
Keck School of Medicine of USC



The Keck Medicine Initiative will transform the future of health care by advancing research, medical education, patient care and infrastructure with support from the W. M. Keck Foundation's \$150 million lead gift. USC President C. L. Max Nikias, right, and Keck Foundation CEO and Chairman Robert Day celebrate the gift at a festive gathering on the USC Health Sciences Campus.

Founded in 1885, the Keck School of Medicine of USC is part of Keck Medicine of USC, a major center of medical research, education and patient care with more than 1,369 full-time faculty members and a voluntary faculty of more than 4,000 physicians. Faculty of the school include national leaders in each of its 24 clinical and basic science departments. Located on the university's 30.8-acre Health Sciences Campus three miles northeast of downtown Los Angeles, the Keck School is adjacent to the Los Angeles County+USC Medical Center, one of the largest teaching hospitals in the United States.

Keck's faculty, students and residents serve more than one million patients each year through the Los Angeles County+USC Medical Center, the USC Norris Cancer Hospital, the Keck Hospital of USC, Doheny Eye Institute, Children's Hospital Los Angeles, and a network of additional USC-affiliated hospitals throughout Southern California. More than 500 faculty physicians comprise the Keck Doctors of USC, caring for patients with a variety of complex medical needs as well as providing primary care.

The new Eli and Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research of USC, which opened in the fall of 2010, joins the Harlyne J. Norris Cancer Research Tower and USC Zilkha Neurogenetic Institute in providing state-of-the-art facilities for important scientific discovery. With more than \$248 million in total federal research support, the Keck School ranks among the top U.S. medical schools in federal funding. Research programs in stem cell/regenerative medicine, cancer, genetics, neuroscience, preventive medicine, transplantation medicine, bioengineering and other key areas have attracted national recognition.

The Keck School of Medicine of USC is at the forefront of medical education, with an integrated, modern curriculum. Keck was among the first medical schools to adopt Introduction to Clinical Medicine courses for first-year students, providing direct experience in patient care from the start of medical school.

Administration

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Admissions

Doctor of Medicine

Keith Administration Building 100C
1975 Zonal Avenue, Los Angeles 90089-9021
(323) 442-2552
FAX: (323) 442-2433

Associate Dean, Admissions: Raquel D. Arias, M.D.

The Keck School of Medicine Committee on Admissions is responsible for selecting members of the entering class. The committee comprises both faculty and students. The committee reviews candidates whose academic achievement, commitment to service and personal qualities distinguish them from the many thousands of applicants who apply.

The applicant's undergraduate major may be in any subject area from an accredited college or university. Although sound preparation in the basic sciences is essential, a background in the humanities, and depth and breadth of personal experience are also important.

General Admissions Information

All applicants must submit a supplemental application. The Keck School of Medicine of USC receives approximately 7,000 applications per year. Approximately 700 applicants

receive interview invitations, which take place on the Health Sciences Campus. The interview day consists of a tour, lunch with medical students, a financial aid session and two 45-minute interviews with one faculty member and one medical student. Interviews begin in mid-September and end in early March. Students receive acceptance letters beginning in October. Applicants placed on the alternate list may send additional information to update their files.

Requirements

All applicants to the Keck School of Medicine of USC M.D. program must complete a minimum of four full years or 120 semester hours of academic work at an accredited college or university by the time of matriculation. Applicants are strongly encouraged to complete all basic science requirements by the time of application. Required courses include two semesters, with associated labs, in biology, general chemistry, and physics. Applicants must complete one semester of organic chemistry with a lab component. In addition, applicants must complete a course in molecular biology and an additional 30 semester hours in a

combination of social sciences, humanities and English composition courses. USC recommends that applicants take statistics and Spanish courses. The MCAT is required, and scores must be from within the previous three years of the date of matriculation.

International students must take at least one year of study in the United States prior to application; credits from abroad must be certified by a U.S. college both as to number of hours and course content. Individuals who have discontinued studies in medical school for academic reasons are not eligible to apply to the Keck School of Medicine.

Medical College Admission Test (MCAT)

The MCAT is required of all applicants. Applicants are strongly urged to take the MCAT early in the year of application. Applicants to the 2013 entering class are required to take the MCAT no earlier than August 2010 and no later than August 2012. Scores from earlier administrations of the examination will not be accepted.

Applications

The Keck School of Medicine of USC participates in the American Medical College Application Service (AMCAS). AMCAS reproduces and distributes an application and standardized academic record to participating medical schools designated by the student. The fee charged for this service depends upon the number of schools to which an application is sent. Applications may be obtained from its Website (www.aamc.org).

Applications are available after June 1 for the class entering in August of the following year. Applications to USC must be returned to AMCAS before November 1, but earlier application is encouraged. The Keck School of Medicine of USC participates in the Early Decision Program. Interested applicants apply between June 1 and July 31 and are notified of the Admissions Committee's decision by September 1.

M.D./Ph.D. Program

The Keck School of Medicine has developed an M.D./Ph.D. program designed for individuals who aspire to a career in academic medicine or a leadership role within the biomedical industry. Students are expected to acquire the modern skills that are required for physician competence. Additionally, the M.D./Ph.D. program provides an opportunity for the development of research expertise and academic excellence while fulfilling the requirements for a Ph.D. degree.

A joint program between the Keck School of Medicine and the California Institute of Technology (Caltech) was established in fall 1997 for the granting of the M.D./Ph.D. degree. Ph.D. studies may be carried out at Caltech or through collaboration between two laboratories at both institutions. The M.D. will be awarded from the Keck School of Medicine and the Ph.D. will be awarded from Caltech.

The M.D./Ph.D. executive committee is responsible for selecting students for the M.D./Ph.D. program. Members of the committee review the qualifications of each applicant, including MCAT and Graduate Record Examinations (GRE) scores available, academic performance, letters of recommendation and research experience. The committee interviews candidates and then selects students for admission to the program. All applicants to the joint program interview at Keck School of Medicine and the California Institute of Technology.

The Committee on Admissions reviews all information submitted on the AMCAS application as well as any supplemental data; the school charges a \$90 fee for this review. The most qualified candidates, as determined by this review, are invited for an interview.

Personal Interviews

Personal interviews are a required aspect of the application process. Invited candidates participate in two interviews; one with a faculty member and the other with a medical student. Interviews are conducted at the Keck School of Medicine on the Health Sciences Campus of the University of Southern California.

General Information

The M.D./Ph.D. program enrolls two to eight students annually. Students have the option of doing the Ph.D. at USC or Caltech. Each student accepted to the program must also be accepted to the Keck School of Medicine. All positions are fully funded.

Requirements

Admission requirements for the M.D./Ph.D. program are those of one of the graduate programs concerned or Caltech and the Keck School of Medicine. Students select the basic science program of their choice during the first two years of the medical curriculum; descriptions of these programs are available from each department or program and Caltech.

Graduate Record Examinations (GRE)

To assist the M.D./Ph.D. Committee in its evaluation of candidates, applicants to the M.D./Ph.D. program are encouraged to provide recent GRE scores. The committee does not, however, require GRE scores in order to consider an application.

Applications

Applicants to the Keck School of Medicine are advised to request information about the M.D./Ph.D. program at the time of application. In addition to completing the medical school application, applicants should indicate their interest in the M.D./Ph.D. program.

Notice of Acceptance

Notices of acceptance will be sent to successful candidates beginning in October until the class is filled. Since Keck uses a rolling admissions process, it is highly recommended to submit a completed application early in the cycle. If not chosen for an interview, candidates are usually notified by March of the application year.

Candidates must reply to an offer of acceptance within two weeks by sending a \$100 deposit and completing an Essential Characteristics form. A letter of withdrawal is required if students wish to relinquish their place in the class; release is granted automatically when the letter is received.

Students who are currently pursuing the medical curriculum at the Keck School of Medicine may apply to the M.D./Ph.D. program by contacting: M.D./Ph.D. Program, Keck School of Medicine, 1975 Zonal Avenue (KAM 314), Los Angeles, CA 90089-9023; (323) 442-2965, FAX: (323) 442-2318.

Personal Interviews

All applicants are screened by members of the M.D./Ph.D. Executive Committee; candidates who meet the basic criteria of the program are then invited to be interviewed by members of the committee and faculty associated with the program.

Notice of Acceptance

Students selected for acceptance to the M.D./Ph.D. program are notified between January and May of each year. Students begin their program in the fall semester and register for courses in the medical curriculum at that time.

Further information about the M.D./Ph.D. program at the Keck School of Medicine may be obtained by contacting: M.D./Ph.D. Program, Keck School of Medicine, 1975 Zonal Avenue (KAM 314), Los Angeles, CA 90089-9023; (323) 442-2965, FAX: (323) 442-2318; email: mdphdpgm@hsc.usc.edu.

Graduate Degree Programs

Admission standards for these curricula are established jointly by the Keck School of Medicine, its participating programs and the Graduate School.

Applicants to graduate degree programs offered by departments of the Keck School

of Medicine must meet the general criteria for acceptance to the Graduate School. Each participating department may have additional requirements for application. The programmatic requirements for the Keck School of Medicine's graduate programs are detailed in the Graduate Degree Programs section on page 763.

Further information about graduate degree programs at the Keck School of Medicine may be obtained by contacting: Office of the Associate Dean for Graduate Studies, Keck School of Medicine, 1975 Zonal Avenue (KAM B16), Los Angeles, CA 90089-9023; (323) 442-1607, FAX: (323) 442-1199.

Tuition and Fees

The tuition and fees listed below are estimated for fall semester, 2012. All fees are subject to change without notice by action of the University of Southern California Board of Trustees. The university reserves the right to assess new fees or charges. Tuition is not refundable; late registration fees are mandatory and cannot be waived.

Tuition for each semester of the medical school curriculum is due and payable at the beginning of the semester. Registration is not permitted after the third week of instruction. Late payment of tuition is subject to a mandatory late fee. Average budgets for medical students will vary according to their year in the curriculum. Sample budgets for Year I,

Year II, and the Junior/Senior Continuum may be requested from the Office of Financial Aid. Tuition, mandatory fees and parking are the same for all years.

Tuition for courses of the graduate curriculum is based upon the number of units assigned to each course. The Graduate Degree Programs section provides a department-by-department list of graduate course titles; the number following each title indicates the number of units for which tuition is charged. Late payment of tuition is subject to a mandatory late fee.

Required Fees (Estimated)

| | |
|---------------------------------------|---------------|
| Academic Year Tuition (two semesters) | \$50,246 |
| Graduate Tuition (per unit) | 1,473 |
| Student Health Service Fee (annual) | 506 |
| Student Programming Fee (graduate) | 75 |
| Student Services Fee | 25 |
| Norman Topping Scholarship Fee | 16 |
| Health Insurance | 1,288 |
| Annual Dental Rate | 136 |
| Malpractice Insurance | 25 (per term) |
| Disability Insurance | 61 (per term) |

Optional Fees

Parking fee, per semester (see Tuition and Fees, page 42).

Grading and Evaluation

The Keck School of Medicine employs a system of evaluation and grading designed to encourage student self-reliance, to stimulate the student's independent quest for knowledge and to promote excellence in academic achievement.

For courses of the medical curriculum, the Keck School of Medicine does not award numerical or letter grades. The evaluation process leading to a pass or fail grade is based on performance of the student in relation to announced course criteria. Throughout medical school, students will be evaluated on their fund of knowledge, problem-solving ability, professional behavior, relevant personality traits and clinical and interpersonal skills. Additional information on grading and evaluation is contained in the handbook provided to every enrolled medical student.

Faculty instructors are responsible for establishing evaluation criteria appropriate to the objectives of each course, discipline and clerkship, and for specifying the manner in which evaluative information is to be gathered. Instructor comments on student performance form an integral part of a student's total evaluation. For each evaluation, descriptive comments based on the student's overall performance in relation to course criteria are submitted for permanent file to the office of the associate dean for student affairs, together with performance reports.

The student's permanent file is used to prepare a letter from the associate dean of Student Affairs of the Keck School of Medicine, which accompanies student applications for internships and residencies, and to

determine scholastic suitability for election to Alpha Omega Alpha, the medical school honor society. These records are maintained by the Office of Student Affairs; students may review their records during regular office hours. During the lifetime of the physician, the permanent student record may be consulted as evidence of completion of the required curriculum and as certification for licensure.

Grading and evaluation policies for graduate degree programs and for joint M.D./Ph.D. degrees are established in conjunction with the Graduate School. In general, courses taken in partial fulfillment of graduate degree requirements receive letter grades that are recorded by the university.

Degrees and Requirements

The Keck School of Medicine and its departments offer types of curricula leading to award of: the Doctor of Medicine; joint M.D./Ph.D.; joint M.D./MBA; joint M.D./MPH; a Master of Academic Medicine, MAM; Global Medicine, M.S.; Global Health, B.S.; graduate degrees in conjunction with the Graduate School in Applied Biostatistics/Epidemiology, M.S.; Biochemistry and Molecular Biology, M.S., Ph.D.; Biometry, M.S., Ph.D.; Biostatistics, M.S., Ph.D.; Cell and Neurobiology, M.S., Ph.D.; Clinical and Biomedical Investigations, M.S.; Epidemiology, Ph.D.; Experimental and Molecular Pathology, M.S.; Genetic, Molecular and Cellular Biology, Ph.D.; Molecular Epidemiology, M.S., Ph.D.; Molecular Microbiology and Immunology, M.S., Ph.D.; Nurse Anesthesia, M.S.; Physiology and Biophysics, M.S., Ph.D.; Psychology and Public Health, Ph.D./MPH; Statistical Genetics and Genetic Epidemiology, Ph.D.; Systems Biology and Disease, Ph.D.

The Department of Family Medicine has one academic division: the Division of Physician Assistant Studies, which offers the Master of Physician Assistant Practice.

The Department of Preventive Medicine has two academic divisions: the Health Behavior Research Division, which offers a B.S., Health Promotion and Disease Prevention Studies/Master of Public Health; Master of Public Health; Pharm.D./Master of Public Health; Ph.D., Physical Therapy/Master of Public Health; Ph.D., Preventive Medicine (Health Behavior Research); and the Biostatistics Division, which offers M.S. programs in Biostatistics, Molecular Epidemiology, and Applied and Biostatistics/Epidemiology.

The division also offers Ph.D. programs in Biostatistics, Epidemiology, Molecular Epidemiology, and Statistical Genetics and Genetic Epidemiology.

In addition, departments of the school have certificate programs in certain medical specialties.

The Medical Education Committee is responsible for overall planning of the medical school curriculum. Separate curriculum committees plan and supervise the instructional programs for each year of medical school. Each of the committees includes student representatives and faculty members from the departments involved in each year's teaching program.

The curriculum of medical education at USC continues to emphasize preparation of the student to give optimal patient care. Students are progressively involved in patient care beginning with their first semester. The curriculum is patient-oriented, and students are expected to assume increasing responsibility for patient care as they acquire sufficient knowledge and skills. During the clinical experiences of the Junior/Senior Continuum students eventually attain a level equivalent to that of an intern.

At the same time, the school recognizes that the explosion of knowledge and techniques brought about by the current "biotechnology revolution" is rapidly altering the practice of medicine. During the four years of medical school, students cannot be taught all that will

be needed for the practice of medicine — either now or in the years ahead. To a far greater degree than in the past, the present curriculum encourages students to acquire skills and habits of self-education and self-instruction that will prepare them for lifelong learning.

The faculty of the school recognize that while most students will eventually practice medicine, some will choose an academic research career. The plan of medical education fosters the development of individuals whose careers may be directed along this path. Faculty are available to counsel and encourage research participation by students during their medical school training.

The curricula of the Keck School of Medicine and its departments acknowledge the crucial place of basic medical science in the advance of modern clinical practice. Both basic and clinical science are taught throughout the four years of the undergraduate medical curriculum. Basic science is taught both as pure basic science and in correlation with clinical science. In addition, a number of the school's departments cooperate with the USC Graduate School to offer degree courses leading to the award of the Master of Science and Doctor of Philosophy. Most of these graduate courses may also be taken as part of the school's joint M.D./Ph.D. program.

Doctor of Medicine

The Keck School of Medicine awards the Doctor of Medicine to enrolled students who have satisfactorily completed the four-year curriculum of the school. This curriculum integrates instruction in all departments of the school: Department of Anesthesiology, Department of Biochemistry and Molecular Biology, Department of Cell and Neurobiology, Department of Dermatology, Department of Emergency Medicine, Department of Family Medicine, Division of Medical Education, Department of Medicine, Department of Molecular

Microbiology and Immunology, Department of Neurological Surgery, Department of Neurology, Department of Obstetrics and Gynecology, Department of Ophthalmology, Department of Orthopaedics, Department of Otolaryngology – Head and Neck Surgery, Department of Pathology, Department of Pediatrics, Department of Physiology and Biophysics, Department of Preventive Medicine, Department of Psychiatry and

the Behavioral Sciences, Department of Radiation Oncology, Department of Radiology, Department of Surgery and Department of Urology.

The sections that follow provide a synopsis of the emphases and organization of this four-year curriculum.

Years I-II (two academic years)

The curriculum is designed to enhance the students' understanding of the basic sciences and their relevance to clinical medicine. The methodology used will improve students' problem-solving and independent study skills. Curriculum themes are delivered in a case-centered format with the integration of small-group learning sessions, directed independent study and newer instructional technologies emphasized.

Year I-II begins in the first semester with Core Principles of Health and Disease followed by organ system review ending with Integrated Case Study section. There is an eight-week summer break between the first and second years. Students also take Introduction to Clinical Medicine and Professionalism and the Practice of Medicine.

Each week of the academic year is composed of approximately 20 hours of lecture and small group sessions with an additional 20 hours of independent directed study, Introduction to Clinical Medicine and the Patient and Professionalism and the Practice of Medicine. Examinations in all systems throughout the first two years are graded Pass/Fail. Dean's recognition is awarded on the basis of year-end comprehensive examinations and special projects.

Core Principles of Biomedicine

This introductory section provides the student with the fundamental knowledge necessary for the integrated study of the basic and clinical sciences in the subsequent human organ systems. Included in Core Principles are these major areas: molecular and cellular medicine, development and structural medicine, foundations of clinical medicine, evidenced-based medicine, preventive medicine including biostatistics, epidemiology and nutrition. This section is taught in an integrated fashion and includes the use of clinical case correlations. Gross Anatomy and Introduction to Clinical Medicine begin during this introductory section of the Year I-II curriculum.

Gross Anatomy

Cadaver dissection remains a unique teaching tool by which the three dimensional organization of the human body is studied. Gross Anatomy will begin in the Core Principles of health and disease system with the dissection of the body wall and major body cavities followed by head and neck dissection in the neurosciences system, limbs, dissection during the musculoskeletal system and pelvic cavity dissection in reproduction system. Continued study of gross anatomy by use of prosected anatomical specimens as well as computer programs, selected review lectures, and so on, continues throughout the integrated organ systems.

Introduction to Clinical Medicine (ICM)

ICM expresses the strongly patient-centered orientation of the medical school curriculum. The student is introduced to patients and is involved in patient care activities from day one. Students are introduced to the principles of patient care and management and examine what it means to be a physician and how one becomes a physician.

The major content areas of the course include communication in the setting of illness, the unified concept of health and disease (the biopsychosocial model), basic clinical skills and the correlation of basic science with clinical medicine.

ICM emphasizes the systematic acquisition of the clinical skills of interviewing, history taking, physical examination, elementary clinical problem solving, and medical record keeping. Throughout the Year I-II continuum, the ICM clinical skills curriculum is integrated with basic science instruction. Students can therefore learn and apply basic science knowledge in the clinical setting. By encouraging a thorough understanding of the direct applications of basic science research to modern clinical medicine, instructors motivate the student to learn, use and retain more of the content and concepts presented in the basic science portions of the curriculum.

A group of five or six students spends from four to eight hours each week with an instructor from the clinical faculty who remains with the group for one to two years. As the group deals with basic medical themes (death, pain and helplessness) and issues (patient responsibility, learning to live with ambiguity and uncertainty), instructors help students to cope with their own feelings. This format opens the door for student-faculty interaction and improvement of student-faculty communication.

Instructors encourage students to take advantage of the learning experiences provided by their roles as helping and therapeutic persons. Students develop their ability to communicate with patients in the setting of illness and are guided by patient concerns to enhance their own growing knowledge, skills, abilities and responsibilities. Students are expected to acquire skills and habits of self-education and self-instruction that will prepare them for lifelong learning.

The unified concept of health and disease presented in this course enables students to comprehend the human organism in all its complexity. Using their clinical experiences as a teaching model, students are taught to consider the patient as an integrated whole and to view the patient's illness or disease as

more than simply a disruption of physiologic processes or a collection of physical findings.

Additional learning experiences occur through workshops and focus experiences. ICM workshops provide standardized instruction in history taking and physical examination, as well as integrated instruction in areas that cross disciplines. These include physician well being, substance abuse, domestic violence, and ethics. Through focus experiences, students are encouraged to explore a variety of practice environments as well as community-based health and social services. For example, students may visit outpatient clinical settings, a geriatrics long term care facility, a hospice care facility or homeless services organizations.

Professionalism and the Practice of Medicine (PPM)

The purpose of the PPM course is to create a community and social context to provide, identify and facilitate learning from professional role models for students throughout the first two years of the medical school curriculum, as well as to help students gain skills and competence in the areas of communication, the social and community context of health care, ethical judgment, self-awareness and reflection, self-care and personal growth, professionalism, cultural competence, and lifelong learning. The curriculum is dynamic and interactive, allowing for much small-group discussion and participation. Students are encouraged to work collaboratively and enhance small-group skills, in order to improve their participation in Introduction to Clinical Medicine (ICM), Gross Anatomy, MDL laboratories and large-group sessions, as well as to prepare them for the team work of their clinical years.

The PPM course sessions meet on Monday afternoons, typically for two hours per session. The students meet in groups with two faculty members, who serve as their mentors throughout the first year of their pre-clinical education; at least one mentor is a clinician. The clinical faculty comes from multiple disciplines within Keck and the local community. While the course features large lectures, there is a great emphasis on small-group learning acquired from community leaders, faculty-mentored small-group discussions, student presentations and student-led sessions.

The students participate in a core curriculum in Year I, which includes general topics such as cultural competence, ethics, health care policy and finance, professionalism, and empathy. In Year II, the students are allowed to select from nine different areas of interest (selectives), and meet in groups with faculty

having expertise in the given area. Examples of selectives presented include advanced ethics, medicine and the mind, spirituality and medicine, medical arts and humanities, global health, complementary and alternative medicine, medicine's intersection with technology, physicians operating outside their comfort zones, and the future of health care.

The PPM course provides students with an opportunity to build a professional identity, develop relationships with faculty mentors, and increase team-building and community-building skills. Students receive an introduction to the concepts of professionalism and ethics, with a better understanding of their real-world implications. The PPM course encourages leadership while engaging in the process of learning, characterized by presentations within both small and large groups, as well as professional development through exposure to multiple professional, ethical, and cross-cultural scenarios, cases, and providers. Evaluation is provided through student submission of portfolios containing written self-reflections, responses to faculty and peer feedback, and evaluations completed over the course of a two-year longitudinal curriculum. Finally, PPM hones sensitivity and skills relevant to medical professionalism to better prepare students for their transition into the clinical years of the medical school curriculum.

Organ System Review

A sequence of study presenting integrated basic and clinical science instruction involving 10 human organ systems — Skin, Hematology and Clinical Immunology, Neurosciences, Musculoskeletal, Cardiovascular, Renal, Respiratory, Endocrine/Metabolism, Reproduction, Gastrointestinal/Liver — follows Core Principles of Biomedicine.

Integrated Case Study

This section completes the second year of the Year I-II continuum and emphasizes patient-centered problems that integrate the basic and clinical science presented in the preceding organ systems. Students will explore the multi-organ effects of disease processes and reinforce diagnostic reasoning skills. In addition, concepts of pathophysiology, evaluation and management that can be applied to any organ system will be included. This section will also reinforce the appropriate use of medical information resources, effective self-directed learning skills, and interpersonal and group communication skills.

Separate review sessions of the important basic science and clinical concepts covered during the previous two years also occur during this seven-week section. These sessions will assist students in preparing to take Step I

of the United States Medical Licensing Examination (USMLE).

By early spring of the second year of the Year I-II continuum, students are expected to select their academic clinical advisers and to begin arranging the schedule of clerkships to be taken during Year III-IV. By the end of the fall semester, Year II, each student receives information that describes the curriculum requirements of Year III-IV. Students choose the area of medical practice that they are most likely to pursue and an adviser is assigned from that discipline. The adviser counsels the student on clerkships and opportunities in graduate medical education.

Year III-IV (two academic years)

The final two years of medical school are designed as a continuum of two calendar years, beginning in July at the end of Year II. During the spring of their second year, students schedule clerkship rotations to be taken during the two years. Each student's program is designed with the assistance of faculty advisers and includes 50 weeks of required clerkships, 16 weeks of selective clerkships and 16 weeks of elective clerkships.

All degree candidates are required to take Step I of the United States Medical Licensing Examination (USMLE) prior to entering Year III-IV and pass it before starting their senior year. Students must pass Step II CK and CS of the USMLE as a graduation requirement.

During Year III-IV, each student may schedule 16 weeks of discretionary time for personal convenience, remedial work, funded research work and other non-curricular activities, such as investigating postgraduate training programs. Although every effort is made to provide flexibility in the scheduling of each student's program, some inherent limitations are imposed by the maximum enrollment permitted for each clerkship. Students are a vital part of the university's medical team, which provides health care for patients throughout the year. Vacations are therefore subject to some scheduling adjustments.

Required Clerkships

| | |
|----------------------------------|---------|
| Family Medicine | 6 weeks |
| General Surgery | 6 weeks |
| Surgical Subspecialty | 4 weeks |
| Internal Medicine | 6 weeks |
| Internal Medicine Sub-internship | 4 weeks |
| Neurology | 4 weeks |
| Obstetrics and Gynecology | 6 weeks |
| Pediatrics | 6 weeks |
| Psychiatry | 6 weeks |
| Intersessions | 2 weeks |

(two, one-week sessions)

Intersession I and II

The Intersession curriculum is two one-week sessions established for Year III students that will enable learners to pause, reflect and consolidate the many and varied clinical experiences that they encounter in their third year of medical school; to promote advanced clinical skills, professional development, health policy formulation and ethical decision-making, and patient safety; and to further prepare for the residency application process.

This individualized curriculum will allow students to revisit and focus basic-science topics through the prism of newly learned clinical material and to foster capacity for the analysis and formulation of health care policy in light of the political, economic, legal and social, and ethical dimensions of health care.

Students will be instructed in a systems-based approach to patient safety by stimulating the imagination, curiosity and skills of close observation and careful interpretation through engagement with the arts and humanities. Developing and building advanced clinical skills by acquiring, appraising and applying evidence in the context of individual patient decision-making, (i.e., Evidence Based Medicine) are two important goals of the Intersession curriculum.

Providing comprehensive, coordinated and consistent career advising along with fostering the continuing professional development of the learners in the frame of clinical practice are key components. Finally, the curriculum will provide ongoing instruction in the provision of culturally competent care and prepare learners for their Required Community Project.

Selective Clerkships

Students are required to schedule 16 weeks of selective clerkships, chosen from a list of four- or six-week clerkships approved by the Clinical Curriculum Committee. Selective clerkships are carried out at USC-affiliated hospitals and encompass virtually all specialty areas. Information is available at medweb.usc.edu.

Elective Clerkship

The elective period consists of 16 weeks, during which electives may be taken on campus, at USC-affiliated hospitals or at more distant medical schools or medical centers. Approved on-campus electives that are offered regularly are listed in the elective catalogue.

Proposals for other on-campus and off-campus electives are reviewed individually by a committee composed of faculty members and students. All petitions must be submitted at least six weeks before the beginning of the rotation. Off-campus electives require documentation from the off-campus preceptor, endorsement of the student's medical school adviser, and prior approval and review by the Clinical Curriculum Committee. Credit is not given for electives until an evaluation has been received from the preceptor and a critique of the elective submitted by the student. Students with an academic deficiency may not schedule off-campus electives.

Program in Medical Humanities, Arts and Ethics

This curriculum begins with collaborative discourse about ethical problems to help students learn to identify, analyze and resolve clinical ethical problems. This exercise is followed by interim skill building/maintenance and by instructor facilitated discussion of videotaped ethics cases.

