of issue and may be renewed one time only for a period of two years, provided a minimum of 20 semester hours towards the master's degree on a teacher education program has been accumulated.

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

40 credits as follows:

Humanities: minimum of 18 credits (for example English, Fine Arts, Folklore, Foreign Language, Music, Philosophy, Speech & Theatre)

Social and Behavioral Sciences: minimum of 9 credits (for example Anthropology, Economics, Geography, History, Political Science, Psychology, Sociology)

Life and Physical Sciences: minimum of 9 credits (subject matter area meets this requirement; some departments specify lab sciences)

Electives as needed for a total of 40 credits.

Professional Education

EDUC H340 — Education and American Culture (3 Cr)

EDUC P253 — Educational Psychology for Secondary Teachers (3 Cr)

EDUC M300 — Introduction to Teaching in a Culturally Pluralistic Society (3 Cr)

EDUC M462 — Methods of Teaching High School Reading (3 Cr)

EDUC M440-478 — Special Methods in major academic area (4 Cr)

EDUC M480 — Student Teaching in Secondary School (9 Cr)

EDUC M313 — Teaching in the Secondary School (3 Cr)
(Required for Indiana University degrees. Recommended for Purdue University degrees.)

Subject Matter Area

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

Pre-Optometry and Pre-Pharmacy Programs

IUPUI does not grant a degree in either optometry or pharmacy. However, students may complete one year of pre-optometry or 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). For further information contact the pre-optometry, pre-pharmacy counselor in the Biology Department, Dr. Doug Lees.

PRE-PHARMACY SAMPLE PROGRAM

FRESHMAN	1	BIOL N105 (4) Introduction to Botany	CHEM C105 (5) Principles of Chemistry I	MATH 147 (3) or MATH 163 or MATH 221	ENG W131 (3) English Composition I	Elective (1)
	2	BIOL N107 (4) Introduction to Zoology	CHEM C106 (5) Principles of Chemistry II	MATH 148 (3) or MATH 164 or MATH 222	ENG W132 (3) English Composition II	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 pre-veterinary program counselor in the Department of Biology, Dr. Richard McCracken.

PRE-VETERINARY SAMPLE PROGRAM

FRESHMAN	1	BIOL N105 (4) Introduction to Botany	AGR 101 (1) Introduction to Agriculture	MATH 147 (3) or MATH 221	CHEM C105 (5) Principles of Chemistry I	ENG W131 (3) English Composition I	ANSC 101 Animal (3) Agriculture
	2	BIOL N107 (4) Introduction to Zoology		MATH 148 (3) or MATH 222	CHEM C106 (5) Principles of Chemistry II	ENG W132 (3) English Composition II	Elective* (3)
SOPHOMORE	3	SPCH C110 (3) Speech	CHEM C341 (3) Organic Chemistry I	CHEM C343 (2) Organic Chem. Laboratory I	PHYS 218 (4) Physics	ECON E202 (3) Economics	Elective (3)
	4	ANSC 221 (3) Animal Nutrition	CHEM C342 (3) Organic Chemistry II	CHEM C344 (2) Organic Chem. Laboratory II	PHYS 219 (4) Physics	BIOL N322 (3) Principles of Genetics	
JUNIOR SENIOR	5-8	TRANSFER TO SCHOOL OF VETERINARY SCIENCE AND MEDICINE PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS					

*Electives commonly selected from: AG ECON, Agronomy, Biology, Business, Economics, Geography, Geology, History, Horticulture, Philosophy, Political Science, Psychology, Sociology

Pre-Dental and Pre-Medical Programs

Admission to dental and medical schools in 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 Fife and Boaz (Chemistry) and Ockerse and Stark (Biology)

Cooperative Education Program

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

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

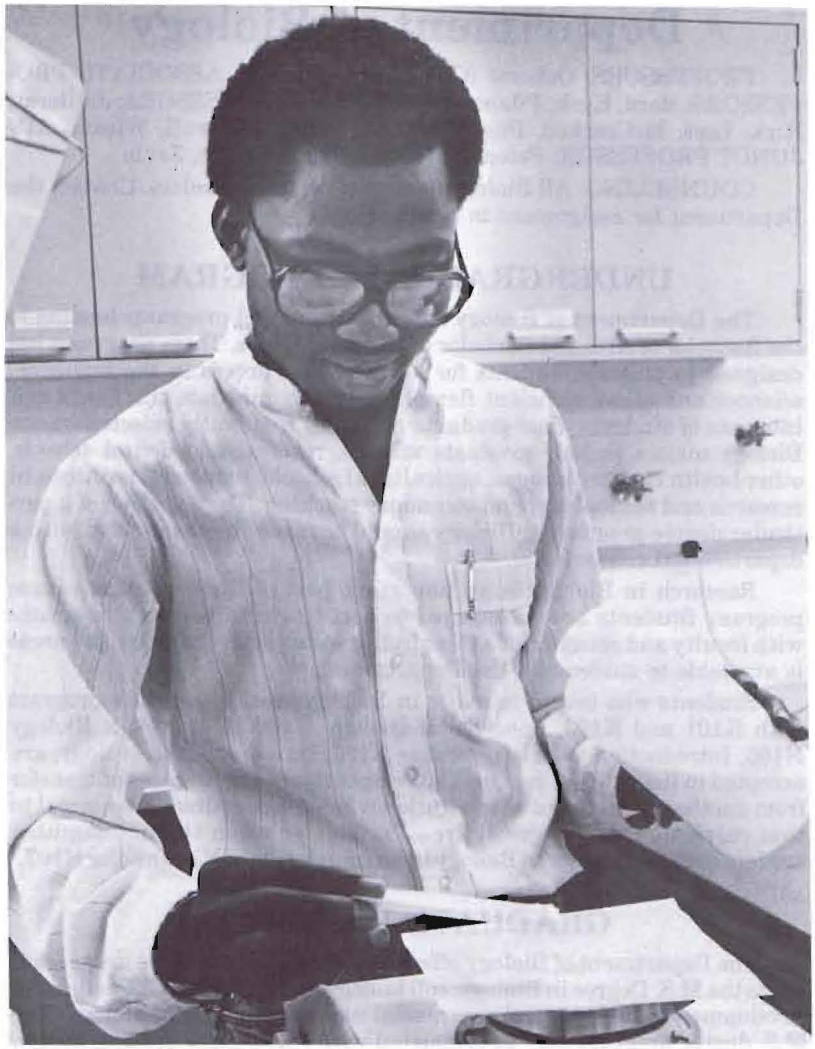
A cooperative education employer will have been approved by the School of Science and will have agreed to offer a meaningful work experience related to a student's scientific interests. Normally, a student will work for the same employer throughout his program and be given increasing responsibility.

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

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

Officer Training Programs (ROTC)

Both Army and Air Force ROTC are available to IUPUI students. Completion of either program leads to a commission as a 2nd Lieutenant. Programs are available to both men and women. Courses are pursued in conjunction with academic curriculum and receive academic credit as electives. Placement credit is available to veterans and students with high school ROTC backgrounds. For information, contact Professor of Military Science (Army ROTC) (317) 264-2691 or Professor of Aerospace Studies (Air Force ROTC) (812) 337-4191.



Johnson Oyerinde weighs chemicals to incorporate in plant tissue culture media.

Department of Biology

PROFESSORS: Ockerse (Chairman), Sanborn; ASSOCIATE PROFESSORS: Bard, Keck, Pflanzer; ASSISTANT PROFESSORS: Juillerat, Kirk, Lees, McCracken, Russo, Spencer, Stark, Stillwell, Wilson; ADJUNCT PROFESSOR: Petersen; LECTURERS: Davee, Zevin.

COUNSELING: All Biology faculty serve as counselors. Contact the Department for assignment to a counselor.

UNDERGRADUATE PROGRAM

The Department of Biology offers instructional programs leading to the Bachelor of Arts and Bachelor of Science degrees. These programs are designed to prepare students for a variety of careers in the biological sciences and allow sufficient flexibility to accommodate the needs and interests of students. 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.

GRADUATE PROGRAM

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

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

COURSES FOR THE NON-MAJOR

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

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

N107 INTRODUCTION TO ZOOLOGY (4 Cr)
P: None. Equiv. PU BIOL 109, IU 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.

N120 TOPICS IN BIOLOGY (1-3 Cr)
P: None. Fall, Spring; day, night.
A course dealing with topical aspects of biology designed for undergraduate students not in the School of Science. A topic such as genetics and man, environmental biology and reproductive biology will be offered as a separate course in a given semester.

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

N213 HUMAN BIOLOGY LABORATORY (1 Cr)
P or C: N212. Equiv. PU BIOL 203. Fall; day.
Accompanying laboratory for N212.

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

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

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

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

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

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

N322 INTRODUCTORY PRINCIPLES OF GENETICS (3 Cr)

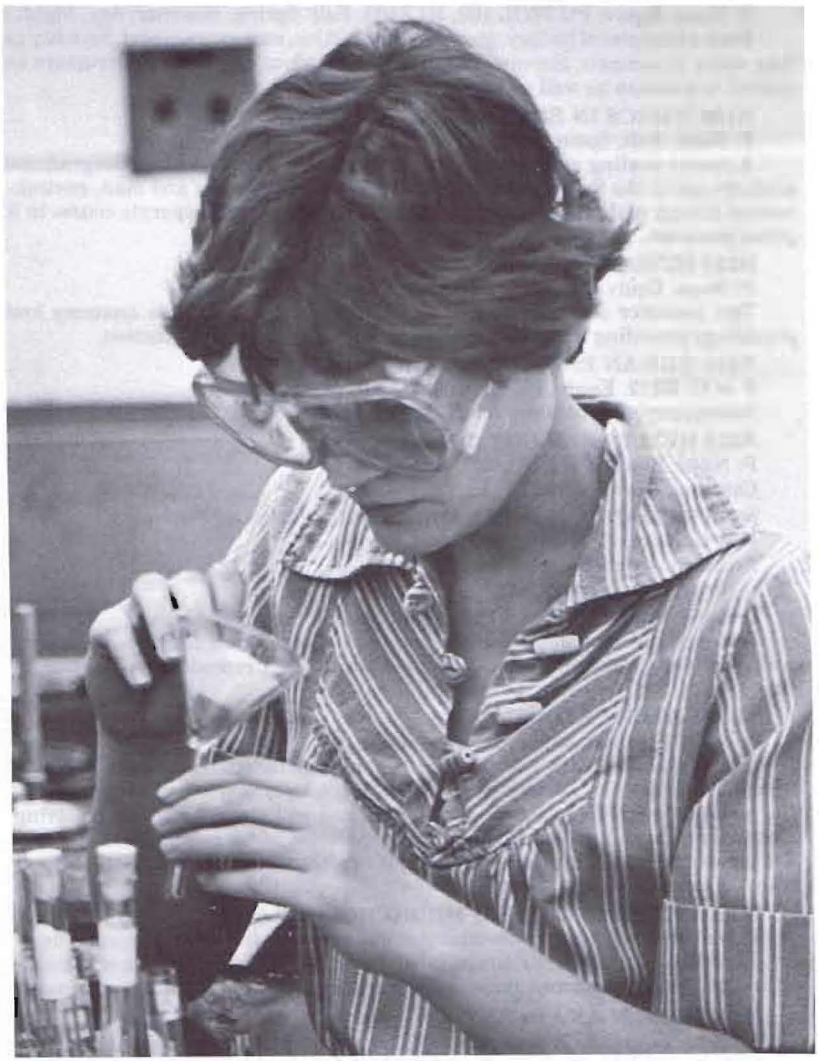
P: N105 or N107 or K101. Equiv. PU AGRY 430. Spring; day, night.

Basic principles of plant and animal genetics. Emphasis on transmission mechanisms as applied to individuals and populations. For students in health and agricultural sciences.

N400 CONTEMPORARY BIOLOGICAL SKILLS FOR TEACHERS (3 Cr)

P: Consent of instructor. Fall; night.

Concepts and laboratory skills necessary to prepare teachers with diverse backgrounds to return to graduate academic biology courses are reviewed. Topics include general principles of biology, biochemistry, and biomathematics.



Jo Ann Hoskins prepares for recrystallization in an Organic Chemistry laboratory.

Department of Chemistry

PROFESSORS: Boschmann, Fife (Chairman), Nevill, and Rabideau; PROFESSOR EMERITUS: Welcher; ASSOCIATE PROFESSORS: Boaz, Cutshall, Fricke, Metz, Nurok, O'Donnell, and Wyma; ASSISTANT PROFESSORS: Cheng and Lipkowitz; ADJUNCT PROFESSORS: Jackson, Janis, McCarthy, Shields.

DEPARTMENTAL COUNSELORS: Professors Boaz, Cutshall, Fife, Fricke, and Wyma.

GRADUATE COUNSELOR: Professor Rabideau

HEALTH PROFESSIONS COUNSELOR: Professor Boaz

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

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.

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.

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

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

BACHELOR OF ARTS

PREPROFESSIONAL CHEMISTRY MAJOR

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

Degree Requirements

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

Area II: Foreign Language: No language required.

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

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

Area IV: Chemistry Concentration Requirements: C105, C106, C224, C225, C341, C342, C343 (for 2 credits during first and second semesters; or C343 for 1 credit and C344 for 1 credit during the summer session), C360 (recommended C361). Recommended C207 or C483, C301 or C302.

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 in this bulletin.

Area II: Foreign Language: German G095 and G096.

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

Area IIID: Mathematical Sciences: MATH 163 and MATH 164.

Area IV: Chemistry Concentration Requirements: C105, C106, C224, C225, C341, C342, C343 (2 credits; or C343 for 1 credit and C344 for 1 credit during the summer session), C360 (recommended C361). Recommended C207 or C483, C301 or C302.

BACHELOR OF SCIENCE

CHEMISTRY MAJOR

Recommended to students who plan to be professional chemists, secondary school teachers, and those who plan 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 in this bulletin.

Area II: Foreign Language: No language required.

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

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

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

Business	A201 Introduction to Accounting I
	A202 Introduction to Accounting II
	L203 Commercial Law I
	L303 Commercial Law II
Economics	E201 Introduction to Microeconomics
	E202 Introduction to Macroeconomics
Engineering	109 Introduction to Computer Programming
	190 Elementary Engineering Design
	196 Engineering Problem Solving

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

PROFESSIONAL CHEMISTRY MAJOR
A.C.S. Certified

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

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

Area II: Foreign Language: German G095 and G096.

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

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

CHEMISTRY PLANS OF STUDY
Bachelor of Arts—Preprofessional Chemistry Major

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

Bachelor of Arts — Chemistry Major

FRESHMAN	1	C105 (5) Principles of Chem. I	MATH 163 (5) Calculus I	ENG W131 (3) Composition I	Elective (3)	
	2	C106 (5) Principles of Chem. II	MATH 164 (5) Calculus II	PHYS 152 (4) Mechanics	Elective (3)	
SOPHOMORE	3	C341 (3) Organic Chem. I	C343 (2) Organic Chem. Lab I	PHYS 251 (5) Heat, Elect., Optics	SPCH C110 (3) Speech	Elective (3)
	4	C342 (3) Organic Chem. II	C344 (2) Organic Chem. Lab II	Electives (12)		
JUNIOR	5	C310 (3) Analytical Chemistry	C311 (2) Anal. Chem. Lab.	C361 (3) Phys. Chem. I	G095 (3) German I	Elective (3)
	6	C362 (3) Phys. Chem. II	C315 (3) Chem. Meas. Lab. I	G096 (3) German II	Elective (5)	
SENIOR	7	Chemistry Electives (3-5)	Electives (12)			
	8	Electives (15)				

Bachelor of Science — Chemistry Major

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

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

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

MASTER OF SCIENCE

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

Admission Requirements

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

Application for Admission

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

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

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.

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 com-

position or by scoring 600 or higher on the Verbal Aptitude Section of the Graduate Record Examination. Students who do not satisfy the English requirement by either of the above methods may take a written examination administered by the English Department to demonstrate their proficiency.

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

Departmental Degree Requirements

The requirements for each degree are designed to provide both depth and diversity in knowledge. Of the 30-hour requirement for the nonthesis program or the 20-hour course requirement for the thesis program, 12 hours must be at the CHEM 600-level and 9 hours must be in a declared major. Courses from three of the following areas must be taken: biochemistry, CHEM 533 (I.U. C483); organic, CHEM 651 (IU C540); analytical, CHEM 525, CHEM 621 (I.U. C510); inorganic, CHEM 641 (I.U. C530); and physical, CHEM 671 (I.U. C561), CHEM 672 (I.U. C661), CHEM 675 (I.U. C673) or CHEM 679 (I.U. C563). Electives to meet the total number of credits may be taken in other departments, but prior approval of the advisory committee is required. A minimum grade point average of 3.00 must be maintained.

Financial Assistance

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

COURSES IN CHEMISTRY

C100 CHEMISTRY (3 Cr)

P: none. Fall, day; Spring, day.

How molecules are built, react, and affect our lives. Lectures, demonstrations, and discussion. For students desiring only one semester of chemistry. Does not count toward any degree requirements in the School of Science.

C101 ELEMENTARY CHEMISTRY I (5 Cr, 3 Cr without laboratory)

P: At least 1 semester high school algebra. Equiv. PU CHEM 113. Fall, day, night; Spring, day, night; Summer, day.

