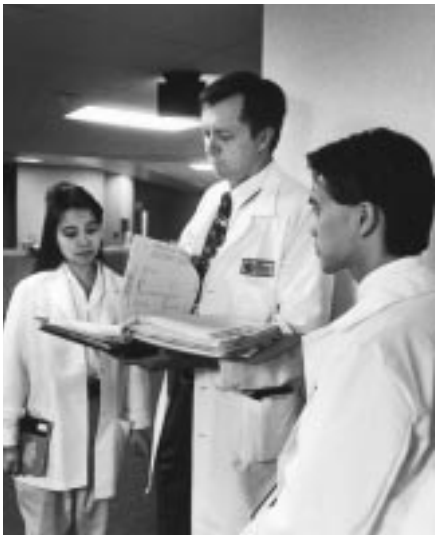
USC School of Pharmacy



The pharmacy curriculum combines rigorous basic science education with extensive clinical training which qualifies graduates for professional careers in a variety of practice settings.

Founded in 1905, the USC School of Pharmacy was the first pharmacy school in Southern California. Approximately 50 percent of the practicing pharmacists in the region are graduates of USC. The school has an annual average student body of 650 full-time students in the professional program, 70 students in the Master of Science and Doctor of Philosophy programs, a full-time faculty of 76 and more than 355 part-time and volunteer clinical faculty.

The school occupies modern facilities on the USC Health Sciences Campus in metropolitan Los Angeles, adjacent to the Los Angeles County + USC Medical Center (one of the largest teaching hospitals in the country), the USC/Norris Comprehensive Cancer Center, the Doheny Eye Institute and the USC University Hospital. USC pharmacy students receive their clinical training at these facilities. In addition, the school utilizes many affiliated hospitals, health care clinics, skilled nursing facilities, home health care agencies and pharmacies in the Southern California region for its clinical and experiential programs. Recognized as one of the most innovative schools of pharmacy in the nation, the USC School of Pharmacy has served as a model for other progressive pharmacy schools throughout the country. USC was the first to establish the six-year program leading to the Doctor of Pharmacy degree as the first professional degree. USC also initiated, in 1968, the first clinical pharmacy program in the nation. In 1988, the school initiated a Pharm.D./M.B.A. dual degree program, the first of its kind in the country. In collaboration with the Andrus Gerontology Center, a Pharm.D./Graduate Certificate in Gerontology was developed in 1990. In 1994, the school implemented the M.S. and Ph.D. programs in Pharmaceutical Economics and Policy, also the first of its kind in the country.

The school is a member of the American Association of Colleges of Pharmacy, which promotes the interests of pharmaceutical education. All institutions holding membership must maintain certain minimum requirements for entrance and graduation. The school is accredited by the American Council on Pharmaceutical Education.

Health Sciences Campus
John Stauffer Pharmaceutical Sciences Center
1985 Zonal Avenue, Los Angeles, CA 90033
(323) 442-1369 Office of the Dean
FAX: (323) 442-1681
(323) 442-1466 Office of Admission and Student Affairs
Email: pharmadm@hsc.usc.edu
Email: pharmfa@hsc.usc.edu

Administration

Timothy M. Chan, Ph.D., *Dean*

Vincent H.L. Lee, Ph.D., *Associate Dean, Research and Graduate Affairs*

Fred G. Weissman, Pharm.D., J.D., *Associate Dean, Academic Affairs*

Cynthia White, B.A., *Associate Dean, Administrative Affairs*

Bradley R. Williams, Pharm.D., *Associate Dean, External Programs*

Ronald L. Alkana, Pharm.D., Ph.D., *Assistant Dean, Interdisciplinary Programs*

Melvin F. Baron, Pharm.D., *Assistant Dean, Programmatic Advancement*

Faculty

John Stauffer Dean's Chair in Pharmaceutical Sciences: Timothy M. Chan, Ph.D.

Gavin S. Herbert Professorship in Pharmaceutical Sciences: Vincent H.L. Lee, Ph.D.

Charles Krown/Pharmacy Alumni Professorship in Pharmaceutical Sciences: Henry J. Forman, Ph.D.

QSAD Centurion Professorship in Pharmaceutical Sciences: Joel W. Hay, M.Ph., Ph.D.

Boyd P. and Elsie D. Welin Professorship in Pharmaceutical Sciences: Jean Chen Shih, Ph.D.

Professors: Ronald L. Alkana, Pharm.D., Ph.D.; Enrique Cadenas, M.D., Ph.D.; Timothy M.Chan, Ph.D.; Henry J. Forman, Ph.D. (*Pediatrics and Pathology*); Robert T. Koda, Pharm.D., Ph.D.; Vincent H. L. Lee, Ph.D. (*Ophthalmology*); Eric J.C. Lien, Ph.D.; Alex Sevanian, Ph.D. (*Pathology*); Wei-Chiang Shen, Ph.D.; Jean C. Shih, Ph.D.; Walter Wolf, Ph.D., *Distinguished*

Associate Professors: James D. Adams, Jr., Ph.D.; David K. Ann, Ph.D.; Michael B. Bolger, Ph.D.; Roberta E. Brinton, Ph.D.; Roger F. Duncan, Ph.D.; Ian S. Haworth, Ph.D. (*Biochemistry and Molecular Biology*); Joel W. Hay, Ph.D.; Deborah L. Johnson, Ph.D. (*Biochemistry and Molecular Biology*); Jeffrey S. McCombs, Ph.D. (*Gerontology*); Michael B. Nichol, Ph.D. (*Gerontology and Public Administration*)

Assistant Professors: Denise Globe, Ph.D.; Sarah F. Hamm-Alvarez, Ph.D. (*Physiology/Biophysics*); Ian S. Haworth, Ph.D. (*Biochemistry and Molecular Biology*); Gordon G. Liu, Ph.D.; Curtis T. Okamoto, Ph.D.; Hermann von Grafenstein, M.D., Ph.D. (*Physiology/Biophysics*)

Adjunct Professors: Thomas Cairns, Ph.D.; Stuart P. Eriksen, Ph.D.; Ronald P. Evens, Pharm.D.; Colin G. Pitt, Ph.D.

Adjunct Associate Professors: Pramod M. Lad, Ph.D.; Andrew R. Peterson, Ph.D.; Diane D.-S. Tang-Liu, Ph.D.

Adjunct Assistant Professors: William Abraham, Ph.D.; John W. Berger, Pharm.D., J.D.; Eric A. Forssen, Pharm.D., Ph.D.; Abhay Joshi, Ph.D.; Randy N. Roth, Ph.D.; Steven J. Shire, Ph.D.; Kamlesh M. Thakker, Ph.D.

Research Associate Professor: Kevin J.Y.H. Shin Chen, Ph.D.

Research Assistant Professors: Natalie S. Cohen, Ph.D.; Richard L. Ernst, Ph.D.; Ruiming Liu, Ph.D.

Professors of Clinical Pharmacy: Mark A. Gill, Pharm.D.; Glen L. Stimmel, Pharm.D. (*Psychiatry and the Behavioral Sciences*)

Associate Professors of Clinical Pharmacy: Alfred Chin, Pharm.D.; William C. Gong, Pharm.D.; Kathleen A. Johnson, Pharm.D., M.P.H., Ph.D. (*Pharmaceutical Economics and Policy*); Mervyn K. Kalman, M.B.A.; Stanley G. Louie, Pharm.D.; Gladys H. Mitani, Pharm.D.; Jay P. Rho, Pharm.D.; Daniel C. Robinson, Pharm.D. (*Clinical Medicine*); N. Jane Takagi, Pharm.D.; Gregory A. Thompson, Pharm.D.; Fred G. Weissman, Pharm.D., J.D.; Bradley R. Williams, Pharm.D. (*Clinical Gerontology*); Michael Z. Wincor, Pharm.D. (*Clinical Psychiatry and the Behavioral Sciences*)

Assistant Professors of Clinical Pharmacy: Melvin F. Baron, Pharm.D.; Annet Bedikian, Pharm.D.; Paul M. Beringer, Pharm.D.; Kathleen H. Besinque, Pharm.D., M.S. Ed.; Barbara C. Bolinger, Pharm.D.; Lanchi Le Bui, Pharm.D.; Steven Chen, Pharm.D.; Leslie Nii Chin, Pharm.D.; Jennifer H. Cupo, Pharm.D.; Julie A. Dopheide, Pharm.D.; Kevin L. Forrester, Pharm.D.; Jeffery Goad, Pharm.D.; Mary A. Gutierrez, Pharm.D.; Robert T. Holbrook, Jr., Pharm.D.; Agneta K. Hurst, Pharm.D.; George S. Jaresko, Pharm.D.; Jack W. Kern, Pharm.D.; Kum Ja K. Lee, Pharm.D.; Cynthia L.L. Lieu, Pharm.D.; May C. Mak, Pharm.D.; Jean K. Noguchi, Pharm.D.; Maria I. Rudis, Pharm.D.; Leanne M. Sakamoto, Pharm.D.; Irving Steinberg, Pharm.D. (*Clinical Pediatrics*); Robert W. Ulrich, Pharm.D.; Tien T. Kiat-Winarko, Pharm.D.; Frances S. Wong, Pharm.D.

Instructor of Clinical Pharmacy: Mindy Oshiro, Pharm. D.

Lecturer: Suman Mukherjee, Ph.D.

Distinguished Professors Emeritus: John A. Biles, Ph.D.; Paul Hochstein, Ph.D.

Emeritus Professors: Edward S. Brady, M.S.; Glenn H. Hamor, Ph.D.