In Year II, the program focuses on ethical discernment and action in simulated settings and the study of the human dimensions of medicine. In the first exercise, standardized patients interact with students to help teach the telling of bad news. Students also learn from the humanities about patients as persons. The program concludes with a forum theatre in which students must decide what action to take based on their own convictions.

M.D./Ph.D. Program

Departments and programs of the University of Southern California and the California Institute of Technology participate in the joint M.D./Ph.D. degree program administered by the USC Graduate School, the Keck School of Medicine and the California Institute of Technology. This program integrates the medical school curriculum with graduate curricula in the basic sciences, to provide a unified course of study leading to both the M.D. and Ph.D. degrees.

This program is especially designed to prepare highly qualified students for careers in academic medicine and medical research. Formal course work and dissertation research provide the student with in-depth scientific preparation and research experience which enhances the application of basic science information to the diagnosis, treatment and prevention of disease.

Year III is devoted to ethics education by clinical role models and encompasses instruction in the core clerkship by ethical standard-bearers. Students also participate in home hospice care and pain management cases.

During Intersession I and II, the program includes a series of sessions that focus on contemporary health care and the physician-in-society. The goal of the sessions is to provide students with the experience of integrating the principles, methods and bedside issues included in Year I-III of the program. Students practice applying the micro-level (individual/clinical) decisions to the ethical dilemmas and policy issues that face physicians at the mezzo-level (health care organizations), and to the macro-level (profession as a whole, state and nation). Topics include issues of professionalism; allocation of resources; the economics, organization and societal oversight of health care; and the care of dying patients.

Fifth Year Research Option

USC offers students the opportunity to take a full year of research experience with either a Keck School of Medicine faculty mentor or an approved faculty mentor at another institution. This program is open to any student in good to excellent academic standing who has completed his or her first year of medical

Conversely, the Ph.D. education becomes more meaningful because of its disease-oriented emphasis.

The curriculum for M.D./Ph.D. students differs from that of Ph.D. graduate students in the basic sciences in that the former take medical school courses as well as selected graduate level basic science courses and specific courses designed for M.D./Ph.D. students. The integrated training of the M.D./Ph.D. program enables students to compress their total academic effort by applying some course work toward the requirements of both degrees. On average, completion of the combined program requires a total of eight years.

school. Students interested in the option should identify a faculty preceptor and present a description of the proposed research program and funds available in support of the program to the associate dean for curriculum. A stipend, comparable to that received by a graduate student at the postgraduate level, is available. Application for this program is made through the Office for Student Affairs (KAM 100B) and will be supervised through the Office of the Associate Dean for Student Affairs (KAM 100B). Dean's research scholarships are available for selected dean's research scholars pursuing this option.

Baccalaureate/M.D. Program

The focus of this program is to assure these students admission to medical school (based upon the maintenance of their GPAs and requisite MCAT scores) and to allow them the opportunity to enrich their studies with a balanced liberal arts education. The goal is that these students will explore the diverse educational opportunities the University of Southern California has to offer and become members of the medical profession with a balance of medicine, science and the arts. The Baccalaureate/M.D. Program is not designed to advance these potential medical professionals with four years of science and medicine prior to attending medical school, but rather to allow them the necessary time to explore and develop into mature and serious students of medicine. There are no new admissions to this program beginning in academic year 2013-14.

The following graduate programs participate in the M.D./Ph.D. program:

- Biochemistry and Molecular Biology
- Cell and Neurobiology
- Epidemiology
- Genetic Molecular and Cellular Biology
- Molecular Microbiology and Immunology
- Pathology
- Physiology and Biophysics
- Preventive Medicine
- Systems Biology and Disease

Selected graduate programs from the Viterbi School of Engineering and the Dornsife College of Letters, Arts, and Sciences also participate in the combined degree program.

Time limits for qualifying examinations and other procedures are determined by considering M.D./Ph.D. students as medical students for the periods when they are following the medical curriculum and as full-time graduate students during their years of graduate research prior to advancement to the Junior/Senior Continuum.

M.D./Ph.D. candidates have the option of pursuing a laboratory experience before beginning the Year I medical curriculum through a laboratory rotation at either USC or the California Institute of Technology. This laboratory experience is strongly encouraged although not required.

During the first two years of their program, M.D./Ph.D. students follow the medical school curriculum and gain added exposure to the basic science departments through a special survey course. Students are guided by the M.D./Ph.D. executive committee, which outlines the integration of the graduate program with the medical school curriculum and serves as the students' liaison until they have selected a graduate program and graduate research adviser. The graduate programs vary widely in the extent to which they allow credit toward the Ph.D. for courses taken during the first two years of medical school. M.D./Ph.D. students are encouraged to select a graduate program by early spring of the second year of medical school. Students are required to apply for admission to the Ph.D. program of their choice by the recommended deadline on the graduate application.

Prior to entering Ph.D. studies, the Keck School of Medicine allows M.D./Ph.D. candidates the option of beginning their clinical training by taking the six-week required clerkship in Family Medicine, Internal Medicine or Pediatrics. This can provide an early introduction to clinical medicine and a context for integration with the basic sciences of the thesis years.

Beginning with the third year of the M.D./Ph.D. program, students enter their selected program as full-time graduate students. Although the content of graduate courses required of M.D./Ph.D. students is generally identical to that required of Ph.D. students in the same graduate program, M.D./Ph.D. students are permitted greater latitude in the scheduling of their graduate courses. Four years are commonly necessary to fulfill requirements for the Ph.D., including course work, qualifying examinations, independent dissertation research, and writing of the dissertation.

After completion of the graduate program, the student is advanced to the Junior/Senior Continuum and completes the final two years of clinical training required by the medical school curriculum. No portion of clinical training is deleted from the joint program. Prior to entering the clinical component of the joint degree, students will be expected to participate in a clinical shadowing experience, which could be done throughout the Ph.D. studies or as part of an intensive program prior to entering the clinic. Students will also be required to participate in the Medical Scholars Program clinical tutoring

skills program held in April of each year and re-take the Year II Objective Structured Clinical Examination at the end of May with the second year medical students.

Keck School of Medicine-Caltech M.D./Ph.D. Program

A joint program between the Keck School of Medicine and the California Institute of Technology (Caltech) was established for the granting of the M.D./Ph.D. degree. Students do their preclinical and clinical work at the Keck School of Medicine and their Ph.D. work with any member of the Caltech faculty, including the biology, chemistry, engineering, applied sciences divisions and interdisciplinary programs divisions.

Admission to this joint program is made through the usual Keck/USC M.D./Ph.D. process. All applicants are interviewed at Keck School of Medicine and Caltech. Matriculated students in this program have the option of doing their Ph.D. at USC or Caltech. The M.D. degree will be awarded from the Keck School of Medicine and the Ph.D. from Caltech.

Further information about the M.D./Ph.D. programs at the Keck School of Medicine may be obtained by contacting: M.D./Ph.D. Program, Keck School of Medicine, 1975 Zonal Avenue (KAM 314), Los Angeles, CA 90089-9023; (323) 442-2965, FAX: (323) 442-2318; Email: mdphdp@usc.edu.

M.D./MBA Dual Degree Program

In response to the ongoing reorganization of health care delivery systems, and the growing awareness of the impact of business decisions on health care, the Keck School of Medicine and the Marshall School of Business jointly offer an innovative program for individuals seeking knowledge in both medicine and business administration. The program is designed to prepare its graduates to assume leadership in the design and management of health care systems.

The M.D./MBA program spans five years. Interested students apply during their second or third year of medical school, and begin required MBA courses following successful completion of the first two or first three years of medical school. The remaining time is devoted to the clinical clerkships of the Keck School of Medicine and completion of graduate business elective courses.

At the conclusion of the program, students will have completed 48 units in the Marshall School of Business, including required and elective courses, and four years of courses in the Keck School of Medicine. Dual degree students may not count courses taken outside the Marshall School of Business toward the 48 units.

First and Second Years: Required medicine courses.

Third or Fourth Year: Required MBA courses and graduate business electives.

Remaining Years: Keck School of Medicine core, selective, and elective clerkships and graduate business electives.

Admission Requirements

Students who have a baccalaureate degree from an accredited college or university and have successfully completed at least two years in the Keck School of Medicine will be considered for admission to the Marshall School of Business (see page 154). All requirements for admission to the regular MBA Program (GPA, GMAT score, etc.) must be fulfilled by the medical student for admission to the Marshall School.

The M.D. and the MBA degrees are awarded simultaneously upon completion of their requirements by the Keck School of Medicine and the Marshall School of Business.

M.D./Master of Public Health

The joint M.D./MPH program at the Keck School of Medicine is designed for individuals who envision a medical career that combines public health and medical disciplines. Many individuals entering careers as medical doctors or public health practitioners wish to acquire not only medical practice competencies, but also an understanding of the history, organization, goals and philosophy of public health. The joint M.D./MPH program offers a broad-based orientation to public health while the student completes medical school requirements. The Master of Public Health degree provides increased knowledge of and sensitivity to the political, historical, economic and social environments of health promotion and health services delivery.

The M.D./MPH program spans five years (four years of medical school and one year of public health courses). Students begin the core MPH courses following the successful completion of the first two years of medical school. The last two years of the program are devoted to clinical clerkships of the School of Medicine and to the completion of the elective courses and practicum (field experience) of the MPH program. At the conclusion of the joint degree program, students will have completed 42-46 units in the Master of Public Health program and four years of courses in the Keck School of Medicine.

Students who are enrolled in the Keck School of Medicine must apply to the Master of Public Health program no later than January of their second year. All requirements for admission to the regular MPH program must also be fulfilled by dual degree applicants.

All students in the M.D./MPH program must meet course requirements, grade point average requirements and program proficiency requirements of both programs. Students must have a grade point average of 3.0 in the MPH curriculum to meet graduation requirements.

The M.D. and the MPH degrees are awarded simultaneously upon completion of the Keck School of Medicine and the Master of Public Health program requirements. For more information, contact the MPH Program Office at (626) 457-6677.

Master of Science in Clinical, Biomedical, and Translational Investigations

Admission

Candidates for admission include medical students, fellows or other health professionals. The program will consider applicants who satisfy all requirements for admission to the Graduate School. MCAT scores may be substituted for GRE scores. All graduate students must maintain a GPA of 3.0 throughout their graduate studies.

The Master of Science in Clinical, Biomedical, and Translational Investigations is a joint effort to train medical students, residents, fellows or other health professionals, including faculty and other scientists conducting clinically related research, in clinical research methods to translate clinical, biomedical and technological discoveries into advances in population-based, clinical or basic science research. The M.S. in Clinical, Biomedical, and Translational Investigations is available to medical students who have completed their second year of medical school, as well as MDs doing their fellowships at USC or Children's Hospital Los Angeles (CHLA), and faculty interested in advancing their research careers. Tracks include: 1) patient-oriented translational research, 2) community-based intervention trials, 3) design, conduct and analyze clinical studies, 4) epidemiology and disease etiology, 5) molecular biology, 6) cell biology, 7) health outcomes research, 8) vision science, 9) environmental epidemiology, and 10) alternative options track.

For those trainees who do not wish to pursue an M.S. degree, the school offers a Certificate in Clinical, Biomedical, and Translational Investigations.

The Keck School of Medicine, through an oversight committee that includes a director and senior staff, administers this program in conjunction with faculty representing basic science and clinical departments.

The M.S. in Clinical, Biomedical, and Translational Investigations is designed to train students for future independent research careers in academic, government or private sector settings. The program gives students a solid background in the methodological aspects of research and in statistical thinking as applied to molecular epidemiology, as well as a solid grounding in biostatistical, epidemiological methods.

General Requirements

Graduation requires the completion of 29 units, of which a maximum of 15 units are research track core courses taken in the first year (including summer sessions), with the remaining being directed to: 590 Directed Research (1-10 units) in an approved graduate-degree granting department for which research is being conducted and 594ab Thesis (2-2 units) in the same approved department taken in the second year. The equivalent of one year of full-time effort must be devoted to research leading to a master's thesis.

Because the background and interests of applicants vary widely, the director will consult with each student prior to the first year to design a schedule of recommended courses. The direction of research will also be facilitated by mandatory attendance in the Recent Advances Journal Club workshop. At the end of the first year, the student must submit a final program to the director. This will summarize the courses taken, the proposed thesis title and the names and credentials of the thesis committee. One of the members of the thesis committee will be the student's research adviser and will serve as the committee chair. For faculty, at least two members of the thesis committee must be from outside the student's department.

Certificate Program

Students who do not wish to pursue an M.S. degree may earn a university Certificate in Clinical, Biomedical, and Translational Investigations. The certificate program requires 12 credits and a minimum of six months of practical experience working on a research project approved by the oversight committee.

Recommended Core Courses for Each Research Track

PATIENT-ORIENTED TRANSLATIONAL RESEARCH UNITS

| | | |
|----------|---|----|
| MPTX 517 | Structure and Management of Clinical Trials | 4 |
| PM 510L | Principles of Biostatistics | 4 |
| PM 512 | Principles of Epidemiology | 4 |
| PM 523 | Design of Clinical Studies | 3 |
| PM 570 | Statistical Methods in Human Genetics, or | |
| BIOC 543 | Human Molecular Genetics | 4 |
| | | 19 |

COMMUNITY-BASED INTERVENTION TRIALS UNITS

| | | |
|---------|---------------------------------|----|
| PM 510L | Principles of Biostatistics | 4 |
| PM 512 | Principles of Epidemiology | 4 |
| PM 526 | Communications in Public Health | 4 |
| PM 528 | Program Design and Evaluation | 4 |
| | | 16 |

DESIGN, CONDUCT AND ANALYSIS OF CLINICAL STUDIES UNITS

| | | |
|---------|--|----|
| PM 510L | Principles of Biostatistics | 4 |
| PM 511a | Data Analysis | 4 |
| PM 523 | Design of Clinical Studies | 3 |
| PM 538 | Introduction to Biomedical Informatics | 3 |
| PM 570 | Statistical Methods in Human Genetics | 4 |
| | | 18 |

EPIDEMIOLOGY AND DISEASE ETIOLOGY UNITS

| | | |
|---------|--|----|
| PM 510L | Principles of Biostatistics | 4 |
| PM 512 | Principles of Epidemiology | 4 |
| PM 517a | Research Methods in Epidemiology | 3 |
| PM 518a | Statistical Methods for Epidemiological Studies I | 3 |
| PM 527 | Epidemiology of Infectious Disease, or | |
| PM 529 | Environmental and Occupational Health: An Epidemiological Approach, or | |
| PM 533 | Genetic and Molecular Epidemiology | 3 |
| | | 17 |

HEALTH OUTCOMES RESEARCH UNITS

| | | |
|------------|--|-----|
| PM 511a | Data Analysis | 4 |
| PMEP 538 | Pharmaceutical Economics | 4 |
| PMEP 539 | Economic Assessment of Medical Care | 4 |
| PMEP 540ab | Seminar in Pharmaceutical Economics and Policy | 2-2 |
| | | 16 |

MOLECULAR BIOLOGY UNITS

| | | |
|----------|--|----|
| BIOC 543 | Human Molecular Genetics, or | |
| INTD 504 | Molecular Biology of Cancer, or | |
| INTD 555 | Biochemical and Molecular Bases of Disease, or | |
| MICB 551 | Prokaryotic Molecular Genetics | 4 |
| INTD 531 | Cell Biology | 4 |
| INTD 561 | Molecular Genetics | 4 |
| INTD 571 | Biochemistry | 4 |
| | | 16 |

CELL BIOLOGY UNITS

| | | |
|-----------|--|----|
| INTD 504 | Molecular Biology of Cancer, or | |
| INTD 555 | Biochemical and Molecular Bases of Disease | 4 |
| INTD 531 | Cell Biology | 4 |
| INTD 571 | Biochemistry | 4 |
| PATH 552a | Methods in Experimental Pathology | 3 |
| | | 15 |

VISION SCIENCE UNITS

| | | |
|------------|--|----------|
| BME 670 | Early Visual Processing | 4 |
| CNB 590 | Directed Research | 1-12 |
| CNB 594abz | Master's Thesis | 2-2-0 |
| INTD 501 | Recent Advances in Vision Science | 1, max 4 |
| INTD 531 | Cell Biology | 4 |
| INTD 571 | Biochemistry | 4 |
| PHBI 608a | Advanced Cellular, Molecular and Systemic Physiology | 2 |
| PSCI 667 | Intracellular Drug Delivery and Targeting | 2 |
| | | 21-24 |

ENVIRONMENTAL EPIDEMIOLOGY UNITS

| | | |
|---------|--|---|
| PM 510L | Principles of Biostatistics | 4 |
| PM 512 | Principles of Epidemiology | 4 |
| PM 518a | Statistical Methods for Epidemiological Studies I | 3 |
| PM 529 | Environmental and Occupational Health: An Epidemiological Approach | 3 |

Elective Options (select one course)

| | | |
|---------|---------------------------------------|-------|
| PM 511a | Data Analysis I | 4 |
| PM 533 | Genetic and Molecular Epidemiology | 3 |
| PM 570 | Statistical Methods in Human Genetics | 4 |
| PM 599 | Special Topics | 4 |
| | | 17-18 |

ALTERNATIVE OPTIONS TRACK (MINIMUM 15 UNITS)

Courses are determined by mentor and student, based on research interests, with approval from the Oversight Committee.

Seminars/Workshops

Participation is required in a Recent Advances Journal Club to learn how to read papers critically and develop the speaking skills necessary to explain a research paper. Faculty members in the program rotate as course directors in order to emphasize new topics. Students are expected to attend the three-day workshop on NIH Proposal Development offered by Thomas Ogden, Ph.D., and a workshop on the principles of scientific manuscript preparation.

Certificate in Health, Technology and Engineering (HTE@USC)

Academic Director: Terry Sanger, M.D., Ph.D.,
Provost Associate Professor of Biomedical Engineering, Neurology, Biokinesiology, and Physical Therapy

Administrative Director: George Tolomiczenko, Ph.D.,
Assistant Professor, Neurology

This program offers current second-year USC Ph.D. engineering students and first-year M.D. students an opportunity to learn about and gain experience in medical device and process innovation. Through project-based and interdisciplinary collaboration, students will augment their current programs with a set of courses and lab experiences linking medical and engineering research groups. By applying design-informed approaches toward problem identification and solution prototyping, students will be involved in all the steps of medical device innovation from conception to commercialization. The program aims to create interdisciplinary, boundary-spanning, inventive entrepreneurs seeking early practical experience with device and method

innovation in health care. Program participants will form bonds with a group of like-minded medical students and engineers who will be their mentors, colleagues and contacts as they advance in their careers.

The courses unique to the program include a seminar sequence (Topics in Health, Technology and Engineering), which must be taken during the first two years of involvement with the HTE@USC program, a case studies sequence taken during the second year and a research course to earn project-related credits:

| COURSES | | UNITS |
|-------------|--|---------|
| BME 566abcd | Topics in Health, Technology and Engineering | 2-2-2-2 |
| BME 567ab | Case Studies in Health, Technology and Engineering | 2-2 |
| BME 790 | Research | 12 |

Other required courses that are part of the M.D. curriculum (Ph.D. students enroll in INTD course versions of the same courses open only to HTE students on CR/NC basis):

| | | |
|------------|--|-----|
| INTD 621ab | Introduction to Clinical Medicine (ICM) for HTE | 3-3 |
| INTD 622L | Pre-clinical System Block for Health, Technology and Engineering | 3-9 |

Candidates interested in applying should contact HTE@usc.edu via email.

Ph.D. Programs in Biomedical and Biological Sciences (PIBBS)

Keith Administration Building B-16
1975 Zonal Avenue
Los Angeles, CA 90089-9031
(323) 442-1609
FAX: (323) 442-1199
Email: pibbs@usc.edu
www.usc.edu/pibbs

Program Director: Ite A. Laird-Offringa, Ph.D.,
Associate Professor of Surgery, Biochemistry and Molecular Biology

The USC Ph.D. Programs in Biomedical and Biological Sciences (PIBBS) is a university-wide program that is an entryway into graduate studies and research leading to the Ph.D. degree in a broad range of biological and biomedical disciplines. Interdisciplinary studies that span multiple fields have sparked a startling surge in new discoveries that excite intellectually and also promise great benefits to society.

Students will complete three research rotations in any of over 200 different research laboratories during their first year. In addition, they spend two semesters taking courses of their choice in a variety of disciplines such as biochemistry, epidemiology, (stem) cell biology, neurobiology, molecular genetics, cancer and physiology. At the end of the

second semester each student chooses a faculty member to serve as a thesis research adviser and chooses a specific Ph.D. program from among the participating programs listed. Subsequently, each student will focus on the completion of course requirements and qualifying examinations for the chosen Ph.D. program and will develop and complete an original research project that will serve as the basis for a doctoral dissertation.

For information on application materials and descriptions of the research interests of participating faculty, see the PIBBS site on USCweb (www.usc.edu/pibbs).

Participating Schools and Graduate Programs

Dornsife College of Letters, Arts and Sciences
Department of Biological Sciences
Marine Environmental Biology
Molecular and Computational Biology
Integrative and Evolutionary Biology
Department of Chemistry
Neuroscience
Ostrow School of Dentistry
Craniofacial Biology
Viterbi School of Engineering
Biomedical Engineering
Davis School of Gerontology

Keck School of Medicine
Genetic, Molecular and Cellular Biology
Preventive Medicine
Biostatistics
Health Behavior Research
Molecular Epidemiology
Systems Biology and Disease
School of Pharmacy
Pharmacology and Pharmaceutical Sciences
Molecular Pharmacology and Toxicology
Pharmaceutical Sciences

A detailed description of each of the Ph.D. programs listed here can be found by consulting the Catalogue index.

Admission

Applicants to PIBBS must have a bachelor's or master's degree with a major emphasis in the natural sciences. Applicants must have a strong record of academic achievement, satisfactory performance on the general and advanced portions of the GREs. Three letters of recommendation are required, one of which should be from a laboratory research mentor. Previous research experience is expected. Students are admitted for the academic year beginning in the fall. Although there is no formal application deadline, complete applications received before December 1 will be given priority.

Applications are submitted electronically. Please see the PIBBS Website for information: www.usc.edu/pibbs. Supporting materials should be sent to: PIBBS, University of Southern California, 1975 Zonal Avenue, KAM B-16, Los Angeles, CA 90089-9031.

Financial Support

Admitted students are supported by research assistantships or fellowships during their two semesters in the PIBBS program. Tuition, health insurance and standard fees are also covered. After the student completes the PIBBS program and enters a specific Ph.D. program, similar support mechanisms are generally provided by the Ph.D. granting program.

Graduate Degree Programs

In conjunction with the Graduate School, the Keck School of Medicine offers graduate curricula on the Health Sciences Campus leading to the Doctor of Philosophy in two interdisciplinary programs: Genetic, Molecular and Cellular Biology (GMCB) and Systems Biology and Disease (SBD) with participating faculty from biochemistry and molecular biology, cell and neurobiology, molecular microbiology and immunology, physiology and biophysics and preventive medicine. In addition, individual departments offer degrees in biochemistry and molecular biology, cell and neurobiology, molecular microbiology and immunology, physiology and biophysics.

The Departments of Preventive Medicine and Cell and Neurobiology along with the Price School of Public Policy offer the Master in Public Health with concentrated study in one of four tracks: health promotion and disease prevention, biostatistics/epidemiology, nutrition, and health communication.

The Department of Preventive Medicine also offers graduate curricula leading to Ph.D. degrees in biostatistics, epidemiology, molecular epidemiology, statistical genetics and genetic epidemiology or health behavior research.

Graduate credit is provided for some courses included in the Years I and II curriculum of the medical school.

The following sections provide an overview of the departmental graduate studies programs. The requirements listed are those of the individual departments and must be taken in conjunction with the general requirements of the Graduate School. For further information regarding graduate studies in the medical sciences, consult the

Curriculum

Most students will choose from the following courses during a two-semester period:

| COURSES | | UNITS |
|----------|--|-------|
| BIOC 790 | Research (taken in conjunction with the rotation plan described below) | 1-12 |
| INTD 504 | Molecular Biology of Cancer, or | |
| INTD 555 | Biochemical and Molecular Bases of Disease, or | |
| INTD 572 | Systems Physiology and Disease I | 4 |

| | | |
|----------|-----------------------------------|---|
| INTD 531 | Cell Biology | 4 |
| INTD 561 | Molecular Genetics | 4 |
| INTD 571 | Biochemistry | 4 |
| INTD 573 | Systems Physiology and Disease II | 4 |

However, the list of courses for individual students may vary from this plan with permission of the program director. As part of the BIOC 790 course, each student will complete research rotations with three or more faculty members in participating Ph.D. programs. At the end of the second semester, each student will choose a faculty member to serve as dissertation adviser and will choose a specific Ph.D. program from the list of participating programs.

specific departments or contact: Office of Graduate Affairs, Keck School of Medicine, 1975 Zonal Avenue (KAM B-16), Los Angeles, CA 90089-9023; (323) 442-1607, FAX: (323) 442-1199.

Doctor of Philosophy in Genetic, Molecular and Cellular Biology

Genetic, Molecular, and Cellular Biology
KAM B-16, MC 9031
(323) 442-1475
FAX: (323) 442-1199
Email: intbio@usc.edu

Director: Henry Sucov

Participating faculty: School of Medicine faculty from both basic and clinical departments who perform research. Interested faculty from other schools including Pharmacy, Dentistry, Engineering and USC College are encouraged to request to become participating faculty.

The goal of the Ph.D. program in Genetic, Molecular and Cellular Biology (GMCB) is to train investigators to develop multidisciplinary strategies to elucidate the basic molecular and cellular mechanisms responsible for the ability of cells and organisms to reproduce, differentiate, communicate with each other, and respond to internal and external stimuli. Such studies will also logically facilitate our understanding of disease processes and the ability of organisms to defend themselves against disease.

Major advances in biological and biomedical sciences frequently involve the bridging of ideas and technology from diverse disciplines. The Ph.D. program in genetic, molecular and cellular biology will emphasize breadth

of research training fostered by the broad range of research interests and technological emphasis among participating faculty members from a variety of academic departments and disciplines. Close interactions among faculty and students provide an ideal environment for learning not only the skills required to conduct experiments but also the skills required to form new liaisons and collaborations with other scientists in diverse fields.

Admission Requirements

A baccalaureate degree in life sciences or sufficient courses in mathematics and the life sciences is required to provide a strong background for studies in biomedical research. Appropriate undergraduate degrees would be biology, physiology, engineering, chemistry or computer science. Successful applicants must have satisfactory performance on the general and advanced portions of the GREs and three letters of recommendation. Previous research experience in a related field is expected but not required. Applicants who are accepted with minor deficiencies are expected to correct these during the first year.

In general (although not exclusively), new graduate students apply for admission to USC through the Ph.D. Programs in Biomedical and Biological Sciences (PIBBS), and become enrolled in the genetic, molecular and cellular biology graduate program after having completed the first year's course work and rotations. Application forms and information are available online at www.usc.edu/pibbs, or can be obtained from the PIBBS program, Office of Graduate Affairs, University of Southern California Keck School of Medicine, KAM B-16, 1975 Zonal Ave., Los Angeles, CA 90089-9031; email pibbs@usc.edu.

Degree Requirements

These degrees are awarded under the jurisdiction of the Graduate School. Refer to the Requirements for Graduation section, page 86, and the Graduate School section, page 97, of this catalogue for general regulations. All courses applied toward the degrees must be courses accepted by the Graduate School.

Advisory Committee

The student will be advised during the first year by the genetic, molecular and cellular biology executive committee. The purpose of the executive committee is to help the student in the selection of courses, selection of research rotations and, ultimately, a mentor and laboratory, to monitor the student's progress, and to ensure preparation for the screening procedure at the end of the first year.

Course Requirements

A minimum of 60 units is required, consisting of formal courses, seminars and research credits. At least 24 of the 60 units are to be formal graduate course work (lecture or seminar courses). Students must complete 16 units of course work before they are considered for the screening procedure. Additional course work relevant to the research interests of the student may be required by the student's guidance committee or by the student's academic adviser in addition to the required 24 units.

Lab Rotations

During the first year, students sign up for BIOC 790 Research (4 units each semester) and rotate through the labs of three mentor members of the program (potential research advisers). By the first summer of graduate study, but no later than after 18 months in the program, each student is expected to have selected a research adviser.