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

C102 ELEMENTARY CHEMISTRY II (5 Cr, 3 Cr without laboratory)

P: C101. Continuation of C101. Equiv. PU CHEM 251. Fall, night; Spring, day, night; Summer, day.

Introduction to organic and biochemistry; or ganic 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 CHEM 117. Fall, day, night; Spring, day, night; Summer, day, night.

Basic concepts and nomenclature, atomic structure, nuclear chemistry, chemical bonding, stoichiometry, 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 CHEM 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 CHEM 101. Fall, day; Summer, day.

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 CHEM 102. Spring, day; Summer, day.

Continuation of C111. Lectures, recitation.

C207 BIOCHEMISTRY (4 Cr)

P: C102. Equiv. PU BCHM 207. Spring, night.

An introductory course which 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 CHEM 290. Every semester, time arranged.

Individually supervised special problems of chemical interest, e.g., environmental problems, development of experiments, development of audiovisual materials, etc. May be repeated for credit. But maximum credit of 2 hours may be applied toward a chemistry degree.

C224 QUANTITATIVE ANALYSIS (4 Cr)

P: C106. Equiv. PU CHEM 224. Fall, night.

Introduction to the major methods of chemical analysis and separation for the chemical technician or non-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 or non-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 CHEM 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; C: C362. Spring.

Experimental work dealing with inorganic synthesis and various physical chemical studies. Selected topics: structural analysis, vacuum techniques, thermodynamics, kinetics, spectroscopy, synthetic inorganic chemistry.

C316 CHEMICAL MEASUREMENTS LABORATORY II (3 Cr)

P: C410, C361, C362. Fall.

Experimental techniques in inorganic and instrumental analysis. Selected topics: statistical analysis, chemical analysis, chemical separations, electrochemistry, spectroscopy, synthetic inorganic chemistry.

C341 ORGANIC CHEMISTRY I (3 Cr)

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

Comprehensive study of aliphatic and aromatic compounds. Nomenclature, qualitative theory of valence and reactions. Commercial and laboratory syntheses and uses of monofunctional compounds.

C342 ORGANIC CHEMISTRY II (3 Cr)

P: C341. Equiv. PU CHEM 262. Fall, day; Spring, day, night; Summer, day.

Syntheses and reactions of polyfunctional compounds. Natural and industrial products. Physical and chemical methods of purification.

C343 ORGANIC CHEMISTRY LABORATORY I (1 or 2 Cr)

P or C: C341. Equiv. PU CHEM 255L (1 Cr), CHEM 263L (1 Cr), CHEM 265L (2 Cr.). Fall, day, night; Spring, day, night; Summer, day, night. (1 Cr option offered only in Summer).

Fundamental laboratory techniques of organic chemistry and general synthetic methods.

C344 ORGANIC CHEMISTRY LABORATORY II (1 or 2 Cr)

P or C: C342, P: C343. Equiv. PU CHEM 256L (1 Cr), CHEM 264L (1 Cr), CHEM 266L (2 Cr). Fall, day; Spring, day, night; Summer, day. (1 Cr option offered only in Summer).

Preparation, isolation and identification of organic compounds; emphasis on modern research methods.

C360 ELEMENTARY PHYSICAL CHEMISTRY (3 Cr)

P: C106, MATH 222, PHYS 219. Fall.

Chemical thermodynamics, chemical equilibria, solutions, phase equilibria, electrochemistry, and kinetics. For students who desire a survey course in physical chemistry.

C361 PHYSICAL CHEMISTRY I (3 Cr)

P: C106, MATH 164, PHYS 219 or 251. Equiv. PU CHEM 373. Fall, day, night. Order of taking C361 and C362 optional.

Kinetic-molecular theory, gases, chemical thermodynamics, solutions, phase and chemical equilibria, and introduction to statistical thermodynamics.

C362 PHYSICAL CHEMISTRY II (3 Cr)

P: C106, MATH 164 and PHYS 219 or 251. Equiv. PU CHEM 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, electrochemistry, chemical kinetics and photochemistry.

C400 CHEMICAL DOCUMENTATION (1 Cr)

P: C341. Equiv. PU CHEM 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 CHEM 499. Every semester. Time Arranged.

Chemical or literature research with a report. Can be elected only after consultation with research advisor and approval of program. May be taken for a total of 10 credit hours which count toward graduation. However, a maximum of 3 hours may be used to satisfy the 6 hours of advanced chemistry electives in the Bachelor of Science in Chemistry degree programs.

C410 INSTRUMENTAL METHODS OF ANALYSIS (3 Cr)

P: 1 year of physical chemistry, C310. Equiv. PU CHEM 424. Spring.

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 CHEM 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: C342 or equivalent. Equiv. PU CHEM 533. Spring, night.

Chemistry of biologically important molecules, including carbohydrates, lipids, proteins and nucleic acids. Special emphasis on chemistry of intermediary metabolism.

525 INTERMEDIATE ANALYTICAL CHEMISTRY (3 Cr)

P: C310. P or C: second semester physical chemistry. Not open to students with credit in CHEM 424. Equiv. IU C520. Spring, night.

Survey of chemical and instrumental methods of analysis.

542 INORGANIC CHEMISTRY (3 Cr)

P: 1 year of physical chemistry. Equiv. IU 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.

573 PHYSICAL CHEMISTRY (3 Cr)

P: C106, MATH 164, PHYS 219 or 251. Fall, day and night.

Order of taking 573 and 574 optional. Kinetic-molecular theory, gases, chemical thermodynamics, solutions, phase and chemical equilibria, introduction to statistical thermodynamics.

574 PHYSICAL CHEMISTRY (3 Cr)

P: C106, MATH 261 and PHYS 251. Spring, day and night.

Order of taking 573 and 574 optional. Introduction to quantum chemistry, symmetry, atomic and molecular structure and spectra, solids, liquids, electrochemistry, chemical kinetics and photochemistry.

599 SPECIAL ASSIGNMENTS (1-4 Cr)

P: consent of instructor. Every semester, on demand. Time arranged.

Directed reading or special work not included in other courses.

621 ADVANCED ANALYTICAL CHEMISTRY (3 Cr)

P: C310, C410. Equiv. IU C510. Spring, odd years, night.

A critical survey of recent developments in chemical and instrumental methods of analysis.

626 ON-LINE COMPUTER METHODS FOR CHEMICAL ANALYSIS (2 Cr)

P: CHEM 621. Spring, odd years, night.

Introduction to the principles of minicomputer programming for chemical analysis and for interfacing to chemical instrumentation. The use of machine-language programming for time-critical data acquisition and control functions is covered. Emphasis is placed on the combination of high-level languages and machine language for on-line application of numerical methods in chemical experimentation. Various applications to interfacing chemical instrumentation to computer are considered, ranging from dedicated microcomputer systems to time-shared laboratory systems.

626L ON-LINE COMPUTER METHODS FOR CHEMICAL ANALYSIS LABORATORY(1 Cr)

P or C: CHEM 626. Spring, odd years, night.

Experimental studies with laboratory computer systems related to topics covered in CHEM 626. These include interface design and digital data handling for computerized chemical instrumentation.

629 CHROMATOGRAPHIC METHODS OF ANALYSIS (2 Cr)

P: C410 or equivalent. Spring, even years.

Principles and practice of modern gas and liquid chromatography are developed from an integrated point of view. Emphasis is placed on those features useful in practical analytical separations. Instrumentation is described and evaluated using chemical examples from recent literature. Although column techniques are emphasized, thin-layer chromatography and electrophoresis methods are also described.

634 BIOCHEMISTRY: STRUCTURAL ASPECTS (3 Cr)

P: C310, C342, C361 and C362 or equivalent.

Chemistry of materials of biochemical interest; carbohydrates, lipids, proteins, amino acids, nucleic acids, porphyrins, biochemistry of blood.

636 BIOCHEMICAL MECHANISMS (3 Cr)

P: 1 year of physical chemistry and CHEM 651. 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 CHEM 542 Equiv. IU C530. Spring, night.

Bonding in inorganic chemistry, symmetry and group theory, transition metal chemistry, spectra and magnetism, mechansims of inorganic reactions, limited survey of periodic table.

651 ADVANCED ORGANIC CHEMISTRY (3 Cr)

P: C342 or equivalent. Equiv. IU C540. Fall, night.

Modern structural organic chemistry, including introductions to molecular orbital theory and reaction mechanisms.

652 SYNTHETIC ORGANIC CHEMISTRY (3 Cr)

P: CHEM 651. Equiv. IU C543. Fall, odd years, night.

An advanced treatment of methods for preparing major types of organic functionalities and bonds, stressing stereochemical control and involving mechanisms for understanding the reactions employed.

657 REACTION MECHANISMS (3 Cr)

P: CHEM 651. Spring, even years, night.

Mechanisms of representative reactions and methods used in their investigation.

669 THEORETICAL ORGANIC CHEMISTRY (3 Cr)

P: CHEM 651. Spring, odd years, night.

Theoretical aspects of organic chemistry at the molecular level and its relationship to bonding and reactions.

671 ADVANCED PHYSICAL CHEMISTRY (3 Cr)

P: 1 year of physical chemistry. Equiv. IU 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. IU C661. Spring, odd years, night.

Basic principles of classical and quantum mechanics; exact solutions for simple systems; approximation methods; atomic structure; spectroscopy; application of group theory; theory of molecular binding.

675 CHEMICAL KINETICS (2 or 3 Cr)

P: 1 year of physical chemistry. Equiv. IU C673. 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. IU C563. Spring, even years, night.

Advanced thermodynamics of chemical and phase equilibria, of electrolytic and nonelectrolytic solutions, and of imperfect gases.

695 SEMINAR (1 Cr)

For graduate students (may be repeated for credit).

Groups meeting for review and discussion of important current literature in analytical, biological, inorganic, organic, and physical chemistry. Each graduate student is required to attend the seminar of his/her major subject.

696 SPECIAL TOPICS IN CHEMISTRY (1-3 Cr)

On demand, night.

Lectures on selected topics of current interest.

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

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

Dr. Gary Rosenberg, Geology, answers a question about the geode he is holding while Tim Graves and Jean Roberts, two students in the mineralogy lab, take time out from their own work to listen in.

Department of Geology

PROFESSOR: Mirsky (Chairman), ASSISTANT PROFESSORS: de Caprariis, Hall, Pachut, Rosenberg.

DEPARTMENTAL COUNSELORS: Professors Mirsky and Hall.

Geology is the science of the earth—man's systematic attempt to understand the planet and the environment in which he dwells. Geology includes the location, extraction, and economic use of minerals, rocks, soils, water, coal, and petroleum. These natural resources compose the earth and make possible our modern technology and civilization. Geologists study the landforms produced by volcanoes, streams, winds, glaciers, and other surficial earth processes. 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 other planets in the solar system.

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

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

Bachelor of Arts

(Granted by Indiana University)

GENERAL GEOLOGY OPTION

Degree Requirements

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

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

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

Area IIIB: See School of Science requirements.

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

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

Area IV: Geology Concentration Requirements

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

Other Requirements

See School of Science General Requirements.

EARTH SCIENCE SECONDARY TEACHING CERTIFICATION OPTION

Degree Requirements

A. **Humanities:** 18-24 credits

Area I: One course in English Composition, one course in Speech, and one additional course in English Composition or Speech. Geology G205 may partially satisfy this requirement.

Area II: No foreign language requirement.

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

B. **Social and Behavioral Sciences:** 9-15 credits
Area IIIB: See School of Science requirements.

C. **Life and Physical Sciences:** 9-15 credits
Area IIIC & D: Same as under General Geology option above.

D. **Electives as needed to obtain a total of 40 credits**

Earth Science Requirements (Area IV)

51 credits of Geology and related subjects (including G109, G110, G205, G206, G221, G222, G303, G323, G334, G404), Chemistry C105-C106. The additional related subjects are chosen from among those courses listed in the certification requirements.

Certification Requirements

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

Professional Education Requirements

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

Other Requirements

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

Bachelor of Science

(Granted by Indiana University)

Degree Requirements

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

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 requirements.

Area IIIB: See School of Science requirements

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

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

Area IV: Geology Concentration Requirements.

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

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

Other Requirements

See School of Science General Requirements.

GEOLOGY PLANS OF STUDY

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

Bachelor of Arts, General Geology Option

FRESHMAN	1	G109 (4) Geology: Evolution of the Earth	MATH 147 (3) Algebra & Trig I	W131 (3) English Composition	Arts & Humanities (3)		
	2	G110 (3) Geology: Earth's Environment	G206 (1) Physical Geology Laboratory	MATH 148 (3) Algebra & Trig II	N107 (4) Animal Biology	Arts & Humanities (3)	
SOPHOMORE	3	G221 (3) Mineralogy	C105 (5) Principles of Chemistry I	G205 (3) Reporting Skills in Geoscience	Arts & Humanities (3)		
	4	G222 (3) Petrology	C106 (5) Principles of Chemistry II	Arts & Humanities (3)	Social & Behavioral Sciences (3)	Elective (3)	
JUNIOR	5	G303 (4) Maps & Air Photos	G323 (3) Structural Geology	Elective (3)	Elective (3)	Elective (3)	
	6	G334 (3) Sedimentation & Stratigraphy	Social & Behavioral Sciences (3)	Social & Behavioral Sciences (3)	Elective (3)	Elective (3)	G410 (1) Undergraduate Research
SENIOR	7	G404 (3) Geobiology	G410 (1) Research in Geobiology	G415 (4) Geomorphology	Social & Behavioral Sciences (3)	300-Level Elective (3)	Elective (3)
	8	T480 (3) Seminar in Earth Science	G410 (3) Undergraduate Research	300-Level Elective (3)	300-Level Elective (3)	Elective (3)	

Bachelor of Arts, Earth Science Secondary Teaching Certification Option

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

Bachelor of Science

FRESHMAN	1	G109 (4) Geology: Evolution of the Earth	MATH 147 (3) Algebra & Trig I	W131 (3) English Composition	Arts & Humanities (3)		
	2	G110 (3) Geology: Earth's Environment	G206 (1) Physical Geology Laboratory	MATH 148 (3) Algebra & Trig II	C105 (5) Principles of Chemistry I	Arts & Humanities (3)	
SOPHOMORE	3	G221 (3) Mineralogy	G205 (3) Reporting Skills in Geoscience	MATH 163 (5) Calculus I	C106 (5) Principles of Chemistry II		
	4	G222 (3) Petrology	MATH 164 (5) Calculus II	N107 (4) Animal Biology	Elective (3)		
JUNIOR	5	G303 (4) Maps & Air Photos	PHYS 218 (4) Physics I	G323 (3) Structural Geology	Elective (3) Computers or Statistics		
	6	N105 (4) Botany	PHYS 219 (4) Physics II	Elective Area IV (3) 300-400 Level	Elective (3) Computers or Statistics		
SENIOR	7	G404 (3) Geobiology	G410 (1) Research in Geobiology	Elective Area IV (3) 300-400 Level	Elective Area IV (3) 300-400 Level	Social & Behavioral Sciences (3)	
	8	G334 (3) Sedimentation & Stratigraphy	Elective Area IV (3) 300-400 Level	Elective (3)	G410 (2) Undergraduate Research	Social & Behavioral Sciences (3)	
G429—Summer Field Camp in Rockies—(8)							

COURSES IN GEOLOGY

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

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

G107 GEOLOGY, RESOURCES, AND MAN (3 Cr)

P: None. Every.

An introduction to geology through discussion of geological topics that show the influence of geology on modern society. Topics include Mineral and Energy Resources, Land Use and Water Supplies, Geologic Hazards and Problems, Geology and Health, and New Geological Developments.

G109 GEOLOGY: EVOLUTION OF THE EARTH (4 Cr, 3 Cr without laboratory)

P: None. Every, 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, 4 credits (equiv. IU G104, IU G112, and PU GEOS 112); without laboratory, 3 credits. Credit not given for both G109 and G100 or G105.

G110 GEOLOGY: THE EARTH'S ENVIRONMENT (4 Cr, 3 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, 4 credits (equiv. IU G103, IU G111, and PU GEOS 111); without laboratory, 3 credits. Credit not given for both G110 and G100 or G105.

G115 INTRODUCTION TO OCEANOGRAPHY (3 Cr)

P: None, every.

Non-mathematical introduction to the history, geology, biology, and physical characteristics of the ocean. Includes volcanoes and earthquakes in the marine environment, currents of the world ocean, the life history of marine animals, and pollution of the marine ecosystem.

G130 SHORT COURSES IN EARTH SCIENCE: Variable Title (1 Cr)

P: None.

Five-week short courses on a variety of topics in the earth sciences. Examples of topics include: Lunar and Planetary Geology; Geology of Indiana; Geology of National Parks; Geology of Africa; Geology of Cities; Geology of Gemstones; Energy; History of Geology; Geology and Mythology; Prehistoric Life, Dinosaurs, Fossil Clocks and Changing Time. Each short course is one credit; no topic may be taken for credit more than once.

G205 REPORTING SKILLS IN GEOSCIENCE (3 Cr)

P: English W131, Geology G107 or G109 or G110. Fall.

Techniques of presenting written and oral reports from the geoscience approach. The written report: mechanics of format and illustrations, proper citation of geoscience literature, the abstract, proof-reading and editing. The oral report: effective presentation and response to audience questions, simulating a professional science meeting.

G206 PHYSICAL GEOLOGY LABORATORY (1 Cr)

P or C: G110. Every.

The laboratory study of minerals, rocks, topographic maps and aerial photographs, landforms and landscapes, structural geology, and geologic maps.