Programs

The School of Pharmacy offers curricula leading to the Doctor of Pharmacy (Pharm.D.) degree. Through the Graduate School, graduate degrees offered are: Master of Science (M.S.), Doctor of Philosophy (Ph.D.) in pharmaceutical sciences, Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in molecular pharmacology and toxicology, Master of Science (M.S.), Doctor of Philosophy (Ph.D.) in pharmaceutical economics and policy. Two joint degree programs and a joint graduate certificate program are also offered: Pharm.D./Ph.D., Pharm.D./M.B.A. and Pharm.D./Graduate Certificate in Gerontology.

The University of Southern California's Doctor of Pharmacy and Master of Science programs are accredited by the American Council on Pharmaceutical Education, 311 West Superior Street, Suite 512, Chicago, IL 60610, (312) 664-3575, (800) 533-3606, or FAX (312) 664-4652.

Tuition and Fees (Estimated)

Tuition for School of Pharmacy degree programs (Pharm.D.; M.S. and Ph.D. in pharmaceutical sciences; M.S. and Ph.D. in molecular pharmacology and toxicology; M.S. and Ph.D. in pharmaceutical economics and policy) is charged at the following rate (which differs from standard USC tuition): per semester (15-18 units) $11,401; for less than 15 units and each unit above 18 units, $761 per unit. See the Tuition and Fees section, page 22, for fee information. These fees are based upon current information available at the time of publication and are subject to possible later change.

Doctor of Pharmacy students must pay a $500 acceptance deposit which is applicable on tuition; $100 of this deposit is refundable with written withdrawal notice by August 1. For deposit information in other degree programs in the School of Pharmacy, please consult appropriate offices.

School of Pharmacy Grading System

The plus (+) and minus (-) designations are not used in the Pharm.D. program. They are used in the M.S. and the Ph.D. programs.

Honor Societies

Rho Chi

Theta chapter of Rho Chi, national honorary pharmaceutical society, was established at USC in 1925. Charters for chapters of this organization are granted only to student groups in those colleges that are members in good standing of the American Association of Colleges of Pharmacy. Eligibility for membership is based on high attainment in scholarship, character, personality and leadership. All candidates selected for membership must have completed two years of college work, and they must be approved by the Dean of the School of Pharmacy.

Phi Lambda Sigma

The Phi Lambda Sigma chapter was established at USC in 1988. This national pharmacy leadership society is devoted to identifying, supporting and recognizing the contribution of pharmacy students to their colleges, their classmates, their campuses, their communities and to their chosen profession.

Student Housing and Service Facility, Health Sciences Campus

There are at present limited university-managed accommodations on the Health Sciences Campus. Students may wish to live in student housing on the University Park Campus, located about eight miles from the Health Sciences Campus.

The Blanche and Frank R. Seaver Student Residence, adjacent to the John Stauffer Pharmaceutical Sciences Center, provides food facilities and a book store which sells instructional texts, office supplies and other items. For residence information, phone (323) 442-1576; for bookstore information call (323) 442-2674.

Student Health Services, Health Sciences Campus

Services of the Student Health Center, covered by the mandatory student health fee, include the usual ambulatory care health services given by the faculty of the USC Department of Family Medicine and the Student Health Center nursing staff. Hours are from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding USC holidays. The Student Health Center is located in the USC Health Care Consultation Center, 1500 San Pablo Street, Suite 104, adjacent to the USC University Hospital, one block northeast of the School of Pharmacy. The telephone number is (323) 442-5980. In addition to the student health fee, all Pharm.D. students must have major medical insurance coverage on their own or from the USC Health Plan.

Professional Degrees

Doctor of Pharmacy

A four-year curriculum, following a minimum of two years of college prerequisite work, leading to the Doctor of Pharmacy (Pharm.D.) is offered to students admitted to the School of Pharmacy. A sample outline of the curriculum is listed in the following pages. The degree will not be conferred until the student has successfully completed all prerequisite and Doctor of Pharmacy degree requirements.

Application Procedure

Application forms may be obtained by mail or in person from the School of Pharmacy Office of Admission. A non-refundable fee of $55 must be sent with the completed application, personal statement, sealed official transcripts and sealed letters of recommendation by the final deadline date of January 15 (subject to change).

Applications received before January 15 will have priority consideration when all necessary criteria have been met. Application should be mailed to: Student Affairs Office, USC School of Pharmacy, 1985 Zonal Avenue, Los Angeles, CA 90033, (323) 442-1466, email: pharmadm@hsc.usc.edu.

Credentials for admission must include complete records of all previous college or university work. The student must include with the application two copies of sealed official transcripts from each college or university attended.

Evaluation of official transcripts is completed by the School of Pharmacy Admissions Committee and a letter of acceptance is mailed to each applicant who qualifies for entrance. All documents received by the Office of Admissions become the property of the university and cannot be returned or duplicated for other than university purposes.

Admissions Guidelines

The Admissions Committee of the school considers several factors in making admissions decisions. Primary elements include strong academics, competitive performance in the interview, recommendation forms, and written comments as specified in the application. The committee also considers a candidate's motivation to pursue pharmacy, strong interpersonal skills, excellent oral and written communication skills, and leadership abilities. While the School of Pharmacy gives equal consideration to every qualified applicant, the school cannot accommodate all qualified candidates who apply for admission.

Admission of International Students

International students are subject to special admissions procedures which are specified in the Admissions section of this catalogue.

Entrance Requirements

Admission to the School of Pharmacy requires: (1) graduation from an accredited high school; (2) a minimum of two years (60 semester or 90 quarter units) of prerequisite college courses; and (3) a minimum 3.0 (A = 4.0) cumulative grade point average based on all transferable college course work.

Prepharmacy Requirements

A minimum of 60 semester or 90 quarter units, to include English, public speaking, social sciences, humanities, calculus, chemistry and biological sciences, are required for admission to the School of Pharmacy. These requirements may be fulfilled at a two-year community college, four-year college or university. Only grades of C- or higher are acceptable.

Pass/no pass and credit/no credit grades will not be accepted (unless a course is only offered on a pass/no pass basis). Candidates who have received or will receive a baccalaureate degree or who have completed units in excess of the minimum required will be considered more favorably than applicants who have fulfilled only minimum requirements.

English
One year of English composition is required. Remedial English and English as a second language (ESL) are not acceptable. An English proficiency examination may be required.

Public Speaking (Speech)
Course should include oral and written communication skills and the development of listening skills. One semester or one quarter is required. The equivalent course at USC is COMM 102 Human Communication Principles and Practices.

International Students English and speech taken in a foreign country will be accepted only from countries whose native tongue is English (e.g., Great Britain, Canada, Australia, New Zealand and the British West Indies).

Social and Behavioral Sciences
Studies in anthropology, psychology, psychobiology, economics, geography, sociology and political science are recommended; these must total at least 12 semester or 18 quarter units.

Psychology One course in general psychology and human behavior is required. The equivalent course at USC is PSYC 100.

Economics One course in economics, macroeconomics or microeconomics is required. If a one-year course is offered, both semesters may be taken and excess units may be applied to either the remainder of the unit requirements for the subject area, or as elective units. The equivalent course at USC is ECON 203 or 205.

Humanities
Studies in literature, philosophy, history, ethics, foreign language or art/music history totaling at least six semester or nine quarter units are required. The humanities requirement can be met by completing the Humanities Core Course in the University of California system.

Mathematics and Physical Sciences
Courses must include calculus, general chemistry and organic chemistry, totaling at least 19 semester or 28 quarter units. Only courses for science majors are acceptable.

Calculus One semester or two quarters is required. The course should include differential and integral calculus. The equivalent course at USC is MATH 125.

General Chemistry One-year course, including laboratory, for science majors is required. The course should include inorganic chemistry and qualitative analysis. The equivalent course at USC is CHEM 105abL.

Organic Chemistry One-year course, including laboratory, for science majors is required. If the school offers less than a one-year course, the student must complete the second semester at another institution. The equivalent course at USC is CHEM 322abL.

Biological Sciences
A one-year course is required in general biology with laboratory, for science majors (excluding courses in human anatomy, human physiology and microbiology), totaling at least eight semester or 12 quarter units. The USC courses are BISC 110L and 112L.

Electives
The student must complete other courses to meet a minimum of 60 semester or 90 quarter units. Recommended courses: statistics, computer science, physics and biochemistry.

Advanced Placement Examination
The School of Pharmacy Admissions Committee will not accept College Level Examination Program (CLEP) courses. The School of Pharmacy Office of Admission may consider advanced placement examination credit. Only course credit will be given, not unit credit. The school recommends that students apply AP credit to elective credit for their undergraduate program at their current institution, not to waiving the prepharmacy requirements.

The pharmacy prerequisites are essential preparation for a rigorous four-year professional curriculum in the School of Pharmacy. Because of scheduling, it may not be possible to arrange all requirements into a four-semester or six-quarter course of study. It is recommended that, if necessary, summer sessions be used to meet non-science prerequisites.

An entrance examination (PPBE, PCAT) is not required. An interview will be required for admission.

Transfer Students
The Pharm.D. program is currently impacted. Transfer students from other U.S. accredited colleges of pharmacy are not accepted.

Post-Baccalaureate Program
The School of Pharmacy accepts a limited number of applicants (if vacancies exist) who hold a recently conferred baccalaureate degree in pharmacy from a college of pharmacy accredited by the American Council on Pharmaceutical Education. Such applicants may not be required to meet all pre-pharmacy requirements in order to qualify for admission and, if admitted to the Doctor of Pharmacy program, may be accepted at an advanced level for a minimum of two years (66 semester units) of full-time study.

Graduates from a Foreign School of Pharmacy
The School of Pharmacy Admissions Committee may consider, on a limited basis (space permitting), applications for admission into the Doctor of Pharmacy program from applicants holding a recent pharmacy degree (B.S. Pharm.) from a recognized foreign school of pharmacy and who have completed all prerequisite courses listed. One year of English composition and speech must be completed in the United States. The class level into which the applicant will be placed is determined individually by review of the applicant's prior academic record.