In the first year, in addition to lab rotations, students are also required to take two 4-unit graduate-level courses each semester. In the second year, courses are selected with the approval of the student's guidance committee with reference to the research area in which the student is working. The GMCB program requires students to take courses in biochemistry, cell biology and molecular genetics; a list of recommended/suggested courses that will satisfy these requirements is distributed to all students at the beginning of each academic year. During the first summer term, all students take an ethics class (INTD 500 Ethics and Accountability in Biomedical

Research). Within the first two years, each student must take a statistics course (PM 510L Principles of Biostatistics (4) or equivalent); students who have previously taken an undergraduate or graduate course in statistics or one in which statistical methods were emphasized should petition to request permission to waive this requirement. In the second and subsequent years, students are required to take BIOC 573 Optimal Research Presentations by Ph.D. Students. For these required courses, opting out, delaying or substituting a class requires the approval of the advisory committee of the program.

Screening Procedures

At the end of the first year, each student is required to pass a screening procedure based on the first year's required courses submitted by reports from the genetic, molecular, and cellular biology faculty to the executive committee, which is intended to expose any weaknesses in the student's abilities. Progress must be judged satisfactory in two areas: maintenance of satisfactory performance in course work and satisfactory completion of all research rotations.

Qualifying Examination

The qualifying examination, administered by the guidance committee, should demonstrate a conceptual grasp of the major area of interest chosen and an understanding of the general framework and approaches of hypothesis-driven research.

Annual Research Appraisal

After advancing to candidacy, progress on dissertation research by each student is evaluated annually with an Annual Research Appraisal (ARA).

Dissertation

At the last ARA before the defense of the dissertation, the student submits an outline draft to the dissertation committee.

Defense

An acceptable dissertation based upon completion of an original investigation is required. The candidate must defend an approved draft of the dissertation in a public oral defense. The dissertation committee will then meet with the student in a closed session and complete the oral examination.

Doctor of Philosophy in Systems Biology and Disease

Systems Biology and Disease
KAM B-16, MC 9031
(323) 442-1475
FAX: (323) 442-1199
Email: dawnburk@usc.edu

Director: Alicia A. McDonough,
mcdonoug@usc.edu

Participating Faculty: School of Medicine faculty from both basic and clinical departments with research programs. Interested faculty from other schools including Pharmacy, Dentistry, Engineering and USC College are encouraged to petition to join participating faculty.

The goal of the Ph.D. program in Systems Biology and Disease (SBD) is to train investigators to develop strategies to implement and integrate the detailed information gained from cellular, molecular and genetic advances into studies of normal system function as well as studies of how and why systems are disrupted in disease.

The program applies a multidisciplinary approach to understanding the human organism as a whole. Breadth of interests and training are major features of this track and wide and varied skills in many research areas characterize the faculty. To facilitate application of multidisciplinary approaches, close and regular contact between participating faculty and students is a major theme of the Ph.D. track.

Admission Requirements

Students routinely enter the SBD program after completing their first year in the interdisciplinary Ph.D. Programs in Biomedical and Biological Sciences (PIBBS) year 1 program (instructions to apply below), through the M.D./Ph.D. program or after completing one year in a related basic science department. A baccalaureate degree in life sciences or sufficient courses in mathematics and the life sciences is required to provide a strong background for studies in biomedical research. Appropriate undergraduate degrees would be biology, physiology, engineering, chemistry or computer science. Successful applicants must have satisfactory performance on the general and advanced portions of the GREs and three letters of recommendation. Previous research experience in a related field is expected but not required. Applicants who are accepted with minor deficiencies are expected to correct these during the first year.

Students enter the systems biology and disease program only after being accepted into a laboratory for graduate work, usually in their second year through the PIBBS program after completing research rotations, through the M.D./Ph.D. program or through a department-based program. Students may petition the systems biology and disease program executive committee for entrance before the second year if they have been accepted into a lab.

Online application to PIBBS is available at: www.usc.edu/pibbs. Additional information can be obtained from the PIBBS program, Office of Graduate Affairs, University of Southern California Keck School of Medicine, KAM B-16, 1975 Zonal Ave., Los Angeles, CA 90089-9031; email pibbs@usc.edu.

Degree Requirements

These degrees are awarded under the jurisdiction of the Graduate School. Refer to the Requirements for Graduation section, page 86, and the Graduate School section, page 97, of this catalogue for general regulations. All courses applied toward the degrees must be courses accepted by the Graduate School.

Advisory Committee

Students will be advised before their qualifying exam by the PIBBS program director and the systems biology and disease mentor. The purpose of the executive committee is to help students in the selection of courses, selection of research rotations and, ultimately, a mentor and laboratory, to monitor students' progress, and to ensure preparation for the screening procedure at the end of the first year.

Course Requirements

A minimum of 60 units is required, consisting of formal courses, seminars and research credits. At least 24 of the 60 units are to be formal graduate course work (lecture or seminar courses). Students must complete 16 units of course work before they are considered for the screening procedure. Additional course work relevant to the research interests of the student may be required by the student's guidance committee or by the student's academic adviser in addition to the required 24 units.

Lab Rotations

During the first year in PIBBS, students sign up for BIOC 790 Research (4 units each semester), and rotate through the labs of three mentor members of the program (potential research advisers). By the first

summer of graduate study, but no later than after 18 months in the program, each student is expected to have selected a research adviser.

In the first year, in addition to lab rotations, students are also required to take two, four-unit graduate-level courses each semester including one in each of the following areas: biochemistry, cell biology, molecular genetics, systems physiology and disease, or pathology. Substitutions are possible, with approval of the executive committee if a student has already completed advanced course work in one or more of these areas. Suggested courses are provided in the list below. During summer term all students take an ethics class: INTD 500 Ethics and Accountability in Biomedical Research. For these required courses, opting out, delaying or substituting a class requires the approval of the advisory committee of the program.

| SUGGESTED COURSES | | UNITS |
|---|--|-------|
| <i>Biochemistry</i> | | |
| BISC 502a | Molecular Genetics and Biochemistry | 4 |
| INTD 571 | Biochemistry | 4 |
| <i>Cell Biology</i> | | |
| INTD 531 | Cell Biology | 4 |
| <i>Molecular Genetics</i> | | |
| BISC 502b | Molecular Genetics and Biochemistry | 4 |
| INTD 561 | Eukaryotic Molecular Genetics | 4 |
| <i>Systems Physiology and Disease/Pathology</i> | | |
| INTD 550 | Introduction to Pathology | 2 |
| INTD 551 | Pathobiology of Disease | 4 |
| INTD 572 | Systems Physiology and Disease I | 4 |
| INTD 573 | Systems Physiology and Disease II | 4 |
| <i>Ethics</i> | | |
| INTD 500 | Ethics and Accountability in Biomedical Research | 4 |

In the second year, courses are selected with the approval of the student's guidance committee with reference to the research area in which the student is working. By the end of the second year all students are required to complete both INTD 572 Systems Physiology and Disease I and INTD 573 Systems Physiology and Disease II. Completion of both INTD 550 (2) and

INTD 551 (6) can be substituted for either INTD 572 or INTD 573. In the second and subsequent years, students are required to take INTD 574 Systems Biology and Disease Seminar. Participation in an organized journal club or working group recognized by the executive committee is required each year. Within the first two years, each student must take a statistics course: PM 510L Principles of Biostatistics or equivalent.

Screening Procedures

At the end of the first year, each student is required to pass a screening procedure based on the first year's required courses submitted by reports from the Systems Biology and Disease faculty to the executive committee. This is intended to expose any weaknesses in the student's abilities. Progress must be judged satisfactory in two areas: maintain satisfactory performance in course work, and satisfactory completion of all research rotations.

Qualifying Examination

The qualifying examination, taken at the end of the second year, is administered by the guidance committee, should demonstrate a conceptual grasp of the major area of interest chosen and an understanding of the general framework and approaches of hypothesis-driven research.

Annual Research Appraisal

After advancing to candidacy, progress on dissertation research by each student is evaluated annually with an Annual Research Appraisal (ARA).

Dissertation

At the last ARA before the defense of the dissertation, the student submits an outline draft to the dissertation committee.

Defense

An acceptable dissertation based upon completion of an original investigation is required. The candidate must defend an approved draft of the dissertation in a public oral defense. The dissertation committee will then meet with the student in a closed session and complete the oral examination.

Courses of Instruction

INTERDEPARTMENTAL (INTD)

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

INTD 500 Ethics and Accountability in Biomedical Research (1, 5m) The purpose of this course is to engage current (and potential) research trainees in discussions about the responsible conduct of science. The course is designed as an option for meeting current federal regulations which require that all predoctoral and postdoctoral fellows paid from federal contracts and grants have a component of ethical training. Graded CR/NC.

INTD 501 Recent Advances in Vision Science (1, max 4, FaSp) Recent advances in the understanding of the ocular surface are reported and discussed; students will learn how to read papers critically, develop speaking skills to explain a research paper and attend a three-day workshop on NIH proposal development and scientific manuscript preparation. Graded CR/NC.

INTD 504 Molecular Biology of Cancer (4, 2 years, Sp) Epidemiology, pathobiology, carcinogenesis, tumor biology and heterogeneity; retroviruses, oncogenes, cell cycle control, genetics of cancer, tumor immunology; treatment strategies.

INTD 522 Infection and Host Responses (4, Sp) Overview of microbes, their life cycles and the host response they elicit, evade or exploit, including the manipulation and the malfunction of the immune system.

INTD 531 Cell Biology (4, Fa) Current perspectives on major research areas in cell biology. Emphasis will be on in-depth examination of cellular structures, regulatory processes, intra-cellular routing and targeting, and cell/environmental interactions.

INTD 535 Continuing Introduction to Clinical Medicine for M.D./Ph.D. Students (1, FaSp) Course for M.D./Ph.D. students in Ph.D. years designed to allow maintenance and improvement of clinical skills prior to re-entry in clinical rotations in the Year III medical curriculum. Open only to medical students who have completed Years I and II. Graded CR/NC.

INTD 537 The Structure of Scientific Revolutions in Molecular Biology (1, Irregular) A course in how scientists make breakthrough discoveries and whether there are predictable ingredients for significant changes in perception of the living system. Open only to graduate-level students in any of the biological sciences. *Recommended preparation:* one year in cell and molecular biology.

INTD 549 Protein Chemistry – Structure and Function (4, Sp) Chemistry of peptides and proteins; protein structure and folding; molecular basis of protein action. (Duplicates credit in former BIOC 549.) *Prerequisite:* general biochemistry.

INTD 550 Introduction to Pathology (4, Fa) Normal histology and introduction to basic pathological concepts. Provides a solid and basic understanding of normal structures and how they relate to function.

INTD 551 Pathobiology of Disease (4, Sp) Relationship between histopathological and clinical manifestations of disease and their underlying molecular mechanisms. Topics include inflammatory, developmental, environmental, degenerative, and neoplastic disease processes. *Prerequisite:* INTD 550.

INTD 555 Biochemical and Molecular Bases of Disease (4) Biochemical and molecular abnormalities in disease states. *Prerequisite:* general biochemistry.

INTD 561 Molecular Genetics (4, Sp) Prokaryotic and eukaryotic molecular genetics: DNA and RNA structure and function; biochemistry and molecular biology of replication, transcription, RNA processing, translation, and regulation of gene expression. (Duplicates credit in former BIOC 561.) *Prerequisite:* INTD 571.

INTD 567 Molecular and Cellular Neurobiology (4) (Enroll in NEUR 531)

INTD 571 Biochemistry (4, Sp) Physical-chemical basis of life processes: protein structure and enzyme function; synthesis and metabolism of carbohydrates, lipids, amino acids, and nucleotides. (Duplicates credit in former BIOC 441.) *Prerequisite:* open to qualified students.

INTD 572 Systems Physiology and Disease I (4, Fa) Mammalian organ systems operation during health, and pathophysiologic analysis of related diseases with focus on muscle, respiratory, cardiovascular and renal systems. Faculty from basic and clinical sciences. Open to graduate students in biomedical science only.

INTD 573 Systems Physiology and Disease II (4, Sp) Mammalian organ systems operation during health, and pathophysiologic analysis of related diseases with focus on neuroscience, immunology, metabolism, endocrine, reproduction, GI and liver. Faculty from basic and clinical sciences. Open to graduate students in biomedical science only.

INTD 574 Systems Biology and Disease Seminar (1, max 16, FaSp) Selected topics in systems biology and disease. Graded CR/NC. Open only to systems biology and disease Ph.D. students.

INTD 620 Medical Students Elective Program (0) Opportunities for medical students as preceptors in research laboratories or in field medical service under guidance of sponsors approved by faculty committees. Graded CR/NC.

INTD 621ab Introduction to Clinical Medicine (ICM) for HTE (a: 3, Fa; b: 3, Sp) A strongly patient-centered course in which both Ph.D. engineering and M.D. students experience how doctors handle communications, basic diagnostic thinking and engineering perspectives. Open only to Health, Technology and Engineering students. Graded CR/NC.

INTD 622L Pre-clinical System Block for Health, Technology and Engineering (3-9, FaSp) A three-to-nine week block of lectures and laboratories focused on particular body system (e.g., cardiovascular, renal, etc.). Open only to Health, Technology and Engineering students. Graded CR/NC.

INTD 650 Stem Cell Biology and Medicine (4, Sp) Basic principles, available embryonic and adult stem cells, principles of organogenesis and regeneration, animal models, delivery of engineered tissues to patients, promise and limitations of stem cells. Open to master's and Ph.D. students on the Health Sciences Campus and to medical and post-doctoral fellow trainees only. *Prerequisite:* INTD 531 or INTD 571.

Master of Academic Medicine

Keith Administration Building 211
 1975 Zonal Avenue
 Los Angeles, CA 90033
 (323) 442-2372
 FAX: (323) 442-2051
 Email: nyquist@usc.edu

Program Director: Julie G. Nyquist, Ph.D.

Faculty

Professors: Donna Elliott, M.D., Ed.D. (*Pediatrics*); Win May, M.D., Ph.D. (*Pediatrics/Medical Education*); Julie G. Nyquist, Ph.D. (*Pediatrics/Medical Education*); Dwight Warren, III, Ph.D. (*Cell and Neurobiology*); Beverly Wood, M.D., Ph.D. (*Pediatrics/Medical Education*)

Associate Professors: Kathleen Besinque, Pharm.D., M.S.Ed. (*Pharmacy*); Jerry Gates, Ph.D. (*Family Medicine*); Win May, M.D., Ph.D. (*Pediatrics/Medical Education*)

Assistant Professors: Dixie Fisher, Ph.D. (*Pediatrics/Medical Education*); Lori Marshall, Ph.D., MSN (*Pediatrics*); Niurka Rivero, M.D. (*Pediatrics*); Maura Sullivan, Ph.D., MSN (*Surgery*); Janet Trial, Ed.D., CNM/MSN (*Obstetrics/Gynecology*); Samuel Yanofsky, M.D., M.S.Ed. (*Anesthesiology*)

The Master of Academic Medicine is offered by the Keck School of Medicine in collaboration with the Schools of Dentistry and Pharmacy. The goal is to develop leaders who will create and enhance academic and training programs for health care professions globally. Academic medicine is defined in broad terms as relating to those who lead training worldwide in medicine or in other health care related fields. Enacting this vision is possible due to the flexible delivery model selected. The program will employ a hybrid model, combining on-campus face-to-face sessions, blended with online course work. During the 32-unit program, the majority of sessions will be delivered using interactive online delivery methods. All students will also be on campus for one-week intensive sessions in the spring of each year, which focus on community building and the development and evaluation of skills.

The program addresses the unique population of medical and health professions faculty who are focused on leading the academic enterprise for health professionals at the undergraduate, graduate and continuing education levels. Our graduates will be positioned to guide future generations of health professionals around the world toward better

meeting the health needs of our global society. For those with a clear focus on the academic enterprise, a complementary degree in academic medicine offers the specialized skills needed to lead worldwide development of enhanced training for health professionals, increases professional capacity and provides new opportunity for promotion. The audiences for this degree will typically have primary professional degrees in health fields (e.g., M.D., DDS, DPT, R.N., MSN, P.A., DVM, D.O., Pharm.D., D.C., DOM). The Master of Academic Medicine will provide the needed complementary training for clinician educators.

Admission

Applicants for admission to the Master of Academic Medicine program are generally expected to have an advanced degree in a health profession. Proof of graduation is required. For applicants who do not have a degree in a health profession, a bachelor's degree or its equivalent from an accredited institution is required, a grade point average of 3.0 (A = 4.0) is usually expected as well as satisfactory scores on the Graduate Record Examinations (GRE) General Test and three letters of recommendation. For specific information on admission and application procedures, contact the Office of Medical Education, (323) 442-2372.

Students are admitted for the academic year beginning in the fall, although those admitted prior to March 15 may enroll in summer courses. Although there is no formal application deadline, complete applications received before March 1 will be given priority. Application inquiries should be made to: Master of Academic Medicine Program, University of Southern California, Office of Medical Education, 1975 Zonal Avenue, KAM 211, Los Angeles, CA 90033, telephone (323) 442-2372.

Satisfactory Academic Progress

A graduate GPA of at least 3.0 is required at all times. Any student whose graduate GPA falls below 3.0 will be placed on academic probation. Students on academic probation who do not raise their GPA to 3.0 after two semesters of written notification of academic probation will be academically disqualified.

A minimum of 32 units of graduate-level course work is required.

Degree Requirements

| ACADEMIC COURSES (26 UNITS) | | UNITS |
|--|---|-------|
| ACMD 501 | Introduction to Academic Medicine Worldwide | 3 |
| ACMD 502 | Becoming a Leader in Academic Medicine Worldwide | 3 |
| ACMD 503 | Leading Change in Academic Medical Centers | 3 |
| ACMD 511 | Competencies in Academic Medicine and Health I | 3 |
| ACMD 512 | Competencies in Academic Medicine and Health II | 3 |
| ACMD 513 | Professionalism in Academic Medicine and Health | 3 |
| ACMD 514 | Accreditation and Program Evaluation in Academic Medicine | 3 |
| ACMD 591 | Designing Research on Innovations in Academic Medicine | 2 |
| ACMD 592 | Implementing Research on Innovations in Academic Medicine | 2 |
| ACMD 598 | Fieldwork: Designing Innovations for the Health Professions | 1 |
| Electives (6 units) | | |
| Six units of electives may be selected from the recommended courses below, or these may be replaced with approved courses at the 500 level or within USC that equal 6 units. | | |
| ACMD 593 | Foundations of Scholarly Writing in Academic Medicine | 1 |
| ACMD 598 | Fieldwork in Designing Innovations for the Health Professions | 1-2 |
| ACMD 604 | Supporting the Educational Enterprise in Academic Medicine | 3 |
| ACMD 605 | Faculty Development for Health Sciences Faculty Educators | 2 |
| ACMD 615 | Maintenance of Competence in the Health Professions | 2 |
| INTB 603 | Systematic Approach to Scientific Writing | 2 |
| MPTX 517 | Structure and Management of Clinical Trials | 4 |
| PM 513 | Experimental Designs | 3 |

Courses of Instruction

ACADEMIC MEDICINE (ACMD)

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

ACMD 501 Introduction to Academic Medicine Worldwide (3) Introduces the master's program; includes historical development of training in the health professions; current issues, challenges and opportunities in academic medicine and health worldwide.

ACMD 502 Becoming a Leader in Academic Medicine Worldwide (3) Current approaches to leadership within the context of global academic medicine and health professions education; individual applications, group dynamics, teamwork, and interpersonal skill enhancement.

ACMD 503 Leading Change in Academic Medical Centers (3) Exploration and practice of skills for promoting programs within academic medicine and health professions' education; building trust, organizational change, conflict resolution, negotiation, and managing resources.

ACMD 511 Competencies in Academic Medicine and Health I (3) Acquisition of cognitive knowledge and problem-solving skills in health professions worldwide; instructional methods, assessment techniques, designing curricula for health professions education.

ACMD 512 Competencies in Academic Medicine and Health II (3) Learning theory, teaching methods, assessment techniques related to acquisition and reinforcement of competencies related to patient care, practice-based learning and improvement and systems-based practice.

ACMD 513 Professionalism in Academic Medicine and Health (3) Acquisition and evaluation of interpersonal and communication skills and professionalism including ethics and cultural competence; within the context of health care disparities and health initiatives.

ACMD 514 Accreditation and Program Evaluation in Academic Medicine (3) Evaluating health professions training programs within guidelines of relevant accreditation organizations; models of evaluation, designing plans and tools for evaluation of program elements.

ACMD 591 Designing Research on Innovations in Academic Medicine (2) Introduction to design and scholarly review of innovations in health professions education; needs assessment, problem selection, use of research methods to study an innovation.

ACMD 592 Implementing Research on Innovation in Academic Medicine (2) Mentored research on an innovation in academic medicine leading to the master's degree. The project will result in a formal written research report. *Prerequisite:* ACMD 591.

ACMD 593 Foundations of Academic Writing (1) Academic writing for conference papers, grant proposals and journal articles. *Recommended preparation:* A completed study of an innovation in academic medicine or other health-related field that is ready to move to publication.

ACMD 598 Fieldwork: Designing Innovations for the Health Professions (1-3, max 3) Individual projects designing curricular or other innovations for the home program as an application of Year 1 concepts and as part of the capstone experience. *Prerequisite:* ACMD 591.

ACMD 604 Supporting the Educational Enterprise in Academic Medicine (3) Explores support functions in academic medical centers and health professions schools; financial, scientific, educational, faculty and student affairs departments, and offices of medical education.

ACMD 605 Faculty Development for Health Sciences Faculty Educators (2) Role of faculty development programs in health professions schools; tools for delivering effective continuing education and faculty development; models for mentoring clinical faculty.

ACMD 615 Maintenance of Competence in the Health Professions (2) Maintenance of competence and continuing professional development (CPD) of physicians and other health care professionals; trends, needs, strategies, assessing outcomes, examining effectiveness of CPD programs.

Master of Science in Global Medicine

Keith Administration Building 317
1975 Zonal Ave.
Los Angeles, CA 90033
Tel: (323) 442-3141
FAX: (323) 442-1766
www.usc.edu/msgm

Program Directors: Elahe Nezami, Ph.D.; Allan Abbott, M.D.

The Master of Science in Global Medicine is offered by the Department of Educational Affairs of the Keck School of Medicine. The program aims to train medical, dental and pharmacy students; current physicians and allied health professionals; and those planning to pursue degrees in the allied health professions to analyze and address critical issues in global medicine. The program provides a solid foundation in basic science

while also exposing students to a broad scope of pertinent issues in global medicine. Physicians and current medical students may use previous equivalent course work for 8 units of credit toward GM 503L Core Principles System I and GM 504L Core Principles System II course requirements.

By providing the knowledge and training necessary to address current and future global medical challenges, the M.S. in Global Medicine program responds to the Institute of Medicine's recommendation that the education of health professionals include course work that promotes literacy in global medicine. In addition to gaining a strong medical science foundation, students are immersed in course work that examines methods used to create innovative programming, solutions and

responses to global health challenges, thereby furnishing them with the problem-solving skills and analytical frameworks essential to their future career paths. Through partnerships with the Marshall School of Business and the Viterbi School of Engineering, the M.S. in Global Medicine also includes a management track for students who intend to pursue international health management.

Upon completion of the M.S. in Global Medicine, students will be equipped to serve as leaders within the allied health field, including, but not limited to: medicine, pharmacy, dentistry and nursing. In addition, graduates will be prepared to collaborate with or seek employment from a variety of international aid, nonprofit, and global health organizations

such as: the United Nations, the International Red Cross, United Nations Joint Programme on HIV/AIDS, United Nations Children’s Fund, World Health Organization, World Bank and the Centers for Disease Control and Prevention.

Admission

Applicants for admission to the program must have a bachelor’s degree or its equivalent from an accredited institution and have earned a GPA of 3.0 (A = 4.0) in undergraduate work. Prerequisite undergraduate course work must include one year of general biology, one year of general chemistry, one year of organic chemistry and one semester of calculus.

All applicants are required to have taken either the Graduate Record Examinations (GRE) General Test or the Medical College Admission Test (MCAT). A minimum score of 1000 on the GRE or 28 on the MCAT is required. Students must also supply three letters of recommendation from evaluators qualified to assess their potential for graduate work.

Applicants must supply a completed application for graduate studies including: transcripts from all institutions previously attended, standardized test scores and three letters of recommendation. Applications are considered for enrollment in both fall and spring semesters. For further information contact: Dr. Elahe Nezami, Master of Science in Global Medicine Program, 1975 Zonal Ave., KAM 317, Los Angeles, CA 90033, Tel: (323) 442-3141, Fax: (323) 442-1766.

Advisement

The program recommends that students meet with the academic adviser of the program each semester prior to registration.

Satisfactory Academic Progress

A graduate GPA of at least 3.0 is required at all times. Any student whose graduate GPA falls below 3.0 will be placed on academic probation. Students on academic probation who do not raise their GPA to 3.0 after two semesters of written notification of academic probation will be academically disqualified. A minimum of 32 units of graduate level course work is required for graduation.

Degree Requirements

CORE COURSES (MINIMUM 14 UNITS) UNITS

| | | |
|---------------------------|--|---|
| <i>Common Core</i> | | |
| GM 500 | Basic Concepts in Global Health | 4 |
| GM 502 | Global Epidemiology of Diseases and Risk Factors | 4 |
| <i>GM Core</i> | | |
| GM 503L | Core Principles System I | 4 |
| GM 504L | Core Principles System II | 4 |
| <i>GM Management Core</i> | | |
| GSBA 520 | Business Fundamentals for Non-Business Professionals | 3 |
| IOM 582 | Service Management: Economics and Operations | 3 |

ELECTIVE COURSES (MINIMUM 16 UNITS; GM MANAGEMENT TRACK STUDENTS MUST COMPLETE AT LEAST 12 GM ELECTIVES)* UNITS

| | | |
|---------------------|---|---|
| <i>GM Electives</i> | | |
| GM 501 | Critical Issues in Global Health | 4 |
| GM 510 | Global Health Modules, Malaria | 2 |
| GM 511 | Global Health Modules, Tuberculosis | 2 |
| GM 512 | Global Health Modules, Maternal and Child Health I | 2 |
| GM 513 | Global Health Modules, Maternal and Child Health II | 2 |

| | | |
|--------|---|------|
| GM 514 | Global Health Modules, Tropical Diseases | 2 |
| GM 515 | Global Health Modules, HIV/AIDS | 2 |
| GM 516 | Cultural Competence in Health and Medicine | 2 |
| GM 517 | Health and Human Rights | 2 |
| GM 521 | Emerging and Re-emerging Infectious Diseases | 2 |
| GM 522 | Human Hepatitis Viruses | 2 |
| GM 523 | Global Toxicity and Carcinogenesis | 2 |
| GM 524 | Grantwriting for Non-Government Organizations | 2 |
| GM 526 | Alternative and Eastern Medicine: A Biomedical Approach | 2 |
| GM 535 | Culture, Lifestyle, and Health | 2 |
| GM 550 | Clinical Medicine and Healthcare Reform in Taiwan | 2 |
| GM 551 | Clinical Medicine and Socioeconomic Factors in Uganda | 2 |
| GM 590 | Directed Research | 2, 4 |

GM Management Track Electives

| | | |
|---------|---|---|
| MOR 569 | Negotiation and Deal-making | 3 |
| MOR 470 | Global Leadership | 4 |
| MKT 565 | Global Marketing | 3 |
| ISE 507 | Six-Sigma Quality Resources for Health Care | 3 |
| ISE 508 | Health Care Operations Improvement | 3 |

Note: On a case-by-case basis, GM students and GM Management students may take classes outside their particular group.

*Students will take 8 units of electives that have a global focus, chosen in consultation with their adviser from among GM courses.

Graduate Certificate in Global Medicine

The certificate program in global medicine is for students who do not wish to pursue an M.S. degree in global medicine, but hope to pursue or expand careers in global health care. Students will study current topics in global health and health care, and will have a strong grounding in cultural competence, specific diseases, and creating and implementing health interventions in developing countries.

Students take 16 units of graduate course work that may not be used or have been used for any other degree or certificate program. These units include two core classes and eight units of electives, as follows:

| | | |
|---------------------|--|--------------|
| CORE COURSES | | UNITS |
| GM 500 | Basic Concepts in Global Health | 4 |
| GM 502 | Global Epidemiology of Diseases and Risk Factors | 4 |

ELECTIVE COURSES:

Students will take 8 units of electives, chosen in consultation with their adviser, from among all GM courses numbered 510 or above. For example, there are groups of courses relevant to women’s and family health; infectious diseases; health care in developing countries; working with diverse populations in the United States, etc.