G221 INTRODUCTORY MINERALOGY (3 Cr)

P: An introductory geology course or consent of instructor. Fall.

Crystallography: morphology, classes, symmetry. Mineral chemistry, physics, and genesis. Description, identification, association, occurrence, and use of common and important minerals. 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 (4 Cr)

P: G206 or consent of instructor. Fall.

Techniques of mapping. Field use and interpretation of maps and aerial photographs. Pace-and-compass and plane-table mapping. Measuring stratigraphic sections. Interpretations of structural geology and landforms and landscapes. Remote sensing.

G323 STRUCTURAL GEOLOGY (3 Cr)

P or C: G222. R: G303.

Nature and origin of primary and secondary structural features of the earth's crust; with emphasis on mechanics of deformation and origin. Laboratory consists of three-dimensional problems illustrating structural concepts. Field trips.

G334 PRINCIPLES OF SEDIMENTATION AND STRATIGRAPHY (3 Cr)

P: G222 or consent of instructor. Spring.

Interrelationship of sedimentation and stratigraphy: processes and factors influencing genesis of sedimentary strata; provenance, depositional environment, sedimentary facies, paleoecology; analytical techniques, application of principles to interpretation of stratigraphic record.

G401 OPTICAL MINERALOGY (3 Cr)

P: G222. Fall in alternate years.

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.

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 109 for non-Biology majors. Fall.

Principles of paleontology. Application of biological principles and use of fossils in the study of earth history. Emphasis is on documentation of macroevolution and development of the basic theory of evolution. G410 (1 Cr) must be taken concurrently for field project by Geology majors; optional for non-majors.

G406 INTRODUCTION TO GEOCHEMISTRY (3 Cr)

P: G221, Chemistry C106 or consent of instructor.

Chemistry in the study of the earth employing elementary chemical thermodynamics, the phase rule, chemical equilibria, redox reactions, the radioactive decay law, and organic chemistry.

G409 INDEPENDENT STUDY IN GEOLOGY (1-3 Cr)

P: Consent of instructor. Every, day, night.

Supervised independent study of topics and techniques in geology that are not available in formal courses in the department.

G410 UNDERGRADUATE RESEARCH IN GEOLOGY (1-6 Cr)

P: junior standing and consent of instructor. Every, day, night.

Field and laboratory research in selected problems in geology. May be repeated. Total of 6 credits may be applied toward the degree.

G413 INTRODUCTION TO EARTH PHYSICS (3 Cr)

P: consent of instructor. Spring.

Physics in the study of the earth, its origins, history, and internal constitution. Exploration techniques.

G415 PRINCIPLES OF GEOMORPHOLOGY (4 Cr)

P: G222, G303. P or C: G323, G334. Spring.

Geomorphic processes, evolution, and classification of landforms. Laboratory: topographic maps; aerial photographs.

G416 ECONOMIC GEOLOGY (3 Cr)

P: G222 or consent of instructor.

Origin, geologic occurrence, distribution, use, and conservation of important geologic natural resources of the world. Metallic minerals; industrial minerals and rocks; coal, petroleum, natural gas, and other energy resources; water as a natural resource. Credit not given for both G416 and G316.

G420 REGIONAL GEOLOGY FIELD TRIP (1-2 Cr)

P: consent of instructor. Spring, day.

Seminar and field investigation of selected regions for study of mineralogic, lithologic, stratigraphic, structural, paleontologic, geomorphologic, or other geological relationships. Seminar held during the semester. Six to ten days in the field during or following the semester.

G429 FIELD GEOLOGY IN THE ROCKY MOUNTAINS (6 or 8 Cr)

P: G221, G222, G303, G323, and G334. Summer.

Six or eight weeks at Geologic Field Station in Montana. Geologic reconnaissance, measurement of stratigraphic sections, mapping on aerial photographs, construction of structure sections. Regional geomorphology, stratigraphy, and structure through South Dakota, the Black Hills, Wyoming, Montana, Yellowstone Park, and Glacier Park. Students register through the Geology Department at Indiana University-Bloomington.

G430 PRINCIPLES OF HYDROLOGY (4 Cr)

P: G110, R: G300, MA148, introductory chemistry, physics, and biology.

Water as a natural resource, including both surface and subsurface water; investigation of physical, chemical, and biological properties of water; components of hydrologic cycle; environmental hydrology; includes field and laboratory study.

G451 PRINCIPLES OF HYDROGEOLOGY (3 Cr)

P: G109, G110 or consent of instructor. R: G334.

Water resources; occurrence, regulation, and management of water; hydrologic cycle, water movement, water quality and pollution; surface and subsurface investigations; basin-wide development of water resources.

G490 SEMINAR IN GEOLOGY (2-3 Cr)

P: junior or senior standing and consent of instructor.

Readings and discussion of selected topics. May be repeated, provided different topics are studied, for a maximum of 6 credits.

G561 PALEOECOLOGY (3 Cr)

P: G334, G404, and consent of instructor. Fall, alternate years.

Relationships between modern and fossil organisms and their physical, chemical, and biological environment; emphasis on techniques for interpreting past environmental conditions.

G700 GEOLOGIC PROBLEMS (1-5 Cr)

P: Consent of instructor.

Consideration of special geologic problems.

T309 EARTH SCIENCE: GEOLOGIC ASPECTS I (4 Cr)

P: None. 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 (4 Cr)

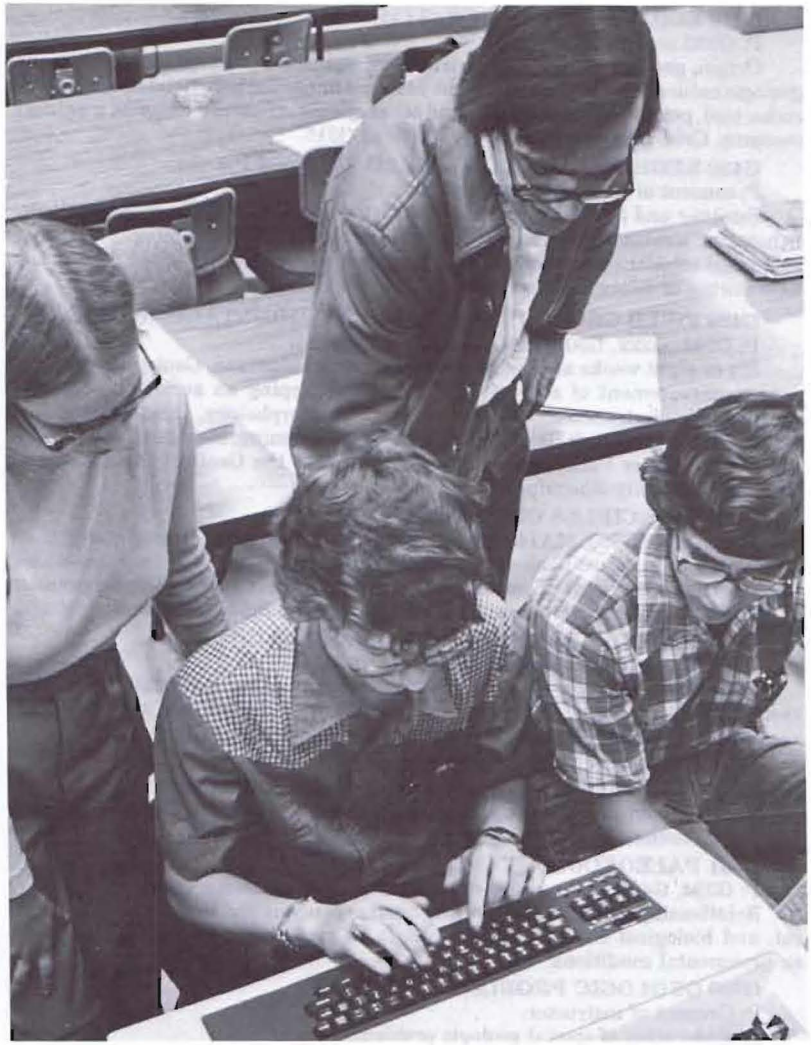
P: None. Spring, night.

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: G107 or G109 or G110 or consent of instructor. Spring.

Selected topics in earth sciences. May be repeated, provided different topics are studied, for a maximum of 6 credits. May be used for graduate credit by students in education.



Computer science students learn interactive computing on the DEC-10.

Department of Mathematical Sciences

PROFESSORS: Alton, Bittinger, Crown, Gemignani (Chairman), John Gersting, Judith Gersting, Huffman, Kuczkowski, Yovits; PROFESSORS EMERITUS: Bridges, Johnston, Suter, Sconce; ASSOCIATE PROFESSORS: Aliprantis, Bodonyi, Burkinshaw, Kaminker, Kleyle, Loh, Luke, Morrel, Ng, Penna; ASSISTANT PROFESSORS: Duncan, Hutton, Miller (Columbus), Patterson, Pramanik, Rigdon, Swart; ADJUNCT PROFESSOR: Pollack; LECTURERS: Ingojo, Richards.

DEPARTMENTAL COUNSELOR: Gemignani

GRADUATE COUNSELOR: Kuczkowski.

The Department of Mathematical Sciences includes the areas of Computer and Information 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 four optional areas: pure mathematics, applied mathematics, computer science, and secondary school teaching.

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

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

UNDERGRADUATE PROGRAMS BACHELOR OF SCIENCE (MATHEMATICS)

Although a student may declare a mathematics major in the freshman year, he or she is not officially admitted to the department as a major in mathematics until completion of MATH 351 or its equivalent. An average grade of 2.0 with no failing grades in mathematics courses through MATH 351 is a minimum indication of success in this major.

Degree Requirements

The 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, except that
   a. Mathematics courses below MATH 163 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; Geology G107; and Geography

G107 may not be used to fulfill the Science requirement, Area IIIC, of the School of Science. If in doubt about a particular course, the student should consult 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.

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 science 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.

   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 in which you expect to teach. You can obtain these requirements by writing to the Department of Public Instruction, Certification Office, in the capital city of any state.

According to Indiana state law, a student should have 40 semester hours in general education courses and a specified core of professional education courses as part of the requirement for a teaching license. You should be sure to see an advisor to ensure that these hours are properly distributed and that the professional education requirements are met. The secondary teaching program here which has been approved by the State of Indiana requires the completion of at least 38 semester hours of mathematics courses. The general requirements for this option differ from the other options in that an additional three hours of English composition and communication skills is required under Area I and one year (at least five semester hours) in a modern foreign language is required under Area II. 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 calculus sequence MATH 163, 164, 261
2. Computer Science CSCI 220
3. Linear and Abstract Algebra MATH 351 (or MATH 511) and MATH 453
4. Analysis MATH 361 and MATH 300
5. Geometry MATH 563 (or MATH 561)
6. Probability and Statistics STAT 311 (or MATH 519)
7. Three hours selected from a mathematics, computer science or statistics course at the 300 level or higher.

BACHELOR OF SCIENCE (COMPUTER SCIENCES)

Degree Requirements

Those general requirements under Area I and III of the University and the School of Science, except that

a. Mathematics courses below MATH 163 and Computer Science courses below CSCI 220 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; Geology G107 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.

AREA IV: Major Requirements

1. The calculus sequence MATH 163, 164, 261.
2. One year of algebra MATH 351 and CSCI 482.
3. One year of analysis MATH 361 and CSCI 414
4. CSCI 220, 300, 320, 402, 484.
5. STAT 511 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, 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: CSCI 220, CSCI 300, CSCI 320, MATH 163, MATH 164, MATH 261, and MATH 351.

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 to any of the M.S. degree programs.

This non-thesis program requires a minimum of 33 credits. A plan of study will normally include six semester hours in algebra, six semester hours in geometry, six semester hours in analysis, and one course in mathematics, computer sciences, or statistics to be selected with the

approval of the advisory committee. Courses which meet these requirements include MATH 547, 548, 550, 511, 561, and 563. A student who has completed a course equivalent to any of these as an undergraduate must substitute a more advanced course unless it is determined by the advisory committee not to be feasible. The student must complete 12 additional hours. These may be in related areas.

MASTER OF SCIENCE

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

MASTER OF SCIENCE (APPLIED MATHEMATICS)

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

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

The program consists of six core courses, three areas of specialization—each comprising two courses—and an individual project.

1. Core Course Requirements:
   Boundary Value Problems and Differential Equations: MATH 520 and MATH 522
   Complex Analysis: MATH 525
   Real Analysis: MATH 534 or MATH 544
   Mathematical Modelling of Physical Processes: MATH 626 and MATH 627
2. Areas of Specialization: One of the following sequences or an approved sequence of two courses.
   a. Analytical Techniques: MATH 523, MATH 624
   b. Numerical Methods: CSCI 514, CSCI 516
   c. Statistics: STAT 513, STAT 514
3. Research Project: Each student will be required to carry out an individual project related to a current problem. The project may emphasize the generation of a mathematical model or its analysis, or some solution techniques or empirical verification. Three to six hours credit will be given for this project.

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—CSCI 514, CSCI 520, and either CSCI 614 or CSCI 615.

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

   b. Systems programming — CSCI 501, CSCI 502, CSCI 503, and CSCI 660.

      In addition to the general admission requirements, students entering the systems programming option should also have completed CSCI 402, CSCI 403, CSCI 461, or the equivalent.
3. Completion of at least one course from each of the following categories:
   a. Numerical analysis above CSCI 512.
   b. Systems programming—CSCI 501 or CSCI 502.
   c. Logic and automata theory—CSCI 582 (CSCI 482 and CSCI 484 together count as one course in Logic and Automata theory).
   d. Mathematics above MATH 511.
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: CSCI 402, CSCI 403, CSCI 461, CSCI 482, CSCI 484.

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	MATH 163 (5) Calculus	SPCH C110 (3) Speech	ENGL W131 (3) Composition	Laboratory Science (3-5)	Free Elective (3)
	2	MATH 164 (5) Calculus	CSCI 220 (3) Programming I		Laboratory Science (3-5)	Free Elective (3-4)
SOPHOMORE	3	MATH 261 (4) Calculus	Free Elective (3)	Humanities or Soc. Science (3)	Science Elective (3-5)	Free Elective (3)
	4	MATH 351 (3) Linear Algebra	MATH 361 (3) Advanced Calculus	Humanities or Soc. Science (3)	Science Elective (3-5)	Free Elective (3)
JUNIOR	5	MATH 441 (3) Analysis	STAT 311 (3) MATH or CSCI Elective	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)
	6	MATH 453 (3) Algebra I	Free Elective (3)	Humanities or Soc. Science (3)	Free Elective (3)	Free Elective (3)
SENIOR	7	MATH, STAT or CSCI Elective (3)	MATH, STAT or CSCI Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)
	8	MATH, STAT or CSCI Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)	Free Elective (3)

APPLIED MATHEMATICS OPTION SAMPLE PROGRAM

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

MATHEMATICS TEACHING
MAJOR SAMPLE PROGRAM

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

* MATH 563 is offered only in the fall of even numbered years, and EDUC 448 is offered only in the fall of odd numbered years.

COMPUTER SCIENCE SAMPLE PROGRAM

FRESHMAN	1	CSCI 220 (3) Programming I	MATH 163 (5) Calculus	ENGL W131 (3) Composition	Humanities or Soc. Science (3)	Free Elective (3)
	2	CSCI 320 (3) Programming II	MATH 164 (5) Calculus	SPCH C110 (3) Speech	Humanities or Soc. Science (3)	
SOPHOMORE	3	CSCI 300 (3) Assembly Language	MATH 261 (4) Calculus	Free Elective (3)	Laboratory Science (3-5)	Free Elective (3)
	4	CSCI 402 (3) Architecture of Computers	MATH 351 (3) Linear Algebra	Free Elective (3)	Laboratory Science (3-5)	Free Elective (3)
JUNIOR	5	Advanced CSCI Elective (3)	MATH 361 (3) Advanced Calculus	Free Elective (3)	Science Elective (3-5)	Free Elective (3)
	6	CSCI 482 (3) Discrete Structures	Advanced CSCI 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 CSCI 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; Every — offered in both Fall and Spring Semesters and Summer Session; Fall — offered Fall Semester; Spring — offered Spring Semester; Summer — offered in Summer Session; 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 And Information Science

UNDERGRADUATE LEVEL

Lower-Division Courses

CSCI 201 INTRODUCTION TO COMPUTERS FOR THE HUMANITIES (3 Cr)

P: None.

An introduction to computers intended for students in the humanities and liberal arts. 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.

CSCI 208 THE COMPUTER IN BUSINESS (3 Cr)

P: MATH 111 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.

CSCI 220 PROGRAMMING I (3 Cr)

P or C: One semester of mathematics beyond MATH 150. Not open to students with credit in CSCI 208.

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

CSCI 300 ASSEMBLY LANGUAGE PROGRAMMING (3 Cr)

P: CSCI 320.

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.

CSCI 320 PROGRAMMING II (3 Cr)

P: CSCI 208 or CSCI 220 or ENGR 109 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.

CSCI 385 INTRODUCTION TO LOGIC See MATH 385.

CSCI 402 ARCHITECTURE OF COMPUTERS (3 Cr)

P: CSCI 300 and CSCI 320 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.

CSCI 403 SYSTEMS PROGRAMMING (3 Cr)

P: CSCI 300 and CSCI 320 or equivalent and CSCI 402.

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.

CSCI 414 NUMERICAL METHODS (3 Cr)

P: MATH 262 or MATH 361, CSCI 220 or equivalent.