Trojan Early Decision Program (TED)
The TED program was introduced to encourage highly qualified applicants with bachelor's degrees who wish to apply to the USC School of Pharmacy Pharm.D. program as their first choice. Applicants who submit an application with all required documents and meet specific requirements by October 15 will be considered for early priority admission. If admitted, it is understood that these students will not apply to other schools.

Special Admissions Program for High School Students
The Trojan Admission Prepharmacy Program (TAPP) has been designed to attract highly qualified, mature high school seniors to take their prepharmacy course work at USC beginning as first semester freshmen. Admission to TAPP requires a student to have a minimum 1200 combined score on the SAT, a minimum 3.5 high school GPA, and have good oral and written communication skills. An interview will be required.

Applicants accepted into TAPP must complete the freshman and sophomore years (four academic semesters with a minimum of 16 units each semester) at University Park Campus. All prepharmacy courses must be taken during the fall and spring semesters at USC for letter grades. Summer school at USC or elsewhere and credit/no credit grades are not acceptable. Participation in the TAPP program will guarantee the unique advantage of acceptance into the Doctor of Pharmacy program, if students earn an approved cumulative GPA, which includes math and science and all prerequisites. Each student receives ongoing individual advisement, access to the School of Pharmacy's student services and the privilege of joining the Prepharmacy Club. The prepharmacy requirements are listed below.

FIRST YEAR, FALL SEMESTER

BIOL 110	Introduction to Biology I	4
CHEM 105a	General Chemistry	4
WRIT 140	Writing and Critical Reasoning	4
General Education (Social Issues)		4

FIRST YEAR, SPRING SEMESTER

BIOL 112	Introduction to Biology II	4
CHEM 105b	General Chemistry	4
COMM 102	Human Communication Principles and Practices	4
General Education (Arts and Letters)		4

SECOND YEAR, FALL SEMESTER

CHEM 322a	Organic Chemistry	4
MATH 125	Calculus I	4
General Education	Cultures and Civilization I	4
General Education	Cultures and Civilization II	4

SECOND YEAR, SPRING SEMESTER

CHEM 322b	Organic Chemistry	4
WRIT 340	Advanced Writing	3-4
PSYC 100	Introduction to Psychology	4
ECON 203	Principles of Microeconomics, or	
ECON 205	Principles of Macroeconomics	4

High school students interested in this program must initially request an admission application from the USC Office of Undergraduate Admission. Upon admission to USC, applicants should contact the School of Pharmacy Office of Admission for a TAPP application.

This unique six-year prepharmacy/doctor of pharmacy program will afford students continuity in their professional education.

Curriculum Requirements

The completion of a four-year professional curriculum is required to earn the Doctor of Pharmacy degree. The curriculum except for the fourth year is a "block" program. All students must enroll in 18 units each semester in courses designed for that level, fall and spring. Students do not have choices of courses to take nor are they permitted to drop any one course or courses during the semester. (Level III students have elective course choices). Progress is permitted only when the prior semester is completed in full. Students should view the curriculum outlined here as advisory only and subject to modification. "Level" is used in place of the term "year" because it connotes an achievement stage rather than a fixed period of time. "Hours" are substituted for "units" in identifying acceptable time requirements for completion of the program stages. Aggregate hours must equal a minimum of 144 units/hours.

Program of Courses

LEVEL I, FALL (18 HOURS)

PHAR 303	Pharmaceutics I
PHAR 309	Biological Systems I
PHAR 315	Biochemistry
PHAR 319	Pharmacy Literature Review and Statistical Analysis
PHAR 361	Introduction to Pharmaceutical Care Externship I (Hospital or Community)
PHAR 363	Communications Workshop
PHAR 365	Leadership and the Profession of Pharmacy

LEVEL I, SPRING (18 HOURS)

PHAR 306L	Pharmaceutics II
PHAR 310	Biological Systems II
PHAR 316	Molecular Genetics and Therapy
PHAR 332	Over-the-Counter Pharmacy Products
PHAR 362	Introduction to Pharmaceutical Care Externship II (Hospital or Community)
PHAR 366	Statistics Laboratory
PHAR 368	Pharmaceutical Care Pharmacy Practice Lab I

Total Level I: 36 hours

LEVEL II, FALL (18 HOURS)

PHAR 403L	Pharmaceutics III
PHAR 411L	Clinical Microbiology
PHAR 419	Pathology
PHAR 437	Public Health and Epidemiology
PHAR 441	Immunology
PHAR 450	Pharmaceutical Care Practice II, or
PHAR 460	Parenteral Therapy Externship

LEVEL II, SPRING (18 HOURS)

PHAR 406	Pharmaceutics IV
PHAR 414	Therapeutics I
PHAR 418	Therapeutics II
PHAR 422	Nutrition
PHAR 432	Management within Health Care Organizations
PHAR 450	Pharmaceutical Care Practice II, or
PHAR 460	Parenteral Therapy Externship

Total Level II: 36 hours

LEVEL III, FALL (18 HOURS)

PHAR 545	Therapeutics III
PHAR 547	Therapeutics IV
PHAR 549	Therapeutics V
PHAR 553	Pharmaceutical Economics and Outcome Studies

LEVEL III, SPRING (18 HOURS)

PHAR 546	Therapeutics VI
PHAR 548	Therapeutics VII
PHAR 550	Therapeutics VIII
PHAR 552	Pharmacy Law
PHAR 554	Pharmacy Ethics

Level III students must select one for the fall and one for the spring from the following electives:

PHAR 555	Community Pharmacy I
PHAR 556	Community Pharmacy II
PHAR 557	Health Systems Pharmacy I
PHAR 558	Health Systems Pharmacy II
PHAR 559	Geriatric Pharmacy I
PHAR 560	Geriatric Pharmacy II
PHAR 563	Computing Applications
PHAR 565	Basic Research Design
PHAR 566	Pharmaceutical Development
PHAR 568	Drugs of Abuse
PHAR 570	Sleep and the Pharmacologic Management of Its Disorders
PHAR 571	Disease State Management
PHAR 573	Molecular Therapeutics: Signal Transduction
PHAR 574	Clinical Problem Solving
PHAR 575	Therapeutic Drug Monitoring
PHAR 576	Health Care Needs of Special Populations
PHAR 577	Pharmacy Practice in Women's Health
PHAR 578	Psychiatric Pharmacy Practice
PHAR 579	Complementary/Alternative Therapeutics

Total Level III: 36 hours

LEVEL IV, FALL (18 HOURS)

Required Clerkships
Elective Clerkships

LEVEL IV, SPRING (18 HOURS)

Required Clerkships
Elective Clerkships

Total Level IV: 36 hours

Required Clerkships – four rotations:

PHAR 601	Acute Care Clinical Practice Clerkship
PHAR 604	Primary Care Clerkship, or
PHAR 607	Outpatient Psychiatric Pharmacy Clerkship
PHAR 605	Community Pharmacy Clerkship

An Inpatient Practice Elective must be satisfied by PHAR 602 if the student selects PHAR 604 Primary Care Clerkship rather than PHAR 607 Outpatient Psychiatric Pharmacy Clerkship. If the student selects PHAR 607, the student may take electives marked * to satisfy the requirement.

Elective Clerkships — two rotations:

PHAR 602*	Inpatient Psychiatric Pharmacy Clerkship
PHAR 603	Long Term Care Clerkship
PHAR 606	Geriatrics Clerkship
PHAR 610*	Inpatient Clinical Practice Clerkship
PHAR 611*	Pediatric Drug Therapy Clerkship
PHAR 612*	Surgery Clerkship
PHAR 613*	Cardiovascular Drug Therapy Clerkship
PHAR 614*	Applied Clinical Pharmacokinetics Clerkship
PHAR 615	Drug Information Services Clerkship
PHAR 616	Radiopharmacy Clerkship
PHAR 617*	Oncology Clerkship
PHAR 618*	Ob-Gyn Clerkship
PHAR 619	Dermatology Clerkship
PHAR 620	Hospital Pharmacy Practice Clerkship
PHAR 621	Advanced Pharmaceutical Literature
PHAR 623	Pain Management Clerkship
PHAR 624*	Critical Care Clerkship
PHAR 625	Drug Utilization and Evaluation Clerkship
PHAR 627*	Nutritional Support Clerkship
PHAR 628	Advanced Community Pharmacy Clerkship
PHAR 629	International Pharmacy Clerkship
PHAR 630abcd	Directed Clinical Project
PHAR 631	Acute Care Geriatrics Clerkship
PHAR 633**	Pharmacy Administration Clerkship
PHAR 634*	Anticoagulation Therapy Clerkship
PHAR 635*	Antimicrobial Therapy Clerkship
PHAR 636	Clinical Pharmacy Research Clerkship
PHAR 637*	Chemical Dependency
PHAR 638*	Clinical Transplantation
PHAR 639	Pharmaceutical Industry
PHAR 640	AIDS/Immune Disorders
PHAR 642	Health Care Systems Administration Clerkship
PHAR 646	Clinical Pharmacology
PHAR 650	Clinical Pharmacology and Pathophysiology

*Acceptable for satisfying the inpatient practice elective requirement.

**PHAR 633 required for Pharm.D./M.B.A. degree.

Total for Pharm.D. degree: minimum 204 semester units (hours). This includes 60 semester units of prepharmacy courses.

Degree Requirements

All students in the Doctor of Pharmacy degree program must meet course requirements, grade point average requirements and program residency requirements. All course requirements must be completed with a grade of "C" or better. The degree will not be conferred until the student has successfully completed all pre-pharmacy and Doctor of Pharmacy degree requirements. Students are subject to the degree requirements in the catalogue current for the semester of their admission into the Doctor of Pharmacy program. Students must have a cumulative grade point average of 2.4 in the Pharm.D. curriculum to meet graduation requirements.

Registration

Details of the School of Pharmacy registration procedure will be included in the orientation program prior to the first week of classes.