Courses of Instruction

GLOBAL MEDICINE (GM)

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

GM 500 Basic Concepts in Global Health (4, Fa) Exploration of global health issues facing resource-poor societies; emphasizes contributing factors including behavioral and physiological bases, economic, social, and political context.

GM 501 Critical Issues in Global Health (4, FaSpSm) Evaluation of government and non-government organizations' new global health responses, and critical issues affecting global health including: environment, workforce conditions, obesity, nutrition, drugs, poverty.

GM 502 Global Epidemiology of Diseases and Risk Factors (4, FaSpSm) Survey of major populations' crises and risk factors accounting for global health challenges. Evaluation of case studies of global health interventions and effective methodologies.

GM 503L Core Principles System I (4, Fa) Introduction to basic medical concepts and biological system functions; examination of core principles of science and medical treatment.

GM 504L Core Principles System II (4, Fa) Continuation of concepts from GM 503L. Basic medical concepts and biological system functions; examination of core principles of science and medical treatment. *Prerequisite:* GM 503L.

GM 510 Global Health Modules, Malaria (2, FaSp) Critical issues in international control and treatment of malaria. Exploration of biological and epidemiological fundamentals of human-parasite interaction, including dynamics of transmission among populations.

GM 511 Global Health Modules, Tuberculosis (2, FaSpSm) Exploration of biological and epidemiological fundamentals of tuberculosis including dynamics of transmission among populations. Overview of clinical manifestations, diagnosis, and treatment of infections.

GM 512 Global Health Modules, Maternal and Child Health I (2, FaSpSm) Biopsychosocial, cultural and economic aspects of women's health: pregnancy, childbirth, marriage. Examination of health promotion and policy efforts to improve women's health globally.

GM 513 Global Health Modules, Maternal and Child Health II (2, FaSpSm) In-depth examination of women's health issues; health promotion and policy efforts to improve women's health globally.

GM 514 Global Health Modules, Tropical Disease (2, FaSpSm) Examination of prevalent tropical diseases: epidemiology, clinical manifestations, treatment, impact on economies of tropical countries. Key issues related to these diseases; World Health Organization responses.

GM 515 Global Health Modules, HIV/AIDS (2, FaSpSm) HIV epidemiology, basic biology of transmission and pathophysiology, associated opportunistic infections, and challenges to providing care in the developing world, including government responses.

GM 516 Cultural Competence in Health and Medicine (2, FaSpSm) Practical approach to the development of professional skills for providing culturally sensitive clinical health services to ethnically and linguistically diverse patients.

GM 517 Health and Human Rights (2, FaSpSm) The relationship between health and human rights, and the study of human rights issues relevant to healthcare professionals.

GM 520 Medical Spanish for the Health Professions (2, FaSpSm) Spanish language course for students planning to enter the health professions. Graded CR/NC.

GM 521 Emerging and Re-emerging Infectious Diseases (2, FaSpSm) Exploration of the threat of major worldwide epidemics and diseases with a focus on the recent emergence of new plagues.

GM 522 Human Hepatitis Viruses (2, FaSpSm) Human hepatitis and the viruses that cause them, how they are spread, symptoms, treatment, and prevention.

GM 523 Global Toxicity and Carcinogenesis (2, FaSpSm) Covers the occurrences of toxic substances and the toxicity/diseases they cause, and chemical carcinogens and the types of cancer they cause worldwide.

GM 524 Grantwriting for Non-Government Organizations (2, FaSpSm) Instruction on the process and methods of writing effective grants from identifying appropriate funders to implementing project upon receipt of funding award.

GM 525 Global Mental Health (2, FaSpSm) Examines the major mental health diagnoses from clinically relevant perspectives and their prevalence in specific geographical regions around the world.

GM 526 Alternative and Eastern Medicine: A Biomedical Approach (2, FaSpSm) Exploration of issues of complementary and alternative medicine (CAM) and traditional Eastern medical views of health and illness from a Western biomedical perspective.

GM 530abc Foundation of Medicine: Anatomy, Physiology, and Pathology (4-4-4, FaSpSm) *a:* Fundamentals of physiology, chemistry, anatomy, biochemistry and microbiology, as well as pharmacological issues, mathematical basis of lab instruments or techniques, and computational modeling. *b:* The basics of human anatomy (gross anatomy, histology, radiographic anatomy), physiology (cellular physiology, organ system areas) and pathology (general, systemic, cellular pathology). *c:* Continues material from GM 530*a* and GM 530*b*, covering human anatomy (gross anatomy, histology, radiographic anatomy), physiology (cellular physiology, organ systems) and pathology (general, systemic, cellular pathology).

GM 535 Culture, Lifestyle, and Health (2) Overview of national and international variations in health status indicators in regard to cultural and lifestyle differences.

GM 550 Clinical Medicine and Healthcare Reform in Taiwan (2, Sm) Two-week in-depth study abroad in Taipei, Taiwan, focused on understanding Taiwan's health care system, health priorities, and needs.

GM 551 Clinical Medicine and Socioeconomic Factors in Uganda (2, Sm) Two-week course that provides students with hands-on experience in clinical medicine/public health and exposure to the various socioeconomic factors impacting health in the developing world.

GM 590 Directed Research (1-12) 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.

GM 597ab Health Technology Internship (2-2, FaSpSm) Internship course on the use of new technology based on sensors and wireless communications to the health care industry. Open only to M.S., Electrical Engineering (Wireless Health Technology) students. Graded IP/CR/NC.

GM 599 Special Topics (2-4, max 8) Lecture and discussion focused on specific topics within global medicine. Course topic will vary from semester to semester.

Department of Anesthesiology

Nurse Anesthesia Program
1540 Alcazar Street
Suite 205
Los Angeles 90089-9012
(323) 442-2037
FAX: (323) 442-1701
Email: uscnap@usc.edu
keck.usc.edu/nurse-anesthesia

Program Director: Michele E. Gold

Associate Program Director: Teresa Norris

Assistant Program Director of Clinical Services:
Kären Embrey

Faculty

Chair and Professor: Philip Lumb

Professor of Pediatrics and Anesthesiology:
Randall Wetzel

Professors of Clinical Anesthesiology:
Mary Joseph; Ronald Katz; Vladimir Zelman

Associate Professors of Clinical Anesthesiology:
Jack Berger; Jeffrey Lee; Rajesh Patel; David Raphael; Earl Strum

Assistant Professors of Clinical Anesthesiology:
Rudolfo Amaya; Dimiter Arnaudov; Armin Azad; Maxim Benbassat; Martin Bohorquez; Kari Cole; James Daniel; Barbara Gasior; Gligor Gucev; Samuel Yanofsky

Instructors of Clinical Anesthesiology: Roberta Ashley; Deborah Avnet; Brindusa Bauer; James Carey; Jennilyn Casalme; Carey Catania; Johnny Cheng; Nancy Christiano; Geoffrey Edwards; Judy Franco; Charlotte Garcia; Sarah Giron; Elizabeth Glazer; David Godden; Heather Hamza; Jennifer Hogan; Robert Horn; Dina Hunt; Monique Jabbour; Kim Jones-Tang; Rory Keenan; Cathy Kiem; Benjamin Lindsey; Victoria McKinzie; Arthur Norcliffe; Nilu Patel; Margaret Oliveto; Robert Olson; Patty Paik; Erin Peters; Gabriel Punsalan; Ilene Richards; Joseph Sammut; Hil Tantoco; Rhona Wang; Kelly Zhou

The nurse anesthesia program prepares qualified nurses in the specialty of nurse anesthesia and qualifies the graduate to sit for the certification examination given by the Council on Certification of Nurse Anesthetists. The graduate attains a high level of clinical competence with an extensive body of didactic knowledge relevant to the specialty and advanced practice nursing. The mission of the USC Program of Nurse Anesthesia is scholarly education and professional development of future nurse anesthetists with the academic strength and leadership skills to advance our profession.

Students enrolling in the M.S., Nurse Anesthesia course of study must complete the nurse anesthesia core curriculum and specialty practicum. The program consists of 45 to 49 units and is completed in 24 months of continuous enrollment (six semesters). There is an optional one-semester clinical fellowship offered in the seventh semester of enrollment to provide specialty training in a clinical area of choice: critical care, cardiovascular, neurosurgical, ambulatory anesthesia or pain management. Students may sit for the certification examination during this semester.

The program is based in the Department of Anesthesiology, and classroom instruction is provided by nurse anesthesia program faculty and faculty from the Department of Anesthesiology, the Department of Physiology and Biophysics, and the Department of Cell and Neurobiology within the Keck School of Medicine, as well as clinical faculty from the program clinical sites. Clinical training occurs at Los Angeles County + USC Medical Center, Keck Hospital of USC, Harbor-UCLA Medical Center, Long Beach Veterans' Administration Medical Center and West Los Angeles Veterans' Administration Medical Center for the primary rotations. Advanced rotations occur at those sites, as well as Cedars-Sinai Medical Center, Children's Hospital of Los Angeles, Hallmark Pain Management and Surgery Center, and UCLA Medical Center.

Master of Science (in Nurse Anesthesia)

General requirements for admission include a minimum 3.0 undergraduate grade point average, a minimum score on the verbal and quantitative sections of the Graduate Record Examinations of 1000 (or the equivalent score on the GRE after September 2011), current licensure as a Registered Nurse, a bachelor's degree in nursing or a related field from an accredited university or college, submission of an essay describing the applicant's career goals, professional resume and three letters of reference.

Competitive applicants will be interviewed and must demonstrate an acceptable understanding of the role and responsibilities of certified registered nurse anesthetists. Selections are made on the basis of the formal interview and consideration of a variety of factors that include academic record, type and amount of clinical experience and professionalism.

Academic and Scientific Prerequisites

The admission requirements also include appropriate undergraduate course work in biology, anatomy, physiology, chemistry, biochemistry, physics and statistics (or nursing research). A minimum of one year of experience in critical care nursing as a registered nurse is required. Licensure as an RN in California and current BCLS, ACLS and PALS certifications are required prior to enrollment. Conversational Spanish is strongly recommended.

Computer Skill Requirements

During the program, students must have a personal computer or notebook with Internet access and a PDA. The primary mode of program communication is email. Computer accounts are provided by the university to all students and can be activated online.

Advisement

Prospective students should contact the program's admission office, (323) 442-2037 or uscnap@usc.edu for evaluation of previous course work and clinical background.

Admission

Admission procedures follow the information in the USC Graduate School section of this catalogue. Admission standards for the USC nurse anesthesia program are established jointly by the Keck School of Medicine, the USC Graduate School and the Department of Anesthesiology. Interested students should apply online at www.usc.edu/admission/graduate/apply. Additional admissions requirements and the supplemental application must be obtained from the nurse anesthesia program and can be requested through email at uscnap@usc.edu or accessed at keck.usc.edu/nurse-anesthesia.

| DEGREE REQUIREMENTS | | UNITS |
|-------------------------|---|-------|
| <i>Academic Courses</i> | | |
| ANST 500 | Human Anatomy | 3 |
| ANST 501 | Pharmacology of Anesthesia Practice | 4 |
| ANST 502 | Principles of Nurse Anesthesia Practice | 4 |

| | | |
|----------|--|---|
| ANST 503 | Advanced Pharmacology of Anesthesia Practice | 3 |
| ANST 504 | Pathophysiology Related to Anesthesia Practice | 4 |
| ANST 506 | Advanced Principles of Nurse Anesthesia Practice | 4 |
| ANST 508 | Research: Investigative Inquiry | 2 |
| ANST 510 | Professional Aspects of Nurse Anesthesia | 3 |
| ANST 512 | Research Integration: Capstone Experience | 1 |
| INTD 572 | Systems Physiology and Disease I | 4 |

Residency Courses

| | | |
|----------|---|---|
| ANST 505 | Clinical Residency in Nurse Anesthesia I | 3 |
| ANST 507 | Clinical Residency in Nurse Anesthesia II | 2 |
| ANST 509 | Advanced Clinical Residency in Nurse Anesthesia I | 3 |

| | | |
|----------|---|-----|
| ANST 511 | Advanced Clinical Residency in Nurse Anesthesia II | 4-8 |
| ANST 513 | Advanced Clinical Residency in Nurse Anesthesia III | 1 |

Total Units 45-49

Optional Course

| | | |
|----------|----------------------|---|
| ANST 514 | Specialty Fellowship | 2 |
|----------|----------------------|---|

All students will take the Self-Evaluation Examination (SEE) administered by the Council on Certification of Nurse Anesthetists at the end of the first clinical year. Student scores must be above the national mean for advancement into the research capstone experience.

Courses of Instruction

ANESTHESIOLOGY (ANST)

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

ANST 500 Human Anatomy (3, Fa) Lectures and laboratory simulation in anatomy emphasizing structure and function of major organs to include brain, cardiovascular, lungs, liver, kidneys and musculoskeletal system. Open to nurse anesthesia students only.

ANST 501 Pharmacology of Anesthesia Practice (4, Fa) Pharmacokinetic and pharmacodynamic principles, uptake and distribution of inhalational anesthetics, and pharmacology of respiratory and cardiovascular drugs. Application of pharmacologic principles to anesthetic management. Open to nurse anesthesia students only.

ANST 502 Principles of Nurse Anesthesia Practice (4, Fa) Basic theory of anesthesia administration, preanesthetic assessment, physical examination, monitoring. Case management including airway and blood/fluid management, anesthesia machine, and postoperative pain. Lecture/case study format. Open to nurse anesthesia students only.

ANST 503 Advanced Pharmacology of Anesthesia Practice (3, Sp) Pharmacokinetic/pharmacodynamic principles of drugs covering different organs systems (CNS, hematology, endocrine), herbal therapies, chemotherapeutics, and antimicrobials. Application of pharmacology to anesthetic management using problem-based learning. *Prerequisite:* ANST 501, ANST 502.

ANST 504 Pathophysiology Related to Anesthesia Practice (4, Sp) In-depth study of cardiovascular, respiratory, renal, liver, endocrine and neuropathophysiology with application of these principles to anesthetic case management using problem-based learning. *Prerequisite:* ANST 501, ANST 502.

ANST 505 Clinical Residency in Nurse Anesthesia I (3, Sp) Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory in the clinical setting with observation and supervised clinical residency. *Prerequisite:* ANST 501, ANST 502.

ANST 506 Advanced Principles of Nurse Anesthesia Practice (4, Sm) Advanced theory of anesthesia management for general and specialized procedures, diagnostic procedures, pediatrics and obstetrics. *Prerequisite:* ANST 503, ANST 504, ANST 505.

ANST 507 Clinical Residency in Nurse Anesthesia II (2, Sm) Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory in the clinical setting with observation and supervised clinical residency. *Prerequisite:* ANST 505.

ANST 508 Research: Investigative Inquiry (2, Fa) Utilization of research, which includes the evaluation of research, problem identification within the practice setting, awareness of practice outcomes and the clinical application of research. *Prerequisite:* research course, basic statistics.

ANST 509 Advanced Clinical Residency in Nurse Anesthesia I (3, Fa) Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory expanded to geriatric, obstetrical, and pediatric anesthesia; anesthetic management to include medically compromised patients. *Prerequisite:* ANST 506, ANST 507.

ANST 510 Professional Aspects of Nurse Anesthesia (3, Fa) Emphasis on the professional components of nurse anesthesia practice including socialization, regulation, culture, ethics, law, employment, advocacy, and contemporary practice issues. Open to nurse anesthesia students only.

ANST 511 Advanced Clinical Residency in Nurse Anesthesia II (4-8, Sp) Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory expanded to neuroanesthesia, cardiac anesthesia, trauma anesthesia, critical care and pain management. Open to nurse anesthesia students only. *Prerequisite:* ANST 509.

ANST 512 Research Integration: Capstone Experience (1, Sm) A capstone course requiring students to demonstrate ability to integrate theory, research and practice through a mentored research experience with direct relevance to graduate specialization. Open to nurse anesthesia students only.

ANST 513 Advanced Clinical Residency in Nurse Anesthesia III (1, Sm) Correlation of advanced techniques of anesthesia administration with application of scientific and pharmacologic theory in diverse specialty anesthesia rotations. *Prerequisite:* ANST 511.

ANST 514 Specialty Fellowship (2, Fa) Optional internship to develop advanced skills and critical assessment of anesthesia specialty or clinical research. Graded CR/NC. *Prerequisite:* ANST 513; graduate of an accredited nurse anesthesia program.

ANST 590 Directed Research (1-12, FaSpSm) Research leading to the master's degree in nurse anesthesia. Maximum units which may be applied to the degree to be determined by the department. Open to nurse anesthesia majors only. Graded CR/NC. *Prerequisite:* ANST 508.

ANST 591 Special Projects (1-4, max 4, FaSpSm) Supervised learning in functional and/or clinical area of focus reflecting current trends and development in the field of nurse anesthesia. Open to nurse anesthesia majors only. Graded CR/NC.

Department of Biochemistry and Molecular Biology

1333 San Pablo Street, MCA 51-A
Los Angeles, CA 90089-9151
(323) 442-1145
FAX: (323) 442-1224
Email: camaren@usc.edu
www.usc.edu/medicine/biochemistry
www.usc.edu/pibbs

Faculty

Michael R. Stallcup, *Chair and Professor of Biochemistry and Molecular Biology*

Zoltan A. Tokes, *Vice Chair for Doctoral Education and Master of Science Program*

Joseph G. Hacia, *Vice Chair for Medical Education*

Catherine and Joseph Aresty Chair in Urologic Research: Chih-Lin Hsieh

Ralph Edgington Chair in Medicine: Zea Borok

Judy and Larry Freeman Chair in Basic Science Research: Amy S. Lee

H. Leslie Hoffman and Elaine S. Hoffman Chair in Cancer Research: Peter A. Jones

William M. Keck Chair in Biochemistry and Molecular Biology: Peggy Farnham

J. Harold and Edna L. LaBriola Chair in Genetic Orthopaedic Research: Baruch Frenkel

Rita and Edward Polusky Chair in Basic Cancer Research: Michael Lieber, Ph.D., M.D.

Provost Professor of Medicine and Pharmacy: Michael Kahn

Professors: N. Arnheim (*Biological Sciences*); Z. Borok (*Medicine*); E. Cadenas (*Molecular Pharmacology and Toxicology*); P.V. Danenberg; Y.A. De Clerck (*Medicine*); R. Farley (*Physiology and Biophysics*); P. Farnham; B. Frenkel (*Orthopaedics*); C.L. Hsieh (*Urology*); D. Johnson; P.A. Jones (*Urology*); M. Kahn; V.K. Kalra; R. Langen; A.S. Lee; D. Levy; M. Lieber (*Pathology*); F.S. Markland, Jr.; R.E. Maxson; M.E. Nimni (*Pediatrics*); P. Patel; D. Polk (*Pediatrics*); P. Roy-Burman (*Pathology*); M.R. Stallcup; Z. Tokes; A. Warshel (*Chemistry*)

Associate Professors: W. An; P. Cannon (*Pediatrics*); I.S. Haworth (*Pharmacy*); J. Hacia; Y. Hong (*Surgery*); I. Laird-Offringa (*Surgery*); P. Laird (*Surgery*); R.D. Mosteller; S. Reddy; J. Rice; H. Sucov (*Cell and Neurobiology*); T. Ulmer

Assistant Professors: R. Bajpai (*Dentistry*); S. Curran (*Bio-Gerontology*); M. Frey (*Pediatrics*); A. Kobiela (*Otolaryngology*); C. Lien (*Pediatrics*); A. Merrill (*Dentistry*); W. Lu

Assistant Professors of Research: T. Miki; S. Swenson; D. Weisenberger; S. Zhong

The USC Department of Biochemistry and Molecular Biology prides itself on maintaining a broad-based approach to various aspects of biochemical and molecular biological research. In 2010, the department received more than \$10 million in research funding for its primary faculty members.

Altogether, the department numbers 49 primary and joint-appointment faculty members, who conduct research in a variety of areas including: molecular biology and

genetics of development and cell differentiation; mammalian and human genetics; DNA methylation, replication, recombination and repair; membrane transport; kinetics and mechanism of enzyme action; protein structure-function interrelationships; carcinogenesis and cancer chemotherapy; and stem-cell biology.

The department also has major research programs in the molecular basis of control and regulation of gene expression, epigenetics, molecular mechanisms of signal processing and transduction, developmental and stem cell biology, detailed analysis of macromolecular structure and function, the biochemistry and molecular biology of the brain, and genetic medicine including gene therapy.

The department's exceptionally strong research into various aspects of the biochemistry and cell biology of cancer is internationally recognized. Ongoing research programs in this area include mechanism of action of cancer chemotherapeutic agents, tumor cell invasion and metastasis, and cancer cell epigenetics and gene regulation.

Many members of the department are members of the USC Norris Comprehensive Cancer Center, USC Institute for Genetic Medicine (IGM), USC Zilkha Neurogenetic Institute (ZNI), Eli and Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research at USC, and Children's Hospital Los Angeles (CHLA).

The USC Norris Comprehensive Cancer Center maintains a microchemical core facility that includes capabilities for gas phase protein sequencing, amino acid analysis, peptide synthesis, DNA synthesis and sequencing.

The Institute for Genetic Medicine maintains a customized microarray core facility. Other facilities available to support the research of members of the department include mass spectroscopy, transgenic mice, flow-cytometry, biostatistics, microchemical resource for DNA, and protein sequencing and synthesis core facilities.

The primary offices and laboratories of the department are located on the Health Sciences Campus.

Graduate Programs

Admissions

The prerequisite for applicants to the graduate program in biochemistry and molecular biology is a bachelor's degree with an undergraduate major in one of the natural sciences. Undergraduate course work should have included organic chemistry, the physics and mathematics required of a chemistry major and some courses in the biological sciences. A course in general biochemistry is also required, but may be taken during the period of graduate study. Previous course work in physical chemistry is strongly recommended. A minimum GPA of 3.0 in the natural sciences (including mathematics) is normally required.

Applicants must pass satisfactorily the general portions of the Graduate Record Examinations. In addition, the department requires at least three letters of recommendation from faculty members who can evaluate the applicant's potential for graduate work and independent research.

Faculty members of the Department of Biochemistry and Molecular Biology participate in a variety of interdisciplinary Ph.D. programs. Students interested in pursuing a Ph.D. degree in the fields related to biochemistry, molecular and cellular biology, and genetics should apply to USC's Programs in Biomedical and Biological Sciences (PIBBS). Applications for the Ph.D. Programs in Biomedical and Biological Sciences should be submitted online through the PIBBS Website (www.usc.edu/pibbs).

Applications should be submitted before the application due date specified on the PIBBS Website. Applications for the M.S. program in biochemistry and molecular biology can be obtained from the department at the address listed below. In addition to the university application, a supplemental departmental application must be completed and returned with transcripts, GRE scores and letters of recommendation to: Graduate Admissions Committee, Department of Biochemistry and Molecular Biology, 1333 San Pablo Street, Los Angeles, CA 90089-9151.

Fellowships

Students admitted to PIBBS are awarded fellowships which pay for tuition and provide a stipend. No fellowships are available for master's degree students.

Master of Science

The Department of Biochemistry and Molecular Biology offers a program for the Master of Science degree. The primary objectives of this program are to provide the necessary theoretical preparation for biochemical careers and to expose students to biochemistry and molecular biology related research activities culminating with the Master of Science degree. Goals of the program are to train students in preparation for (1) further doctoral study, (2) advanced biochemical research positions in industry and academia and (3) teaching positions at the community college level.

In general, admission requirements are the same as for the Doctor of Philosophy degree. The prerequisite for applicants to the graduate program in biochemistry is a bachelor's degree with an undergraduate major in one of the natural sciences. A minimum GPA of 3.0 in the natural sciences (including mathematics) is normally required. Applicants must satisfactorily pass the general and advanced (chemistry, or biology or molecular biology) portions of the Graduate Record Examinations. In addition, the department requires at least three letters of recommendation from faculty members who can evaluate the applicant's potential for graduate work and independent research. Demonstrated proficiency in the English language is required. Special circumstances may provide consideration for conditional admission.

The master's degree in biochemistry and molecular biology requires 34 units of elective graduate study to be determined by the student's Advisory Committee. Fourteen or more course units must be taken in biochemistry and molecular biology; eight units may be pursued outside the department. Students interested in the commercial aspects of biotechnology may take courses focusing on business entrepreneurship, finance, management and marketing in the Marshall School of Business. Master's students have the option of completing a research thesis allowing state-of-the-art laboratory-based investigation or a non-research-based theoretical thesis. Upon approval, a maximum of 10 units of directed research in biochemistry will be applied to the degree. Up to six units of graduate course work taken outside of USC may be applied toward the M.S. degree. Flexibility exists to plan each student's program to suit individual needs, ambitions and background.

Master of Science, Molecular Epidemiology

A joint program with the Department of Preventive Medicine offers an M.S. degree in Molecular Epidemiology that requires 37 units of graduate study (see page 782 for course requirements). Students must also complete a master's thesis. Students can register for up to 10 units of master's research units. Interested students should contact Anne Rice (annvazqu@usc.edu) or the Department of Preventive Medicine.

Ph.D. in Genetic, Molecular and Cellular Biology (GMCB) or Ph.D. in Systems Biology and Disease (SYBD)

Faculty members in the Department of Biochemistry and Molecular Biology participate in the GMCB and SYBD Ph.D. programs. For admission information and degree requirements, see GMCB (page 763) and SYBD (page 764).

Doctor of Philosophy

The Department of Biochemistry and Molecular Biology offers graduate degree courses directed toward the Ph.D. degree in this discipline. The objective of this program is to prepare students for careers as independent investigators and instructors in biochemistry, molecular biology and related fields.

The program consists of both course work and research and is intended to provide students with a broad conceptual background as well as focused research training. The flexibility of the program is designed to meet the interests of individual students and to prepare them for specialization in any of the major subdivisions of biochemistry.

Course Requirements A total of 60 units of graduate credits is required for the Ph.D., including course work, research and dissertation units. At least 24 of these units must be from courses numbered 500 or higher; at least 12 of these units must be taken in biochemistry, while the remaining 12 units may be taken in various related disciplines. Students are expected to take the three seminar courses and additional courses may be required by the Graduate Advisory Committee or by the student's guidance committee. Students must complete all courses with a cumulative GPA of not less than 3.0 and must maintain this average in order to remain in the graduate program. Students are expected to spend full time during the academic year and summer on course work or research.

Screening Procedure The department's Graduate Advisory Committee, consisting of four faculty members, assesses the educational objectives and research interests of each student admitted to the graduate program. The committee then recommends a program of graduate courses and research suited to the individual student. The advisory committee

evaluates the student's performance throughout the first year and must approve the student's progress prior to his or her selection of a research adviser.

Guidance Committee To assist students in selecting their research advisers, doctoral students rotate through four research laboratories during their first year in the graduate program. By the first summer of graduate study, each student is expected to have selected a research adviser. Shortly afterward the student should form a five-member guidance committee. Members of the committee must include the student's research adviser, at least three faculty members from the Department of Biochemistry and Molecular Biology and at least one member from outside the department.

Qualifying Examination Students in the Ph.D. program must pass both the written and oral portions of a comprehensive qualifying examination on the major areas of biochemistry. The written portion consists of a comprehensive examination given annually, which must be passed before the oral portion can

be taken. The oral portion must be scheduled within three months of the successful completion of the written examination. The proposition will be focused on the student's dissertation research and is intended to test the student's depth and breadth of knowledge in his or her area of research. The student will be asked to prepare a short summary of the dissertation research proposal and submit it within two weeks of the oral defense. The oral examination consists of a defense of both propositions and can include questions dealing with the written examination and other areas of biochemistry. The oral examination will give applicants the opportunity to unravel complex problems and will also test their overall knowledge of biochemistry and molecular biology.

Recommendations for advancement to candidacy for the Ph.D. degree are made on the basis of the successful completion of these requirements and the student's maintenance of at least a 3.0 GPA. A student who has not been recommended for advancement to

candidacy at the end of three years will be terminated unless given permission to write a master's thesis and terminate graduate work with an M.S. degree.