Error analysis, solution of nonlinear equations, direct and iterative methods for solving linear systems, approximation of functions, numerical differentiation and integration, numerical solution of ordinary differential equations. Not open to students with credit in CSCI 512.

CSCI 461 PROGRAMMING III (3 Cr)

P: CSCI 320 or equivalent. R: CSCI 300.

Syntax and semantics of ALGOL, COBOL and PL/1. Students are expected to write, debug, and run programs in the languages discussed.

CSCI 482 DISCRETE COMPUTATIONAL STRUCTURES (3 Cr)

P: MATH 351.

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.

CSCI 484 THEORY OF COMPUTATION (3 Cr)

P: CSCI 482.

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.

CSCI 490 TOPICS IN COMPUTER SCIENCES FOR UNDERGRADUATES (1-5 Cr)

By arrangement.

Supervised reading and reports in various fields. Open to students only with the consent of the department.

DUAL LEVEL
Undergraduate-Graduate

CSCI 501 DATA AND STORAGE STRUCTURES (3 Cr)

P: CSCI 300 and CSCI 320 or equivalent. R: CSCI 461.

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.

CSCI 502 COMPILING AND PROGRAMMING SYSTEMS (3 Cr)

P: CSCI 403, CSCI 461 or equivalents. R: CSCI 501.

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.

CSCI 503 OPERATING SYSTEMS (3 Cr)

P: CSCI 403. R: CSCI 501.

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.

CSCI 512 NUMERICAL METHODS FOR ENGINEERS AND SCIENTISTS (3 Cr)

P: MATH 262 or MATH 361, CSCI 220 or equivalent. Not open to students with credit in CSCI 414.

Error analysis, solution of nonlinear equations, direct and iterative methods for solving linear systems, eigenvalues, approximation of functions, interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations, numerical instability.

CSCI 514 NUMERICAL ANALYSIS (3 Cr)

P: CSCI 414 or CSCI 512 or equivalent.

Difference equations, spline theory, analysis of iterative methods for solving nonlinear equations, quotient-difference algorithm for solution of polynomial equations, numerical solution of ordinary differential equations, analysis of algorithms for stability and round-off error.

CSCI 515 NUMERICAL ANALYSIS OF LINEAR SYSTEMS (3 Cr)

P: MATH 351 or 511, CSCI 220 or equivalent.

Computational aspects of linear algebra; linear equations and matrices, direct and iterative methods; eigenvalues and eigenvectors of matrices; error analysis.

CSCI 516 COMPUTATIONAL METHODS IN APPLIED MATHEMATICS

P: CSCI 320 or equivalent, MATH 510 or consent of instructor.

A study of techniques such as direct integration, shooting, finite difference, finite element, method of weighted residuals, methods of characteristics and others for solving problems in fluid mechanics, solid mechanics, dynamics and other fields of applied mathematics.

CSCI 520 LINEAR SYSTEMS AND MATHEMATICAL PROGRAMMING (3 Cr)

P: MATH 351 or MATH 511.

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.

CSCI 541 DATA BASE SYSTEMS (3 Cr)

P: Consent of instructor.

Introduction to database concept, query languages, data definitions, and manipulation languages. CODA SYL-DBTG network data model, relational data models, and hierarchical data models. Indexing techniques. Case studies of current database management systems. Systems evaluation and selection. Logical database design and restructuring. Data translation. Data security and integrity protections.

CSCI 542 DESIGN OF DATA PROCESSING SYSTEMS (3 Cr)

P: CSCI 402 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.

CSCI 543 DISCRETE SYSTEM SIMULATION (3 Cr)

P: MATH M119, CSCI 208 or 220, STAT 311 or 511, or consent of the instructor. R: CSCI 320.

Simulation and modeling. Monte Carlo techniques; use of special simulation languages to simulate actual systems; generation of random numbers and stochastic variates; vertification of simulation models; design of simulation experiments.

CSCI 582 AUTOMATA, FORMAL LANGUAGES, AND COMPUTABILITY I (3 Cr)

P: CSCI 484. By arrangement.

Formal grammars, with particular emphasis on context-free grammars. Computational complexity, LR (k) grammars, unsolvability questions.

CSCI 585 MATHEMATICAL LOGIC I (See MATH 585)

CSCI 590 TOPICS IN COMPUTER SCIENCES (1-5 Cr)

By arrangement.

Directed study for students who wish to undertake individual reading and study on approved topics.

CSCI T590 COMPUTER SCIENCE FOR TEACHERS (3 Cr)

An introduction to computer science intended for high school mathematics teachers. 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

CSCI 614 NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (3 Cr)

P: CSCI 514 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.

CSCI 615 NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (3 Cr)

P: CSCI 514, MATH 523. By arrangement.

The numerical solution of hyperbolic, parabolic, and elliptic equations by finite difference methods; iterative methods (Gauss-Seidel, overrelaxation, alternating direction) for solving elliptic equations; discretization and round-off errors; explicit and implicit methods for parabolic and hyperbolic systems; the method of characteristics; the concept of stability for initial value problems.

CSCI 660 DESIGN OF TRANSLATING SYSTEMS (3 Cr)

P: CSCI 502. R: CSCI 501.

Advanced topics in language processing, continuing the coverage of compilers in CSCI 502. Source-level logic optimization; compilers for small machines; debugging compilers. Formal properties of languages and their effects on syntax analysis; language specification methodologies. Extensible languages and nonprocedural languages. Compiler-compilers and decompilers.

CSCI 661 FORMAL COMPILING METHODS (3 Cr)

P: CSCI 484, CSCI 502.

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

Mathematics

SPECIAL SERVICE COURSES

MATH 001 REMEDIAL ALGEBRA (3 Cr)

P: Eighth Grade Mathematics

Covers the material in the first year of high school algebra. Numbers and algebra, integers, rational numbers, equations, polynomials, graphs, systems of equations, inequalities, radicals. Credit does not apply toward any degree.

MATH 002 PLANE GEOMETRY (3 Cr)

P: MATH 001 or one year of high school algebra.

Covers the material in a year of high school geometry. Sets and real numbers, coordinate systems, loci, lines, circles, angles, triangles, constructions, area and perimeter, surface area and volume. Credit does not apply toward any degree.

UNDERGRADUATE LEVEL
Lower-Division Courses

MATH 111 ALGEBRA (3 Cr)

P: MATH 001 or one year of high school algebra.

Real numbers, linear equations and inequalities, systems of equations, polynomials, exponents, logarithmic functions. Covers material in the second year of high school algebra.

MATH 112 TRIGONOMETRY (3 Cr)

P: MATH 111 or 3 semesters of high school algebra. Spring. Not open to students with credit in MATH 151 or 153.

Real numbers, factoring, functions, exponents, trigonometric functions, tables, identities, complex numbers.

MATH M118 FINITE MATHEMATICS I (3 Cr)

P: MATH 111 or equivalent. Equiv. PU MATH 213.

Set theory, vectors, matrices, permutations, combinations, simple probability, conditional probability, Markov chains, linear programming, graphical and simplex methods, duality theorem.

MATH M119 BRIEF SURVEY OF CALCULUS I (3 Cr)

P: MATH 111 or two years of high school algebra.

Sets, limits, derivatives and applications, integrals and applications, functions of several variables.

MATH 123 ELEMENTARY CONCEPTS OF MATHEMATICS (3 Cr)

P: None.

Mathematics for liberal arts students; experiments and activities which provide an introduction to inductive and deductive reasoning, number sequences, functions and curves, probability, statistics, topology, metric measurement, and computers.

MATH 130 MATHEMATICS FOR ELEMENTARY TEACHERS I (3 Cr)

P: MATH 001 or one year of high school algebra, MATH 002 or one year of high school geometry. Equiv. IU MATH T101. The sequence MATH 130, 131, 132 fulfills the mathematics requirements for elementary education majors.

Numeration systems, mathematical reasoning, natural numbers, whole numbers, properties, algorithms, sets, sentences, logic.

MATH 131 MATHEMATICS FOR ELEMENTARY TEACHERS II (3 Cr)

P: MATH 130. Equiv. IU MATH T102.

Number systems: numbers of arithmetic, integers, rationals, reals, mathematical systems, decimal and fractional notations; probability, simple and compound events, algebra review.

MATH 132 MATHEMATICS FOR ELEMENTARY TEACHERS III (3 Cr)

P: MATH 131. Equiv. IU MATH T103. Fall.

Metric and nonmetric properties of geometric figures, measurement; introduction to the foundations of euclidean geometry; coordinate geometry.

MATH 147 ALGEBRA AND TRIGONOMETRY FOR TECHNOLOGY I (3 Cr)

P: 3 semesters of high school algebra.

MATH 147-148 is a two semester version of MATH 150. MATH 147 covers Algebra.

MATH 148 ALGEBRA AND TRIGONOMETRY FOR TECHNOLOGY II (3 Cr)

P: 4 semesters of high school algebra. Equiv. IU MATH M107.

MATH 147-148 is a two semester version of MATH 150. MATH 148 covers Trigonometry.

MATH 150 MATHEMATICS FOR TECHNOLOGY (5 Cr)

P: 3 semesters of high school algebra. Equiv. IU MATH M015.

MATH 147-148 is a two semester version of MATH 150. Fundamental laws of algebra, functions and graphs, trigonometric functions, linear equations, factoring, exponents, vectors, complex numbers, logarithms, ratio, proportion, variation.

MATH 163 INTEGRATED CALCULUS AND ANALYTIC GEOMETRY I (5 Cr)

P: 2 years of high school algebra, one semester of trigonometry, one year of geometry. Equiv. IU MATH M215.

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

MATH 164 INTEGRATED CALCULUS AND ANALYTIC GEOMETRY II (5 Cr)

P: MATH 163. Equiv. IU MATH M216.

Transcendental functions, methods of integration, conics, polar coordinates, parametric equations, vectors, improper integrals.

MATH 214 FINITE MATHEMATICS II (3 Cr)

P: MATH M118.

Vectors, matrices, systems of linear equations, linear programming, game theory.

MATH 221 CALCULUS FOR TECHNOLOGY I (3 Cr)

P: MATH 150 or equivalent.

Analytic geometry, the derivative and applications, the integral and applications.

MATH 222 CALCULUS FOR TECHNOLOGY II (3 Cr)

P: MATH 221.

Differentiation of transcendental functions, methods of integration, power series, Fourier series, differential equations.

MATH 261 MULTIVARIATE CALCULUS (4 Cr)

P: MATH 164. Equiv. IU MATH M311.

Partial differentiation, multiple integration, vector functions and vector analysis, infinite series.

MATH 262 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS (4 Cr)

P: MATH 261.

Vector spaces, bases, orthogonality, determinants, differential equations, first order equations, applications, second order equations.

Upper-Division Courses

MATH 300 FOUNDATION OF THE NUMBER SYSTEMS (3 Cr)

P: MATH 163. Equiv. IU MATH M391.

Logic, sets, functions, relations, groups, natural numbers, rational numbers, real numbers. The notion of proof is emphasized. Suggested for prospective high school teachers.

MATH 351 ELEMENTARY LINEAR ALGEBRA (3 Cr)

P: MATH 261.

Systems of linear equations, matrices, vector spaces, linear transformations, determinants, inner product spaces, eigenvalues, applications.

MATH 361 INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS (3 Cr)

P: MATH 261.

First order equations, the method of separation of variables, existence theorems, second order linear equations, initial and boundary value problems, power series solutions, systems of first order equations, stability for linear systems, Laplace transforms, applications.

MATH 385 INTRODUCTION TO LOGIC

P: MATH 261.

Propositional calculus and predicate calculus with applications to mathematical proofs, valid arguments, switching theory, and formal languages. Not open to students with credit in MATH 581.

MATH 441 FOUNDATIONS OF ANALYSIS (3 Cr)

P: MATH 261.

Topology of Cartesian spaces, sequences, continuity, differentiation, Riemann-Stieltjes integral.

MATH 442 MULTIVARIATE ANALYSIS (3 Cr)

P: MATH 351 and 441.

Euclidean spaces, differentiation, vector valued functions, measure and integration, exterior algebra, differential calculus, integration on manifolds.

MATH 453 ALGEBRA I (3 Cr)

P: MATH 351 or consent of the instructor.

Fundamental properties of groups, rings, and fields with emphasis on structure, morphisms, quotients, fundamental homomorphism theorems.

MATH 490 TOPICS IN MATHEMATICS FOR UNDERGRADUATES (1-5 Cr)

By arrangement.

Supervised reading and reports in various fields. Open only to students with the consent of the department.

MATH S490 SENIOR SEMINAR (3 Cr)

DUAL LEVEL COURSES
Undergraduate — Graduate

MATH 510 ADVANCED CALCULUS (3 Cr)

P: MATH 262.

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.

MATH 511 LINEAR ANALYSIS (3 Cr)

P: MATH 261. -

Matrices, rank and inverse of a matrix, linear programming, simplex method, eigenvectors, unitary and similarity transformations on matrices.

MATH 517 MATHEMATICAL MODELING (3 Cr)

P: MATH 262, MATH 351, MATH 511, or MATH 554.

Linear programming; game theory, mathematical modeling of problems in economics, politics, psychology, sociology.

MATH 519 INTRODUCTION TO PROBABILITY (3 Cr)

P: MATH 362 or 510.

Algebra of sets, sample spaces, combinatorial problems, conditional probability, independence, random variables, distribution functions, characteristic functions, special distributions, limit theorems.

MATH 520 BOUNDARY VALUE PROBLEMS OF DIFFERENTIAL EQUATIONS (3 Cr)

P: MATH 261, 361. Recommended P or C: MATH 362 or 510.

Sturm-Liouville theory; singular boundary conditions, orthogonal expansions, separation of variables in partial differential equations; spherical harmonics.

MATH 522 QUALITATIVE THEORY OF DIFFERENTIAL EQUATIONS (3 Cr)

P: MATH 262 or both 351, 361.

Laplace transforms, systems of linear and nonlinear ordinary differential equations, brief introduction to stability theory, approximation methods, other topics.

MATH 523 INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS (3 Cr)

P: MATH 261 and 361. Recommended P or C: MATH 362 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.

MATH 525 INTRODUCTION TO COMPLEX ANALYSIS (3 Cr)

P: MATH 510.

Complex numbers and complex-valued functions: differentiation of complex functions; power series, uniform convergence; integration, contour integrals; elementary conformal mapping.

MATH 529 OPERATIONAL CALCULUS (3 Cr)

P: MATH 525.

Laplace and Fourier transforms; Heaviside-Mikusinski calculus; generalized functions; asymptotic evaluation of Fourier integrals.

MATH 532 ELEMENTS OF STOCHASTIC PROCESSES (3 Cr)

P: MATH 519, 525.

A basic course in stochastic processes including normal processes, covariance processes, Poisson processes, renewal processes, and Markov processes.

MATH 534 ADVANCED ANALYSIS FOR ENGINEERS AND SCIENTISTS (3 Cr)

P: MATH 510 or consent of instructor.

Metric spaces, convergence and uniform convergence, Banach and Hilbert spaces.

MATH 544 REAL ANALYSIS AND MEASURE THEORY (3 Cr)

P: MATH 441 or consent of instructor.

Algebras of sets, real number system, Lebesgue measure, measurable functions, Lebesgue integration, differentiation, absolute continuity, Banach Spaces, Metric Spaces, general measure and integration theory, Riesz representation theorem.

MATH 545 PRINCIPLES OF ANALYSIS II (3 Cr)

P: MATH 544.

Continues the study of measure theory begun in MATH 544.

MATH 546 INTRODUCTION TO FUNCTIONAL ANALYSIS (3 Cr)

P: MATH 545. By arrangement.

Banach spaces, Hahn-Banach theorem, uniform boundedness principle, closed graph theorem, open mapping theorem, Hilbert spaces.

MATH 547 ANALYSIS FOR TEACHERS I (3 Cr)

P: MATH 261.

Set theory, logic, relations, functions, Cauchy's inequality, metric spaces, neighborhoods, Cauchy sequences.

MATH 548 ANALYSIS FOR TEACHERS II (3 Cr)

P: MATH 547.

Functions on a metric space, continuity, uniform continuity, derivative, chain rule, Riemann integral, fundamental theorem of calculus, double integrals.

MATH 550 ALGEBRA FOR TEACHERS I (3 Cr)

P: MATH 351.

Definitions and elementary properties of groups, rings, integral domains, fields. Intended for secondary school teachers.

MATH 551 ALGEBRA FOR TEACHERS II (3 Cr)
P: MATH 550.
Polynomial rings, fields, vector spaces, matrices.

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

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

MATH 556 INTRODUCTION TO THE THEORY OF NUMBERS (3 Cr)
P: MATH 261.
Divisibility, congruences, quadratic residues, Diophantine equations, the sequence of primes.

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

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

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

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

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

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

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

MATH 587 GENERAL SET THEORY (3 Cr)
P: MATH 351.
Informal axiomatization of set theory, cardinal numbers, countable sets, cardinal arithmetic, order types, well ordered sets and ordinal numbers, axiom of

choice and equivalences, paradoxes of intuitive set theory, Zermelo-Fraenkel axioms.

MATH 592 MATHEMATICAL MODELING OF TRANSPORT PROCESS IN THE LOWER ATMOSPHERE (3 Cr)

P: MATH 361 or consent of instructor.