Cancellation of Registration

During the first three years of the Doctor of Pharmacy program (Levels I, II and III), a student will only be permitted to withdraw from all courses enrolled in a semester and may not selectively withdraw from a single course or group of courses. During the fourth year, students must contact the School of Pharmacy Admission and Student Affairs Office for withdrawal guidelines. Procedures for readmission into the program or make up of incomplete courses and clerkships are included in the school's brochure on academic policies and procedures.

Graduate Degrees

The School of Pharmacy, through the Graduate School, offers curricula leading to the M.S. and Ph.D. degrees in pharmaceutical sciences and in molecular pharmacology and toxicology. The Ph.D. degree in pharmaceutical economics and policy is offered jointly with the Department of Economics. The M.S. degree in pharmaceutical economics and policy is offered jointly with the School of Policy, Planning, and Development and the Department of Economics. Instructions given in the Admissions section of this catalogue are to be followed, but the application and the supplemental information requested should first be submitted to: Graduate Programs Office, USC School of Pharmacy, 1985 Zonal Avenue, Los Angeles, CA 90033. Additional information may be obtained by calling (323) 442-1474 or sending email to pharmgrd@hsc.usc.edu.

Admission Requirements for the Master of Science and Doctor of Philosophy in Pharmaceutical Sciences

Applicants should possess a bachelor's degree or equivalent from an accredited college or university. A minimum grade point average of 3.0 and qualifying scores on the GRE in the verbal and quantitative tests are required. In addition to excellent communication skills, applicants should possess knowledge and competence equivalent to one year of acceptable course work in at least three of the

following disciplines: mathematics, organic chemistry, physical chemistry, biochemistry, physiology and pharmacology. In addition to the application for admission, three letters of recommendation from faculty members who can evaluate the promise of the applicant for graduate study and a personal statement summarizing career objectives and research interests must be submitted.

Applicants who do not meet all the specific requirements indicated above, but who show unique potential, may be considered for admission with conditions which may be fulfilled during the first semester of enrollment. See the Graduate School section of this catalogue, page 555.

Admission Requirements for the Master of Science and Doctor of Philosophy in Molecular Pharmacology and Toxicology
All applicants must possess a bachelor's or higher degree from an accredited college or university with a grade point average of 3.0 or better and must have qualifying scores on the GRE. Students who have strong backgrounds in biology and/or chemistry are best suited for this program. Proficiency in English is essential. Whenever possible, students will be selected for admission on the basis of interviews with one or more members of the faculty.

Both the M.S. and Ph.D. programs emphasize research in molecular and neuropharmacology, receptor pharmacology, biochemical and oxidant toxicology. Applications for admission are reviewed by the Molecular Pharmacology and Toxicology Graduate Committee of the School of Pharmacy and are evaluated on the basis of academic excellence and commitment to scientific research.

Admission Requirements for the Master of Science in Pharmaceutical Economics and Policy
Applicants for admission must have achieved a minimum 3.0 GPA in undergraduate or professional school and adequate scores on the GRE. In addition, applicants will be required to have completed upper division courses in statistical methods, calculus and microeconomics.

Admission Requirements for the Doctor of Philosophy in Pharmaceutical Economics and Policy
Candidates with a bachelor's, master's or Pharm.D. degree are invited to apply. Applicants must have demonstrated proficiency in verbal and written English and aptitude in economics, mathematics, statistics and computer science. Deficiencies in economics and statistical background can be addressed through preliminary course work after admission to the program.

A minimum grade point average of at least 3.0 (A = 4.0) is required. Special attention is given to the grades achieved in economics, statistics and mathematics courses relevant to the program. A qualifying score on the GRE in verbal and quantitative areas is required. Students with GRE scores of 1200 or better will be given priority for financial aid support.

Admission of International Students to Graduate Degree Programs
All requirements described in this section are also applicable to the admission of international students. In addition, special application and admission procedures are required of international students. Refer to the section on Admission of International Students in this catalogue.

Degree Requirements

These degrees are under the jurisdiction of the Graduate School. Students should also refer to the Requirements for Graduation section, page 56 and the Graduate School section of this catalogue for general regulations, page 555. All courses applied toward the degrees must be courses accepted by the Graduate School.

Master of Science in Pharmaceutical Sciences
A Master of Science degree in the pharmaceutical sciences will be granted on the basis of completion of at least 24 units of formal course work and presentation of an acceptable thesis (PSCI 594ab, 4 units) based on the results of an original investigation.

Master of Science in Molecular Pharmacology and Toxicology
A minimum of 32 units is required including BIOC 551 or 561; MPTX 500, 501, 602; 603 or 605 or 606; MPTX 700 (4 units) and MPTX 594ab (4 units); PM 510; PSCI 661L. An acceptable thesis based on laboratory investigation is required. The candidate will defend an approved draft of the thesis in an oral examination.

Master of Science in Pharmaceutical Economics and Policy
The Department of Pharmaceutical Economics and Policy (School of Pharmacy) offers a program of study leading to the M.S. degree. Applicants must apply to the Graduate School and meet the admissions requirements of the program. This program requires students to demonstrate skills in the analysis of pharmaceutical and health technology innovations, as well as an understanding of contemporary health policy issues. A minimum of 35 units of graduate level courses is required.

Grade Point Average
A grade point average of at least 3.0 (A = 4.0) must be achieved on graduate course work at USC.

Course Requirements
The student is required to complete the following 35 units of graduate level course work: ECON 414 (4 units) or 511 (4 units), ECON 500 (4 units) or PUAD 512 (4 units), PM 511aL (4 units), PM 512 (3 units), PUAD 559 (4 units), PUAD 572 (4 units), PMEP 538 (4 units), PMEP 539 (4 units), and PMEP 540 (4 units). Students must complete all requirements for the degree within five years of entry into the program.

Additional Degree Requirements
The student must satisfactorily complete the specified courses in economics, preventive medicine and public administration prior to enrolling in PMEP 538 or 539. Upon successful completion of all other course work, the student may enroll in PMEP 540. The student is also required to complete a research/policy paper on a topic relevant to pharmaceutical economics and policy while completing PMEP 540.

Doctor of Philosophy in Pharmaceutical Sciences
This program emphasizes basic as well as applied research in drug delivery and targeting, utilizing medicinal chemistry, computational chemistry, pharmaceutics, pharmacodynamics, molecular pharmacology, immunology and cell biology.

A minimum of 60 units is required for the Doctor of Philosophy degree. At least 24 units of course work are required at the 500-level or above, exclusive of seminar and directed research. The guidance committee may require more than 24 units of course work. A minimum of 12 units is to be taken in courses in the Department of Pharmaceutical Sciences and a minimum of eight units must be taken in various related disciplines outside the department. The remaining 36 units may be fulfilled with other courses, directed research and dissertation.

Foreign Language Requirement
There is no formal foreign language requirement. However, an individual guidance committee can require competency in a foreign language or some other research tool such as computer language, if this is relevant for the student's area of research.

Guidance Committee
Upon admission, the student will be assigned to a member of the graduate faculty who will serve as his or her temporary advisor until a permanent advisor has been identified. The student's program of study will be under the direction of a guidance committee composed of at least five members, one of whom must be from outside the department granting the degree. The student should select a graduate advisor and guidance committee no later than the third semester in residence.

Screening Procedure
The performance of each student will be evaluated no later than the end of the second semester of enrollment in the graduate program. This screening procedure is conducted by the student's guidance committee or, if a student has not selected his or her research advisor at that time, by the Graduate Review Committee of the department. The committee reviews thoroughly the student's progress up to that point in various areas including course work, research interests and laboratory performance on his or her research project or laboratory rotations. If a performance deficiency is detected at that point by the committee, the student will be recommended to either take additional course work or transfer to the Master of Science program. Passing this screening procedure is prerequisite to continuation in the Ph.D. program.

Qualifying Examination
Students will be required to pass a comprehensive qualifying examination in major areas of the pharmaceutical sciences. The examination is administered by the guidance committee and consists of two parts: a written examination and a written proposition outlining a research project, followed by an oral examination based on the proposition and questions dealing with the written examination.

All course and qualifying examination requirements for the Doctor of Philosophy must be completed within two and one half years after admission.

Dissertation
A dissertation based on original investigation is required. The research should make a contribution to science and should demonstrate the candidate's scholarly advancement and competence to undertake independent research. An oral defense of the dissertation will be held after the candidate submits the final draft of the dissertation to the dissertation committee (see Graduate School policies and requirements, page 560).

Student Teaching
Teaching experience is considered an integral part of the training of graduate students. Thus, as part of the general requirements for the Ph.D., each student is required to participate in the teaching program of the School of Pharmacy.

Doctor of Philosophy in Molecular Pharmacology and Toxicology

A minimum of 60 units is required. At least 24 units must be in formal course work and include BIOC 551 or 561; MPTX 500, 501, 602; 603 or 605 or 606; PM 510; PSCI 661L. The remaining 36 units may be fulfilled with other courses, directed research and the dissertation. Other courses selected from graduate courses (500 level or above) in pharmaceutical sciences, biochemistry, cell biology, chemistry, molecular biology, neurosciences, pathology and physiology will be arranged by students in consultation with their guidance committee. All students will be expected to participate in the departmental seminar series (MPTX 700) during each year of residency.

Screening Procedure
The progress of all students accepted into the program is evaluated on a semester basis by the graduate affairs committee.

Language Requirement
There are no formal foreign language or computer language requirements. The guidance committee may, however, require competence in a foreign language or computer language if such competence is relevant to the student's research interests.

Qualifying Examination
Following the successful completion of all formal course work (usually two years), students must demonstrate excellence in general pharmacology and toxicology as well as their area(s) of research specialization. General and specialist knowledge are tested in both written and oral qualifying examinations, which also involve the presentation of a research proposal.