Dissertation and Oral Defense The student's dissertation committee consists of the research adviser, one other member from the department and one member from outside the department. The dissertation must represent an original contribution to biochemistry and should indicate the ability of the student to undertake independent investigation. The defense of the dissertation includes the presentation of a seminar that is open to the public.

Ph.D. in Molecular Epidemiology Faculty members in the Department of Biochemistry and Molecular Biology participate in the Molecular Epidemiology Ph.D. program. For admission information and degree requirements, see the Department of Preventive Medicine, page 795.

Courses of Instruction

BIOCHEMISTRY (BIOC)

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

BIOC 501 Recent Advances in Biochemistry (2-4, max 16, Fa) Lectures on areas of intermediary metabolism and the chemistry of natural products. *Prerequisite*: BISC 435, CHEM 430ab.

BIOC 502 Biochemistry Seminar (1, max 12, FaSp) Formal presentations and discussion by students of material from research literature.

BIOC 504 Molecular Biology of Cancer (4, Sp) (Enroll in INTD 504)

BIOC 510 Introductory Molecular Biology (2, Sp) Principles of molecular biology with applications to the medical sciences. Nucleic acid structure, function, and analysis. *Recommended preparation*: a course in biochemistry.

BIOC 512 Molecular Basis of Cell Proliferation and Differentiation (2, Irregular) An advanced seminar course in molecular cell biology, discussing current literature with significant impact on the understanding of the cell cycle and differentiation of various cell types. *Recommended preparation*: basic cell biology and molecular biology. (Frenkel)

BIOC 522 Applications of Physical Methods in Biochemistry (2, FaSp) Applications of physical analytical methods commonly utilized in research in biochemistry and molecular biology. *Concurrent enrollment*: CHEM 521. (Langen)

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

BIOC 536 Molecular Biology of Cellular Communication in the Nervous System (2, Sp) Discussion of cellular communications in the nervous system through neurotransmitters and their receptors, neuromodulators; biochemical changes during development and the impact of human genomic research. *Recommended preparation*: one year of general biochemistry or molecular biology. (Tokes)

BIOC 542 Cellular and Molecular Basis of Animal Development (4, Fa) Processes of cell type specification, determination, and morphogenesis in metazoans from vertebrates to insects. Genetic, paragenetic and molecular biological approaches to developmental processes. *Prerequisite*: INTD 571. (Maxson)

BIOC 543 Human Molecular Genetics (4, Fa) Comprehensive course covering basic principles of human genetics, genetic disease, the Human Genome Project, and gene therapy. *Recommended preparation*: undergraduate genetics. (Allayee)

BIOC 551 Prokaryotic Molecular Genetics (4, Fa) (Enroll in MICB 551)

BIOC 555 Biochemical and Molecular Bases of Disease (4) (Enroll in INTD 555)

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

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

BIOC 573 Optimal Research Presentations by Ph.D. Students (1, max 12, FaSp) Students will attend lectures by peers, and after their first year in the Ph.D. program, prepare and present their own research to an audience of faculty and peers. Open to Ph.D. students in Genetic, Molecular and Cellular Biology Program (GMCB), Biochemistry and Molecular Biology and Molecular Epidemiology only. Graded CR/NC. (Hong)

BIOC 574 Systems Physiology and Disease II (4, Sp) (Enroll in INTD 573)

BIOC 590 Directed Research (1-10, 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.

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

BIOC 599 Special Topics (2-4, max 8)

BIOC 601 Molecular Biology of Gene Regulation (2, max 8, FaSp) Current techniques and systems in molecular biology from an interdisciplinary perspective: microbiological, biochemical, and pharmaceutical.

BIOC 604 Current Topics in Animal Development (2, Sp) (Enroll in CNB 604)

BIOC 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.

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

Department of Cell and Neurobiology

Bishop Medical Teaching and Research Building 401
1333 San Pablo Street
Los Angeles 90089-9112
(323) 442-1881
FAX: (323) 442-3466
Email: cnb@hsc.usc.edu

Graduate Advisory Committee Chair: Joel Schechter (323) 442-1862

Faculty

Professor and Chair: Pat Levitt

William M. Keck Chair in Medicine: Martin Pera

Provost Professor of Cell and Neurobiology, Pharmacology and Pharmaceutical Sciences and Psychology: Pat Levitt

Professors: M. Fini; T.H. McNeill*; M. Pera; J.E. Schechter*; M. Snow; R. I. Wood*; S.Y. Ying

Associate Professors: G.H. Albrecht*; J. Chen; K. Eagleson; J.A. Garner*; R. Gopalakrishna*; J.D. Miller; P. Elyse Schauwecker; B.G. Slavin*; H. Sucov*

Assistant Professors: A. Bonnin; K. Chang; G. Crump; L. Ma; Francesca Mariani; H. Tao; B. Thompson; H. Wu; Q. Ying

Associate Professor Clinical: J.D. Miller*

Assistant Professor Clinical: M. Winfield

Adjunct Professor: Vijaya Kumari

Emeritus Professors: D.A. Berman*; Dwight Warren III

Emeritus Associate Professor: C.K. Haun*

*Recipient of university-wide or school teaching award.

The Department of Cell and Neurobiology provides interdisciplinary training in molecular, cellular and systems biology. Ongoing programs explore basic mechanisms in molecular and cellular neurobiology, neurogenetics, endocrinology, pharmacology, stem cell biology and vertebrate evolution. Disease-oriented research, bridging basic and clinical disciplines, investigates inherited or acquired disorders in vision, stroke, Parkinson's disease, Alzheimer's disease, epilepsy and steroid abuse. The challenge is to weld interdisciplinary activities into a conduit for transferring basic science discoveries into more effective and innovative clinical interventions in the treatment of disease-related disabilities.

The Department of Cell and Neurobiology has 34 primary faculty members, including 21 dual appointments in other university departments or research institutes.

The graduate program of the Department of Cell and Neurobiology is dedicated to excellence and state-of-the-art training and education in molecular and cellular aspects of normal function and in acquired or genetic disorders that cause human disease. Professional and intellectual development is fostered through a broadly based curriculum from which students can tailor a menu of specialization and by a supportive environment of faculty interactions. Graduate education is designed to prepare the student for a lifetime of learning, exploring the limits of research, teaching and creative activities.

Master of Science and Certificate Program in Clinical, Biomedical, and Translational Investigations

Refer to page 760, for certificate and degree requirements.

Cell and Neurobiology Graduate Program

The graduate program offered in cell and neurobiology provides a flexible, individualized course of study directed toward developing independent, resourceful scholars. The major thrust of this program is devoted to

students training for the Ph.D. degree but study toward the M.S. degree is also possible.

Admissions

Master of Science The prerequisite for applicants to the M.S. graduate program in cell and neurobiology is a bachelor's degree with a science major or equivalent. Applicants should have a superior undergraduate record at an accredited college or university. Additional requirements include three letters of recommendation and satisfactory performance on the general and advanced (biology or chemistry) portions of the Graduate Record Examinations. Students are normally admitted for the academic year beginning in the fall; however admission to the master's program can begin in the spring semester with approval from the Graduate Admission Committee. Application deadline for the following academic year is January 1.

Doctor of Philosophy Doctoral candidates interested in working with CNB faculty in the areas of neural, computational, cognitive and behavioral science should apply through either of the two university wide interdisciplinary graduate programs at USC: the neuroscience graduate program or the Program in Biomedical and Biological Science (PIBBS). Applicants interested in working with CNB faculty as part of the M.D./Ph.D. program should apply directly to the Keck School of Medicine.

Application deadlines:

M.D./Ph.D. program – American Medical College Application Service (AMCAS) – November 1; Supplemental – December 1

Neuroscience – January 15 (see Graduate School, page 97, for Ph.D. student funding deadline information)

PIBBS – December 15

Master of Science

The Master of Science degree is awarded for demonstrated competence in the cell biological sciences, broadly defined. Two options are available: (1) a non-thesis M.S. program based entirely on course work followed by a comprehensive examination; and (2) a thesis M.S. program that includes fewer courses but requires a written thesis based on original laboratory research. Students take courses both from the Department of Cell and Neurobiology and other departments to obtain a broad appreciation of structure and function. Students must maintain a minimum GPA of 3.0. The Master of Science candidate may engage in teaching if this is beneficial to the individual program.

Students in the non-thesis program must complete a minimum of 34 units of graduate level courses (500 or higher) beyond the baccalaureate degree.

Non-thesis students must take 16 units from the following list of courses: BISC 421, BME 552, BME 575L, BME 670, BME 671, CNB 501ab, CNB 511abL, CNB 512L, CNB 513, CNB 521, CNB 525, CNB 534, CNB 631, INTD 504, INTD 531, INTD 555, INTD 561, INTD 571, INTD 572, INTD 573, MICB 551, NEUR 524. All students must pass additional courses totaling 18 units. All course work must be approved by the student's graduate adviser and the chair of the graduate program.

Students in the thesis program must complete a minimum of 38 units of graduate level courses (500 or higher) beyond the baccalaureate degree.

The regulations for thesis students are the same as specified above, except the student is required to take only 12 units from the course list and an additional 16 units from other departmental or non-departmental courses. Students will also take 6 units of CNB 590. The thesis M.S. student is required to take at least 4 units of Master's Thesis (CNB 594). All course work must be approved by the student's graduate adviser and the chair of the graduate program.

Doctor of Philosophy

The Ph.D. student develops background knowledge in cellular, molecular and structural biological sciences. The objective of the Ph.D. program is rigorous, original research experience obtained by design and execution of a dissertation project. Active research areas for which guidance is available include

cell and molecular biology, neurobiology of circadian rhythms, visual neuroscience, neuropharmacology, neurodegenerative and neurogenetic diseases, developmental and cellular neuroscience, neuroendocrinology, reproductive endocrinology and evolutionary biology.

Research Tool-Statistics

Each student must demonstrate competence in statistics. The student must demonstrate competence in the theory and use of statistics including knowledge of regression, correlation and analysis of variance. A student who has prior experience in statistics should consult the faculty adviser and petition the Graduate Advisory Committee to waive the research tool requirement. This requirement may be fulfilled by obtaining a grade of B (3.0) or higher in specified courses. This requirement must be fulfilled before the qualifying examination.

Course Requirements

A minimum of 60 units of course credit is required for the Ph.D. Course requirements vary according to the specific needs of the student. Graduate students must take at least 16 units from the following list of courses: BISC 421, BME 552, BME 575L, BME 670, BME 671, CNB 501ab, CNB 511abL, CNB 512L, CNB 521, CNB 525, CNB 534, CNB 631, INTD 504, INTD 531, INTD 555, INTD 561, INTD 571, INTD 572, INTD 573, MICB 551, NEUR 524. Ph.D. students must take additional classes or research units totaling 44 units from other departmental or non-departmental courses. All course work must be approved by the student's graduate adviser and the chair of the graduate program.

Prior to the qualifying examination, each student must complete at least three, eight-week periods of introductory research in the laboratories of departmental faculty. The purpose of the laboratory rotations is to encourage one-on-one interactions between new students and departmental faculty while at the same time providing an introduction to research in a sampling of departmental laboratories.

Course work outside of the departmental offerings is often encouraged and may be required by the student's guidance committee. In most instances, a program will include extradepartmental courses such as physiology, biochemistry and molecular biology. A grade point average of at least 3.0 (A = 4.0) must be maintained in both departmental and overall course work.

Communication Skills Requirement

The department considers teaching experience to be an important part of graduate education. Students in the Ph.D. program are required to serve a teaching practicum during at least one semester of their graduate training.

Screening Procedure

The Graduate Affairs Committee conducts a screening for each student at the end of one full year in the program. The committee reviews thoroughly all facets of the student's performance in the graduate program. The student's progress must be judged satisfactory before a guidance committee can be nominated.

Guidance Committee

Students are expected to select a general area of research interest and a dissertation adviser as soon as possible but no later than 18 months after entering the graduate program in this department. The dissertation adviser and the Graduate Affairs Committee consult with the student to select a guidance committee. After the student has successfully completed the first-year screening, the guidance committee's nomination is forwarded to the Graduate School.

Qualifying Examination

Before the end of their fifth semester of graduate standing, students in the Ph.D. program must pass both the written and oral portions of a qualifying examination. The examination is intended to reveal the student's insight and understanding of general concepts and the ability to design and defend a dissertation research project. The examination is designed and administered by the student's guidance committee.

Dissertation and Oral Defense

After the student has passed the qualifying examination, a dissertation committee (commonly comprising the former guidance committee) is appointed to advise the student regarding the research project and to supervise writing of the dissertation. The dissertation must be an original contribution giving evidence of the student's ability to perform independent and innovative research. The final oral defense shall be open to the public and the dissertation adviser will entertain questions from the dissertation committee and assembled audience.

Courses of Instruction

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

CELL AND NEUROBIOLOGY (CNB)

CNB 501ab Gross Human Anatomy (3-4, FaSp) A complete dissection of the adult human body. Supplementary lectures and demonstrations. Emphasis on correlating development, structure and function.

CNB 511abl Microscopic Anatomy (3-3, FaSp) Lectures and laboratory in microscopic anatomy emphasizing embryonic origin of the basic body plan, cells, tissues, and organs; ultrastructural and functional correlations.

CNB 512L Pharmacology I (5, Fa) Actions, chemical properties, bodily distribution, and toxicology of drugs. Laboratory. (Duplicates credit in former PHNU 510L.)

CNB 513 Pharmacology II (3, Sp) Continuation of 512L. (Duplicates credit in former PHNU 511.) *Prerequisite:* CNB 512L.

CNB 521 Neuroanatomy (3, Sp) Structure and function of the human nervous system with emphasis on central conduction pathways, especially those of clinical significance.

CNB 525 Neural Development (3, Fa) Cellular, molecular, and physiological features of development and plasticity in the nervous system. Lecture and student presentations and discussion of classic and current research literature. *Prerequisite:* BISC 524; *recommended preparation:* background in neurosciences.

CNB 530 Anatomy for the Artist (1-2, Irregular) This course includes lectures and demonstrations of human anatomy specifically for the artist, and art instruction on drawing the human figure.

CNB 531 Cell Biology (4, Fa) (Enroll in INTD 531)

CNB 534 Molecular Aspects of Neuropharmacology (2, FaSp) Current advances in selected areas of molecular neuropharmacology, e.g., mechanisms by which drugs affect neurotransmitter systems, neural plasticity, treatment of neurological and psychiatric diseases.

CNB 550 Cell and Neurobiology Seminar (1, max 6, FaSp) Reports and discussion on recent advances in anatomy. Graded CR/NC. (Duplicates credit in former ANCB 550.)

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

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

CNB 572 Systems Physiology and Disease I (4, Fa) (Enroll in INTD 572)

CNB 573 Systems Physiology and Disease II (4, Sp) (Enroll in INTD 573)

CNB 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.

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

CNB 598 Introductory Laboratory Rotations (1-3, FaSp) Introductory laboratory rotations wherein students are directed in individualized research, reading and discussion to provide perspective and supplemental background in areas of faculty research interests.

CNB 599 Special Topics (2-4, max 8, FaSp) Special topics provides background for instruction and research in the Department of Cell and Neurobiology through lectures, discussions, assigned readings, and student presentations. (Duplicates credit in former ANCB 599 and PHNU 599.)

CNB 600 Literature Tutorial (1, max 3, FaSp) Individualized readings and discussions culminating in a literature-review paper; to promote the acquisition of critical thinking skills in the evaluation of scientific problems. *Recommended preparation:* background in biological sciences.

CNB 603 Current Topics in Vision Research (2, Sp) Basic science (e.g., anatomy, cell biology, electrophysiology) and clinical aspects of the eye: cornea, lens, retina, and optic nerve. USC faculty and authorities from other institutions will lecture.

CNB 604 Current Topics in Animal Development (2, 2 years, Sp) Current research in selected aspects of mammalian and non-mammalian developmental biology, including the molecular genetics and molecular biology of organogenesis, morphogenesis, lineage specification, and differentiation. *Prerequisite:* INTD 561 and CNB 542.

CNB 631 Morphogenesis and Regeneration (2, 2 years, Sp) Analysis of developing and regenerating systems: historical and recent interpretations of morphogenetic movements, tissue interactions, fields, gradients, differentiation, and determination.

CNB 641 Brain-Endocrine Interactions in Reproduction (2, 2 years, Fa) Past and current experimental approaches to morphology and endocrinology at hypothalamic, pituitary, and gonadal levels in both males and females. *Prerequisite:* CNB 511abl or a general endocrinology course.

CNB 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.

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

Department of Family Medicine

Division of Physician Assistant Studies
Primary Care Physician Assistant Program
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 FAX: (626) 457-4245
 Email: uscpa@usc.edu
www.usc.edu/pa

Program Director: Kevin Loheny, Ph.D., PA-C

Medical Director: Ignacio DeArtola, M.D.

Faculty

Professor of Clinical Family Medicine: D. Lie

Assistant Professors of Clinical Family Medicine:
 I. DeArtola; M. Durham; C. Forest;
 L. Landry-Taylor; K. Loheny; J. Mabec

Instructors of Clinical Family Medicine:

L. Kirakosian; M. Maldonado; D. Mayo;
 A. Schultz; J. Tramel; A. Walsh; J. Wegler

The faculty listed above are faculty with the Primary Care Physician Assistant Program.

The Primary Care Physician Assistant Program prepares students to practice medicine under the supervision of a physician. Students earn a Master of Physician Assistant Practice (MPAP) upon completion of the program.

The program is part of the Department of Family Medicine's Division of Physician Assistant Studies. Didactic instruction is provided by physician assistant program faculty and faculty from other departments within the Keck School of Medicine, the USC School of Pharmacy, divisions within the Health Sciences Campus, as well as clinicians from the surrounding communities. Emphasis is placed on primary care medicine and caring for medically underserved populations. Clinical training occurs at various clinical sites throughout the greater Los Angeles region, including the Los Angeles County+USC Medical Center, Arrowhead Regional Medical Center, Long Beach Memorial Family Practice Residency, private offices and managed-care settings, community-based clinics, VA facilities and specialty settings. Opportunities to train in selected off-site settings serving Native American populations in the Southwest are also available to students upon approval.

Students complete eight, six-week clinical clerkships in emergency medicine, family medicine, internal medicine/geriatrics, orthopedics/occupational medicine, pediatrics, general surgery and women's health. These clerkships emphasize the development of

necessary clinical skills as well as learning to work as part of a health care team. The Primary Care Physician Assistant Program is committed to recruiting disadvantaged applicants and preparing graduates to practice in medically underserved communities.

The USC Primary Care Physician Assistant Program is accredited by the Accreditation Review Committee on Education for the Physician Assistant (ARC-PA), which is sponsored by seven national medical associations including the American Medical Association. The program is approved by the Physician Assistant Committee (PAC) of the Medical Board of California. Graduates must pass the NCCPA Physician Assistant National Certifying Exam to qualify for licensure in California.

Master of Physician Assistant Practice

Admission Requirements and Procedures

Application to the Physician Assistant Program requires completion of a bachelor's degree (in any discipline) from a regionally accredited four-year institution and completion of academic prerequisite requirements.

Admission to the program is for the fall semester only. Admission is granted by the physician assistant admissions committee after careful review of all applications. Selections are made on the basis of a formal interview (for competitive applicants) and consideration of a variety of factors which include: academic record, type and amount of clinical experience, multicultural sensitivity, community service experience and professional experience.

Applicants are required to submit an application through the Central Application Service for Physician Assistants (CASPA) as well as a USC Supplemental Application by December 1 of each year. Further details regarding admission procedures are provided online at www.usc.edu/pa.

Transfer Students or Advanced Placement

The Physician Assistant Program does not accept transfer students, nor do we allow advanced placement based on prior education or clinical experience. Each applicant who is admitted is required to complete the full Master of Physician Assistant Practice curriculum in residence at USC. No waivers or substitutions are permitted.

Registration

Students receive information regarding registration procedures during an orientation program held the week before classes begin.

Advisement

Monthly information sessions are available for prospective students who would like to receive more information regarding the program. Applicants who are interested in applying to the program are encouraged to visit the PA Program Website at www.usc.edu/pa or call the PA Program Office at (626) 457-4240.

Degree Prerequisites

A bachelor's degree from a regionally accredited institution and completion of all prerequisite course work are required for admission to the Physician Assistant Program.

Science Prerequisites

A one-year general biology sequence with lab and a one-year general chemistry sequence with lab, each for science majors. All science prerequisites must be completed within 10 years of application to the program.

Three semester units or 4 quarter units of each of the following: human anatomy with lab; human physiology with lab; and microbiology with lab.

Online science courses are not eligible for consideration as a prerequisite.

Students are expected to have a strong competency in medical terminology.

Non-Science Prerequisites

Six semester units or 8 quarter units: English composition (6) or English composition (3) and critical thinking (3) or logic (3).

Six semester units or 3 quarter units each: general (introduction to) psychology.

Three semester units or 4 quarter units of statistics, preferably statistics for psychology or sociology.

Two semester units or 3 quarter units: Spanish language composition and speech.

Students who intend to apply to the Physician Assistant Program should contact the admission office for evaluation of previous baccalaureate and/or post-baccalaureate course work.

Standardized Tests

The GRE (Aptitude) or the MCAT is required. Either test must be taken within five years of application to the program.

The program expects that applicants earn a combined quantitative and verbal score of no less than 1000 (a score of 450 or higher on the verbal is expected).

Clinical Experience Prerequisite

A minimum of 1,000 hours of "hands-on" patient care experience is strongly recommended. Successful applicants typically have 2,000 hours or more of paid clinical hours and have worked as one of the following: emergency medical technician, licensed vocational nurse, medical assistant, medical scribe, medical technologist, military medical corpsman, paramedic, psychiatric technician, physical therapy aide, radiological technician, respiratory therapist or registered nurse. Other health care experience is equally acceptable as long as the experience is "hands-on" in nature.

Physician Assistant Shadowing Experience

Shadowing a physician assistant in a clinical setting is strongly recommended. This activity provides the applicant with the up-close experience needed to understand the role and responsibilities of the PA and may help the applicant make a better informed decision in choosing a career as a PA.

Community Service Prerequisite

Community service activities/projects are strongly recommended of all applicants. Service which benefits medically underserved or disadvantaged populations is preferred.

Curriculum Requirements

The completion of a 33-month professional curriculum is required to earn the Master of Physician Assistant Practice degree. Students do not have choices of courses to take nor are they permitted to drop any course or courses during the semester. Progress is permitted only when the prior semester is successfully completed. Students should view the curriculum outlined here as advisory only and subject to modification.

Summative Evaluation

A summative evaluation is conducted on each student during the sixth and final semester of the program to verify that each student is prepared to enter clinical practice.

Degree Requirements

All students in the Master of Physician Assistant Practice degree program must meet course and grade point average requirements. All course requirements must be completed with a grade of "B" or better. The degree will not be conferred until the student has successfully completed all degree requirements. Students are subject to the degree requirements in the catalogue current for the semester of their admission into the program.

Physician assistant students are enrolled in a standard curriculum during their 33 months in the program. The following courses must be successfully completed in order to earn the Master of Physician Assistant Practice. Only physician assistant students may enroll in these courses. Departmental clearance is required to enroll.

| YEAR I, FALL SEMESTER | | UNITS |
|-------------------------|------------------------|-------|
| PCPA 503 | Behavioral Sciences I | 4 |
| PCPA 523 | Clinical Skills I | 4 |
| PCPA 530 | Basic Medical Sciences | 6 |
| PCPA 543 | Topics in Medicine I | 4 |
| | | 18 |
| YEAR I, SPRING SEMESTER | | UNITS |
| PCPA 506 | Behavioral Sciences II | 4 |
| PCPA 526 | Clinical Skills II | 6 |
| PCPA 546 | Topics in Medicine II | 6 |
| | | 16 |

| YEAR II, FALL SEMESTER | | UNITS |
|------------------------|-------------------------|-------|
| PCPA 509 | Behavioral Sciences III | 4 |
| PCPA 529 | Clinical Skills III | 6 |
| PCPA 549 | Topics in Medicine III | 6 |
| | | 16 |

| YEAR II, SPRING SEMESTER | | UNITS |
|--------------------------|------------------------|-------|
| PCPA 561 | Clinical Assignment I | 3.5 |
| PCPA 562 | Clinical Assignment II | 3.5 |
| PCPA 564a | Clinical Assignment IV | 3.5 |
| PCPA 565a | Clinical Assignment V | 3.5 |
| | | 14 |

| YEAR II, SUMMER SESSION | | UNITS |
|-------------------------|------------------------|-------|
| PCPA 564b | Clinical Assignment IV | 0 |
| PCPA 565b | Clinical Assignment V | 0 |

| YEAR III, FALL SEMESTER | | UNITS |
|-------------------------|--------------------------|-------|
| PCPA 563 | Clinical Assignment III | 3.5 |
| PCPA 566 | Clinical Assignment VI | 3.5 |
| PCPA 567 | Clinical Assignment VII | 3.5 |
| PCPA 568 | Clinical Assignment VIII | 3.5 |
| | | 14 |

| YEAR III, SPRING SEMESTER | | UNITS |
|---------------------------|--|-------|
| PCPA 532 | Clinical Skills IV | 3 |
| PCPA 583 | Advanced Topics in PA Studies: Education | 4 |
| PCPA 586 | Advanced Topics in PA Studies: Research | 4 |
| PCPA 589 | Advanced Topics in PA Studies: Medical Care Organization | 4 |
| | | 15 |

Requests for further information may be addressed to: USC Primary Care Physician Assistant Program, Keck School of Medicine, University of Southern California, 1000 South Fremont Avenue, Unit 7, Building A11, Room 11-150, Alhambra, CA 91803, or accessed at the program Website at www.usc.edu/lpa.

Courses of Instruction

PRIMARY CARE PHYSICIAN ASSISTANT (PCPA)

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

PCPA 503 Behavioral Sciences I (4, Fa) First of three-semester sequence in current topics in behavioral medicine, psychological and cultural factors in health and illness, interpersonal and sociological aspects of patient care, and competencies for PA practice. Open to physician assistant practice majors only.

PCPA 506 Behavioral Sciences II (4, Sp)

Second of three-semester sequence in current topics in behavioral medicine, psychological and cultural factors in health and illness, interpersonal and sociological aspects of patient care, and competencies for PA practice. Open to physician assistant practice majors only. *Prerequisite:* PCPA 503.

PCPA 509 Behavioral Sciences III (4, Fa)

Last of three-semester sequence in current topics in behavioral medicine, psychological and cultural factors in health and illness, interpersonal and sociological aspects of patient care, and competencies for PA practice. Open to physician assistant practice majors only. *Prerequisite:* PCPA 506.

PCPA 523 Clinical Skills I (4, Fa) Laboratory experiences with basic clinical skills essential to medical practice. First of four courses. Open to physician assistant practice majors only.

PCPA 526 Clinical Skills II (6, Sp) Laboratory experiences with basic clinical skills essential to medical practice. Second of four courses. Open to physician assistant practice majors only. *Prerequisite:* PCPA 523.

PCPA 529 Clinical Skills III (6, Fa) Laboratory experiences with basic clinical skills essential to medical practice. Third of four courses. Open to physician assistant practice majors only. *Prerequisite:* PCPA 526.

PCPA 530 Basic Medical Sciences (6, Fa)
A one-semester overview of clinical anatomy, physiology, pathophysiology, and pathology essential to understanding disease mechanisms commonly encountered in primary care and specialty practices of medicine. Open to physician assistant practice majors only.

PCPA 532 Clinical Skills IV (3, SpSm) Laboratory experiences with basic clinical skills essential to medical practice. Last of four courses. Open to physician assistant practice majors only. *Prerequisite:* PCPA 529.

PCPA 543 Topics in Medicine I (4, Fa) Basic instruction in normal/abnormal states of organ systems in the study of human disease. The first of three courses that includes instruction in pathophysiology, pharmacology, diagnostic studies, and medicine. Open to physician assistant practice majors only.

PCPA 546 Topics in Medicine II (6, Sp) Basic instruction in normal/abnormal states of organ systems in the study of human disease. The second of three courses that includes instruction in pathophysiology, pharmacology, diagnostic studies, and medicine. Open to physician assistant practice majors only. *Prerequisite:* PCPA 543.

PCPA 549 Topics in Medicine III (6, Fa) Basic instruction in normal/abnormal states of organ systems in the study of human disease. The third of three courses that includes instruction in pathophysiology, pharmacology, diagnostic studies, and medicine. Open to physician assistant practice majors only. *Prerequisite:* PCPA 546.