Derivation of the governing differential equations. Transport equations in turbulent flow. Application of the governing differential equations to planetary boundary layer. Mechanics of turbulence. Profiles of velocity and temperature in lower atmosphere. Magnitude of turbulent fluctuations. Diffusion and estimation of diffusion from meteorological data.

MATH 598 TOPICS IN MATHEMATICS (1-5 Cr)

By arrangement.

Directed study and reports for students who wish to undertake individual reading and study on approved topics.

MATH T501 REMEDIAL MATHEMATICS FOR THE MIDDLE SCHOOL — JUNIOR HIGH SCHOOL TEACHER (3 Cr)

Set theory, systems of numeration, operations on whole numbers, mathematical sentences, integers, rational numbers, real numbers.

MATH T502 GEOMETRY FOR MIDDLE SCHOOL — JUNIOR HIGH SCHOOL TEACHERS (3 Cr)

Rational numbers, real numbers, measurement, geometry.

MATH T503 MATHEMATICS FOR MIDDLE SCHOOL — JUNIOR HIGH SCHOOL TEACHERS (3 Cr)

Additional topics not covered in MATH T501 or MATH T502.

GRADUATE LEVEL

MATH 611 METHODS OF APPLIED MATHEMATICS I (3 Cr)

Introduction to Banach and Hilbert spaces, linear integral equations with Hilbert-Schmidt kernels, eigenfunction expansions and Fourier transforms.

MATH 624 PERTURBATION AND ASYMPTOTIC ANALYSIS (3 Cr)

P: MATH 520, 525 and some background in partial differential equations.

Matched asymptotic expansions, inner and outer expansion, strained coordinates and multiple scales, turning point problems.

MATH 626 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.

MATH 627 MATHEMATICAL FORMULATION OF PHYSICAL PROBLEMS II (3 Cr)

P: MATH 626.

Theories of continuous fields, continuous media, field equations of continuum mechanics, inviscid fluid flow, viscous flow, turbulence.

Statistics

UNDERGRADUATE LEVEL
Upper-Division Courses

STAT 301 ELEMENTARY STATISTICAL METHODS I (3 Cr)

P: College algebra. Not open to students in the Division of Mathematical Science and School of Engineering and Technology.

A basic introductory statistics course with applications shown to various fields and emphasis placed on assumptions, applicability, and interpretations of various statistical techniques. Subject matter includes frequency distribution, descriptive

statistics, elementary probability, normal distribution, applications, sampling distribution, estimation, hypothesis testing, and linear regression.

STAT 302 ELEMENTARY STATISTICAL METHODS II (3 Cr)

P: STAT 301 or equivalent. Continuation of STAT 301.

Multiple regression and analysis of variance, with emphasis on statistical inference and applications to various fields.

STAT 311 INTRODUCTORY PROBABILITY (3 Cr)

P: MATH 261 or equivalent.

Formulation of probability problems, discrete and continuous random variables, expectation, standard distributions, applications to statistical problems and problems in the physical sciences.

STAT 490 TOPICS IN STATISTICS FOR UNDERGRADUATES (1-5 Cr)

Supervised reading and reports in various fields.

DUAL LEVEL
Undergraduate-Graduate

STAT 511 STATISTICAL METHODS I (3 Cr)

P: MATH 163.

Descriptive statistics; elementary probability; normal, binomial, Poisson, hypergeometric distributions; sampling distributions; testing hypotheses, and estimation; one-way analysis of variance; chi-square test; correlation and regression.

STAT 512 STATISTICAL METHODS II (3 Cr)

P: STAT 511.

Linear and multiple regression; non-linear regression; analysis of variance; random, fixed, mixed models, nested factorial, expected mean squares, pooling, modifications under relaxed assumptions, multiple comparisons, variance of estimates; analysis of covariance.

STAT 513 APPLICATIONS OF STATISTICS IN INDUSTRY (3 Cr.)

P: STAT 511.

Control charts and acceptance sampling, continuous sampling plans, sequential analysis, statistics of combinations, and some non-parametric methods.

STAT 514 DESIGN OF EXPERIMENTS (3 Cr)

P: STAT 512.

Fundamentals, completely randomized design, randomized complete blocks; Latin square; multiclassification; factorial; incomplete blocks and fractional replications; confounding; lattice design; general mixed factorials; split plot; analysis of variance to regression models; optimum design.

STAT 516 BASIC PROBABILITY AND APPLICATIONS (3 Cr)

P: MATH 164 or equivalent. MATH 261 desirable.

A first course in probability intended to serve as a foundation for statistics and other applications. Intuitive background; sample spaces and random variables; joint, conditional, and marginal distributions; special distributions of statistical importance; moments and moment generating functions; statement and application of limit theorems; Markov chains.

STAT 517 STATISTICAL INFERENCE (3 CR)

P: STAT 516 or equivalent.

Sampling Distribution, Estimation including unbiased, maximum likelihood, and moment estimation, testing hypotheses for standard distributions and contingency tables; confidence intervals and regions; introduction to nonparametric inference and tests of goodness of fit; introduction to multivariate analysis.

STAT 519 INTRODUCTION TO PROBABILITY

See MATH 519.

STAT 528 FOUNDATIONS AND METHODS OF STATISTICS I (3 Cr)

P: MATH 519.

Distribution of the mean and variance in normal samples, sampling distribution derived from the normal distribution, chi-square, t, and F. Distribution of

statistics based on ordered samples. Asymptotic sampling, distributions. Introduction to multivariate normal distribution and linear models. Maximum likelihood, least squares, linear estimation, other methods of point estimation, and discussion of their properties, Cramer-Rao inequality and Rao-Blackwell theorem. Tests of statistical hypotheses, simple and composite hypotheses, likelihood ratio tests, power of tests.

STAT 532 ELEMENTS OF STOCHASTIC PROCESSES
See MATH 532.

Physics student Andy Pruitt operates the department's EPR spectrometer used for biophysics research.

Department of Physics

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

DEPARTMENTAL COUNSELORS: Professors Kleinhans, Meiere, 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 welcomed and encouraged.

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

BACHELOR OF SCIENCE

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

Area 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 MATH 163, MATH 164, MATH 261 and MATH 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	MATH 163 (5) Calculus	CHEM C105 (5) Principles of Chemistry I	ENG W131 (3) English Composition	Elective	
	2	MATH 164 (5) Calculus	CHEM C106 (5) Principles of Chemistry II	PHYS 512 (4) Mechanics	Elective	
SOPHOMORE	3	MATH 261 (4) Calculus	PHYS 251 (5) Heat, Electricity and Optics	Language	Elective	
	4	MATH 262 (4) Linear Algebra and Diff. Equations	PHYS 342 (3) Modern Physics	PHYS 342L (1) Modern Physics Lab	Language	Elective
JUNIOR	5	PHYS 310 (4) Intermediate Mechanics	PHYS 322 (3) Oscillations and Waves	PHYS 350 (2) Intermediate Lab I	Electives	
	6	PHYS 330 (3) Electricity and Magnetism	PHYS 351 (2) Intermediate Lab II	Electives		
SENIOR	7	PHYS 550 (3) Quantum Mechanics	PHYS 515 (3) Thermodynamics	PHYS 590 (1-3) Research	Electives	
	8	PHYS 545 (3) Solid State Physics	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: MATH 150 or equivalent. Equiv. IU P201. Fall, Spring, Summer; day, night.

Mechanics, conservation laws, gravitation; simple harmonic motion and waves; kinetic theory, heat and thermodynamics for students not specializing in physics.

219 GENERAL PHYSICS (4 Cr)

P: PHYS 218. Equiv. IU P202. Fall, Spring, Summer; day, night.

Electricity, light and modern physics for students not specializing in physics.

152 MECHANICS (4 Cr)

P or C: MATH 164. Equiv. IU P221. Fall, Spring, Summer; day, night.

Statics, uniform and accelerated motion; Newton's laws; circular motion; energy, momentum, and conservation principles; dynamics of rotation; gravitation and planetary motion; properties of matter; simple harmonic and wave motion.

251 HEAT, ELECTRICITY, AND OPTICS (5 Cr)

P: PHYS 152. Equiv. IU P222. Fall, Spring; day, night.

Heat, kinetic theory, elementary thermodynamics, heat transfer. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Geometrical and physical optics.

310 INTERMEDIATE MECHANICS (4 Cr)

P: MATH 261 and two terms of general physics. Fall.

For students familiar with calculus. Elements of vector algebra; statics of particles and rigid bodies; theory of couples; principle of virtual work; kinematics; dynamics of particles and rigid bodies; work, power, and energy; elements of hydro-mechanics and elasticity.

322 OSCILLATIONS AND WAVES (3 Cr)

P: PHYS 251. Fall.

Modes of vibration of a system; emission and absorption of waves; properties of sound, electromagnetic and particle waves including phenomena of refraction, reflection, dispersion, diffraction, interference, polarization, and double refraction; lasers and holography.

330 INTERMEDIATE ELECTRICITY AND MAGNETISM (3 Cr)

P: PHYS 251; P or C: MATH 262. Spring.

Electrostatics; electric currents; magnetostatics; electromagnetic induction; Maxwell's equations; electromagnetic waves.

342 MODERN PHYSICS (3 Cr)

P: PHYS 251. Equiv. IU P301. Fall, Spring.

A survey of basic concepts and phenomena in atomic, nuclear, and solid state physics.

342L. MODERN PHYSICS LABORATORY (1 Cr)

Laboratory experiments to accompany PHYS 342.

350 INTERMEDIATE LABORATORY I (2 Cr)

P or C: PHYS 322.

Lectures on geometrical optics; instructor demonstrations and student experiments involving mechanical and electromagnetic wave and oscillation phenomena.

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

470 READING IN SPECIAL TOPICS (1-3 Cr)

490 UNDERGRADUATE READING AND RESEARCH (1-3 Cr)
Independent study for undergraduates.

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

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

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

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

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

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

570 SELECTED TOPICS IN PHYSICS (3 Cr)
Specialized topics in physics selected from time to time.

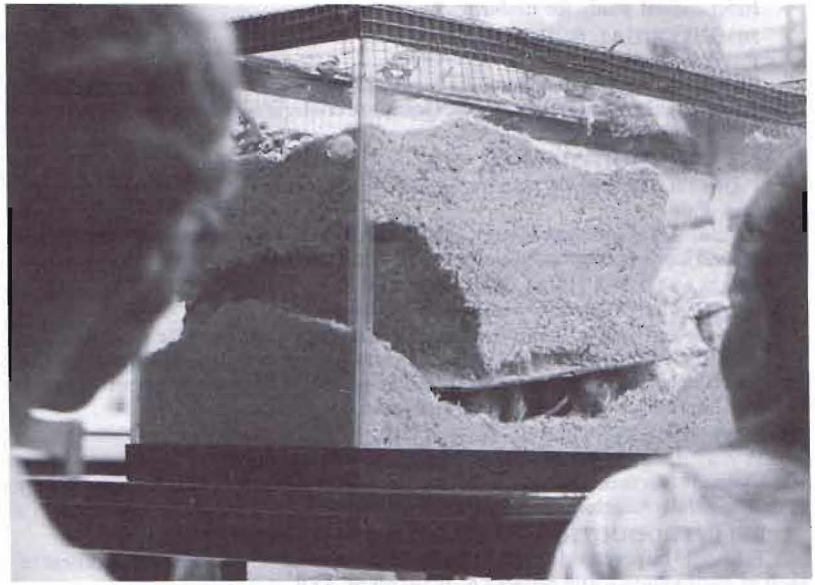
590 READING AND RESEARCH (1-3 Cr)

ASTRONOMY

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

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

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



Dr. Terry Hall, Psychology, explains to a student the underground behavior of Mongolian gerbils.

Department of Psychology

PROFESSORS: Davis, Hanford, Landis (Chairperson), Long, Morris, Neel; ASSOCIATE PROFESSORS: Evenbeck, Fleener, Flynn, Fortier, Goldberg, Kremer, Lauer, Lynch, Tzeng, Ware; ASSISTANT PROFESSORS: Aeschleman, Berck, Bringle, Hall, Hazer, Hoffman, Nitsch, Rytting (Columbus), Svanum; ADJUNCT PROFESSORS: Clodfelter, DeVries, Laube, Levitt, Mannan, Wakefield.

UNDERGRADUATE COUNSELORS: All faculty.
GRADUATE COUNSELORS:
HABILITATION CONCENTRATION: Professor Nitsch
INDUSTRIAL CONCENTRATION: Professor Hoffman
REHABILITATION CONCENTRATION: Professor Lynch
APPLIED SOCIAL CONCENTRATION: Professor Bringle.

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

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

UNDERGRADUATE PROGRAM IN PSYCHOLOGY

The Department of Psychology at IUPUI has determined areas of concentration or specialization at the undergraduate level. The undergraduate psychology student may wish to continue with the standard program for majors requiring 24 hours of selected courses, or he/she may

wish to take courses toward a psychology major according to the Graduate School Option, the Psychological Services Option, or the Personnel-Industrial Option. Each of these options requires 36 hours of selected courses as specified in Area IV below. These options are being offered to enhance students' chances of entering graduate school or appropriate employment after graduation. The department cannot, however, guarantee employment or entrance into graduate school.

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

The Department of Psychology is in the process of developing a placement file for the purpose of helping the student achieve his/her option program objective. Should you desire to follow one of the options, please indicate this when you call the department for counseling.

Undergraduate Degree Requirements

BACHELOR OF ARTS

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

Area I: See School of Science requirements.

Area II: There is no requirement for a foreign language. However, students 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: See description below, "Requirements for Psychology Major."

BACHELOR OF SCIENCE

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

Area I: See School of Science requirements.

Area II: There is no requirement for a foreign language. However, students 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: See description below, "Requirements for Psychology Major."

AREA IV: REQUIREMENTS FOR PSYCHOLOGY MAJOR (B.A. OR B.S.)

In addition to the two semester Introductory Psychology course sequence (B104 & B105), which is required of all majors, the chart below lists the requirements for Psychology courses under each of the four options for undergraduate majors:

OPTION	CONTENT COURSES	METHODS COURSES	PRACTICA	ELECTIVES
Standard Major (24 Hours)	9 hours of courses above the 100 level which end in even numbers (excluding those ending in the digit 2).	9 hours of courses above the 100 level which end in odd numbers	None required	None required
Graduate School Preparation (36 Hours)	2 courses from Cluster A[1] 2 courses from Cluster B[2] Either: B492-Readings *or* B499-Honors Research	B211-Intro. Lab B305-Statistics B307-Tests & Measurement One additional lab course	None required	Any one Psychology course
Psychological Services (36 Hours)	1 course from Cluster A[1] 1 course from Cluster B[2] 2 courses from Cluster C[3]	B211-Intro. Lab B305-Statistics B307-Tests & Measurement	2 Practica chosen from departmental offerings	Any one Psychology course
Personnel-Industrial (36 Hours)	1 course from Cluster A[1] 1 course from Cluster B[2] B366-Organizational Psych B368-Personnel Psych	B211-Intro. Lab B305-Statistics B307-Tests & Measurement One additional lab or computer science course	B372-Industrial Practicum	One course (see counselor for approved electives)

[1]CLUSTER A
B320 Physiological Psych
B324 Psychophysiology of the Senses
B326 Comparative Psych
B334 Perception
B344 Learning
B356 Motivation
B462 Behavior Management
B464 Psych of Language

[2]CLUSTER B
B360 Child & Adolescent Psych
B364 Community Psychology
B366 Organizational Psychology
B368 Personnel Psychology
B370 Social Psychology
B374 Group Dynamics
B376 Psychology of Women
B424 Personality

[3]CLUSTER C
B320 Physiological Psychology
B364 Community Psychology
B462 Behavior Management
549 Intro to Vocational Rehab
550 Intro to Clinical Psych
552 Counseling Theory and Practice in Rehabilitation
557 Psychology of the Urban Environment

Psychology Plans of Study

There is no single semester-by-semester plan of study for any of the degrees offered by the Department of Psychology. However, one possible sequence of courses for the B.A. degree and one for the B.S. degree is given below; variations from these examples (e.g., to include the requirements of the Graduate School Preparation, Psychological Services, or Industrial-Personnel Options) should be made in consultation with a departmental counselor.

BACHELOR OF ARTS SAMPLE PROGRAM

FRESHMAN	1	PSY B104 (3)	ENG W131 (3)	SPCH C110 (3)	AREA IIIA (3)	Elective (3)
	2	PSY B105 (3)	AREA IIIA (3)	AREA IIIB (3)	Electives (6)	
SOPHOMORE	3	PSY B211 (3)	AREA IIIC (3-5)	AREA IIIA (3)	AREA IIIB (3)	Elective (1-3)
	4	PSY B305 (3)	AREA IIIC (3-5)	AREA IIIA (3)	AREA IIIB (3)	Elective (1-3)
JUNIOR	5	PSY Content (3)	PSY Elective (3)	PSY Methods (3)	AREA IIIC (3-5)	AREA IIIB (3)
	6	PSY Content (3)	PSY Elective (3)	AREA IIIC (3-5)	Electives (4-6)	
SENIOR	7	PSY Content (3)	PSY Elective (3)	Elective (11)		
	8	PSY Elective (3)	Electives (12-14)			

BACHELOR OF SCIENCE SAMPLE PROGRAM

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

UNDERGRADUATE HONORS PROGRAM IN PSYCHOLOGY

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

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

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

Departmental Requirements for Graduate Admission

Admission to graduate program requires a Bachelor's degree from an accredited institution, and is based on previous academic performance, letters of recommendation, relevant work experience, and Graduate Record Examination (GRE) scores. (The Advanced Psychology portion of the GRE is not required.) In addition, students must complete Psychology B305, 500, or equivalent and Psychology B307, 505, or equivalent. Stu-

dents admitted without these two 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. Not more than nine hours of credit may be applied to an advanced degree program if an individual is later admitted as a regular graduate student. However, if an application to a regular degree program is approved during the session in which a person is enrolled for the ninth credit hour as a nondegree registrant, then all credits taken prior to and during that term will be eligible for inclusion on a plan of study for a degree program, providing the courses are appropriate to the degree program and acceptable to the department and the Graduate School. No course in which a grade of less than "B" has been received will be permitted on a plan of study if the course was taken while enrolled as a nondegree registrant. Nondegree registrants may be required to secure consent from each of the departments in which they would like to register for courses.