Dissertation
After passing the Ph.D. qualifying examinations, students begin work on their dissertation research, which typically requires two to three years of full-time effort. The dissertation research must involve original investigation in a relevant scientific area and must demonstrate the student's ability to plan, conduct and evaluate laboratory experiments. The dissertation research must represent a significant contribution to knowledge and must be successfully defended in an oral examination. The final written dissertation must be of publishable quality, and must be approved by the graduate advisor and the dissertation committee.

Doctor of Philosophy in Pharmaceutical Economics and Policy

The Department of Pharmaceutical Economics and Policy (School of Pharmacy) and the Department of Economics (College of Letters, Arts and Sciences) jointly offer a program of study leading to the Ph.D. degree and to the M.A. degree in the process of work toward the Ph.D. degree. Applicants must apply to the Graduate School and meet the admissions requirements of both academic units. This program focuses on economic assessment of pharmaceuticals and medical technology and research into the finance and delivery of pharmaceuticals and pharmacy services. A minimum of 64 units of graduate level courses numbered 500 or higher (excluding 794) and a minimum of four units of 794 is required.

Foreign Language Requirement
There is no formal foreign language requirement. However, competence in the use of one computer programming language is required for the graduate degrees. Such competence can be demonstrated either by course work or examination.

Grade Point Average
A grade point average of at least 3.0 (A = 4.0) must have been achieved on graduate course work at USC. ECON 586 or a higher level course in econometrics must be completed with a grade of B or higher.

Guidance Committee
The student will be assigned to a member of the graduate faculty who will serve as his or her temporary advisor until the formation of a guidance committee. The student should consult the pharmaceutical economics and policy director of graduate studies on the appointment of a Ph.D. guidance committee

after taking the core theory examination. The chairman of the student's Ph.D. guidance committee advises the student on matters of curriculum and graduate opportunities. The guidance committee comprises three to five members, at least one of whom must be from outside the department; at least two members must specialize in the student's area of emphasis, and at least three of the members must be suitable for service on the student's dissertation committee. The composition of all Ph.D. guidance committees must be approved by the PEP director of graduate studies. The student must form his or her guidance committee within one month after passing the departmental screening procedure.

Screening Procedure
The placement examinations in basic economics, mathematics and statistics must be completed and deficiency requirements completed in these areas. Depending on the results of these examinations, the student may require some preparation for his or her graduate program by taking some appropriate courses in economic theory (ECON 500 and/or 501), mathematics (ECON 482) or statistics (ECON 483). The student's progress will be reviewed after each semester and before registration for any additional course work to determine if progress has been satisfactory.

Core Theory Examination
Before completing three years of full-time graduate study or its part-time equivalent and prior to taking the qualifying examination, the student must pass the Department of Economics written core examination in general economic theory including applications.

Seminar Requirements
Every student is required to take and satisfactorily complete three two-unit research seminars chosen from PMEP 698 or the equivalent. At least one of these seminars must be related to the student's major field and the same seminar may be taken more than once. Before completing the dissertation, the student must present at least one original research paper in a seminar of his or her choice. This paper should typically consist of original results contained in the student's dissertation. It becomes part of the student's permanent file.

Dissertation Proposal Preparation
The student is required to register for two units of PMEP 790 and write a research paper on a topic suitable for a dissertation. Typically, the chair of the student's guidance committee directs this work. The resulting essay becomes part of the student's written dissertation proposal which is presented and critiqued during the oral portion of the qualifying examination.

Qualifying Examination
Upon successful completion of course and grade requirements, the student takes a written and oral examination on the chosen area of research emphasis and presents a detailed written dissertation proposal. After passing this examination, the student is admitted to candidacy for the Ph.D. degree.

Dissertation
After admission to candidacy, the student forms a dissertation committee comprising three faculty members, one of whom must be from an outside department. The chair of this committee is the dissertation supervisor. The student must register for PMEP 794 each semester, excluding summer sessions, until the dissertation and all other degree requirements are completed.

The student is expected to complete a dissertation based on original investigation. The dissertation must represent a significant contribution to knowledge and must be defended in an oral examination administered by the dissertation committee. The final written dissertation must be of publishable quality and must be approved by all members of the dissertation committee (see the section on Graduate School policies and requirements, page 560).

Pharm.D./M.B.A. Dual Degree Program
Responding to the growing demand on pharmacists to be knowledgeable in both science and business administration, the USC School of Pharmacy in 1988 helped pioneer an innovation in pharmaceutical education by offering this unique five-year dual degree program.

The Pharm.D./M.B.A. dual degree program is offered cooperatively by the School of Pharmacy and the Marshall School of Business. Students must complete concurrently all requirements established by both schools for their respective degrees.

The program involves completion of the first year in the School of Pharmacy, the second in the Marshall School of Business, and then completion of the balance of the Pharmacy program in the School of Pharmacy. A total of 48 units must be completed in the Marshall School of Business.

First Year: Required Pharmacy School courses

Second Year: Required M.B.A. core courses

Third to Fifth Years: 108 units of Pharmacy courses and graduate business electives sufficient to bring the total units completed in the Marshall School of Business to at least 48.

The Pharm.D. and the M.B.A. are awarded simultaneously upon completion of the School of Pharmacy and the Marshall School of Business requirements.

Admission Requirements
Students who have a baccalaureate degree from an accredited college or university and have been admitted and have successfully completed one year in the School of Pharmacy will be considered for admission to the Marshall School of Business. See the Marshall School of Business, page 114, for admission requirements.

Doctor of Pharmacy/Doctor of Philosophy
The Doctor of Pharmacy/Doctor of Philosophy (Pharm.D./Ph.D.) program is designed to permit qualified Pharm.D. students with a Bachelor of Science or equivalent degree to pursue research training in the pharmaceutical sciences and toxicology. A student accepted into the joint program must meet all requirements for the Pharm.D., as well as the requirements for the Ph.D. in the pharmaceutical sciences or toxicology sections listed in this catalogue. A maximum of 20 units from the Pharm.D. program may be credited toward the Ph.D. These units cannot, however, be substituted for the required 24 units of core course work.

Post-Pharm.D. Graduate Studies
Qualified students who wish to continue graduate studies within the School of Pharmacy upon completion of the Pharm.D. may, with permission of the dean, substitute certain Pharm.D. courses with courses necessary for the graduate degree so that the graduate program will not be delayed. These units cannot, however, be substituted for the 24 units of core course work.

Pharm.D./Graduate Certificate in Gerontology
The Pharm.D./Graduate Certificate in Gerontology is a program developed by the School of Pharmacy and the Andrus Gerontology Center. This integrated program in pharmacy and gerontology prepares students with an interest in geriatric pharmacy to assume leadership roles in academic, administrative or policy levels within the profession.

The program involves the completion of 16 units of core courses in physiology, psychology, sociology and social policy aspects of aging offered by the School of Gerontology (GERO 510, 520, 530, 540.). In addition, students are required to complete 8 to 12 units of approved elective courses in gerontology or geriatric pharmacy to be credited toward the requirements for the Pharm.D. and the Graduate Certificate in Gerontology.

Non-degree Programs

Office of External Programs
1985 Zonal Avenue, Los Angeles, CA 90033
(323) 442-2403
FAX: (323) 442-3600
Email: pharmce@hsc.usc.edu
www.usc.edu/go/pharmce

Management Development Program in Health Care
The USC Management Development Program in Health Care is designed for managers representing various areas of health care. This certificate program is designed to increase the participants' knowledge in the areas of management related to health care.

The topic areas covered are intended to enhance the manager's competence to lead and make decisions in the increasingly turbulent world of health care. Some of the critical subjects examined are outcomes assessment, capitation, integrated delivery networks, health care accounting and finance, strategic planning, marketing and communication, the critical role of HMOs, policy issues, health care trends and others.

This program will prove vital to managers in both technical and functional areas who desire increased responsibility or are being prepared for additional responsibilities.

Executive Institute in Health Care Management
This program is especially geared for senior managers who are concerned with strategic planning, policy issues, governmental and major corporate directions and the expected changes in health care administration and financing.

Both of the above programs are accredited for continuing education credit for physicians, pharmacists, nurses and insurance personnel. The Management Development Program is scheduled twice each year; the Executive Institute annually. For additional information, call the Center of Excellence in Health Care Management at (323) 442-2403; FAX (323) 442-3600 or email: pharmce@hsc.usc.edu.

Continuing Education Division
The School of Pharmacy, Office of External Programs, is a recognized provider of continuing education by the American Council on Pharmaceutical Education (ACPE) and the California State Board of Pharmacy. The school serves as a primary educational resource for pharmacists in California and as a supplementary resource for other health professionals and pharmacists, nationally and internationally.

Numerous continuing education courses are offered and designed to improve knowledge in the areas of practice management, patient management, disease states and therapeutics, new drugs and dosage forms. Continuing education programs are held at the School of Pharmacy, prior to many local and national association meetings, and in Las Vegas and Hawaii annually.

For information concerning continuing education programs contact: Office of External Programs Continuing Education Division (see above).

Minor in Health: Social Ecology
This minor presents many different views of health and health care as it examines health from an ecological viewpoint. It is designed both for the student who anticipates a future in health care but wants to learn more about promotion of health and how the system that provides health care in the United States is managed (understanding from either a provider or a consumer viewpoint). See the Department of Nursing section of this catalogue, page 574.

Courses of Instruction

MOLECULAR PHARMACOLOGY AND TOXICOLOGY (MPTX)

The terms indicated are *expected* but are not *guaranteed*. For the courses offered during any given term, consult the *Schedule of Classes*.

462 Physiology for the Health Professions (4) Enroll in PHBI 462.

500 Molecular Pharmacology and Toxicology I (4, Fa) This is the first part of a two-semester introductory and survey course for the molecular pharmacology and toxicology degree program. *Prerequisite:* knowledge of biochemistry.