PCPA 561 Clinical Assignment I (3.5, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 562 Clinical Assignment II (3.5, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 563 Clinical Assignment III (3.5, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 564ab Clinical Assignment IV (a: 3.5; b: 0, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 565ab Clinical Assignment V (a: 3.5; b: 0, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 566 Clinical Assignment VI (3.5, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 567 Clinical Assignment VII (3.5, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 568 Clinical Assignment VIII (3.5, FaSpSm) One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

PCPA 583 Advanced Topics in PA Studies: Education (4, Sp) Seminar format: students explore educational theories and methods used by PAs in a variety of settings, including clinical practice, classroom and community. Open to physician assistant practice majors only.

PCPA 586 Advanced Topics in PA Studies: Research (4, Sp) Seminar format: students receive an integrated experience in research methods including methodology, data collection, analysis and evaluation. Open to physician assistant practice majors only.

PCPA 589 Advanced Topics in PA Studies: Medical Care Organization (4, Sp) Seminar format: students will explore current topics in medical care organization and physician assistant practice including administration, financing, changing organizational settings, and workforce issues. Open to physician assistant practice majors only.

Department of Molecular Microbiology and Immunology

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Faculty

Professor and Chair: Jae U. Jung, Ph.D.

Fletcher Jonas Foundation Chair of Molecular Biology and Immunology: Jae Jung, Ph.D.

Rita and Edward Polusky Chair in Basic Cancer Research: Michael Lieber, Ph.D., M.D.

Walter A. Richter Chair in Cancer Research: W. Martin Kast, Ph.D.

Leslie P. Weiner Chair in Neurology and Richard Angus Grant, Sr., Chair in Neurology: Leslie P. Weiner, M.D.

Chair, Graduate Advisory Committee: Stanley M. Tahara, Associate Professor

Professors: S. Chen; L. Comai; S.J. Gao; D.A. Horwitz (*Medicine*); M. Lieber (*Pathology, Biochemistry and Molecular Biology*); W.M. Kast; M. McMillan; J.-H. Ou; P. K. Pattengale (*Pathology*); L.P. Weiner (*Neurology*)

Associate Professors: Omid Akbari; E. Bogenmann (*Pediatrics*); P. Cannon; G. Coetzee (*Urology*); R. Duncan (*Pharmacy*); P. Feng; H.K.W. Fong (*Ophthalmology*); C. Hill (*Radiation Oncology*); A. Jong (*Pediatrics*); J.R. Landolph; H. Lee; A. Schönthal; S. Tahara; E. Zandi

Assistant Professors: R.W. DePaolo; X.F. Huang; C. Liang; K. Machida; T. Saito (*GI Liver-Medicine*); W. Yuan

Associate Professor of Research: S.Y. Park

Assistant Professors of Research: H. Jeong;
M. Villacres (*Pediatrics*)

Emeritus Professors: F. Aladjem; M. Lieb;
G. Dennert

Clinical Assistant Professor: Jie Li

Distinguished Professor, Emeritus: Michael M.C.
Lai

The Department of Molecular Microbiology and Immunology is located on the Health Sciences Campus in the Elaine Stevely Hoffman Medical Research Center, in the USC Norris Comprehensive Cancer Center and at the USC Institute for Genetic Medicine. Faculty guidance and specialized facilities are available for advanced research in animal virology, eucaryotic cell biology and cellular differentiation, molecular and cellular immunology, genetic diseases, microbial and molecular genetics, regulation of gene expression, and chemical and viral carcinogenesis.

Graduate Programs

Admissions

An applicant to the graduate programs in molecular microbiology and immunology must have a bachelor's degree from an accredited college or university with a major in science — usually biology, chemistry or physics. The applicant must have demonstrated strength in science or mathematics. Undergraduate course work should have included at least one year of biology, chemistry through organic chemistry, mathematics through calculus, physics and physical chemistry. Deficiencies may be made up early in the predoctoral program.

The department encourages applicants to contact its office prior to making formal application. Each applicant must pass satisfactorily the general and advanced (biochemistry, cell and molecular biology or biology, chemistry or physics) portions of the Graduate Record Examinations, and must also arrange for three letters of recommendation to be written. In addition, the applicant must provide a one-page statement of career objectives, including the general area of research interest. This statement is intended to facilitate selection of those students who will most benefit from the department's graduate program. A personal interview is strongly recommended but not required.

Applicants who have attended graduate school at another university may be admitted to advanced standing upon recommendation of the department.

Training Grants and Fellowships

Incoming domestic students may be supported by a departmental training grant or by a research grant to a specific faculty mentor during their first year; subsequently, students are supported by research grants awarded to individual faculty members. International students are supported by research assistantships.

Master of Science

The primary objective of the Master of Science program is to prepare students for a career in the broad field of biomedical sciences with focus on, but not limited to, microbiology, virology, immunology and cancer research. This program provides extensive theoretical preparation in combination with hands-on research, where students are trained in research laboratories located on the Health Sciences Campus (HSC), comprising the Keck Medical School, the School of Pharmacy and the USC Norris Comprehensive Cancer Center, or located at Children's Hospital Los Angeles (CHLA).

Goals of the program are to prepare students for employment opportunities in: academic research or teaching at universities, institutes or not-for-profit research centers; research and development in industry (biotech, pharma, petrol, dairies, breweries); health care (hospitals and health care providers, medical technology, diagnostic laboratories); law firms (patents, intellectual property rights, technology transfer, toxic torts); environmental organizations (advisory, management, planning); government (public health, waste management, EPA, FDA, NIH, etc.); publishing (journalism, journal editor).

Admission Requirements Applicants are expected to have a bachelor's degree in science (usually biology, chemistry or physics) from an accredited college or university. Generally required courses include: at least one year of college-level biology, chemistry through organic chemistry, mathematics through calculus, and one year of college-level physics. Students who do not meet all requirements may still apply, and admission will be decided on a case-by-case basis. In general, a minimum undergraduate GPA of 3.0 is expected. Additionally, a student must take the Graduate Record Examinations (GRE), and a minimum score of 1000 is expected. International applicants are expected to provide results from the Test of English as a Foreign Language (TOEFL; results from Internet-based, computer-based or paper-based tests are acceptable).

Course Requirements A total of 34 units is required. Students may pursue a thesis option which requires completion of MICB 594abz (2-2-0) plus 30 units of approved course work, no more than 8 of which can be MICB 590 Directed Research. Students pursuing a non-thesis option must complete 34 units of approved course work. Students must choose one of these options by the end of the first year of study.

Fourteen or more course units must be taken in the Department of Molecular Microbiology and Immunology; 8 units may be pursued outside the department and, upon approval, a maximum of 8 units of directed research in molecular microbiology and immunology may be applied to the degree. No more than 4 units of course work taken outside of USC can be applied toward the M.S. degree requirements. Students considering such an action should submit a petition to the department and document a rigorous academic standard for the course (reading materials, tests and other performance criteria, lecture content, etc.). The graduate advisory committee will review the petition and inform the student of its decision.

Doctor of Philosophy

The Department of Molecular Microbiology and Immunology offers a Ph.D. degree program geared toward training students for future independent research careers in an academic or industrial setting. The program introduces students to research early in their first year through rotations in laboratories. Subsequent required course work in basic and advanced topics and an intensive research experience are designed to foster independent and critical thinking.

Students normally select a faculty research adviser for their dissertation by the end of their first year.

Course Requirements A minimum of 60 units of graduate study is required for the Ph.D. degree; at least 30 of these must be taken at USC. Because the background of applicants varies widely, the department's graduate advisory committee consults with each student to design an individualized schedule of prescribed courses. In the course of their program, all students are expected to become familiar with the principles of microbiology and general biochemistry and to study advanced biochemistry, microbial physiology and genetics, immunology, virology, molecular biology, and chemical and viral oncology.

Screening Procedure Before completing more than six courses (24 units) in regular graduate status, each student is required to pass a written screening examination administered at the end of the first year of graduate study. This examination consists of questions submitted by the faculty and is intended to expose any areas of weakness in the student's abilities. After passing the screening examination, the student is expected to select an area of research and obtain the consent of a member of the department to serve as research adviser.

Guidance Committee The department's graduate advisory committee serves as the advisory committee for all first- and second-year graduate students. To replace the graduate committee, a five-member guidance committee is appointed for each student after the departmental screening examination is passed. The guidance committee is responsible for counseling the student, preparing the student for the qualifying examination, administering the examination, and recommending advancement of the student to candidacy for the Ph.D. degree. The student may recommend a chair for this committee, who must be a departmental faculty member but not the student's Ph.D. adviser. Appointment of the chair is subject to approval of the student's research adviser, the department chair and the graduate advisory committee. Other committee members must include three faculty members from within the department (other than the student's Ph.D. adviser) and one faculty member from another Ph.D. granting department. Members of the committee must be approved by the department chair and the full training committee faculty and are officially appointed by the dean of graduate studies.

Qualifying Examination Students in the Ph.D. program must pass both the written and oral portions of the qualifying examination administered by their guidance committee during the second year of graduate study. The examination consists of a research proposition which must be presented in written form and defended orally. The written proposition is an independent research proposal, outside of the student's immediate area of thesis research and supported by documentary references.

The graduate advisory committee and the guidance committee will instruct the student in how to prepare the proposition in appropriate subdisciplines of microbiology. The final draft of the written proposition must be submitted to the department faculty at least two weeks in advance of the oral examination. The oral examination is open, and all members of the department faculty may

participate in questioning the student. The examination will include exploration of the student's written proposition but need not be restricted to it; faculty may also question the student on relevant areas of science covered in course work or in current scientific literature. All portions of the oral examination must be completed at the same time.

Final evaluation of the examination is by vote of the guidance committee alone. If there is more than one dissenting vote from the guidance committee, the student is judged to have failed the examination. At the discretion of the committee, the student may be allowed to repeat the examination once within a period of one year from the date of the original examination but not before six months.

Annual Research Appraisal (ARA) Beginning in the second year, each graduate student presents a progress report to his or her research committee. For students not yet appointed to candidacy, their major adviser, one faculty member from within the department and one faculty member from outside the department comprise the committee. Students appointed to candidacy meet with their dissertation committee. Prior to the meeting, the student prepares a short written document describing significant experiments, problems and projected studies. This document is distributed to committee members and is included in the student's file. The ARA meeting is intended to be a working session between the student and his or her committee; experimental results and problems are discussed within this context. In addition the student presents a research plan for the next year of work.

A satisfactory ARA is required of every student for each year in residence.

A final ARA is required before the student is permitted to write the dissertation. The student collects and organizes all experimental data to be written into the dissertation as the final ARA document. This will be considered a preliminary draft of the dissertation. At the conclusion of the final ARA meeting, the dissertation committee will either recommend further experiments or approve the document and give permission for writing the dissertation.

Advancement to Candidacy When the student has successfully passed the qualifying examination, the guidance committee recommends the student's advancement to candidacy for the Ph.D. degree. Admission is by action of the dean of graduate studies. At this time the guidance committee also approves the student's dissertation topic.

Dissertation Committee After advancement to candidacy and approval of the dissertation topic, and with the unanimous recommendation of the committee to the dean of graduate studies, the guidance committee may be reduced to a three-member dissertation committee. Members of the dissertation committee should include the student's research adviser as chair, another faculty member from the department and one faculty member from outside the department; additional members may be appointed. This committee is responsible for counseling the student during preparation of the dissertation, and conducting the final oral examination during the dissertation defense.

Dissertation and Oral Defense The student's research is reported in a dissertation written under the guidance of the research adviser. The dissertation must demonstrate the student's capacity for independent research, scholarly achievement and technical mastery of a special field. When the final draft of the dissertation is ready, the student will take the final oral examination, which is open to the university community. This examination is a defense of the major research conclusions of the dissertation.

All doctoral candidates must be registered in 794 Doctoral Dissertation each semester (excluding summer sessions) from the time of their advancement to candidacy until their dissertation is approved for final text preparation. Under exceptional circumstances students may be excused from registration for a semester by petitioning the Graduate School for a leave of absence. The granting of a leave does not alter the student's responsibility to meet the time schedule for completion of all degree requirements.

Time Requirements It is the policy of the department to encourage students to complete the degree program for the Ph.D. as rapidly as possible. Ph.D. degrees are currently taking an average of four-and-a-half to five years. The university requires that the student complete the degree within six or eight years of the date on which USC graduate work commenced, depending upon whether the student was admitted with a prior applicable master's degree. Extensions may be granted for compelling reasons, but in no case may the time be extended for more than two years.

Courses of Instruction

MOLECULAR MICROBIOLOGY AND IMMUNOLOGY (MICB)

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

MICB 500L Introductory Medical Microbiology (4, Irregular) A survey of microorganisms which cause human infectious diseases including mechanisms of pathogenesis, principles of antibiotic usage, pertinent microbial genetics; lectures, laboratories and demonstrations. *Prerequisite*: one year general biology, one semester biochemistry.

MICB 501 Introduction to Immunology (1, Irregular) Basic introduction into molecular, cellular, and clinical immunology for second year medical students and graduate students in Microbiology. (Duplicates credit in BISC 450L.)

MICB 502 Molecular and Cellular Immunology (2, max 8, Irregular) Specific topics to be scheduled on a yearly and rotating basis. *Prerequisite*: MICB 501.

MICB 503 Current Topics in Immunology (1, max 8, Irregular) Discussion forum on the diverse areas of research which constitute modern immunology. *Prerequisite*: MICB 501.

MICB 504 Molecular Biology of Cancer (4, Sp) (Enroll in INTD 504)

MICB 522 Infection and Host Responses (4, Sp) (Enroll in INTD 522)

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

MICB 542 Animal Virology (2, max 6, Irregular) Virus structure and chemistry; virus-cell interactions; aspects of virus genetics; molecular biology; pathogenesis, immunology, and evolution of viral infections.

MICB 549 Student Seminar Series (1, max 8, FaSp) Microbiology students will present research seminars describing their thesis progress.

MICB 550 Microbial Pathogenesis (2, Irregular) Critical discussion of recent developments in pathogenesis of select microbial, viral and parasitic agents with particular emphasis on molecular factors and their synergistic (antagonistic) actions.

MICB 551 Prokaryotic Molecular Genetics (4, Fa) Macromolecular processes and their regulation in prokaryotes; DNA replication, transcription, and post-transcriptional events in general and as related to operons, phage biology, and eucaryotic organelles.

MICB 560 Recent Advances in Microbiology (1, max 6, Irregular) Intensive examination of selected topics in microbiology. Student presentations and critiques. Required for all graduate students.

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

MICB 570 Microbiology Research Seminar (1, max 10, FaSpSm) Critical discussion of current research topics. Students present published and unpublished research results for discussion and critique. *Prerequisite*: current enrollment in Microbiology Ph.D. program.

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

MICB 572 Systems Physiology and Disease I (4, Fa) (Enroll in INTD 572)

MICB 573 Systems Physiology and Disease II (4, Sp) (Enroll in INTD 573)

MICB 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.

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

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

MICB 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.

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

Department of Pathology

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Ph.D. Student Adviser: Florence M. Hofman, Ph.D., (323) 442-1153
FAX: (323) 442-3049

Faculty

Michael E. Selsted, M.D., Ph.D., *Professor and Chair*

Renette and Marshall Ezralow Family Chair in Cancer Therapeutics: Parkash Gill, M.D.

Harold E. Lee Chair in Cancer Research: Michael F. Press, M.D., Ph.D.

Kenneth T. Norris Jr. Chair in Medicine and Hastings Professor of Medicine: Edward D. Crandall, M.D., Ph.D.

Rita and Edward Polusky Chair in Basic Cancer Research: Michael Lieber, Ph.D., M.D.

Rupert and Gertrude Stieger Vision Research Chair: Narsing Rao, M.D.

Gavin S. Herbert Professor of Vision Research: David R. Hinton, M.D.

Professors: V. Askanas (*Neurology*); P.T. Chandrasoma*; C.-M. Chuong; T.D. Coates (*Pediatrics*); E.D. Crandall (*Medicine*); L. Dubeau; W.K. Engel (*Neurology*); A.L. Epstein; P.S. Gill (*Medicine, Urology*); F.H. Gilles (*Neurological Surgery, Neurology*); S. Govindarajan; D. Hinton (*Neurological Surgery,*

Ophthalmology); F.M. Hofman (*Ophthalmology, Neurological Surgery*); R.W. Jelliffe (*Medicine*); M.N. Koss; M.R. Lieber (*Biochemistry and Molecular Biology, Molecular Microbiology and Immunology*); T.M. Mack (*Family and Preventive Medicine*); C.A. Miller (*Neurology*); B.N. Nathwani; A. Ouellette; P.K. Pattengale (*Molecular Microbiology and Immunology*); M.F. Press; F.P. Quismorio, Jr. (*Medicine*); N.A. Rao (*Ophthalmology*); S. Rasheed; P. Roy-Burman (*Biochemistry and Molecular Biology*)*; M.E. Selsted; R.P. Sherwin; D.K. Shibata; I.A. Shulman; M.R. Stallcup (*Biochemistry and Molecular Biology*); C.R. Taylor; T.J. Triche (*Pediatrics*); H. Tsukamoto

Associate Professors: S. Bellusci (*Surgery*); T.C. Chen (*Neurological Surgery*); W. Cozen (*Preventive Medicine*); A. Erdreich-Epstein (*Pediatrics*); B.H. Gross (*Psychiatry and Behavioral Sciences, Medicine*); A. Kovacs (*Pediatrics*); B.W. Kovacs (*Obstetrics and Gynecology*); J.R. Landolph (*Molecular Microbiology and Immunology, Molecular Pharmacology and Toxicology*); H.A. Liebman (*Medicine*); S.E. Martin; S.B. Turkel (*Psychiatry and Behavioral Sciences, Pediatrics*)

Assistant Professors: S. Asgharzadeh (*Pediatrics*); E.P. Kartalov; Y.M. Kim (*Pediatrics*); K. Kobiela; R.D. Ladner; B. Stiles (*Pharmacology and Pharmaceutical Sciences*)

Adjunct Professor: W.M. Blackmore (*Physiology and Biophysics*)

Clinical Professors: R.D. Aller; C.A. Bell; H.N. Canawati; J.N. Carberry; J. Ciccirelli (*Urology*); K.A. Frankel; A.M. Gown; D.S. Harrington; R.E. Horowitz; G. Kanel; A. Keyser; L. Khawli; D.V. Kon; O.T. Kuzma (*Medicine*); D.H. Mills; D.L. Moyer; J. Nelson; P. Nichols; P.N. Rao; C. Rogers; A.A. Roscher; L. Sathyavagiswaran (*Medicine*); S.-R. Shi; S.V. Sostrin; A. Verity

Clinical Associate Professors: C. J. Cobb; M.M. Cosgrove; B.D. Florentine; T.E. Howard; G. Pezeshkpour; M. Pietruszka; A.S.S. Raza; J.S. Wollman

Clinical Assistant Professors: A. Baltayan; S.G. Brodie; E. Carpenter, Jr.; J.A. Chan; W. Chick; O. Chinwah; P.D. Colman; E.C. Dinovo; R. Gellibolian; M.D. Haimowitz; L.K. Kelly; M.T. Kiyabu; B. Kwok; B.J. Le Berthon; M.S. Lewis; A.M. Marinovich; K. Matsuda; V. Nelson; M. Osby; L.A. Pena; R. Phan; G. Pinsky; S.T. Pullarkat; V. Richters; L.A. Scheinin; R.A. Soni; K.J. Young; S.K. Young

Clinical Instructors: P. Javaherbin; G.N. Pontrelli

Professors of Clinical: R.K. Brynes; K.-M. Chan; D.L. Commins; J.F. Emerson; D.B. Endres; J.C. Felix (*Obstetrics and Gynecology*); E.M. Gomperts (*Pediatrics*); A.L. Hiti; Y. Iwaki (*Urology, Surgery*); P. Mhawech-Fauceglia; W.Y. Naritoku; L.M. Petrovic; A.E. Sherrod; H. Shimada; S. Wu (*Pediatrics*)

Professors of Research: J. Groffen (*Pediatrics*); E. Heisterkamp (*Pediatrics*)

Associate Professors of Clinical: N.J. Barr; D.B. Casebolt; A.N. Fedenko (*Orthopaedic Surgery*); D. Hawes; S. He (*Ophthalmology*); A.R. Judkins; Y. Ma; L.L. Wang (*Surgery*); P.M. Ward; G.D. Zeger

Assistant Professors of Clinical: J.A.M. Benjamin; M. Burnett (*Neurology*); A.J. Correa; C.E. Day; W.A. Elat; X. Fu; G.H. Kim; N.E. Klipfel; I. Knezevic-Maramica; K.K.Y. Lai; F. Ough; K.A. Rich; M. Shamszadeh; M.E. Sibug; I. Siddiqi; R.G. Simental-Pizarro; K.D. Tsoulas; J.D. Vallone; L. Wang; Y. Wang

Associate Professors of Research: W. Cozen (*Preventive Medicine*); R.B. Widelitz; L. Wu

Assistant Professors of Research: K. Asahani; Y.-P. Han (*Surgery*); T. Jiang; R.D. Ladner; S. Lee; R.A. Moats (*Radiology*); K.A. Nash; P. Tongaonkar; P. Wu; Jun Xu; J.F. Zhong; D. Zhu

Research Professor: T. Oki

Research Associate Professor: S.M. Brennan

Research Assistant Professors: P. Hu; N.W. Marten; Y. Ouyang

Resident Clinical Instructors: S. Acree; M. Afkhami; W. Apichairuk; W. Bishop; M. Boonyasampant; E. Broxman; D. Cortez; S. Das; A. D'Auria; N. Ellis; J. Friedman; A. Garcia; Juan Guo; T. Hacopian; A. Hagiya; M. Holden; M. Karunanayake; B. Kay; M. Kennedy; K.I. Kersch; G. Kim; C. Lee; E. Loo; C. Magana; A. Marachan; J. Marchan; A. Mathew; T. Meneses; C. Pang; M. Pessaraki; O. Press; K. Qidwai; X. Qing; N. Rawlinson; D. Samrao; M. Sharifian; B. Shlopov; S. Srivastava; L. Whitley (Zamis); J. Xie; Y. Xie; E. Yung

Emeritus Professors: S.B. Chandor; J.W. Parker; A. Richters; D. Tatter; R. Terry; N.E. Warner; E.T. Wong

Emeritus Associate Professor: A.D. Cramer

Emeritus Clinical Professors: H.S. Aijian; M. Greenblatt; G.G. Hadley; W.H. Kern; J.A. Kernen; E.B. Reilly; D.S. Shillam; R.J. Schroeder; S.C. Sommers; P.R. Thompson

Emeritus Clinical Associate Professor: W.C. Smith

Emeritus Clinical Assistant Professors: R.L. McClure; J.K. Waken

Emeritus Professors of Clinical: J.F.P. Dixon; T.T. Noguchi (*Emergency Medicine*)

Emeritus Associate Professor of Clinical: W.P. Lewis

Emeritus Assistant Professor of Clinical: R.B. Hopper

Emeritus Professor of Research: T.L. Lincoln

*Recipient of university-wide or school teaching award.

The Department of Pathology provides training for both medical and graduate students. Medical students are trained in general, systemic and cellular pathology, providing them with an understanding and visualization of the basic processes underlying symptoms and clinical courses, as well as the ability to evaluate laboratory findings. This department also contributes to the training of residents and fellows at the LAC+USC Healthcare Network, Keck Hospital of USC and USC Norris Cancer Hospital, and the VA Greater Los Angeles Healthcare Network, providing these residents and fellows with an intensive residency program in anatomic and clinical pathology and offering subspecialty fellowship training in surgical pathology, cytopathology, hematopathology and neuropathology.

The Department of Pathology has a Master of Science program. The two-year M.S. program provides training in the latest technologies and concepts of biomedical research and provides the graduate with enhanced opportunities for positions in biotechnology companies, teaching colleges and various health department/governmental positions.

With more than 87 full-time faculty and more than 40 residents and fellows in training, the USC Department of Pathology is one of the largest pathology departments in the United States. The department is particularly strong in areas of surgical pathology, cytopathology, hematopathology, immunocytochemistry, immunopathology, neuropathology, and AIDS-related research. The department maintains active research programs in hematopathology, neuropathology and translational cancer research and has begun to expand its base in radioimmunology and immunotherapy. It also has ongoing research projects in the new areas of molecular and genetic pathology. Since October 2003, the VA Greater Los Angeles Healthcare System Pathology Residency Training Program has been incorporated with the LAC+USC Medical Center Pathology Residency Training Program.

The department provides diagnostic laboratory services for the LAC+USC Medical Center, the USC Norris Cancer Hospital, the Doheny Eye Hospital, Keck Hospital of USC and the USC Clinical Laboratories Group. Approximately 40 of the department's full-time faculty members work in service laboratories throughout the LAC+USC Medical Center, where they are supported by 40 residents and fellows and a technical and clerical staff numbering in excess of 500. The USC Norris Cancer Hospital and Research Institute and Keck Hospital of USC houses seven full-time pathologists, two fellows, two residents and approximately 25 clerical and support staff.

Graduate Programs

General Admissions

Applicants to the graduate program in pathology must have a bachelor's degree from an accredited college or university with an undergraduate major in one of the natural sciences; a minimum cumulative GPA of 3.0 for undergraduate work is required. Applicants must submit undergraduate transcripts and letters of recommendation from two undergraduate teachers with their application. All applicants must take the general portion of the Graduate Record Examinations (GRE). A combined score of at least 1100 for the verbal and quantitative scores is required. International students whose native language is not English must submit scores from the TOEFL (Test of English as a Foreign Language) examination. Personal interviews by members of the department's Graduate Committee may be requested.

Original application materials, except letters of recommendation, should be sent to the Office of Admission, University of Southern California. To expedite consideration of the application, applicants should also send photocopies of the application, transcripts, and GRE scores to the Pathology Department's Graduate Committee secretary, Lisa Doumak. Letters of recommendation should be addressed directly to the secretary, Graduate Committee. Applications are considered for admission to both the fall and spring semesters.

Residency and Fellowship Programs

The Department of Pathology offers seven first-year residency positions and 28 residency positions in its fully approved four-year training program in anatomic and clinical pathology at the LAC+USC Medical Center. Training is offered in autopsy and surgical pathology, neuropathology, cytology, microbiology, hematopathology, immunohematology, clinical chemistry, toxicology, immunopathology, radioisotopes, cytogenetics, instrumentation, management, computer techniques, electron microscopy, molecular pathology

and other specialty areas. The Department of Pathology also offers the Accreditation Council on Graduate Medical Education (ACGME) fully-credited fellowship training in cytopathology (four positions), Hematopathology (two positions) and neuropathology (one position). The Surgical Pathology Fellowship Training Program recently received five years full accreditation of their program (seven positions).

Master of Science in Experimental and Molecular Pathology

The Department of Pathology offers a program for the master of science degree with a major in experimental and molecular pathology. The primary objectives of this program are to provide the necessary theoretical and practical training in experimental pathology that culminates with the master of science degree. Goals of the program are to train students in preparation for senior research staff or senior technician positions in academic or industrial institutes, further M.D. or Ph.D. study, consultantships requiring multidisciplinary backgrounds or advanced teaching positions in community colleges.

Admissions The prerequisite for applicants to this program in pathology is a bachelor's degree with an undergraduate major in one of the natural sciences. A minimum GPA of 3.0 in the natural sciences (including mathematics) is usually required. Applicants must achieve a competitive score on the general portions of the Graduate Record Examinations (GRE). In addition, the department requires at least three letters of recommendation from faculty members who can evaluate the applicant's potential for graduate work. Demonstrated proficiency in the English language is required. International students whose native language is not English must submit scores from the TOEFL (Test of English as a Foreign Language) examination. Special circumstances may provide consideration for conditional admission.

Course Requirements At least 34 units of graduate study are required. The required courses include INTD 522 Infection and Host Responses (4), INTD 531 Cell Biology (4), INTD 550 Introduction to Pathology (4), INTD 551 Pathobiology of Disease (4), INTD 571 Biochemistry (4), PATH 552ab Methods in Experimental Pathology (5) and PATH 570ab Seminar in Pathology (2). Fourteen or more course units must be taken in the Department of Pathology, 8 units may be pursued outside the department, and a maximum of 8 units of directed research in pathology may be applied to the degree. No more than 4 units of course work taken outside of USC should be applied toward the M.S. degree requirements. Students considering such an action should submit a petition to the pathology graduate committee and document a rigorous academic standard for the course (reading materials, texts and other performance criteria, lecture content, etc.). The pathology graduate committee reviews the petition and informs the student of its decision.