Financial Assistance

Positions as Associate Instructors are available to selected students. In addition, students may apply for graduate stipends as Research Assistants. Students interested in financial assistance should apply by March 15. Others may apply throughout the year.

Research Interests of Faculty

Major research interests of faculty fall within the subareas listed under "Areas of Study Available," and include the following: applied behavior analysis, applied experimental psychology, applied social psychology, biofeedback, cross cultural investigations, environmental psychology, habilitation and early intervention, human factors, industrial/organizational psychology, measurement theory and development, physiological psychology, program planning and evaluation, rehabilitation psychology, and vocational and prevocational training of handicapped persons. A current and more detailed listing of faculty research interests is available from the Department.

Graduate Programs in Psychology

The Department of Psychology provides course work leading to the degree of Master of Science (conferred by Purdue University) in the following areas:

1. Applied Social Psychology/Program Evaluation
2. Habilitation/Early Intervention with Severely Handicapped Children and Adolescents (approval pending)
3. Industrial/Organizational Psychology
4. Rehabilitation Psychology

In Applied Social Psychology/Program Evaluation, three subareas are emphasized: program evaluation, field methods and experimentation, and applied social research. In Habilitation/Early Intervention, subareas include developmental psychology, mental retardation and developmental disabilities, and early intervention strategies and applied behavior analysis. Within Industrial/Organizational Psychology, subareas include personnel selection, organizational behavior, and training and development. Within Rehabilitation Psychology, rehabilitation counseling and applied behavior analysis, vocational training of handicapped youth and adults, and community-integrated services planning and evaluation are a few of the subareas.

Career Information for M.S. Graduates

The Department of Psychology has adapted its course and degree offerings to areas in which there is a current and future demand for trained personnel in Indianapolis, Indiana, and nationally. Our M.S. graduates have excellent employment opportunities upon graduation. In addition, the M.S. degree options are uniformly rigorous and constitute excellent preparation for Ph.D. work in Psychology.

For Further Information, Write To:
Director of Graduate Studies
Department of Psychology
Purdue University School of Science, IUPUI
1201 East 38th Street, Indianapolis, Indiana 46205
(317) 923-1321

M.S. Degree Requirements

A total of 36 credit hours is the minimum required for the M.S. degree. All students are required to take three department-wide core courses: PSY 540: History and Systems of Psychology; PSY 600: Statistical Inference; and PSY 601: Correlation and Experimental Design. Each area of concentration has its own additional required courses. An M.S. thesis is required in all options except Industrial/Organizational Psychology. In Habilitation/Early Intervention and Rehabilitation Psychology, a semester-long internship is also required.

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 — Organizational 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 Psychology
683 — Seminar in Industrial-Social Psychology

Non-Thesis Option

570 — Industrial Psychology
572 — Organizational 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 Psychology
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.

All the master's level, the rehabilitation counselor is a key member of the rehabilitation team which may include a physician, psychologist, social worker, physical therapist, occupational therapist, special teacher, and/or other professional personnel. Typically, the counselor is responsible for the coordination and integration of services provided by these people. The counselor provides continuing counseling services throughout the rehabilitation process to the end that the disabled person is restored to the fullest physical, mental, social, vocational, and economic usefulness possible.

Only a thesis option is offered within the Rehabilitation area of concentration. Listed below are courses required 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

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. Only a thesis option is available within this area. Besides the core courses, the following are required:

640 — Survey of Social-Personality Psychology I
646 — Seminar: Program Evaluation
643 — Field Methods and Experimentation
646 — Seminar: Community Psychology
646 — Seminar: Special Topics
I649 — Internship in Applied Social Psychology
698 — Thesis
2 ELECTIVES
(to be chosen from the following list)
572 — Organizational Psychology
557 — Psychology of the Urban Environment
605 — Applied Multivariate Analysis
608 — Advanced Technology of Tests and Measurements
641 — Survey of Social-Personality Psychology II
642 — Cross-Cultural Social Psychology
650 — Developmental Psychology

HABILITATION/EARLY INTERVENTION AREA OF CONCENTRATION*

The primary objective of the M.S. training in Habilitation (Early Intervention) of Severely/Profoundly Handicapped Children and Youth is the preparation of Master's-level leadership personnel who could (1) create early intervention/habilitation programs in communities and agencies where such programs do not now exist, and/or (2) successfully manage such programs, once they have been initiated.

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*Pending approval. For further information contact the Department Chairperson.

In Indiana, as in other states, there are very few community-integrated habilitation programs for severely/profoundly handicapped children and youth. In order to prepare the needed cadre of "middle management" program developers and administrators, the proposed option will have four major training foci: (1) a strong grounding in the principles and empirical findings of developmental psychology; (2) a relatively thorough knowledge and experience in early intervention practice (with an emphasis on applied behavior analysis and individual program design); (3) an understanding of systemic issues related to the delivery of human services; and (4) at least journeyman expertise in research design and analysis.

It must be emphasized that the graduate of this program will be a program developer and/or manager, and not a classroom teacher or (primarily) a direct-service clinician. Rather the graduate will be a leader capable of supervising bachelor's-level developmental and habilitation specialists, who typically are trained in special education, social work, or psychology. Graduates will be prepared to work in a wide variety of service settings which include residential programs, social/recreation programs, and prevocational training programs in addition to those services which provide primarily educational programs for this population.

While a single prescribed sequence of courses has not been determined, individual student's curricula will be structured so that the following areas of competency are emphasized:

I. Developmental Psychology Knowledge Base

A. Survey of normal child development

B. Psychological aspects of mental retardation and other developmental disabilities

C. Advanced topics in the development of communication, motor skills, and aspects of cognitive functioning

II. Practice/Experiential Knowledge Base

A. Applied behavioral analysis

B. Strategies of assessment and intervention

C. Interdisciplinary teamwork

D. Parent involvement/parent training

E. Field experience (practicum and internship)

III. Human Service Systems Knowledge Base

A. Normalization and the development of community-based services

B. Program planning, implementation strategies, and administration

C. Evaluation of program effectiveness

IV. Research Knowledge Base

A. Research techniques in child development

B. Statistics and experimental design

C. Current research findings related to various habilitation programs and techniques

UNDERGRADUATE COURSES

NOTE: P-prerequisite; C-concurrent registration; Every-offered in both Fall and Spring semesters and Summer Session; Fall-offered Fall

semester; Spring-offered Spring semester; Summer-offered during the Summer Session. For courses with no designated semester, consult the *Schedule of Classes*. Equiv.-course is equivalent to the indicated course taught at Indiana University-Bloomington or the indicated course taught at Purdue University-West Lafayette.

B104 PSYCHOLOGY AS A SOCIAL SCIENCE (3 Cr)

Equiv. to IU P102 and PU 120. Every.

Introduction to scientific method, individual differences, personality, developmental, abnormal, social, and industrial psychology.

B105 PSYCHOLOGY AS A BIOLOGICAL SCIENCE (3 Cr)

Equiv. to IU P101 and PU 120. Every.

Research methods and content areas of learning, sensation-perception,psychophysiology, motivation, emotions, and statistics.

B125 COGNITIVE AND BEHAVIORAL SELF-CONTROL (1 Cr)

Students will be introduced to the basic principles of cognitive and behavioral self-control and will design and carry out a self-control program.

B211 INTRODUCTORY LABORATORY IN PSYCHOLOGY (3 Cr)

P: PSY B105. Equiv. to IU P111, P211 and PU 200. Fall, Spring.

Introductory laboratory in psychology experimental methods, statistical treatment of data, in several areas of psychology; introduction to experimental report writing.

B305 STATISTICS (3 Cr)

P: PSY B105 and one year of high school algebra or equivalent. Equiv. to IU P354, K300, K310 and PU 301. Every.

Introduction to basic statistical concepts; descriptive statistics and inferential statistics.

B307 TESTS AND MEASUREMENT (3 Cr)

P: 3 hours of psychology and B305. Equiv. to IU P336 and PU 302. Every.

An introduction to psychological measurement, including psychophysics, scaling techniques, psychological testing, and individual differences.

B320 PHYSIOLOGICAL PSYCHOLOGY (3 Cr)

P: PSY B105. Equiv. to IU P326 and PU 329. Fall, Spring.

Review of necessary background in neurophysiology and neuroanatomy followed by the relationship of physiology to sensory processes, motivation, and learning. Emphasis on research with animals.

B324 PSYCHOPHYSIOLOGY OF THE SENSES (3 Cr)

P: PSY B105. Equiv. to IU P329 and PU 328. Spring.

This course will consider vision, audition, taste, smell, touch, temperature sensitivity, and the vestibular and kinesthetic senses and their relation to behavior.

B326 COMPARATIVE PSYCHOLOGY (3 Cr)

P: PSY B105. Fall.

An introduction to the psychological and ethological accounts of behavior development. Emphasis on the application of the comparative method to the study of behavior of organisms.

B334 PERCEPTION (3 Cr)

P: PSY B105. Equiv. to IU P329 and PU 310. Fall. Consideration of the concepts and research in perception. Relation of sense organ systems to human behavior. Some attention to social and cultural factors.

B344 LEARNING (3 Cr)

P: 3 hours of psychology. Equiv. to IU P325 and PU 311. Every.

History, theory, and research involving human and animal learning and cognitive processes.

B356 MOTIVATION (3 Cr)

P: 3 hours of psychology. Equiv. to IU P327 and PU 333. Every.

Study of motivational processes in human and animal behavior, how needs and incentives influence behavior, and how motives change and develop.

B360 CHILD AND ADOLESCENT PSYCHOLOGY (3 Cr)

P: 3 hours of psychology. Equiv. to IU P316 and PU 235. Every.

Development of behavior in infancy, childhood and adolescence including sensory and motor development and processes such as learning, motivation, and socialization.

B362 PRACTICUM IN CHILD PSYCHOLOGY (3 Cr)

P: PSY B360. Fall, Spring.

Experience in working with children in field settings. May be repeated once.

B364 INTRODUCTION TO COMMUNITY PSYCHOLOGY (3 Cr)

Begins with historical and conceptual underpinnings, community mental health practices, and alternative conceptions of deviance. Models of social intervention, including rational planning, organizational development, alternative institutions, community organizing, and experimental reform are discussed in the context of public education, mental health, criminal justice, and urban housing. Also included are community research, evaluation, and training issues for the helping professions.

B366 INTRODUCTION TO ORGANIZATIONAL PSYCHOLOGY IN BUSINESS AND INDUSTRY (3 Cr)

The study of organizational psychology as applied to business and industry. Brief coverage of historical development of organizational theory through current theories. Theory weaknesses and strengths. Special problems for business and industry and the methodology for scientific research on these problems will be presented. Some areas or problems to be discussed are organizational structure and climate, leadership and management, communication, motivation, morale, and productivity.

B368 INTRODUCTION TO PERSONNEL PSYCHOLOGY IN BUSINESS AND INDUSTRY (3 Cr)

Psychological methods of assessment in personnel selection and placement, evaluation, and training. Methods and problems of psychological measurement, occupational analysis, human factors engineering, job evaluation, and wages and salary administration.

B370 SOCIAL PSYCHOLOGY (3 Cr)

P: 3 hours of psychology. Equiv. to IU P420 and PU 340. Every.

Study of the individual in social situations including socialization, social perception, social motivation, attitudes, social roles, and small group behavior.

B372 PRACTICUM IN INDUSTRIAL PSYCHOLOGY (3 Cr)

P: PSY B366, B368, B378 or equivalent.

This course will provide students with work experience, one day per week, in local organizations. Practice will be obtained in using the applied skills of Industrial Psychology to solve actual organizational problems.

B374 GROUP DYNAMICS, THEORY AND RESEARCH (3 Cr)

P: PSY B370.

An intensive survey of research and theory on the behavior of small groups and the research methods by which groups are studied.

B376 THE PSYCHOLOGY OF WOMEN (3 Cr)

P: 3 hours of psychology. Equiv. to IU P460. Fall, Spring.

A survey of topics in psychology as related to the biological, social, and psychological development of women in modern society.

B380 ABNORMAL PSYCHOLOGY (3 Cr)

P: 3 hours of psychology. Equiv. to IU P324 and PU 350. Every.

Various forms of mental disorders with emphasis on cause, development, treatment, prevention, and interpretation.

B382 PRACTICUM IN COMMUNITY PSYCHOLOGY (3 Cr)

P or C: PSY B364, B370 or B380 and consent of instructor. Fall, Spring.

Experience in working with individuals who may have a wide range of psycho-

logical problems. Focus is upon both the individual and helping agency as factors in the community.

B423 LABORATORY IN PHYSIOLOGICAL PSYCHOLOGY (3 Cr)
P: PSY B320. Equiv. to IU P426, PU 427. Spring.
Experiments and demonstrations in physiological psychology.

B424 THEORIES OF PERSONALITY (3 Cr)
P: 9 hours of psychology. Equiv. to IU P319 and PU 423. Fall.
Methods and results of the scientific study of personality including the development, structure, and functioning of the normal personality.

B425 LABORATORY IN PERSONALITY (3 Cr)
P: PSY B211 and PSY B424 and PSY B305. Equiv. to PU 424. Spring.
Demonstrations and experiments in personality research.

B427 ADVANCED LABORATORY IN PHYSIOLOGICAL PSYCHOLOGY (3 Cr)
P: B423. Spring.
Experiments and demonstrations in physiological psychology.

B431 LABORATORY IN SENSATION AND PERCEPTION (3 Cr)
P: PSY B211, B305, and either B324 or B334. Equiv. to IU P424 and PU 312.
Experiments and demonstrations in sensation and perception with an emphasis on their physiological basis.

B445 LABORATORY IN LEARNING (3 Cr)
P: PSY B211 and PSY B344. Equiv. to IU P436 and PU 312. Fall.
Experiments and demonstrations involving learning and cognitive processes.

B452 SEMINAR IN PSYCHOLOGY (1, 2, or 3 Cr)
Topics in psychology and interdisciplinary applications. May be repeated, provided different topics are studied, for a maximum of 6 credits.

B457 LABORATORY IN MOTIVATION (3 Cr)
P: PSY B211 and PSY B356. Equiv. to IU P436 and PU 312. Fall.
Experiments and demonstrations in motivation.

B461 LABORATORY IN DEVELOPMENTAL PSYCHOLOGY (3 Cr)
P: PSY B211, PSY B305, and PSY B360. Equiv. to IU P429. Fall.
Principal research methods in developmental psychology and their application to selected problems.

B462 BEHAVIOR MANAGEMENT (3 Cr)
P: Consent of instructor. Equiv. to IU P468. Spring.
Conducted as a seminar and a practicum for psychology majors and teachers in the principles and methods of behavior management.

B464 PSYCHOLOGY OF LANGUAGE (3 Cr)
P: 9 hours of psychology, or permission of instructor. Fall.
Survey of important topics in the psychology of language. Included are historical treatments, generative grammar, development of language, experimental psycholinguistics, and semantics.

B466 SEMINAR IN CHILD PSYCHOLOGY (3 Cr)
P: B360 or equivalent.
Integration of practical experience with relevant psychological literature.

B471 LABORATORY IN SOCIAL PSYCHOLOGY (3 Cr)
P: PSY B211 and PSY B305 and P or C: PSY B370. Equiv. to IU P421 and PU 346. Spring.
Observational, correlational, and experimental studies in social psychology.

B472 PRACTICUM IN GROUP DYNAMICS (3 Cr)
P: 6 hours of psychology and consent of instructor. Equiv. to IU P321 and PU 348. Fall, Spring.
Application in the field of group dynamics through experience as a participant in group sensitivity training.

B492 READINGS AND RESEARCH IN PSYCHOLOGY (1-3 Cr)
P: Consent of instructor. Equiv. to IU P495 and PU 498. Every.
Independent readings and research on psychological problems.

B499 HONORS RESEARCH (credit arranged)
P: Consent of departmental honors committee. Equiv. to IU P499 and PU 499. Every.
Independent readings and research resulting in a research paper.

GRADUATE COURSES

(500 level courses also open to Seniors)

500 STATISTICAL METHODS APPLIED TO PSYCHOLOGY, EDUCATION, AND SOCIOLOGY (3 Cr)
P: PSY B105 and one year of high school algebra or equivalent.
Descriptive statistics and introduction to sampling statistics. Applied to psychological, sociological, and educational data.

505 MENTAL MEASUREMENT (3 Cr)
P: 6 hours of psychology, including PSY 500 or equivalent.
Introduction to the general area of mental measurement. Theory and content of measuring devices in the fields of intelligence, interests, personality, and special aptitudes.