501 Molecular Pharmacology and Toxicology II (4, Sp) The second part of the two-semester course covers the general aspects of molecular pharmacology and toxicology on the basis of biochemical, molecular, biological and environmental approaches. *Prerequisite:* MPTX 500.

531 Cell Biology (4) (Enroll in INTD 531)

561 Molecular Genetics (4, Sp) (Enroll in INTD 561)

562 Systems and Integrative Physiology (4, Sp) (Enroll in PHBI 562)

571 Biochemistry (4, Sp) (Enroll in INTD 571)

594abz Master's Thesis (2-2-0, FaSpSm) Credit on acceptance of thesis. Graded IP/CR/NC.

599 Special Topics (2-4, max 8) Special topics in Molecular Pharmacology and Toxicology.

602 Science, Research and Ethics (2, Fa) A discussion of the unique technological and philosophical issues that challenge modern scientists and a discernment of ethical responses to those challenges.

603 Molecular Mechanisms for Biological Signals (4, Fa) Biological mechanisms of hormone, neuro-transmitter, growth factor and xenobiotic actions from ligand-receptor interactions, signal transductions, modification processes to regulation of gene expression and cellular growth. *Prerequisite:* knowledge of physiology and biochemistry.

605 Toxicology of Oxidants and Free Radicals (2, Sp) The chemistry, biochemistry, and physiology of oxygen and the biochemical mechanism of tissue-specific oxygen toxicity. *Prerequisite:* knowledge of biochemistry.

606 Pulmonary Toxicology (2, Sp) Current concepts of inhalation toxicology and toxic mechanisms leading to lung injury. Lectures include basic pulmonary anatomy and physiology. *Prerequisite:* knowledge of biochemistry.

700 Seminar in Molecular Pharmacology and Toxicology (1, max 8, FaSp) Contemporary advances in molecular pharmacology and toxicology research. Registration required during each year of residency.

790 Research (1-12, FaSpSm) Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm) Credit on acceptance of dissertation. Graded IP/CR/NC.

PHARMACY (PHAR)

300 Self Care Managing Non-Prescription Drug Products and Devices (2) Review the active ingredients and formulations of commonly used classes of over-the-counter drugs. Special emphasis on mechanism of action, side effects, contraindication and drug interactions.

303 Pharmaceutics I (4, Fa) Introduction to physiochemical principles of dosage forms; properties of molecules in dosage forms, stability of pharmaceuticals and their interactions in body tissue, including computational approaches. Open to Doctor of Pharmacy students only.

306L Pharmaceutics II (4, Sp) Principles involved in molecules movement across biological barriers. Properties, characteristics, application of homogeneous and heterogeneous dosage forms, liquid, semi-solid and solid. Discussion and laboratory. Open to Doctor of Pharmacy students only.

309 Biological Systems I (4, Fa) Integrated teaching of anatomy, histology, physiology and pathophysiology in organized sequence: cellular, skeletal, muscular, nervous and lymphatic systems. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 313 and PHAR 314.)

310 Biological Systems II (6, Sp) Continued integration of anatomy, histology, physiology and pathophysiology: cardiovascular, respiratory, renal, gastrointestinal (digestive), endocrine, and reproduction systems. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 313 and PHAR 314.)

315 Biochemistry (4, Fa) Chemical and molecular aspects of biological processes, including the chemistry of biomolecules, enzymology, bioenergetics, biochemical control mechanisms, and an introduction to metabolic diseases. Open to Doctor of Pharmacy students only.

316 Molecular Genetics and Therapy (2, Sp) Principles of gene expression, and recombinant DNA methods and applications. Focus on human genetics and influence of genetic background on the utilization and effectiveness of specific drugs. Open to Doctor of Pharmacy students only.

319 Pharmacy Literature Review and Statistical Analysis (3, Fa) Literature evaluation and biostatistics of clinical and health services research, and epidemiology. Emphasis on the management of drug therapy products, patient outcomes and formulary development. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 332.)

332 Over-the-Counter Pharmacy Products (3, Sp) Facilitate patient selection of self-care health care products: OTC drugs, their dosages, pharmacology, efficacy, cost, side effects, adverse reactions, contraindications, and interactions with other medications. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 331.)

361 Introduction to Pharmaceutical Care Externship I (Hospital or Community) (1, Fa) Introduction of principles and the application of pharmaceutical care in community or hospital pharmacy setting. Open to Doctor of Pharmacy students only.

362 Introduction to Pharmaceutical Care Externship II (Hospital or Community) (1, Sp) Continuation of Externship. At completion of this series, students will have had practical experience in pharmaceutical care in both community and hospital settings. Open to Doctor of Pharmacy students only.

363 Communications Workshop (1, Fa) Development of communication skills to interact with other health care professionals, patients, and community members. Verbal/nonverbal communication is emphasized with specific reference to speaking, writing, listening. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 531.)

365 Leadership and the Profession of Pharmacy (1, Fa) Development of leadership skills for the pharmacist in various pharmacy practice locations, in the community, and in professional societies and organizations. Open to Doctor of Pharmacy students only.

366 Statistics Laboratory (1, Sp) Development of relevant computational skills to collect, organize, validate and analyze data, display quantitative information graphically and visually, test statistical hypotheses and produce reports. Open to Doctor of Pharmacy students only.

368 Pharmaceutical Care Pharmacy Practice Lab I (1, Sp) Practical pharmaceutical calculations involving prescription interpretation, calculation of doses, reducing/enlarging formulas, specific gravity, percentage and ratio strength, dilution, isotonic solutions, electrolyte and parenteral solutions. Open to Doctor of Pharmacy students only.

390 Special Problems (1-4) Supervised, individual studies. No more than one registration permitted. Enrollment by petition only.

403L Pharmaceutics III (4, Fa) Principles of absorption, distribution, metabolism, and elimination. Linear, non-linear, model-independent pharmacokinetics. Design of individualized dosing regimens and drug therapy monitoring. Lecture and discussion. Open to Doctor of Pharmacy students only.

406 Pharmaceutics IV (3, Sp) Principles and applications of controlled, targeted, and self-regulating drug delivery. Methods to deliver therapeutic peptides, proteins and genetic materials. Open to Doctor of Pharmacy students only.

411L Clinical Microbiology (3, Fa) Pathobiology and epidemiology of microscopic organisms pathogenic to man including virus, bacteria, fungi, protozoa, helminths, and other selected "unclassified" microoganisms. Lecture and laboratory. Open to Doctor of Pharmacy students only.

414 Therapeutics I (5, Sp) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics, and therapeutics of drugs, with emphases on general principles, diagnostics, wellness and management of allergies. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 414, PHAR 420, PHAR 561.)

418 Therapeutics II (4, Sp) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics and therapeutics of drugs with emphasis on chemotherapy of infectious diseases: bacterial, microbial, viral, parasitic, fungal. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 412.)

419 Pathology (3, Fa) Fundamental principles of pathophysiologic changes incident to abnormal states. Inflammation, infection, degeneration, regeneration and repair, neoplasia, and metabolic disturbances. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 318*L*.)

422 Nutrition (2, Sp) Biomedical knowledge is correlated with assessments of clinical case-management problems to understand the interrelationship between nutrition and health in both hospitalized and healthy patients. Open to Doctor of Pharmacy students only.

432 Management within Health Care Organizations (2, Sp) Management of the professional practice of pharmacy in organized health care systems. Introduction to formulary development and outcome analysis. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 431.)

437 Public Health and Epidemiology (3, Fa) Introduction to epidemiology, environmental health, health education, health care organizations and financing. Orientation to social and governmental controls on the health care system. Open to Doctor of Pharmacy students only.

441 Immunology (3, Fa) Basic principles of immunology and their application to the understanding and treatment of immunologically-mediated diseases. Provides the scientific basis of immunotherapy and immunodiagnosis. Open to Doctor of Pharmacy students only.

450 Pharmaceutical Care Practice II (2, FaSp) Development of pharmacy clinical skills in physical assessment, microcomputer searching of the medical literature, drug information systems, and patient counseling. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 532, PHAR 564.)

460 Parenteral Therapy Externship (2, FaSp) Drug weight/volume concentrations, dilutions and additive volumes are calculated in compounding of parenteral products in various patient-care settings using aseptic technique. Open to Doctor of Pharmacy students only.

545 Therapeutics III (2, Fa) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics, and therapeutics of drugs, with emphases on pharmaceuticals treating diseases associated with the autonomic nervous system. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 414, PHAR 420, PHAR 561.)

546 Therapeutics VI (6, Sp) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics, and therapeutics of drugs, with emphases on pharmaceuticals affecting cardiovascular and circulatory diseases. CPR certification. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 504, PHAR 514, PHAR 525, PHAR 562.)

547 Therapeutics IV (6, Fa) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics, and therapeutics of drugs, with emphases on pharmaceuticals treating diseases associated with the central nervous system. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 503, PHAR 513, PHAR 525, PHAR 561.)

548 Therapeutics VII (3, Sp) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics, and therapeutics of drugs, with emphases on treating diseases of the renal, GI and pulmonary systems. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 504, PHAR 514, PHAR 526, PHAR 562.)

549 Therapeutics V (4, Fa) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics, and therapeutics of drugs, with emphases on pharmaceuticals affecting the endocrine system, diseases and women's health. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 504, PHAR 514, PHAR 526, PHAR 564.)

550 Therapeutics VIII (2, Sp) Integrated teaching of the biomedicinal chemistry, pharmacology, clinical pharmacokinetics and therapeutics of drugs, with emphases on pharmaceuticals for managing oncological, AIDS and immunological diseases. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 504, PHAR 514, PHAR 526, PHAR 562.)

552 Pharmacy Law (2, Sp) Federal and state statutes, regulations and case law governing pharmacy practice including the laws that establish the standards for dangerous drugs and controlled substances. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 433.)