Master's Examinations/Master's Thesis

The Master of Science has the option of either an experiment-based thesis or theory-based thesis course of study. Each student's program will be tailored to suit individual needs and background. Students who require training mainly in the knowledge of pathology may opt for the theory-based thesis course of study. Students also have an opportunity to register for directed research (PATH 590). For the experiment-based thesis option, the student must take PATH 594ab Master's Thesis. For the theory-based thesis option, the student must take GRSC 810 Studies for Master's Examination during the semester they plan to graduate if not otherwise enrolled.

Courses of Instruction

PATHOLOGY (PATH)

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

PATH 500ab Basic and Applied Systemic Pathology (3-2, Irregular) Clinical, gross, and microscopic study of basic disease processes. Pathophysiology of major organ systems; etiology, pathogenesis and histopathology of important diseases; oral manifestations, clinical recognition.

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

PATH 550 Introduction to Pathology (4, Fa) (Enroll in INTD 550)

PATH 551 Pathobiology of Disease (4) (Enroll in INTD 551)

PATH 552ab Methods in Experimental Pathology (a: 3, Fa; b: 2, Sp) Includes advanced techniques in: *a*: cell biology and protein chemistry; *b*: DNA analysis. The course is a practical approach to acquaint graduate students with current methodologies and applications used in biomedical research.

PATH 555 Biochemical and Molecular Bases of Disease (4, Sp) (Enroll in INTD 555)

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

PATH 570abcd Seminar in Pathology (1-1-1-1, FaSp) Recent advances in the understanding of diseased cells and tissues are reported and discussed using standard seminars, as well as autopsy organ reviews.

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

PATH 572 Systems Physiology and Disease I (4, Fa) (Enroll in INTD 572)

PATH 573 Systems Physiology and Disease II (4, Sp) (Enroll in INTD 573)

PATH 575 Frontiers of Pathology (2, max 8, Sp) Weekly research lectures by leading investigators in the field of homeostatic response to injury such as cell death, inflammation, fibrosis and regeneration.

PATH 580 Cell Cycle Regulation (2, Sp)
The course will focus on recent advances in cell cycle research and discuss its potential significance for human development and health care. *Prerequisite:* biochemistry and cell biology.

PATH 581 Essentials of Animal Experimentation (1, Fa) A course providing basic information on the issues and responsibilities of investigators using animals in biomedical research. *Recommended preparation:* graduate standing.

PATH 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.

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

PATH 599 Special Topics (2-4, max 8, FaSp)

PATH 620 Neuropathology (2, max 8, Sp)
Diseases of the nervous system with special emphasis on disease processes exclusive to that organ system. *Prerequisite:* INTD 550; *corequisite:* INTD 551.

PATH 625 Comparative Pathology (2, Fa)
Unifying concept of diseases common to animals and man. Similarities and differences of diseases affecting certain organ systems of animals as compared to man. *Prerequisite:* INTD 550; *corequisite:* INTD 551.

PATH 630 Viral Oncology (2, Sp) Broad aspects of RNA and DNA viral oncology from epidemiology to molecular genetics. *Prerequisite:* INTD 550; *corequisite:* INTD 551.

PATH 650 Stem Cell Biology and Medicine (4, Sp) (Enroll in INTD 650)

PATH 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.

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

Department of Pediatrics Division of Medical Education

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(323) 442-2372
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Program Adviser: Diane Boughton
(323) 442-2384
Email: boughton@usc.edu

Faculty

Division Head: M.A. Hitchcock

Professors: M.A. Hitchcock (*Education*);
J.G. Nyquist; B.P. Wood

Associate Professors: J. Gates (*Family Medicine*);
R.A. Girard; W. May

Instructor: D. Poole

Clinical Faculty: A.M. Alexander; J. Davis;
D.L. Fisher; S.A. Lemme (*Family Medicine*);
D. Souder; M. Sullivan

Emeritus Professor: S. Abrahamson

Established in 1963 as one of the first medical education units in the United States, the division conducts educational programs for four different types of students: medical students; graduate students in education; those teaching in medical and other health professional education settings; and physicians in the postgraduate study of medical education.

The division's primary mission is to enhance the quality of medical education by serving as a resource of educational expertise for planning, developing, and evaluating medical education programs and conducting educational research. Similar activities and programs are conducted with various government and private organizations outside the university.

Major research and training interests of the faculty include the instruction of lay persons to be used as standardized patients for teaching and evaluation, case-based learning, pre-med programs for minority students and interactive video systems.

Administratively, the division is an independent unit in Educational Affairs in the Keck School of Medicine. The faculty hold appointments in the Department of Pediatrics. The division also employs 10 staff and research assistants. All activities of the division are conducted at the USC Health Sciences Campus.

Fellowship Programs

Teaching and Learning

A Teaching and Learning Fellowship program is offered to health care professionals who are engaged in teaching. The primary goals of this fellowship are to provide participants with multiple ways to teach and evaluate effectively. Through seminars, fellows will gain increased understanding of basic principles of teaching and learning and achieve the skills necessary to apply principles effectively.

Educational Leadership

An Educational Leadership Fellowship program is available for health care professionals with two primary goals: to prepare participants for understanding and serving in positions of leadership and enhance fellows' personal and professional effectiveness. Seminars will explore transformational change, team and community formation, group dynamics, organizational culture and resources.

Health Professions Teachers

From time to time, the division offers special workshops or seminars in various subject areas related to the improvement of instruction. Division staff members are available to plan these special programs on request.

Department of Physiology and Biophysics

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FAX: (323) 442-2283
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Student Adviser: H. Kaslow
 (323) 442-1244

Faculty

Berislav V. Zlokovic, M.D., Ph.D., *Chair of the Department of Physiology and Biophysics and Director of the Center for Neurodegeneration and Regeneration at the USC Zilkha Neurogenic Institute*

Director, USC Research Center for Liver Diseases, Chief, Division of Gastrointestinal and Liver Diseases, USC Associates/Thomas H. Brem Chair in Medicine, and Veronica P. Budnick, M.D., Chair in Liver Disease: Neil Kaplowitz, M.D.

Professors: Michael Arbib (*Computer Science/Engineering*); Thomas Buchanan (*Medicine/Obstetrics and Gynecology*); Vito M. Campese; Timothy M. Chan (*Molecular Pharmacology and Toxicology*); Casey Donovan (*Exercise Science*); Robert A. Farley* (*Biochemistry*); Caleb Finch (*Gerontology and Neurobiology*); Michael Goran (*Preventive Medicine*); Sarah Hamm-Alvarez (*Pharmaceutical Sciences*); Cage S. Johnson (*Medicine/Hematology*); Neil Kaplowitz (*Medicine/GI Liver/Patient Care*); Kwang Jin Kim (*Medicine, Biomedical Engineering*); Herbert J. Meiselman; Austin K. Mircheff; Dennis O'Leary (*Otolaryngology*); Janos Peti-Peterdi; Alan G. Watts

Master of Academic Medicine

The program addresses the unique population of medical and health professions faculty who are focused on leading the academic enterprise for health professionals at the undergraduate, graduate and continuing education levels. The six-semester program consists of 32 graduate units and employs a hybrid model, combining on-campus face-to-face sessions, blended with online course work. For more information, see page 767.

Associate Professors: Marilyn Ader; Robert H. Chow; Harvey R. Kaslow; Richard L. Lubman (*Medicine/Pulmonary Patient Care*); Alapakkam P. Sampath; Richard Watanabe; Jang-Hyun Youn; Alan S.L. Yu; Li Zhang

Assistant Professors: Steven Mittelman; Joyce Richey; Samuel Yiu

Adjunct Professor: Dwight W. Warren III

*Recipient of university-wide or school teaching award.

The Department of Physiology and Biophysics is located on the Health Sciences Campus, with laboratories and administrative offices in the Seeley Mudd Laboratory, the Doheny Eye Institute, the Parkview Medical Building and the Raulston Building. Faculty of the department are also located at the LAC+USC Medical Center and in research laboratories on the University Park Campus.

The graduate program in physiology and biophysics is designed to prepare students for a career in research and teaching in physiology and related fields. Faculty of the department guide students toward becoming effective members of today's scientific community by providing an integrated knowledge of physiological systems at several levels of organization. The course of study required of each candidate is planned to meet his or her individual interests and needs.

Faculty guidance and specialized facilities are available for advanced research in the four broad areas of research represented in the department: endocrinology, reproduction and metabolism; neurophysiology; fluid and electrolyte physiology; and cellular and molecular physiology.

Postgraduate Program

Individually tailored programs of study in medical education are available to visiting postdoctoral fellows who wish to gain an understanding of principles, problems and practices in medical education. These visiting fellows may spend from a few weeks to a year in residence, participating in ongoing projects, seminars, readings and independent study.

Graduate Programs*Admissions*

Applicants should have a bachelor's degree in one of the natural sciences. Undergraduate course work in mathematics (including one and a half years of calculus), physics (one year), organic chemistry (aliphatic and aromatic), and biological sciences (one year) is required. Prospective students should also have completed at least two courses from among the following areas: physical chemistry, advanced physics, electronics, histology, physiology, cell biology, computer science, or biochemistry. Equivalent work will be considered on an individual basis.

Students interested in applying must complete a departmental preapplication available from the director of graduate studies. Graduate Record Examinations scores, complete undergraduate transcripts and three letters of recommendation are required before the application can be considered.

The preapplication procedure should be completed before May 1 for admission to the following fall semester. All applicants must also apply formally to the university. Final acceptance is contingent upon completion of the official admission procedure.

Master of Science

Admission requirements are the same as for the Doctor of Philosophy degree.

Course Requirements The master's degree in physiology and biophysics requires completion of 33 graduate level units with a minimum grade point average of 3.0. All students

are required to take the following: INTD 500, INTD 572, INTD 573, PHBI 608ab and/or PHBI 550, PM 510L, and two of the following: INTD 531, INTD 571, NEUR 524, NEUR 531. Students enroll in additional graduate level classes with prior approval of their graduate student adviser. The Master of Science candidate has the option of either a thesis or non-thesis course of study; the thesis option is usually required if more than 6 research units make up a 33-unit course plan. The specific program followed by thesis-option students is tailored to suit individual needs and background in consultation with the academic director of the program and the student's guidance committee. There is no foreign language requirement.

Minimum standards for satisfactory performance and continued enrollment in the M.S. program are an average of 3.0 in all non-research courses, an average of 3.0 in all courses and a grade of B or higher in INTD 572, INTD 573 and PHBI 608a.

Doctor of Philosophy

Course Requirements A total of 60 units of graduate study is required for the Ph.D. degree. All students are required to take INTD 500, INTD 572, INTD 573, PHBI 608ab and/or PHBI 550, PM 510L, and two of the following: INTD 531, INTD 571, NEUR 524, NEUR 531. The balance of the 60-unit requirement will be drawn from advanced physiology courses and seminars, courses from other departments, research and the dissertation. The specific program to be followed by each student is determined in consultation with the student's adviser, guidance committee and the department faculty. There is no foreign language requirement.

Courses of Instruction

PHYSIOLOGY AND BIOPHYSICS (PHBI)

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

PHBI 524 Advanced Overview of Neurosciences (4, Fa) (Enroll in NEUR 524)

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

PHBI 550 Seminar in Advanced Cellular, Molecular and Systemic Physiology (1, max 12, FaSp) Lectures and student presentations on advanced topics in molecular, cellular and systemic physiology. Open to systems biology and disease program, physiology and biophysics, and pathobiology students only. Graded CR/NC.

Screening Procedure An overall GPA of 3.0 or better and a minimum grade of B (3.0) in all courses given by the department and also in INTD 531 are the minimum requirements for continuation in the Ph.D. program. After completion of the first two semesters of study, the eligibility of each student for continuation in the program will be reviewed by a departmental graduate screening committee. At the discretion of the graduate committee, successful completion of a screening examination may be required for progression to the third semester of graduate study.

Guidance Committee The guidance committee consists of at least five members, three of whom must be from within the department and at least one of whom must be drawn from the faculty of another department. The chair of the committee will be the student's dissertation adviser.

Qualifying Examination The purpose of the qualifying examination is to give the student a formal opportunity to demonstrate to the faculty that he or she is qualified to conduct independent research. Passing this examination is formal recognition that the student has independently developed a research proposal that is significant and can be reasonably accomplished with available resources.

At least 60 days prior to its scheduled date, the student must petition the Graduate School for permission to take the qualifying examination; the examination must be completed by the end of the semester during which application is made. Students must complete this examination no later than the fifth semester of graduate work. If the

student fails to take the examination by this time, the guidance committee will report a failure to pass the examination. The student then has one additional chance to take and pass the examination; this may not occur sooner than six months nor later than one year after the first examination. Applications to take the qualifying examination later than the fifth semester may be considered on an individual basis and must be approved by both the guidance committee chair and the department chair.

The qualifying examination consists of a written and an oral portion. For the written portion, the student must prepare a proposal for a research project. The proposal must be submitted to the members of the guidance committee not less than 10 days prior to the oral portion of the examination. For the oral defense, the student should prepare an oral presentation of the proposal of approximately 30 minutes duration and be prepared to answer questions regarding any topic related to the proposal.

Dissertation and Oral Defense Upon completion of the research project, and with the consent of the dissertation committee, the candidate prepares the written dissertation. After the dissertation has been read by the committee, the candidate must make an oral defense of the work.

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

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

PHBI 572 Systems Physiology and Disease I (4) (Enroll in INTD 572)

PHBI 573 Systems Physiology and Disease II (4) (Enroll in INTD 573)

PHBI 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.

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

PHBI 599 Special Topics (2-4, max 8, Sp)

PHBI 608ab Advanced Cellular, Molecular and Systemic Physiology (a: 2 or 4, Fa; b: 2 or 4, Sp) Lectures and student presentations on advanced topics in molecular, cellular and systemic physiology.

PHBI 618 Mathematical Modeling in Endocrinology and Metabolism (3, Fa) The application of mathematics to problems including hormone-receptor interactions, tracer kinetics, and regulation of hormones and substrates at the level of the whole organism. *Prerequisite:* Calculus III.

PHBI 650 Mechanisms of Ion and Solute Transport Across Cell Membranes (2, Fa)

Biophysical examination of the mechanisms of ion and solute transport across cell membranes; emphasis on the structures of transport proteins and kinetic models of transport. *Recommended preparation:* graduate level course in biochemistry, physical biochemistry, or cell biology.

PHBI 651 Molecular Modeling and Kinetic Simulations in Membrane Transport (2, Fa)

Introduction to the principles of mathematical modeling of biological systems and molecular dynamics simulations, with emphasis on membrane transport. *Recommended preparation:* graduate level courses in biochemistry or physical biochemistry, and cell biology.

PHBI 660 Understanding Diseases of Ion Transport (2, Sp) Examination of the genetics, biochemical mechanisms, and physiological characteristics of diseases caused by inherited mutations in ion channels and ion transport proteins.

PHBI 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.

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

Department of Preventive Medicine

Biostatistics Division

2001 N. Soto Street, Suite 201-A
Los Angeles 90032-3628
Director: W. Gauderman
(323) 442-1810
FAX: (323) 442-2993
Email: mtrujill@usc.edu
keck.usc.edu/Education/Academic_Department_and_Divisions/Department_of_Preventive_Medicine

Health Behavior Research Division

c/o USC/IPR
2001 N. Soto Street, Suite 201-B
Los Angeles 90032-3628
Director: Mary Ann Pentz, Ph.D.
(323) 442-8299
Email: barovich@usc.edu
keck.usc.edu/Education/Academic_Department_and_Divisions/Department_of_Preventive_Medicine

Environmental Health Division

2001 N. Soto Street, Suite 230
Los Angeles 90032-3628
Director: Frank D. Gilliland, M.D., Ph.D.
(323) 442-1096
FAX: (323) 442-3272
keck.usc.edu/Education/Academic_Department_and_Divisions/Department_of_Preventive_Medicine

Master of Public Health Program

2001 N. Soto Street, Suite 201-D
Los Angeles 90032-3628
Director: Louise A. Rohrbach, MPH, Ph.D.
(323) 442-8237
Email: oraliago@usc.edu
keck.usc.edu/Education/Academic_Department_and_Divisions/Department_of_Preventive_Medicine

Health Promotion and Disease Prevention Studies Program

3375 South Hoover Street
University Village, Suite E 210
Los Angeles, CA 90089-7798
Director: Elahe Nezami, Ph.D.
(213) 740-1060
FAX: (213) 821-1733
Email: bhealthy@usc.edu
www.usc.edu/medicine/hp

Global Health Studies

3375 South Hoover Street
University Village, Suite E 210
Los Angeles, CA 90089-7798
Director: Elahe Nezami, Ph.D.
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Email: bhealthy@usc.edu
www.usc.edu/globalhealthprogram

Faculty

AFLAC Chair in Cancer Research: Robert Haile, Ph.D.

The Dr. Robert C. and Veronica Atkins Chair in Childhood Obesity and Diabetes: Michael I. Goran, Ph.D.

Kenneth T. Norris Jr. Chair in Epidemiology: Brian E. Henderson, M.D.

Verna R. Richter Chair in Cancer Research: Duncan Thomas, Ph.D.

Flora L. Thornton Chair in Preventive Medicine: Jonathan M. Samet, M.S., M.D.

Harry J. Bauer and Dorothy Bauer Rawlins Professor of Cardiology: Howard N. Hodis, M.D.

Professors: S.P. Azen (*Biokinesiology and Physical Therapy, Ophthalmology, Occupational Science*); K. Berhane; R. Bluthenthal; G. Casey, C.-P. Chou (*Social Work*); P. Clarke (*Communication*); G. Coetzee (*Urology, Microbiology*); W.J. Gauderman; S. Gayther; F.D. Gilliland;

M. Goran (*Physiology/Biophysics and Pediatrics [CHLA]*); S. Gruskin; R. Haile; B.E. Henderson; H. Hodis (*Medicine*); B. Langholz; T.M. Mack (*Pathology*); Wendy Mack; R. McConnell; B. Meyerowitz (*Psychology*); M.A. Pentz; B. Portnoy (*Pediatrics*); J. Richardson; J.M. Samet; D. Stram; S. Sussman; T. Valente; D.C. Thomas; J. Unger; A. Wu; J. Zhang

Associate Professors: H. Allayee; L. Baezconde-Garbanati; J.C. Chen; M. Cockburn; D. Conti; W. Cozen (*Pathology*); C. Haiman; S. Ingles; S. Ramus; L. Rohrbach; T. Seeman (*Gerontology*); K. Siegmund; D. Spruijt-Metz; P.D. Thomas, Jr.; G. Ursin; R. Watanabe (*Physiology/Biophysics*)

Assistant Professors: B. Berman; C. Breton; C. Curtis; G. Dunton; S. Eckel; M. Franklin; J. Figueiredo; A. Leventhal; J.P. Lewinger; C.L. Pearce; N. Riggs; F. Schumacher; W. Setiawan; H. Wipfli

Professors of Clinical: E.L. Avol; J.T. Casagrande; D. Deapen; A. Hricko; J.M. McCoy

Associate Professors of Clinical: E. Nezami; D. Van Den Berg

Assistant Professors of Clinical: T. Boley-Cruz; C. Koprowski; L. Liu; K. Monroe; C. Patino-Sutton

Clinical Associate Professor: W.S. Linn

Clinical Assistant Professors: K. Dwyer; J. Schmitz

Professors of Research: T. Alonzo; J.D. Buckley (*Pediatrics*); S. Groshen; M. Krailo; B. Langholz; M.C. Pike; R. Sposto; F. Stanczyk (*Obstetrics and Gynecology*)

Associate Professors of Research: A. Hamilton; P. Marjoram; M. Stern

Assistant Professors of Research: D. Barkauskas; G. Chen; V. Cortessis; L. Chen; J. Davis; G. Dunton; S. Fruin; M. Gago; J. Huh; C. Lane; E. Lee; R. McKean-Cowdin; H. Mi; J. Milam; J. Millsten; L. Raskin; M.T. Salam; P. Sun; H. Volk; T. Zhou

Adjunct Professor: J. Niland

Adjunct Associate Professors: C.N. Bailey-Merz; M.R. Calderon; G. Marks

Adjunct Assistant Professors: J. Lawrence; J.A. Longmate; S.V. McKane; S. Montgomery

Emeritus Professors: Leslie Bernstein; R.K. Peters (*Family Medicine*); S. Preston-Martin

The Department of Preventive Medicine is responsible for training medical, graduate and undergraduate students in the areas of biostatistics, epidemiology, health behavior research, public health, and preventive medicine. Faculty from the statistical genetics and molecular epidemiology department also perform research in the areas of biostatistics, epidemiology of acute and chronic diseases, and environmental health.

The undergraduate and graduate programs offered by the department are noteworthy for the extensive opportunities offered to the students for involvement in faculty research. It is not uncommon for students to begin working closely with faculty members on research projects as early as their first or second year of study.

Degree Programs

The Department of Preventive Medicine offers the following degree programs:

B.S. in Global Health
 B.S. in Health Promotion and Disease Prevention Studies
 B.S. in Health Promotion and Disease Prevention/Master of Public Health
 B.S. in Health Promotion and Disease Prevention/M.S. in Biostatistics
 B.S. in Health Promotion and Disease Prevention/M.S. in Molecular Epidemiology
 B.S. in Dental Hygiene/Master of Public Health
 M.S. in Applied Biostatistics/Epidemiology
 M.S. in Clinical and Biomedical Investigations
 M.S. in Molecular Epidemiology
 M.S. in Biostatistics
 Master of Public Health
 Master of Public Health/Doctor of Medicine
 Master of Public Health (Health Promotion)/Ph.D. in Psychology (Clinical)
 Master of Public Health/Pharm.D.
 Master of Public Health/ Master of Planning
 Master of Public Health/Doctor of Physical Therapy

Master of Public Health/Master of Social Work
 Ph.D. in Biostatistics
 Ph.D. in Epidemiology
 Ph.D. in Molecular Epidemiology
 Ph.D. in Preventive Medicine (Health Behavior Research)
 Ph.D. in Statistical Genetics and Genetic Epidemiology

The Department of Preventive Medicine also offers the following undergraduate minor programs:

Minor in Cinema-Television for the Health Professions
 Minor in Cultural Competence in Medicine
 Minor in Global Health
 Minor in Health Communication
 Minor in Public Health
 Minor in Nutrition and Health Promotion
 Minor in Substance Abuse Prevention

Bachelor of Science in Health Promotion and Disease Prevention Studies

3375 S. Hoover Street
 University Village, Suite E 210
 Los Angeles, CA 90089-7798
 Director: Elahe Nezami, Ph.D.
 (213) 740-1060
 FAX: (213) 821-1733
 Email: bhealthy@usc.edu
www.usc.edu/medicine/hp

The undergraduate program in Health Promotion and Disease Prevention Studies (HP) provides a well-rounded, professionally-focused education leading to the Bachelor of Science degree. The program is concerned with the sociocultural, behavioral, psychological, and biological factors contributing to wellness and disease. It is an ideal major for students interested in medicine, pharmacy, dentistry, public health, epidemiology, health psychology, and health behavior research. Areas of study include: global health; cultural diversity in medicine; substance abuse prevention and program planning; nutrition and fitness; health promotion of minority and underserved populations; and general public health issues (e.g., HIV/AIDS, violence, health promotion in the workplace and behavioral medicine).

Program Requirements

The Bachelor of Science degree is awarded after students successfully complete 128 units, consisting of 66 units for the major and fulfillment of USC general education requirements including third semester equivalency in a foreign language.

General Education Requirements

The university's general education program requires six courses plus writing and diversity requirements, which provide a coherent, integrated introduction to the liberal arts and sciences. See pages 63 and 250 for more information.

Requirements for the Major (66 units)

The program is divided into core and elective components.

The following core component (42 units) is required of all students.

| NON-HP COURSES (20 UNITS) | | UNITS |
|---------------------------|--|-------|
| BISC 120L | General Biology: Organismal Biology and Evolution, or | |
| BISC 121L | Advanced General Biology: Organismal Biology and Evolution | 4 |
| BISC 220L | General Biology: Cell Biology and Physiology, or | |
| BISC 221L | Advanced General Biology: Cell Biology and Physiology | 4 |
| CHEM 105aL | General Chemistry, or | |
| CHEM 115aL | Advanced General Chemistry | 4 |
| MATH 116 | Mathematics for the Social Sciences, or | |
| MATH 125* | Calculus I | 4 |
| PSYC 100 | Introduction to Psychology | 4 |

*MATH 125 allows students who have placed out of MATH 116 to take a higher-level math class; it also satisfies the math requirement for premedical students.

| HP COURSES (22 UNITS) | | UNITS |
|-----------------------|---|-------|
| HP 200 | Introduction to Health Promotion and Disease Prevention | 4 |
| HP 300 | Theoretical Principles of Health Behavior | 4 |
| HP 320 | Biological and Behavioral Basis of Disease | 4 |
| HP 340L | Health Behavior Statistical Methods | 4 |
| HP 350L | Health Behavior Research Methods | 4 |
| HP 480 | Internship in Health Promotion and Disease Prevention, or | 2-4 |
| HP 490x | Directed Research | 2-8 |

Advanced HP and Health Profession Preparatory Courses

A total of 24 units of electives are required of all students (at least 12 of the 24 must be HP courses).

| ELECTIVES (24 UNITS) | | UNITS |
|----------------------|---|-------|
| BISC 320L | Molecular Biology | 4 |
| BISC 330L | Biochemistry | 4 |
| CHEM 105bL | General Chemistry, or | |
| CHEM 115bL | Advanced General Chemistry | 4 |
| CHEM 322abL | Organic Chemistry | 4-4 |
| EXSC 300L | Physiology of Exercise | 4 |
| EXSC 301L | Human Anatomy | 4 |
| EXSC 407aL | Advanced Exercise Physiology | 4 |
| HP 400 | Culture, Lifestyle, and Health | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 403 | Behavioral Medicine | 4 |
| HP 404 | Religion and Health | 4 |
| HP 405 | Sexually Transmitted Disease: A Global Public Health Priority | 4 |
| HP 408 | Environmental Health in the Community | 4 |
| HP 410 | Issues in Prevention and Cessation of Drug Abuse | 4 |
| HP 411 | Drug Intervention Program Design and Evaluation | 4 |
| HP 412 | Health Promotion and Prevention Policy | 4 |
| HP 420 | Gender and Minority Health Issues | 4 |
| HP 421 | Violence as a Public Health Issue | 4 |
| HP 422 | AIDS in Society | 4 |
| HP 430 | Obesity and Health | 4 |
| HP 431 | Behavior and Education Strategies for Nutrition and Fitness | 4 |
| HP 432 | Clinical Nutrition | 4 |
| HP 433 | Advanced Topics in Nutrition | 4 |
| HP 434 | Physical Activity and Health | 4 |
| HP 441 | Health Promotion in the Workplace | 4 |
| HP 442 | Chronic Disease Epidemiology | 4 |
| HP 450 | Traditional Eastern Medicine and Modern Health | 4 |
| HP 460 | Adolescent Health | 4 |
| HP 465 | Health Status of Indigenous Peoples of America | 4 |
| HP 485 | Global Health: Obesity and Nutrition | 4 |

| | | |
|-------------|--|-----|
| PHYS 135abL | Physics for the Life Sciences, or | 4-4 |
| PHYS 151L | Fundamentals of Physics I: Mechanics and Thermodynamics, and | 4 |
| PHYS 152L | Fundamentals of Physics II: Electricity and Magnetism | 4 |
| PPD 325 | Fundamentals of Health Policy and Management | 4 |
| PPD 330 | Introduction to Health Care Systems | 4 |
| PSYC 336L | Developmental Psychology | 4 |
| PSYC 355 | Social Psychology | 4 |
| PSYC 437 | Adolescent Development | 4 |
| SOCI 350 | Social Exclusion, Social Power, and Deviance | 4 |
| SOCI 475 | Medical Sociology | 4 |

Bachelor of Science in Global Health Studies

3375 S. Hoover Street
University Village, Suite E 210
Los Angeles, CA 90089-7798
Director: Elahe Nezami, Ph.D.
(213) 740-1060
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www.usc.edu/globalhealthprogram

The Bachelor of Science in Global Health is a multidisciplinary degree of the Keck School of Medicine's Department of Preventive Medicine. This undergraduate program offers an examination of public health and policy issues in the context of global affairs. Students complete course work from Health Promotion and Disease Prevention Studies and International Relations in addition to requirements from other schools of the university. The program provides students with a strong background in understanding and evaluating global health issues and prepares students to become health professionals with international competencies. This program is an ideal major for students interested in medicine, pharmacy, dentistry, international relations, public health, epidemiology, health psychology and health behavior research.