518 MEMORY AND COGNITION (3 Cr)
A survey of theories and research concerned with processes in the acquisition, storage, and retrieval of information, as well as selected additional topics in cognitive psychology.

I521 INTRODUCTION TO APPLIED BEHAVIOR ANALYSIS (3 Cr)
P: Consent of instructor.
The course is designed to provide an advanced introduction to the philosophy, principles, and procedures of applied behavior analysis and a review of selected research. Practical, ethical, and legal constraints on behavioral interventions will be considered. Research conducted in institutional, educational, and home settings will be emphasized.

523 INTRODUCTION TO THEORIES OF PSYCHOTHERAPY (3 Cr)
A survey of the major approaches to psychotherapy, including their theories of illness and cure. Three traditions are represented: psychoanalytical (e.g., Freud, Adler, Jung), behavioral (e.g., Miller and Dollard, Wolpe, Stampfl) and cognitive-phenomenological (e.g., Rogers, Kelley, Binswanger).

526 PSYCHOLINGUISTICS (3 Cr)
P: Consent of instructor.
An introduction to the descriptive devices, central issues, and varying methodologies of psycholinguistics.

535 PSYCHOLOGY OF DEATH AND DYING (3 Cr)*
An examination of psychological research and theory related to death and the dying process. Topics include death concepts, attitudes, and fears, psychosocial predictors of death, effects of death on survivors, psychosocial factors related to individual differences and normative dying behaviors, stages of dying, effects of pain and drugs, and managing the dying process.

540 HISTORY OF PSYCHOLOGY (3 Cr)
A review of the philosophical, theoretical, and methodological issues which entered into the development of modern psychology. Emphasis is placed on historical themes which continue to be active in the science and profession of psychology.

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*Pending approval.

549 INTRODUCTION TO VOCATIONAL REHABILITATION (3 Cr)

P: 9 hours of psychology.

Philosophy, procedures, and practices underlying the vocational rehabilitation movement, including the historical, social, cultural, and economic factors and recent legislation that have contributed to its rapid development.

550 INTRODUCTION TO CLINICAL PSYCHOLOGY (3 Cr)

P: 12 hours of psychology.

The case-study method, including a discussion of the importance of historical information, the contribution of clinical tests to diagnosis, and a general survey of prevention and treatment techniques.

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 and 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.

565 INTERPERSONAL RELATIONS (3 Cr)

P: 9 hours of psychology.

Review of major current theoretical formulations of the interpersonal relationship, including a discussion of some of the more prominent research. Focus is primarily upon two-person interpersonal relations.

570 INDUSTRIAL PSYCHOLOGY (3 Cr)

Survey of the applications of psychological principles and of research methodology to the various human problems in industry, such as: personnel selection and appraisal, the organizational and social context of human work, the job and work situation, human errors and accidents, and psychological aspects of consumer behavior.

572 ORGANIZATIONAL PSYCHOLOGY (3 Cr)

A survey of basic behavioral science research and thinking as these contribute to the understanding of individual, dyadic, group, intergroup, and other large organization behavioral phenomena. The topics covered include motivation, perception, attitudes and morale, communication, leadership, conflict, problem solving, behavior change, and organizational effectiveness.

574 PSYCHOLOGY OF INDUSTRIAL TRAINING (3 Cr)

P: 3 hours of psychology.

Utilization of psychological measurement techniques in assessing training needs and evaluating training effectiveness and the application of learning research and theory to industrial training.

577 HUMAN FACTORS IN ENGINEERING (3 Cr)

Survey of human factors in engineering with particular reference to human functions in man-machine systems, and consideration of human abilities and limitations in relation to design of equipment and work environments.

578 OCCUPATIONAL ANALYSIS (3 Cr)

P: PSY 570.

Survey of systematic study of human work, including techniques of analysis of jobs and occupations for personnel and related purposes. Survey of occupational research and related topics. Practice in job analysis.

585 PSYCHOLOGICAL FOUNDATIONS OF CONSUMER BEHAVIOR (3 Cr)

P: 3 hours of psychology.

A survey of the concepts and methods of psychology as they apply to the study of consumer behavior.

590 INDIVIDUAL RESEARCH PROBLEMS (1, 2, or 3 Cr)

P: 12 hours of psychology and the consent of the instructor.

Opportunity for students to study particular problems in any field of psychology or initiate themselves into research techniques under the guidance of a member of the staff.

593 ETHOLOGY (3 Cr)

P: Consent of instructor.

Animal behavior is analyzed in natural and experimental situations. Emphasis is on the observation of wild and domesticated animals. The effects of early experience, motivation, physiological mechanisms, adaptiveness, and the evolution of behavior are considered.

594 SPECIAL TOPICS IN ETHOLOGY (3 Cr)

P: PSY 593 or equivalent.

Special topics such as imprinting, human ethology, territoriality, orientation, communication, ethology of mammals, etc. will be critically examined in the light of current research findings. One selected topic at a time will be covered in each semester when the course is offered.

595 SEMINAR IN TEACHING PSYCHOLOGY (0 Cr)

P: Consent of the Department of Psychology.

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

600 STATISTICAL INFERENCE (3 Cr)

P: PSY 500 or equivalent.

Emphasis is given to principles underlying both parametric and nonparametric inference.

601 CORRELATION AND EXPERIMENTAL DESIGN (3 Cr)

P: PSY 600.

Continuation of PSY 600 with emphasis upon the design and analysis of experiments.

605 APPLIED MULTIVARIATE ANALYSIS (3 Cr)

P: PSY 600.

A survey of the most frequently employed multivariate research techniques, such as multivariate generalizations of univariate tests and analysis of variance, principal components, canonical analysis, and discriminant analysis. A central theme of the course is the general linear model, both univariate and multivariate. A

multipurpose program for this model provides the student with practical experience in conducting multivariate research.

606 SPECIAL TOPICS IN QUANTITATIVE PSYCHOLOGY (3 Cr)

P: Consent of instructor.

A seminar covering such topics as linear models, statistical decision making, multidimensional scaling.

607 SCALING AND MEASUREMENT (3 Cr)

An introduction to the theory of measurement and a survey of modern scaling methods (unidimensional and multidimensional, metric and nonmetric) within the framework of the modern theory of measurement.

608 ADVANCED TECHNOLOGY OF TESTS AND MEASUREMENTS (3 Cr)

P: PSY 600 and PSY 505 or equivalent. (Formerly numbered PSY 610).

Theory and technique relating to the construction and utilization of measuring devices such as intelligence, special aptitude, interest, achievement, and personality tests.

I610 DYNAMIC MODELING OF REHABILITATION AND HEALTH SYSTEMS

P: Consent of instructor.

An introduction to System Dynamics as a method for computer modeling of rehabilitation and health systems. Includes weekly modeling exercises, and a simulation experiment using an already existing model.

611 FACTOR ANALYSIS (3 Cr)

P: PSY 600.

Theory and applications of factor analysis in psychological research.

612 ADVANCED TEST THEORY (3 Cr)

P: PSY 608 or consent of instructor.

Item Sampling and latent ability theories of test scores, together with related problems and possible solutions. Developments by Lord, Cronbach, Rasch, and Birnbaum will be covered.

I612 DEINSTITUTIONALIZATION AND THE PLANNING OF COMMUNITY-BASED REHABILITATION SERVICE SYSTEMS

P: Graduate standing.

An overview of the successes and failures of the deinstitutionalization movement in developmental disabilities and psychiatric disability. Covers principles of conceptualizing, planning, and implementing community-based residential, vocational, and social skills training programs.

615 INTRODUCTION TO PSYCHOBIOLOGY (3 Cr)

A survey of the integrated neurosciences for nonconcentrators emphasizing human physiological psychology. Neural processes of sensory and motor function, arousal and sleep, motivation, learning and memory, language function, and personality disorders will be presented with selected coverage of neuroanatomy, neurophysiology, neuropharmacology, and neuroendocrinology. Both normal and pathological functions will be covered.

624 HUMAN LEARNING AND MEMORY (3 Cr)

P: Consent of instructor. (Formerly numbered PSY 630.)

Theory of and experimental findings in human learning and memory.

628 PERCEPTUAL PROCESSES (3 Cr)

P: PSY B334 or equivalent.

General review of basic concepts and findings in the area of perception.

633 SEMINAR IN EXPERIMENTAL PSYCHOLOGY (3 Cr)

P: Consent of instructor.

Critical analysis of current problems in experimental psychology. Emphasis upon reviewing literature, preparing, and presenting papers.

640 SURVEY OF SOCIAL-PERSONALITY PSYCHOLOGY I (3 Cr)

P: PSY B370 or equivalent.

An extensive survey of methods, research, and theory in social-personality psychology.

641 SURVEY OF SOCIAL-PERSONALITY PSYCHOLOGY II (3 Cr)

P or C: PSY 600.

An extensive survey of methods, research, and theory in social-personality psychology.

I642 CROSS-CULTURAL SOCIAL PSYCHOLOGY (3 Cr)

P: PSY 600, PSY 640.

A survey of methodology and findings from cross-cultural analysis of social behavior. Findings are applied to the development of techniques for cross-cultural training.

I643 FIELD METHODS AND EXPERIMENTATION (3 Cr)

P: PSY 600.

The course will cover methods appropriate for field experimentation and program evaluation. Topics will include quasi-experimental designs, sampling procedures, and issues associated with program evaluation.

646 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.

I648 PRACTICUM IN APPLIED SOCIAL PSYCHOLOGY (3 Cr)

P: Consent of instructor.

Students will participate in applied research and/or program evaluation in a community agency. The field experience, combined with a seminar, will provide on-site training and skill development under the supervision of the Psychology Department and agency personnel.

I649 INTERNSHIP IN APPLIED SOCIAL PSYCHOLOGY (0 Cr)

P: Consent of instructor.

Open only to Applied Social Psychology students in approved internship facilities. Provides opportunity for application of knowledge of program evaluation and/or social research under supervision of the agency and monitored by the Department of Psychology.

650 DEVELOPMENTAL PSYCHOLOGY (3 Cr)

Major concepts, principles, and facts concerning the biological and environmental influences on behavioral and psychological development. Particular emphasis given to essential principles of ontogenetic development (life span) emerging from current research in genetics and psychology.

655 COGNITIVE DEVELOPMENT (3 Cr)

P: Consent of instructor.

An analysis of research findings and current theories relevant to the development of cognitive processes. Emphasis is placed upon the changing characteristics of some fundamental cognitive processes. Special attention is given to verbal behavior and language.

657 LANGUAGE ACQUISITION (3 Cr)

An examination of research and theory dealing with language acquisition in children. A linguistic framework is used to describe developing language. Topics considered include speech perception, grammatical development, meaning, language in non-modal populations. Supervised laboratory experience.

I679 PRACTICUM IN INDUSTRIAL PSYCHOLOGY (3 Cr)

P: PSY 570, 572 and consent of instructor.

This course will give students the opportunity to spend 8 hours per week within local business organizations in order to gain experience in the skills of industrial psychology. A student will be placed in the organization best matching his or her interests.

R679 PRACTICUM IN COUNSELING PSYCHOLOGY — REHABILITATION (3 Cr)

P: Consent of instructor.

Supervised practice of counseling procedures in a rehabilitation setting.

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

P: PSY 570, 572, 601 or consent of instructor.

A survey of the various areas of industrial psychology (personnel, social-industrial, human factors, and consumer) with particular reference to current research as reflected in current journals and texts. Course provides opportunity for critical evaluation of research investigations, familiarity with sources of material, and experience in the preparation of manuscripts.

681 SEMINAR IN INDUSTRIAL PSYCHOLOGY (3 Cr)

P: PSY 570, 572, 601, 608 or consent of instructor.

Intensive analysis of application of various research and statistical methods to human problems in industry.

683 SEMINAR IN INDUSTRIAL-SOCIAL PSYCHOLOGY (3 Cr)

P: PSY 570, PSY 572, or equivalent.

Study of research and theory emphasizing social perception, attitudes, supervisory behavior, employee participation, motivation, and organizational structure.

688 HUMAN SEXUALITY IN THE REHABILITATION PROCESS (3 Cr)

P: Graduate standing in Rehabilitation Psychology or consent of instructor.

The course provides updated knowledge regarding attitudes and practice related to biological, psychosocial, and attitudinal aspects of human sexuality. A special emphasis is given to sexual concerns experienced by the physically disabled and to increasing students' ability to conduct effective clinical discussion of sexual issues with rehabilitation clients.

690 CAREER DEVELOPMENT, SELECTION, AND PLACEMENT IN REHABILITATION (3 Cr)

P: 9 hours of psychology.

A survey of current methods and criteria used in job development, selective placement, and follow-up of handicapped and deprived individuals.

691 SEMINAR IN REHABILITATION COUNSELING (3 Cr)

P: Consent of instructor.

Current trends, problems, and developments in rehabilitation. Students pursue a special interest and mutually share information and experience with the group. Individual reports and group discussions.

R697 INTERNSHIP IN VOCATIONAL REHABILITATION COUNSELING (0 Cr)

P: Permission of instructor.

Opportunities for application of theory in practice of rehabilitation counseling and case management in a rehabilitation setting under supervision of the Psychology Department and Agency.

698 RESEARCH M.S. THESIS

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 in Agriculture and Forestry. Electives are permitted to enable students to explore the various options in which they may choose to concentrate their 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, Dr. McCracken, in the Biology Department soon after admission to IUPUI to formulate a tentative sequence of courses for the first year or two.

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 (3 Cr)
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 (3 Cr)
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 (3 Cr)

Fundamental principles of crop production and distribution. An introduction to basic soil relations, current field crop production practices, agricultural meteorology, turfgrass management, and plant breeding.

210 TURF MANAGEMENT (2 Cr)

P: None. Spring; day.

Introductory course emphasizing culture, management, and production of turf grown for golf courses, parks, lawns, sod farms, and highways.

255 SOIL SCIENCE (3 Cr)

P: One year college chemistry.

Differences in soils; soil genesis; physical, chemical and biological properties of soils; relation of soils to problems of land use and pollution; soil management relative to tillage, erosion, drainage, moisture supply, temperature, aeration, fertility and plant nutrition. Introduction to fertilizer chemistry and use.

Animal Science

101 ANIMAL AGRICULTURE (3 Cr)

Importance of livestock in the field of agriculture, and the place of meats and other animal products in the human diet.

221 INTRODUCTORY ANIMAL NUTRITION (3 Cr)

P: CHEM C101 or equiv.

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

Biochemistry

207 BIOCHEMISTRY (4 Cr)

P: CHEM 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 (3 Cr)

A broad treatment of the scientific basis for forestry and associated natural resources. For students majoring in forestry and conservation and those interested in a natural resources course as an elective.

225 DENDROLOGY (3 Cr)

P: BIOL N105. Fall; day.

Field identification, taxonomy, and silvical characteristics of forest trees and shrubs.

582 CONSERVATION OF NATURAL RESOURCES (3 Cr)

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

Agriculture Sample Plan of Study

FRESHMAN	1	AGRL 101 (1) Introduction to Agriculture	ENG W131 (3) English Composition I	BIOL N105 (4) Introduction to Botany	CHEM C101 (5) Elementary Chemistry	MATH 147 (3) Algebra and Trigonometry	
	2	Agronomy or (3) Animal Science Elective**	BIOL N107 (4) Introduction to Zoology	MATH 148 (3) Algebra and Trigonometry	ENG W132 (3) English Composition II	Humanities (3) Elective	HORT 102 (3) Fundamentals of Horticulture
SOPHOMORE	3	Science (3-5) Elective*	ECON E201 (3) Economics	SPCH C110 (3) Speech	Humanities (3) Elective	Elective (3)	
	4	Agriculture (3) Elective	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 ANSC 101.