553 Pharmaceutical Economics and Outcome Studies (3, Fa) Economic analysis of the U.S. health care system, the pharmaceutical industry, and the profession; economic assessment of drug therapy costs and health care outcomes applying pharmacoeconomic research methodologies. Open to Doctor of Pharmacy students only.

554 Pharmacy Ethics (2, Sp) Application of ethical principles to specific cases in medicine and pharmacy practice involving resolution of ethical dilemmas, consideration of the primary responsibility to the patient. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 433.)

555 Community Pharmacy I (3, Fa) Development of specialized knowledge and skills in community pharmacy practice involving location analysis, pharmacy management principles, and introduction to business law concepts. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 440, PHAR 541.)

556 Community Pharmacy II (3, Sp) A continuation of pharmacy business law concepts encompassing contract principles and forms of ownership, including a review of pharmacy laws, compounding principles, and OTC agents. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 542. *Prerequisite:* PHAR 555.)

557 Health Systems Pharmacy I (3, Fa) Understanding formal and informal organizations in institutions, managed care, disease management, health care policy and financing, patients' chart organization, and clinical monitoring parameters. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 440, PHAR 541.)

558 Health Systems Pharmacy II (3, Sp) Recognizing resources available for drug information, familiarity with institutional formularies, medication counseling, writing chart notes, and clinical activities at an off-campus health care institution. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 542.) *Prerequisite:* PHAR 557.

559 Geriatric Pharmacy I (3, Fa) Specialized knowledge and skills in geriatric pharmacy, pharmacology of aging, and unique functions of health care team providing care to the elderly patient. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 440, PHAR 541.)

560 Geriatric Pharmacy II (3, Sp) Specialized knowledge and skills in gerontology and geriatric pharmacy including the pathophysiology of selected cardiovascular, endocrine, genitourinary gastrointestinal disorders, osteoarthritis, and osteoporosis. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 542.) *Prerequisite:* PHAR 559.

563 Computing Application (3, Fa) Specialized knowledge and skills using computers in professional practice: telecommunication protocols, typical patient databases in hospital and community pharmacies, drug interactions, insurance billing, inventory control. Open to Doctor of Pharmacy students only.

565 Basic Research Design (3, Fa) Research experience to integrate research into Doctor of Pharmacy program. Research focuses on industrial, academic, or government issues. Open to Doctor of Pharmacy students only.

566 Pharmaceutical Development (3, Sp) Examination of pharmaceutical product development process including discovery, preclinical/clinical studies, regulatory-legal issues, and marketing. Open to Doctor of Pharmacy students only.

568 Drugs of Abuse (3, Sp) Specialized knowledge and skills in specific substance abuse-related areas. Each area will include addiction, wellness, and prevention components. Open to Doctor of Pharmacy students only.

570 Sleep and the Pharmacologic Management of Its Disorders (3, Sp) Overview of normal sleep manifestations, and treatment of common sleep disorders, and the pharmacist's role in assessment, treatment, and referral. Open to Level III Doctor of Pharmacy students only.

571 Disease State Management I (3, Fa) The processes required to develop disease state management protocols based on data drawn from the medical research literature. Open to Level III Doctor of Pharmacy students only.

573 Molecular Therapeutics: Signal Transduction (3, Fa) Principles of molecular therapeutics against signaling pathways; emphasis on biological mechanisms underlying hormone, growth factor, and neurotransmitter-mediated gene regulation, proliferation, and cell death. Open to Level III Pharm.D. students only.

574 Clinical Problem Solving (3, Sp) Integration of physical assessment, laboratory tests, history-taking, and diagnosis to formulate decisions for optimal treatment plans in specific disease states. Open to Level III Pharm.D. students only.

575 Therapeutic Drug Monitoring (3, Fa) Application of pharmacokinetic and pharmacodynamic principles to individualize patient drug regimens. Open to Level III Pharm.D. students only.

576 Health Care Needs of Special Populations (3, Sp) Health care needs of the poor will be examined through participation in a multidisciplinary community clinic setting focusing on medication counseling and compliance. Open to Level III Pharm.D. students only.

577 Pharmacy Practice in Women's Health (3, FaSp) The pharmaceutical care of women patients is emphasized. Therapeutic, psychosocial factors and current research in women's health. Open to Level III Pharm.D. students only.

578 Psychiatric Pharmacy Practice (3, Sp) Specialized knowledge and skills in psychiatric pharmacy practice including child, adult, and geriatric psychopharmacology applied to inpatient and outpatient treatment. Open to Level III Pharm.D. students only.

579 Complementary/Alternative Therapeutics (3, Fa) Examines the therapeutic use of complementary/alternative medicines, such as herbal medicines, homeopathic drugs, vitamins and other nutritional supplements. Open to Level III Pharm.D. students only.

599 Special Topics (2-4, max 8)

601 Acute Care Clinical Practice Clerkship (6, FaSpSm) Application of pharmaceutical care principles to the adult patient population in an acute care environment. Pharmacology, pharmacokinetics, and disease state management will be emphasized. Open to Doctor of Pharmacy students only.

602 Inpatient Psychiatric Pharmacy Clerkship (6, FaSpSm) Application of pharmaceutical care principles to the inpatient psychiatric patient. Understanding of the treatment of common psychiatric disorders, patient interviewing skills and health care teams. Open to Level IV Doctor of Pharmacy students only.

603 Long Term Care Clerkship (6, FaSpSm) Application of pharmaceutical care to patients in long term care environments. Understanding of the therapeutic, legal and special needs of this patient population. Open to Level IV Doctor of Pharmacy students only.

604 Primary Care Clerkship (6, FaSpSm) Disease state management and pharmaceutical care in ambulatory care. Modification and design of drug therapy regimens, participation in medical care team and direct patient care. Open to Doctor of Pharmacy students only. (Duplicates credit in former PHAR 604.)

605 Community Pharmacy Clerkship (6, FaSpSm) Pharmaceutical care principles applied to the community pharmacy environment. Participating in the development, implementation and outcome evaluation of patient care services in the community. Open to Level IV Doctor of Pharmacy students only.

606 Geriatrics Clerkship (6, FaSpSm) Drug therapy and management of geriatric patients with a focus on unique medical, economic, and psycho-social problems of this population. Open to Level IV Doctor of Pharmacy students only.

607 Outpatient Psychiatric Pharmacy Clerkship (6, FaSpSm) Disease state management and pharmaceutical care in ambulatory mental health care. Modification and design of psychiatric therapy regimens, participation in multidisciplinary teams and patient care. Open to Level IV Doctor of Pharmacy students only. (Duplicates credit in former PHAR 604.)

610 Inpatient Clinical Practice Clerkship (6, FaSp) Drug therapy in a variety of inpatient clinical settings. Emphasis: patient monitoring, evaluation of therapeutic response, and provision of drug information.

611 Pediatric Drug Therapy Clerkship (4-6, FaSp) Clinical therapeutic and pharmacokinetic concepts applied to the pediatric patient. Unique aspects of pediatric clinical pharmacology emphasized in treating a variety of organ system diseases.

612 Surgery Clerkship (6, FaSpSm) Drug therapy in clinical situations common to surgical patients. The use of drugs and monitoring for response to treatment in surgical settings. Open to Level IV Doctor of Pharmacy students only.

613 Cardiovascular Drug Therapy Clerkship (6, FaSpSm) Pharmaceutical care applied to cardiac patients. The use of cardiac drugs with an emphasis on physiologic response, pharmacokinetic principles and desired treatment outcomes. Open to Level IV Doctor of Pharmacy students only.

614 Applied Clinical Pharmacokinetics Clerkship (6, FaSpSm) Practical experience in applying pharmacokinetic principles to patients in the health care system. A variety of disease states and therapeutic agents will be reviewed. Open to Level IV Doctor of Pharmacy students only.

615 Drug Information Clerkship (6, FaSpSm) Practical experience and training in the use of information resources and technology to improve patient care. Experience in information retrieval, literature evaluation, problem solving skills and communication skills emphasized. Open to Level IV Doctor of Pharmacy students only.

616 Radiopharmacy Clerkship (6, FaSp) Provides practical and theoretical aspects of radiopharmacy services delivery.

617 Oncology Clerkship (6, FaSp) Directed experiences in the use and monitoring of oncological drugs.

618 Ob-Gyn Clerkship (6, FaSp) Provides experiences in disease states common to this area and the drug therapy management employed.

619 Dermatology Clerkship (6) Provides experiences in disease states common to this area and the drug therapy management employed.

620 Hospital Pharmacy Practice Clerkship (6, FaSpSm) Practical experience and training in the practice of hospital pharmacy. Administrative, practice-based and therapeutic competencies emphasized. Open to Level IV Doctor of Pharmacy students only.

621 Advanced Pharmaceutical Literature (2) Information sources and retrieval; scientific writing.

622 Current Principles of Pharmaceutical Care (4, FaSpSm) Therapeutic principles for pharmaceutical care including pharmacokinetics, pharmacodynamics, patient interactions, law, calculations and dosing in special populations. Enrollment limited to students with a prior degree in pharmacy.

623 Pain Management Clerkship (6, FaSpSm) Pharmaceutical care principles applied to patients requiring treatment in pain management. Pharmacology, patient counseling and management emphasized. Open to Level IV Doctor of Pharmacy students only.

624 Critical Care Clerkship (6, FaSpSm) Drug therapy in a critical care setting. Emphasizes therapeutic management in critically ill patients, often with multisystem failure.

625 Drug Utilization and Evaluation Clerkship (6, FaSpSm) Practical experience and training in the design, implementation and evaluation instruments (DUE/MUE) to measure the appropriate use of therapeutic agents and the evaluation of desired therapeutic outcomes. Open to Level IV Doctor of Pharmacy students only.

626 Home Health Care Clerkship (6, FaSpSm) Practical experience in the provision of comprehensive home intravenous and nutritional support services, including fluid and electrolyte therapy, chemotherapy, antibiotics, pain control and nutrition support. Open to Level IV Doctor of Pharmacy students only.

627 Nutritional Support Clerkship (6, FaSpSm) Experiential training in the pharmacy specialty of nutritional support. Activities include: patient evaluation, developing treatment plans, formula composition and design, integration with nutritional support team and consult services. Open to Level IV Doctor of Pharmacy students only.

628 Advanced Community Pharmacy Clerkship (6, FaSp) Directed project in community pharmacy.

629 International Pharmacy Clerkship (6, FaSpSm) Practical experience and training in the practice of pharmacy in the international setting. Students will visit an international pharmacy practice setting and complete a project. Open to Level IV Doctor of Pharmacy students only.

630abcd Directed Clinical Project (6-6-6-6, FaSp) Directed educational opportunities not presently offered as electives, e.g., research projects or new and evolving clerkships.

631 Acute Care Geriatrics Clerkship (6, FaSpSm) Pharmaceutical care principles applied to the acutely ill geriatric patient population. Emphasis on drug therapy problem solving, physiology, pharmacokinetics and compliance problems. Open to Level IV Doctor of Pharmacy students only.

632 Advanced Geriatrics Clerkship (6, FaSp) Directed projects and experiences in geriatric drug therapy.

633 Pharmacy Administration Clerkship (6, FaSpSm) Principles and practices of hospital pharmacy administration, management and departmental relationships. Practical experiences and projects emphasized. Open to Level IV Doctor of Pharmacy students only.

634 Anticoagulation Therapy Clerkship (6, FaSpSm) Management of patients requiring anticoagulation. Applied knowledge of disease pathophysiology, anticoagulant pharmacology, and laboratory methods toward safe and effective patient outcomes. Open to Level IV Doctor of Pharmacy students only.

635 Antimicrobial Therapy Clerkship (6, FaSpSm) Antimicrobial therapy, including antibiotic selection, dosage adjustment, and outcomes assessment of patients in the health care setting. Open to Level IV Doctor of Pharmacy students only.

636 Clinical Pharmacy Research Clerkship (6, FaSpSm) Drug research administration: research design; ethics; record-keeping; and institutional review. Practical experience and projects are emphasized. Open to Level IV Doctor of Pharmacy students only.

637 Chemical Dependency (6, FaSp) The psychiatric, social, and pharmacological management of chemical dependency. Emphasizes the inpatient, day treatment, and outpatient components of detoxification and recovery.

638 Clinical Transplantation (6, FaSp) Drug therapy to organ transplantation. Emphasizes pre- and post-transplantation therapy designed to minimize organ rejection, prevent infection, and improve survival.

639 Pharmaceutical Industry (6, FaSp) Train within a pharmaceutical company to develop an understanding of the drug development, research, marketing process.

640 AIDS/Immune Disorders (6, FaSp) A multidisciplinary approach to the management of AIDS and other immuno-compromised patients. Pharmacologic management is directed toward opportunistic infections, disease modifiers, and adjuvant therapy.

642 Health Care Systems Administration Clerkship (6, FaSpSm) Practical experience and training in managed care settings and health care systems. Emphasis on administrative principles, management and health outcomes. Students will complete a project. Open to Doctor of Pharmacy students only.

PHARMACEUTICAL ECONOMICS AND POLICY (PMEP)

538 Pharmaceutical Economics (4, Sm) Introduction to pharmacoeconomics with special emphasis on the role of pharmaceuticals and the pharmaceutical industry, insurance, managed care, regulation and pricing. *Prerequisite:* ECON 500.

539 Economic Assessment of Medical Care (4, Fa) Principles of cost-benefit analysis and medical cost-effectiveness analysis with applications in medical care and the pharmaceutical field. *Prerequisite:* ECON 500 and ECON 581.

540ab Seminar in Pharmaceutical Economics and Policy (2-2, Fa) This seminar will expand the student's understanding of fundamental techniques used in analyzing pharmaceutical policies and programs. *Prerequisite: a:* PMEP 538 and PMEP 539; *b:* PMEP 540*a*.

549 Applied Pharmacoeconometrics (4, Sp) Use of quantitative models to describe and analyze pharmaceutical and health care markets; experimental design/power calculations; survival models; multiple indicator models; qualitative and limited dependent variables models; estimation and application of such models to selected problems. *Prerequisite:* ECON 615.

698 Seminar in Pharmaceutical Economics and Policy (4, max 8, FaSp) Current research in pharmaceutical economics and policy presented by outside scholars, faculty and students. Graded CR/NC.

790 Research (1-12) Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

794abcdz Doctoral Dissertation (2-2-2-2-0) Credit on acceptance of dissertation. Graded IP/CR/NC.

PHARMACEUTICAL SCIENCES (PSCI)

462 Physiology for the Health Professions (4) (Enroll in PHBI 462)

530 Biochemistry of Anti-Cancer Agents (2) (Enroll in BIOC 530)

531 Cell Biology (4) (Enroll in INTD 531)

561 Molecular Genetics (4, Sp) (Enroll in INTD 561)

562 Systems and Integrative Physiology (4, Sp) (Enroll in PHBI 562)

571 Biochemistry (4, Fa) (Enroll in INTD 571)

590 Directed Research (1-12, FaSpSm) Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

594abz Master's Thesis (2-2-0, FaSpSm) Credit on acceptance of thesis. Graded IP/CR/NC.

599 Special Topics (2-4, max 8, FaSp) Topics in advanced pharmaceutical sciences.

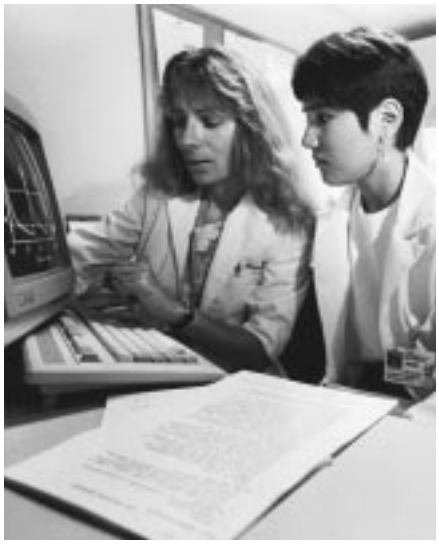
601 Molecular Biology of Gene Regulation (2, max 8) (Enroll in BIOC 601)

613L Radiobiology and Biological Effects of Radiation (4) Effects on the cellular level and on mammalian systems; their bearing on human exposure criteria. Lecture and laboratory.

652L Structure Activity Relationship and Drug Design (4, 2 years, Sp) Computerized correlation of biological activities with molecular structures and physicochemical properties of drugs and their applications in designing new drugs. Lecture and laboratory.

653L Spectrometry in Biomedicine (4, 2 years, Sp) Theory of spectrometry and applications in pharmaceutical and biomedical sciences. Emphasis on structural identification of organic molecules, drugs and their metabolites of pharmaceutical interest. Lecture and laboratory.

654L Computer Applications in Pharmaceutical Sciences (3, 2 years, Fa) Introduction to computing facilities and computer applications frequently used in the study of pharmaceutical sciences. Students receive maximal hands-on exposure to computing.



Professor Kathleen Besinque worked with a team of faculty to develop a revised program which is patient focused and science driven.

655 Immunopharmaceutics (2, 2 years, Fa) Lectures and discussion sessions on pharmaceutics-related immunology, including drugs affecting the immune system, antibodies and cytokines as drugs, and new developments in immunobiotechnology.

661L Advanced Pharmaceutical Analysis (4, 2 years, Fa) Theory and application of quantitative instrumental techniques to the pharmaceutical sciences. Includes principles of chromatography, spectrophotometry, fluorescence, mass spectrometry and immunologic assays. Lecture and laboratory.

662 Advanced Pharmacokinetics (4, 2 years, Sp) Principles of pharmacokinetics including mathematical description of drug disposition processes. Emphasis on design and evaluation of pharmacokinetic studies and statistical analysis of parameter estimates.

663 Advanced Drug Delivery Systems (2, Fa) Design and applications of polymers, liposomes, micro/nanoparticles, prodrugs, and macromolecules for parenteral, oral, transdermal, respiratory and CNS drug delivery. *Recommended preparation:* college level chemistry and biology; *prerequisite:* PSCI 665.

664 Drug Discovery and Design (4, Fa) Principles of drug discovery, design and characterization. Mechanisms of action of major classes of drugs. *Recommended preparation:* college level chemistry and biology.

665 Drug Transport and Delivery (4, Fa) Principles of cellular drug transport, in vivo drug transport, and modern drug delivery, including drug targeting. *Recommended preparation:* college level biology and chemistry.

666 Molecular Structural Biology (2, Sp) Molecular structure of proteins and DNA. Structure-function relationships and structure determination. *Recommended preparation:* college level chemistry and biology.

667 Intracellular Drug Delivery and Targeting (2, 2 years, Sp) Mechanisms of membrane trafficking and intracellular transport and the utilization of these mechanisms in drug delivery and targeting. *Recommended preparation:* college level chemistry and biology, INTD 531.

671 Drug Morphology (3, 2 years, Fa) This course will examine drug metabolism in terms of hepatic and extrahepatic processes. Mechanisms of bioactivation and cellular toxicity will also be covered. *Prerequisite:* departmental approval.

756ab Seminar in Pharmaceutical Sciences (1-1, FaSpSm) Review of current pharmaceutical and related research topics.

790 Research (1-12, FaSpSm) Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

791L Research (2-12, no max) Directed research for the M.S. thesis or Ph.D. dissertation.

794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm) Credit on acceptance of dissertation. Graded IP/CR/NC.