Forest Resources Core

FRESHMAN	1	AGR 101 (1) Introduction to Agriculture	ENG W131 (3) English Composition I	CHEM C101 (5) Elementary Chemistry	BIOL N105 (4) Introduction to Botany	MATH 163 (5) Integrated Calculus & Analytical Geometry
	2	CET 104 (3) (for Ag Eng 212)	ENG W132 (3) English Composition II	CHEM C102 (5) Elementary Chemistry	BIOL N107 (4) Introduction to Zoology	MATH 164 (5) Integrated Calculus & Analytical Geometry
SOPHOMORE	3	BIOL K341 (5) Ecology	FOR 225 (4) Dendrology	ECON 201 (3) Economics	STAT 301 (3) Statistics	CSCI 220 (3) Introduction to Data Processing
	4	SPCH C110 Speech	AGRY 225 (3) Soil Science (for AGRY 260 or 270)	Option (3) Requirement (AGRY 210) Turf Management	Science (4) Elective*	Humanities (3) Elective
JUNIOR SENIOR	5-8	TRANSFER TO SCHOOL OF AGRICULTURE, PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS				

*Select one of the following courses: Chem C207, C224, C225; Math 261; Phys 152, 218

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

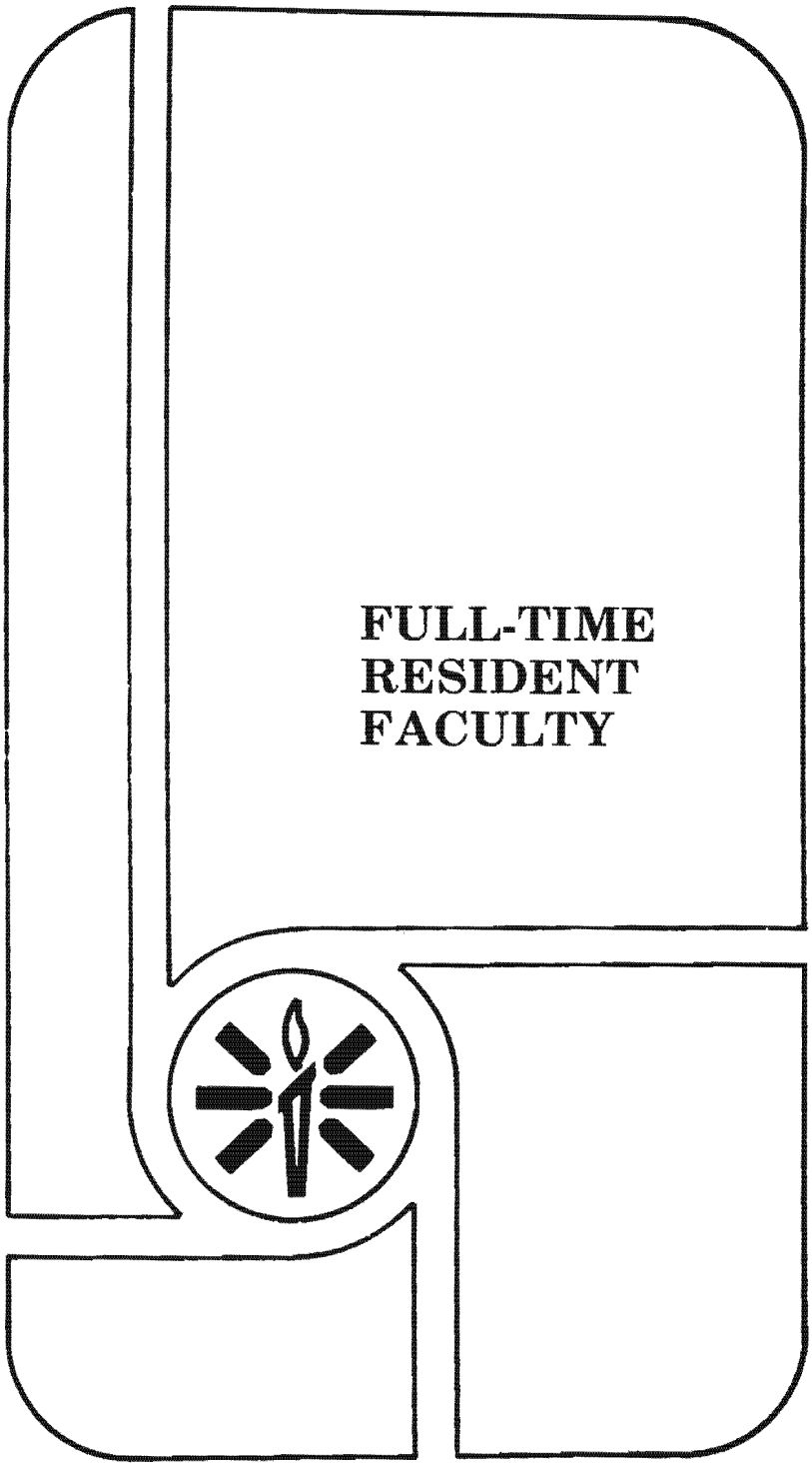
INTERDISCIPLINARY COURSES

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.

Dr. Frederick Kleinhans, Physics, organized a trip to Arborg, Manitoba, Canada, for students interested in viewing the total solar eclipse on February 26, 1979. Here, preparations are made for photographing the stages of the eclipse.


FULL-TIME
RESIDENT
FACULTY

RESIDENT FACULTY

AESCHLEMAN, STAN, Assistant Professor of Psychology (1978); B.A., 1968, Western Illinois University; M.A., 1973, Ph.D., 1977, University of Kentucky. Specialties: Applied Behavioral Analysis, Learning in Developmentally Delayed Children, and Computer Data Systems to Store and Report Child Performance on Educational Programs.

ALIPRANTIS, C.D., 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., Professor of Mathematics-Education (1964); A.B., 1946, State University of New York at Albany; M.Ed., 1951, St. Lawrence University; M.A., 1958, University of Michigan; Ph.D., 1965, Michigan State University. Specialty: Mathematics Education.

BARD, MARTIN, Associate Professor of Biology (1975); B.S., 1965, City College of New York; Ph.D., 1971, University of California, Berkeley. Specialty: Biochemical Genetics.

BERCK, PHILIP, Assistant Professor of Psychology (1977); B.A., 1972, University of California at Los Angeles; M.A., 1976, Ph.D., 1978, University of Illinois at Urbana-Champaign. Specialties: Program Evaluation, Community Psychology and Social Change, Assessment of Environments, Urban Planning.

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

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

BOSCHMANN, ERWIN, Professor of Chemistry (1968); B.A., 1963, Bethel College (Kansas); M.S., 1965, Ph.D., 1968, University of Colorado. Specialties: General Chemistry, Inorganic Chemistry, and Bioinorganic Chemistry.

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

CHENG, CHEUPYENG P., Assistant Professor of Chemistry (1978); B.Sc., 1968, National Taiwan University; Ph.D., 1974, Washington University (St. Louis). Specialty: Physical Inorganic Chemistry.

CLODFELTER, CONSTANCE S., Associate Director and Counselor, Student Services, and Adjunct Assistant Professor of Psychology (1979); B.A., 1968, M.S., 1971, Ph.D., 1975, University of North Dakota. Specialties: Individual Counseling and Psychotherapy.

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

DAVEE, WILLIAM, Lecturer in Biology (1978); B.A., 1975, Hanover College; M.S., 1978, Indiana University. Specialty: Human Anatomy and Physiology.

DAVIS, ROBERT, Professor of Psychology (1976); B.S., 1958, Salisbury State College; M.Ed., 1962, Pennsylvania State University; Ed.D., 1968, University of Maryland. Specialties: Rehabilitation Psychology, Counseling.

DE CAPRARIIS, PASCAL, Assistant Professor of Geology (1978); B.S., 1964, M.S., 1967, Boston College; Ph.D., 1973, Rensselaer Polytechnic Institute. Specialties: Geophysics, Environmental Systems, Analysis.

DEVRIES, EDWARD J., Adjunct Assistant Professor of Psychology (1978); B.A., 1964, Calvin College; M.A., 1966, Western Michigan University; Ph.D., 1976, Michigan State University. Specialties: Medical Psychology and Rehabilitation Counseling Techniques.

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

FIFE, WILMER K., 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.

FLEENER, DON E., Associate Professor of Psychology (1966); B.S. (Ed.), 1949, Indiana Central University; Ph.D., 1967, Indiana University. Specialties: Infancy, Child Development.

FLYNN, ROBERT, Associate Professor of Psychology (1976); B.A., 1963, Ottawa University; B.Th., 1966, Gregorian University; M.A., 1970, Carleton University; Ph.D., 1977, Syracuse University. Specialties: Rehabilitation Psychology, Study of Human Service Systems.

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, Geometry.

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

GOLDBERG, CARLOS I., Associate Professor of Psychology, (1969); B.A., 1961, Brooklyn College; M.A., 1964, Ph.D., 1969, The City University of New York. Specialties: Social Psychology, Urban Psychology.

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, School of Science and Adjunct Professor of Psychology, School of Medicine (1960); B.S., 1952, M.S., 1953, Ph.D., 1958, Pennsylvania State University. Specialties: Experimental Analysis of Behavior, Motivation.

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 and Organizational Psychology, Selection and Placement.

HOFFMAN, R. GENE, Assistant Professor of Psychology (1977); B.S., 1970; Kansas State University; M.A., 1974, Ph.D., 1976, University of Maryland. Specialties: Industrial and Organizational Psychology.

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.

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.

INGOJO, JOSE C., Lecturer in Computer Science (1976); B.S., 1970, University of San Francisco; M.S., 1973, Ph.D., 1978, Purdue University. Specialty: Computer Programming.

JACKSON, BILLY G., Adjunct Associate Professor of Chemistry (1971); B.S., 1953, Ph.D., 1957, Iowa State University. Specialty: Organic Chemistry.

JANIS, TIMOTHY F., Director, Industrial Liaison Office, Indianapolis Center for Advanced Research, and Adjunct Associate Professor of Chemistry (1979); B.S., 1962, M.S., 1963, Wichita State University; Ph.D., 1968, Illinois Institute of Technology. Specialty: Physical Chemistry.

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., 1968, University of California at Los Angeles. Specialty: Algebraic Topology.

KAPLAN, JEROME I., Professor of Physics (1974); B.S., 1950, University of Michigan (Ann Arbor); Ph.D., 1954, University of California, Berkeley. Specialty: Solid State Physics.

KECK, ROBERT WILLIAM, Associate Professor of Biology (1972); B.A., 1962, M.S., 1964, University of Iowa; Ph.D., 1968, Ohio State University. Specialty: Plant Physiology.

KEMPLE, MARVIN D., Assistant Professor of Physics (1977); B.S., 1964, Purdue University; M.S., 1965, Ph.D., 1971, University of Illinois Champaign-Urbana. Specialties: Solid State Physics, Chemical Physics.

KIRK, RONALD, Assistant Professor of Biology (1968); A.S., 1955, Vincennes University; B.S., 1958, M.S., 1959, Ph.D., 1966, Purdue University. Specialties: Invertebrate Zoology, Entomology, Ecology.

KLEINHANS, FREDERICK W., Associate Professor of Physics and Adjunct Associate Professor of Biophysics, School of Medicine (1972); B.S., 1965, University of Michigan; Ph.D., 1971, Ohio State University. Specialties: Solid State Physics, Biophysics.

KLEYLE, ROBERT M., Associate Professor of Mathematics and Statistics (1973); B.A., 1960, Duquesne University, Pittsburgh; M.S., 1962, University of Pittsburgh; Ph.D., 1968, Harvard University. Specialty: Statistics.

KREMER, JOHN F., Associate Professor of Psychology, School of Science and Adjunct Assistant Professor of Psychology, School of Medicine, (1975); B.A., 1966, St. Meinrad College; M.S., 1969, University of Notre Dame; Ph.D., 1975, Loyola University. Specialties: Clinical Psychology, Social Psychology, Program Evaluation.

KUCZKOWSKI, JOSEPH E., Professor of Mathematics (1966); B.S., 1961, Canisius College; M.S., 1963, Ph.D., 1968, Purdue University. Specialty: Semigroup Theory.

LANDIS, DAN, Chairman and Professor of Psychology, School of Science; Adjunct Professor of Psychology, School of Medicine; Adjunct Professor, School of Nursing (1976); B.S., 1957, Arizona State University; M.A., 1960, Temple University; Ph.D., 1963, Wayne State University. Specialties: Cross-cultural Social Psychology, Sensation and Perception, Evaluation Research.

LAUBE, JERRI D., Professor and Chairman of Psychiatric-Mental Health Nursing, and Adjunct Professor of Psychology (1976); B.S.N., 1961, University of Tennessee; M.S., 1969, University of Colorado; Ph.D., 1974, Texas Woman's University. Specialty: Clinical Psychology.

LAUER, JOAN B., Associate 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, Professor of Clinical Psychology and Director of the Section of Clinical Psychology, Department of Psychiatry, School of Medicine, and Adjunct Professor of Psychology (1976); B.A., 1948, City University of New York; M.A., 1950, Ph.D., 1952, Columbia University. Specialty: Clinical Psychology.

LIPKOWITZ, KENNETH B., 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., Acting Assistant Dean and Associate Professor of Mathematics (1968); B.S., 1963, Purdue University; Ph.D., 1968, Stanford University. Specialty: Differential Equations.

LONG, ROBERT IRVIN, Professor of Psychology (1956); A.B., 1950, Indiana University; M.S., 1955, Ph.D., 1956, Tulane University. Specialties: Learning, Individual Differences.

LUKE, JON, Associate Professor of Mathematics (1975); B.S., 1962, M.S., 1963, Massachusetts Institute of Technology; Ph.D., 1966, California Institute of Technology. Specialty: Applied Mathematics.

LYNCH, KEVIN P., Associate Professor of Psychology (1978): B.A., 1965, M.A., 1967, Ph.D., 1973, Ohio State University. Specialties: Rehabilitation Psychology, Teaching Complex Social and Vocational Skills to Severely Handicapped Children and Adults by Operant and Imitative Methods.

MANNAN, GOLAM, Dean, Student Services, Associate Professor of Education, and Adjunct Associate Professor of Psychology (1978); B.Sc., 1954, Carmichael College, Rangpur, Bangladesh; M.A., 1959, B.Ed., 1961,

M.Sc., 1963, Rajshahi University, Bangladesh; M.S., 1966, Ph.D., 1967, Indiana University. Specialty: Educational Psychology.

McCARTHY, JAMES, Adjunct Associate Professor of Chemistry (1978); A.A., 1963, Phoenix College; B.S., 1965, Arizona State University; Ph.D., 1969, University of Utah. Specialty: Organic Chemistry.

McCRACKEN, RICHARD O., Assistant Professor of Biology (1977); B.S., 1965, M.S.T., 1967, University of Wisconsin-Whitewater; Ph.D., 1972, Iowa State University. Specialties: Comparative Physiology, Cell Biology, Helminth Chemotherapy.

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.

MILLER, JOHN GRIER, Assistant Professor of Mathematical Sciences (1977, Columbus); S.B., 1963, S.M., 1964, University of Chicago; Ph.D., 1967, Rice University. Specialty: Geometric and Algebraic Topology.

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.

MORREL, BERNARD B., Associate Professor of Mathematics (1977); B.A., 1962, M.S., 1966, Ph.D., 1968, University of Virginia. Specialty: Operator Theory.

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.

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.

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

NITSCH, KATHLEEN E., Assistant Professor of Psychology (1977); B.A., 1971, M.A., 1974, Ph.D., 1977, Vanderbilt University. Specialties: Cognitive Psychology, Learning and Memory, Developmental Psychology, Psychology of Language.

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.

NUROK, DAVID, Associate Professor of Chemistry (1978); B.Sc., 1959, Ph.D., 1966, University of Capetown. Specialties: Analytical Chemistry, Chromatography.

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.

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PAIK, HAN WON, Associate 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.

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PETERSEN, BRUCE H., Adjunct Assistant Professor of Biology (1978); B.S., 1962, Utah State University; M.S., 1967, Ph.D., 1969, Indiana University. Specialty: Immunology.

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PRAMANIK, SAKTI, Assistant Professor of Computer Science (1978), B.S., 1966, Calcutta University; M.S., 1969, University of Alberta; Ph.D., 1974, Yale University. Specialty: Data Base Management Systems.

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RAO, B. D. NAGESWARA, Associate Professor of Physics (1978), B.S. (Honors), 1955, M.S., 1956, Andhra University, Waltair (A.P.), India: Ph.D., 1961, Aligarh Muslim University, Aligarh (U.P.), India. Specialties: Magnetic Resonance, Biophysics.

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

ROSENBERG, GARY D., Assistant Professor of Geology (1979), B.S., 1966, University of Wisconsin; Ph.D., 1972, University of California at Los Angeles. Specialties: Biomineralization, Evolution, Paleobiochemistry, Historical Geology.

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

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.

SHIELDS, JAMES E., Adjunct Professor of Chemistry (1977); A.B., 1956, DePauw University; Ph.D., 1961, University of California at Berkeley. Specialty: Biochemistry.

SPENCER, DAVID F., Assistant Professor of Biology (1979); B.S., 1970, Georgetown College; Ph.D., 1978, University of Notre Dame. Specialty: Aquatic Ecology.

STARK, ROBERT J., Assistant Professor of Biology (1974); B.S., 1967, Westminister College; Ph.D., 1972, Temple University. Specialties: Developmental Biology, Neurobiology.

STILLWELL, WILLIAM H., Assistant Professor of Biology (1978), B.S., 1967, State University of New York, Albany; M.S., 1973, Ph.D., 1974, Pennsylvania State University. Specialties: Biochemistry, Membranes, Origin of Life.

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.

SWART, CHARLES F., Assistant Professor of Mathematics (1977), B.S., 1969, University of California at Santa Barbara; M.S., 1972, Uni-

versity of Southern California; Ph.D., 1977, University of Illinois. Specialty: Computer Science.

THATCHER, FREDERICK C., Associate 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., Associate 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.

WAKEFIELD, DONALD P., Counselor, Student Services, and Adjunct Instructor of Psychology (1979); B.A., 1959, M.A., 1965, University of Northern Iowa; Ed.D., 1977, Indiana University. Specialty: Problems of Special Students.

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

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.

YOVITS, MARSHALL C., Dean of the School of Science and Professor of Mathematical Sciences (1980); B.S., 1944, M.S., 1948, Union College; M.S., 1950, Ph.D., 1951, Yale University. Specialty: Computer and Information Science.

ZEVIN, MILES R., Lecturer of Biology (1978); B.S., 1969, M.S., 1977, University of Chicago. Specialties: Anatomy, Neurobiology.

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.

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 III C include BIOL N100, N120, 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.

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.

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*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, N120, as well as all agriculture courses.

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School of Science Bulletin Committee

Professor P. Loh, *Chairperson*
Professor T. Cutshall
Professor J. Luke
Professor A. Mirsky
Professor K. Nitsch
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Professor K. Wilson