Program Requirements

The Bachelor of Science degree is awarded after students successfully complete 128 units, consisting of 66 units for the major and fulfillment of USC general education requirements including third semester equivalency in a foreign language.

General Education Requirements

The university's general education program requires six courses plus writing and diversity requirements, which provide a coherent, integrated introduction to the liberal arts and sciences. See pages 63 and 250 for more information.

Requirements for the Major (66 units)

The program is divided into core and elective components. As part of the core research requirements, students must complete a directed research requirement, HP 490x, with a specific international research focus.

The core component (42-46 units) is required for all students.

| CORE COURSES (32 UNITS) | | UNITS |
|-------------------------|---|-------|
| BISC 220L | General Biology: Cell Biology and Physiology, or | |
| BISC 221L | Advanced General Biology: Cell Biology and Physiology | 4 |
| CHEM 105aL | General Chemistry, or | |
| CHEM 115aL | Advanced General Chemistry | 4 |
| ECON 203 | Principles of Microeconomics | 4 |
| HP 270 | Introduction to Global Health | 4 |
| HP 320 | Biological and Behavioral Basis of Disease | 4 |
| HP 470 | Case Studies in Global Health | 4 |
| IR 308 | Globalization: Issues and Controversies | 4 |
| MATH 125 | Calculus I | 4 |

CORE RESEARCH COURSES (10-16 UNITS)

| CORE RESEARCH COURSES (10-16 UNITS) | | UNITS |
|-------------------------------------|-------------------------------------|-------|
| HP 340L | Health Behavior Statistical Methods | 4 |
| HP 350L | Health Behavior Research Methods | 4 |
| HP 490x | Directed Research 2-8, max 8 | |

Students must choose 24 units of elective course work from the following lists. At least 8 units must be from HP and at least 8 units must be from IR.

HP ELECTIVES (MINIMUM 8 UNITS)

| HP ELECTIVES (MINIMUM 8 UNITS) | | UNITS |
|--------------------------------|--|-------|
| HP 300 | Theoretical Principles of Health Behavior | 4 |
| HP 400 | Culture, Lifestyle, and Health | 4 |
| HP 401 | Cultural Competence in Medicine: Promoting Health in Diverse Communities | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 403 | Behavioral Medicine | 4 |
| HP 404 | Religion and Health | 4 |
| HP 405 | Sexually Transmitted Diseases: A Global Public Health Priority | 4 |
| HP 420 | Gender and Minority Health Issues | 4 |
| HP 422 | AIDS in Society | 4 |
| HP 450 | Traditional Eastern Medicine and Modern Health | 4 |

| IR ELECTIVES (MINIMUM 8 UNITS) | | UNITS |
|-----------------------------------|---|-------|
| IR 305 | Managing New Global Challenges | 4 |
| IR 306 | International Organizations | 4 |
| IR 307 | Contemporary International Politics | 4 |
| IR 308 | Globalization: Issues and Controversies | 4 |
| IR 315 | Ethnicity and Nationalism in World Politics | 4 |
| IR 323 | Politics of Global Environment | 4 |
| IR 325 | Rich and Poor States in the World Political Economy | 4 |
| IR 371 | Global Civil Society: Non-State Actors in World Politics | 4 |
| IR 424 | Citizenship and Migration in International Politics | 4 |
| IR 444 | Issues and Theories in Global Society | 4 |
| OTHER ELECTIVES (MAXIMUM 8 UNITS) | | UNITS |
| BISC 120Lx | General Biology: Organismal Biology and Evolution, or | |
| BISC 121L | Advanced General Biology: Organismal Biology and Evolution | 4 |
| BISC 320L | Molecular Biology | 4 |
| BISC 330L | Biochemistry | 4 |
| CHEM 105bL | General Chemistry, or | |
| CHEM 115bL | Advanced General Chemistry | 4 |
| CHEM 322aL | Organic Chemistry | 4 |
| CHEM 322bL | Organic Chemistry | 4 |
| GERO 483 | Global Health and Aging | 4 |
| PHYS 135aL | Physics for the Life Sciences, or | |
| PHYS 151L | Fundamentals of Physics I: Mechanics and Thermodynamics | 4 |
| PHYS 135bL | Physics for the Life Sciences, or | |
| PHYS 152L | Fundamentals of Physics II: Electricity and Magnetism | 4 |
| POSC 442 | The Politics of Human Differences: Diversity and Discrimination | 4 |
| POSC 451 | Politics of Resources and Development | 4 |
| POSC 456 | Women in International Development | 4 |
| PPD 250 | Third World Cities | 4 |
| PPD 382 | International Development | 4 |
| SOCI 432 | Racial and Ethnic Relations in a Global Society | 4 |
| SOCI 460 | Key Issues in Contemporary International Migration | 4 |
| SOCI 470 | Development and Social Change in the Third World | 4 |

Progressive Degree Programs in Preventive Medicine

The Master of Public Health, the Master of Science in Biostatistics and the Master of Science in Molecular Epidemiology programs admit a limited number of undergraduate students to a progressive degree program which allows them to pursue a master's level degree while completing the bachelor's degree. Applicants to the program must have completed 64 units of course work and must submit their applications prior to the completion of 96 units of course work. Applicants need not submit GRE scores, but are expected to have a minimum GPA of 3.0 at the time of application. The application for admission to a progressive degree program must be accompanied by an approved course plan proposal and two letters of recommendation. The requirements for both the B.S. and the master's degrees must be satisfied, including a minimum of 128 undergraduate units. For further details on progressive degree programs, see page 86.

Minor in Cinema-Television for the Health Professions

This minor introduces pre-health students to the theory and techniques of the cinematic arts and to a set of media practices useful for the implementation of health promotion strategies. This minor is designed for students who plan to enter careers or professional programs in medicine after graduation and are interested in working with film and television producers to disseminate accurate health information to the public. It complements major programs such as biological sciences, chemistry, kinesiology, health promotion and disease prevention studies, and environmental studies.

REQUIRED COURSES (24 UNITS)

| | | UNITS |
|-----------------------|--|-------|
| CTCS 190 | Introduction to Cinema | 4 |
| HP 345 | Health Issues in Entertainment Media | 4 |
| Two of the following: | | |
| HP 370 | Introduction to Epidemiology: Methods and Applications | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 408 | Environmental Health in the Community | 4 |
| HP 410 | Issues in Prevention and Cessation of Drug Abuse | 4 |
| HP 420 | Gender and Minority Health Issues | 4 |
| HP 421 | Violence as a Public Health Issue | 4 |
| HP 422 | AIDS in Society | 4 |

Eight additional units from the following:

| | | |
|-----------|--|-----|
| CTAN 451 | History of Animation | 2 |
| CTCS 400 | Non-Fiction Film and Television | 4 |
| CTPR 301 | Creating the Non-Fiction Film | 4 |
| CTPR 375 | Functions of a Director | 4 |
| CTPR 385 | Colloquium: Motion Picture Production Techniques | 4 |
| CTPR 474 | Television Documentary Production | 4 |
| CTWR 315x | Filmwriting | 3 |
| CTWR 412 | Introduction to Screenwriting | 2 |
| CTWR 416 | Motion Picture Script Analysis | 2-4 |

Minor in Cultural Competence in Medicine

This minor is designed for students who plan to enter careers or professional programs in medicine after graduation and are interested in using cultural knowledge to provide more effective health care. The minor focuses on cultural differences in the understanding of health, disease, health care and risk factors unique to specific populations. The minor provides a foundation for students who want to become effective health care providers in an increasingly diverse society. It complements major programs such as biological sciences, chemistry, kinesiology and environmental studies.

REQUIRED COURSES (20 UNITS)

| | | UNITS |
|-----------------------|---|-------|
| HP 200 | Introduction to Health Promotion and Disease Prevention | 4 |
| HP 400 | Culture, Lifestyle and Health | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 420 | Gender and Minority Health Issues | 4 |
| One of the following: | | |
| HP 370 | Introduction to Epidemiology: Methods and Applications | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 408 | Environmental Health in the Community | 4 |
| HP 410 | Issues in Prevention and Cessation of Drug Abuse | 4 |
| HP 421 | Violence as a Public Health Issue | 4 |
| HP 422 | AIDS in Society | 4 |
| HP 442 | Chronic Disease Epidemiology | 4 |
| HP 450 | Traditional Eastern Medicine and Modern Health | 4 |
| HP 460 | Adolescent Health | 4 |
| PSYC 462 | Minority Mental Health | 4 |

Minor in Global Health

This minor provides students with a basic understanding of the factors that determine the health of populations around the globe. Curriculum focuses on the cultural, environmental and clinical aspects of various health topics such as maternal and child health, aging, obesity, infectious disease and others. By studying these issues, students from majors across the university will be prepared to assess and contribute to the resolution of emerging global health challenges. This minor will appeal to a wide variety of majors, particularly majors centered on international affairs, business and health care.

| REQUIRED COURSES (20 UNITS) | | UNITS |
|-----------------------------|---------------------------------|-------|
| HP 270 | Introduction to Global Health | 4 |
| HP 470 | Case Studies in Global Health | 4 |
| Three of the following: | | |
| GERO 483 | Global Health and Aging | 4 |
| HP 400 | Culture, Lifestyle, and Health | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 422 | AIDS in Society | 4 |

Minor in Health Communication

This minor is designed to appeal to students with a wide range of interests, including those with a general interest in promoting healthy lifestyle practices through effective communication. These students will be prepared to seek jobs in areas such as the managed care industry, hospitals, wellness programs, broadcast and cable companies, and private and governmental agencies, as well as other organizations looking for experts with demonstrated knowledge in health-related fields.

| REQUIRED COURSES (20 UNITS) | | UNITS |
|-----------------------------|---|-------|
| COMM 302 | Persuasion | 4 |
| COMM 385 | Survey of Organizational Communication | 4 |
| COMM 443 | Health Communication Strategies and Evaluation | 4 |
| HP 200 | Introduction to Health Promotion and Disease Prevention | 4 |
| One of the following: | | |
| COMM 304 | Interpersonal Communication | 4 |
| COMM 308 | Communication and Conflict | 4 |
| COMM 315 | Health Communication | 4 |
| COMM 324 | Intercultural Communication | 4 |
| COMM 375 | Business and Professional Communication | 4 |

| | | |
|----------|--|---|
| COMM 402 | Public Communication Campaigns | 4 |
| COMM 480 | Nonverbal Communication | 4 |
| COMM 486 | Human and Technological Systems in Organizations | 4 |
| HP 370 | Introduction to Epidemiology: Methods and Applications | 4 |
| HP 400 | Culture, Lifestyle, and Health | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 403 | Behavioral Medicine | 4 |
| HP 408 | Environmental Health in the Community | 4 |
| HP 412 | Health Promotion and Prevention Policy | 4 |
| HP 420 | Gender and Minority Health Issues | 4 |
| HP 421 | Violence as a Public Health Issue | 4 |
| HP 422 | AIDS in Society | 4 |
| HP 430 | Obesity and Health | 4 |
| HP 442 | Chronic Disease Epidemiology | 4 |

Minor in Public Health

This minor is designed for students interested in a broad array of health issues. The focus of the minor is on reducing disability and mortality from avoidable injuries and chronic disease, educating the community about healthy lifestyles, assuring access to health care, and measuring changes using various indicators over time. This minor teaches students to meet the challenges of the changing environment of the health care system. It complements a number of majors including psychology, sociology, American studies and ethnicity, biological sciences, economics, environmental studies, kinesiology, gender studies, international relations, philosophy, religion, gerontology and political science.

| REQUIRED COURSES (20-24 UNITS*) | | UNITS |
|---------------------------------|---|-------|
| HP 200 | Introduction to Health Promotion and Disease Prevention | 4 |
| PPD 330 | Introduction to Health Care Systems | 4 |
| Three of the following: | | |
| HP 370 | Introduction to Epidemiology: Methods and Applications | 4 |
| HP 400 | Culture, Lifestyle, and Health | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 403 | Behavioral Medicine | 4 |
| HP 408 | Environmental Health in the Community | 4 |

| | | |
|--------|--|---|
| HP 410 | Issues in Prevention and Cessation of Drug Abuse | 4 |
| HP 412 | Health Promotion and Prevention Policy | 4 |
| HP 420 | Gender and Minority Health Issues | 4 |
| HP 421 | Violence as a Public Health Issue | 4 |
| HP 422 | AIDS in Society | 4 |
| HP 430 | Obesity and Health | 4 |
| HP 441 | Health Promotion in the Workplace | 4 |
| HP 442 | Chronic Disease Epidemiology | 4 |
| HP 460 | Adolescent Health | 4 |

Minor in Nutrition and Health Promotion

This minor is designed to appeal to students interested in nutrition, especially in preparation for graduate study in health-related fields (e.g., medicine, public health) or to enter health-related fields of employment. The focus of the minor is on assessing, planning and evaluating dietary intake of individuals or groups under various conditions of health and disease based upon principles of nutrition and behavioral science. Students in this minor will study factors associated with dietary habits and the development of effective individual and group interventions. It complements majors including psychology, gerontology, biological sciences, chemistry, kinesiology and environmental studies.

| REQUIRED COURSES (20 UNITS) | | UNITS |
|-----------------------------|---|-------|
| HP 230 | Nutrition and Health | 4 |
| HP 430 | Obesity and Health | 4 |
| HP 431 | Behavior and Education Strategies for Nutrition and Fitness | 4 |

Two of the following:

| | | |
|---------|--|------------|
| HP 370 | Introduction to Epidemiology: Methods and Applications | 4 |
| HP 400 | Culture, Lifestyle, and Health | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 403 | Behavioral Medicine | 4 |
| HP 412 | Health Promotion and Prevention Policy | 4 |
| HP 420 | Gender and Minority Health Issues | 4 |
| HP 432 | Clinical Nutrition | 4 |
| HP 433 | Advanced Topics in Nutrition | 4 |
| HP 460 | Adolescent Health | 4 |
| HP 480 | Internship in Health Promotion and Disease Prevention | 2-4, max 4 |
| HP 490x | Directed Research | 2-8, max 8 |

Minor in Substance Abuse Prevention

This minor offers students an opportunity to gain an overall understanding of substance abuse as a major modifiable risk factor for illness. It allows students to learn theories of behavior change, to understand the issues in prevention and cessation of drug abuse, and to develop, implement, and evaluate intervention strategies. It complements a number of majors including psychology, sociology, American studies and ethnicity, biological science and gerontology.

| REQUIRED COURSES (24 UNITS*) | | UNITS |
|------------------------------|--|-------|
| HP 200 | Introduction to Health Promotion and Disease Prevention | 4 |
| HP 300* | Theoretical Principles of Health Behavior (Prerequisite: PSYC 100) | 4 |
| HP 410 | Issues in Prevention and Cessation of Drug Abuse | 4 |
| HP 411 | Drug Intervention Program Design and Evaluation | 4 |
| One of the following: | | |
| HP 370 | Introduction to Epidemiology: Methods and Applications | 4 |
| HP 400 | Culture, Lifestyle, and Health | 4 |
| HP 401 | Cultural Competence in Medicine | 4 |
| HP 402 | Maternal and Child Health | 4 |
| HP 403 | Behavioral Medicine | 4 |
| HP 412 | Health Promotion and Prevention Policy | 4 |
| HP 421 | Violence as a Public Health Issue | 4 |

*Including prerequisite

Graduate Programs – Admissions

Master of Science in Applied Biostatistics/ Epidemiology

The department encourages applicants with undergraduate degrees in allied health, pharmacology, public health, medicine, biological and clinical sciences or other related fields. Undergraduate preparation should have included applied statistics, college algebra, an introductory course in calculus and basic computer programming. Applicants should also meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a GPA of 3.0 for the first 12 units of graduate study.

Master of Science in Biostatistics

The department encourages applicants with undergraduate degrees in mathematics, statistics or biostatistics, computer science or other related fields. Undergraduate preparation should have included differential and integral calculus, introduction to mathematical statistics, and basic computer programming. Applicants should also meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a GPA of 3.0 for the first 12 units of graduate study.

Master of Science, Molecular Epidemiology

Students with a bachelor's degree in quantitative biological sciences will be eligible for admission. In addition, the B.A. students must have completed at least one year of general biology, one semester of biochemistry and one semester of statistics to be admitted into the Graduate School. Under unusual circumstances, conditional acceptance will be offered to students who do not meet these requirements — allowing them to complete the missing undergraduate courses prior to their full admission into the Graduate School. An introductory biochemistry class is also available in the School of Pharmacy, which may satisfy the biochemistry prerequisite. A joint departmental admission committee will review all applicants.

Master of Public Health

The MPH program has seven tracks: Health Education and Health Promotion, Biostatistics/Epidemiology, Health Communication, Child and Family Health, Global Health Leadership, Public Health Policy and Environmental Health. The curriculum includes a set of core courses for each track and electives. The program also includes an internship placement that integrates academic and practical experiences and prepares individuals to work in governmental and non-governmental organizations in health-related fields.

The department encourages applicants from the USC undergraduate program in health promotion and disease prevention and throughout the campus, as well as health professionals seeking advanced degrees, medical students who are interested in pursuing an MPH along with their medical degree, nurses who desire a more public health focus, pharmacists and dentists. Applicants should meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a grade point average of 3.0

(A = 4.0) in PM 501, PM 510L and PM 512 (12 units).

Doctor of Philosophy in Biostatistics

The department encourages applicants with undergraduate degrees in mathematics, statistics or biostatistics, or other related fields. Undergraduate preparation should have included differential and integral calculus, introduction to mathematical statistics and basic computer programming. Applicants should also meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a GPA of 3.5 for the first 12 units of graduate study.

Doctor of Philosophy in Epidemiology

The department encourages applicants who have undergraduate degrees in allied health, public health, biological sciences or other related fields. Applicants not meeting these requirements may, with approval of the Graduate School, be conditionally admitted contingent upon maintaining a GPA of 3.5 in the first 12 units of graduate studies. Applicants should also meet the minimum requirements for admission to the Graduate School.

Doctor of Philosophy in Molecular Epidemiology

The department encourages applicants who have undergraduate or master's degrees in quantitative biological sciences or other related fields. Undergraduate preparation should include at least one year of general biology, one semester of biochemistry and molecular biology, and one semester of applied statistics. The Ph.D. program is designed to train students for future independent research careers in an academic, government or private sector setting. The objective of the Ph.D. program is to produce a molecular epidemiologist with in-depth laboratory, statistical and analytic skills in both epidemiology and the molecular biosciences. To meet this objective, the program introduces students to molecular/laboratory science and research early in their training.

The program will consider applicants who satisfy all requirements for admission to the Graduate School and demonstrate proficiency in the English language. Applicants not meeting Graduate School requirements for regular standing may, with approval of the Graduate School, be conditionally admitted. Regular standing is contingent upon maintaining a GPA of 3.5 in the first 12 units of graduate credit.

A student in one of the division's master's programs in biostatistics, epidemiology or molecular epidemiology may be considered for either the Ph.D. in biostatistics, epidemiology or molecular epidemiology prior to completing the M.S. degree, providing he or she has met the requirements for admission to the Ph.D. program, obtained approval of the department's Admission Committee, demonstrated research and writing ability, and passed the doctoral-level screening examination. For further information contact: Mary Trujillo, Program Coordinator, Keck School of Medicine, Department of Preventive Medicine, Division of Biostatistics, Center for Health Professions 222, 1540 Alcazar Street, Los Angeles, CA 90089-9010, (323) 442-1810, FAX: (323) 442-2993.

Doctor of Philosophy in Preventive Medicine (Health Behavior Research)

Applicants must have a bachelor's degree from an accredited institution; students entering with an advanced degree may be eligible to transfer course credit. Applicants should also meet the minimum requirements for admission to the Graduate School.

Applicants must supply a completed application for graduate studies, including transcripts from all institutions previously attended, a curriculum vitae (if available), a statement of interest, and three letters of recommendation. For further information contact: Director for Graduate Studies, USC Institute for Health Promotion and Disease Prevention Research, 1000 S. Fremont Avenue, Alhambra, CA 91803, (323) 442-2605, (626) 457-4012, FAX: (323) 442-2601.

Doctor of Philosophy in Statistical Genetics and Genetic Epidemiology

This program is designed to train students for future independent research careers in an academic, government or private sector setting. The department encourages applicants who have undergraduate or master's degrees in mathematics, statistics or biostatistics; statistical genetics or quantitative biological sciences; or other related fields. The program will consider applicants who satisfy all requirements for admission to the Graduate School and demonstrate proficiency in the English language.

Master of Science in Applied Biostatistics/Epidemiology

Course Requirements

General requirements include at least 37 units of required courses as follows: 24 units of core courses and at least 9 units of elective courses. In addition, each student must register for four units of 594ab Thesis and write a master's thesis.

| CORE COURSES (24 UNITS) | | | UNITS | CORE COURSES (26 UNITS) | | | UNITS |
|---|---|------|--------------|-------------------------------------|---|------|--------------|
| PM 510L | Principles of Biostatistics | 4 | | PM 510L | Principles of Biostatistics | 4 | |
| PM 511aL | Data Analysis | 4 | | PM 511abL | Data Analysis | 4-4 | |
| PM 512 | Principles of Epidemiology | 4 | | PM 512 | Principles of Epidemiology | 4 | |
| PM 517a | Research Methods in Epidemiology | 3 | | PM 513 | Experimental Designs | 3 | |
| PM 518a | Statistical Methods for Epidemiological Studies | 3 | | PM 518a | Statistical Methods for Epidemiological Studies | 3 | |
| PM 523 | Design of Clinical Studies | 3 | | PM 522a | Introduction to the Theory of Biostatistics | 4 | |
| PM 527 | Epidemiology of Infectious Disease | 3 | | ELECTIVES (AT LEAST 7 UNITS) | | | UNITS |
| ELECTIVES (AT LEAST 9 UNITS) | | | UNITS | PM 516ab | Statistical Problem Solving | 1-1 | |
| PM 511bL | Data Analysis | 4 | | PM 518b | Statistical Methods for Epidemiological Studies | 3 | |
| PM 515 | Behavioral Epidemiology | 3 | | PM 520 | Advanced Statistical Computing | 3 | |
| PM 516ab | Statistical Problem Solving | 1-1 | | PM 522b | Introduction to the Theory of Biostatistics | 4 | |
| PM 517b | Research Methods in Epidemiology | 3 | | PM 523 | Design of Clinical Studies | 3 | |
| PM 529 | Environmental Health | 3 | | PM 534 | Statistical Genetics | 3 | |
| PM 530 | Biological Basis of Disease | 4 | | PM 544L | Multivariate Analysis | 3 | |
| PM 533 | Genetic and Molecular Epidemiology | 3 | | PM 552 | Survival Methods in Clinical Trials | 3 | |
| PM 590 | Directed Research | 1-12 | | PM 590 | Directed Research | 1-12 | |
| PM 611 | Advanced Topics in Epidemiology | 3 | | PM 603 | Structural Equation Modeling | 4 | |
| THESIS (4 UNITS) | | | UNITS | PM 604 | Health Behavior Research Methods (or MATH 506, MATH 542, MATH 543, MATH 545L, MATH 547, MATH 548, MATH 549, MATH 550) | 4 | |
| PM 594ab | Thesis | 2-2 | | THESIS (4 UNITS) | | | UNITS |
| Electives will be determined by the student's needs and interests and will be approved by the student's adviser. When appropriate, courses not listed above may be chosen with approval of the student's adviser. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required. | | | | PM 594ab | Thesis | 2-2 | |

Electives will be determined by the student's needs and interests and will be approved by the student's adviser. When appropriate, courses not listed above may be chosen with approval of the student's adviser. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

Thesis Requirement

A master's thesis is required of all students. This thesis consists of a research project approved by the faculty and chosen from problems encountered within the department, in other departments of the Keck School of Medicine or university or elsewhere in the community.

Master of Science in Biostatistics

Course Requirements

General requirements include at least 37 units of required courses as follows: 26 units of core courses and at least 7 units of elective courses. Each student must also register for four units of 594ab Thesis and write a master's thesis.

The student's choice of elective courses will be directed by needs and interests and must be approved by the student's graduate adviser. When appropriate, elective courses not listed above may be substituted with approval of the adviser. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

Thesis Requirement

A master's thesis is required of all students. This thesis consists of a research project approved by the faculty and chosen from problems encountered within the department, in other departments of the Keck School of Medicine or university or elsewhere in the community.

Master of Science in Molecular Epidemiology

Course Requirements

The M.S. program requires 37 graduate-level units with a minimum grade point average of 3.0 including epidemiology core courses, 14 units; molecular biology core courses, 12 units; at least 3 elective units; laboratory research plus thesis, 8 units. Students must also complete a master's thesis.

Prerequisite: PM 510 Principles of Biostatistics

| EPIDEMIOLOGY CORE COURSES (14 UNITS) | | UNITS |
|---|---|---------|
| PM 511aL | Data Analysis | 4 |
| PM 512 | Principles of Epidemiology | 4 |
| PM 518a | Statistical Methods for Epidemiological Studies | 3 |
| PM 533 | Genetic and Molecular Epidemiology | 3 |
| MOLECULAR BIOLOGY CORE COURSES (12 UNITS) | | UNITS |
| BIOC 543 | Human Molecular Genetics | 4 |
| INTD 504 | Molecular Biology of Cancer, or | |
| INTD 555 | Biochemical and Molecular Basis of Disease | 4 |
| INTD 571 | Biochemistry | 4 |
| ELECTIVES (AT LEAST 3 UNITS) | | UNITS |
| INTD 561 | Molecular Genetics/Biology | 4 |
| PM 517a | Research Methods in Epidemiology | 3 |
| PM 523 | Design of Clinical Studies | 3 |
| LABORATORY RESEARCH + THESIS (8 UNITS) | | UNITS |
| DPT 590abcd | Directed Research | 1-1-1-1 |
| DPT 594ab | Thesis | 2-2 |

(1) DPT refers to the department offering the laboratory/directed research experience and thesis supervision. DPT is one of the following departments (but not restricted to): PM, BIOC, PATH.

(2) Laboratories should expose students to: statistical and epidemiological methods, molecular techniques, human genetics, population-based studies.

Master of Public Health

Course Requirements

The master's degree program in public health (MPH) requires a minimum of 43-47 semester units of required and elective graduate study.

| CORE REQUIREMENTS | | UNITS |
|-------------------|---|-------|
| PM 501 | Foundations in Health Education and Promotion | 4 |
| PM 508 | Health Service Delivery in the U.S., or | |
| PM 509 | Comparative Health Care Systems | 4 |
| PM 510L | Principles of Biostatistics | 4 |
| PM 512 | Principles of Epidemiology | 4 |
| PM 529 | Environmental Health: An Epidemiological Approach | 4 |

In addition, at least another 24 to 28 units including the practicum must be completed in a selected track of either health education and health promotion, biostatistics/epidemiology, health communication, child and family health, global health leadership, public health policy, or environmental health.

Track 1: Health Education and Health Promotion

| REQUIRED COURSES (12 UNITS) | | UNITS |
|-----------------------------|---|-------|
| PM 526* | Communication in Public Health, or | |
| PM 562* | Intervention Approaches for Health Promotion and Disease Prevention | 4 |
| PM 528 | Program Design and Evaluation | 4 |
| PM 563 | Organizing and Mobilizing Communities for Global Health | 4 |

At least 4 units from: PM 505, PM 514, PM 525, PM 526*, PM 530, PM 536, PM 562*, PM 564 (4 unit courses)

At least 3 units from any 500- or 600-level course

And 8 units of a practicum (PM 593) ending in a final report.

*May not receive credit for both track core and track elective category.

Track 2: Biostatistics/Epidemiology

| REQUIRED COURSES (AT LEAST 10 UNITS) | | UNITS |
|--|------------------------------------|-------|
| PM 511aL | Data Analysis | 4 |
| Select two courses from the following: | | |
| PM 527* | Epidemiology of Infectious Disease | 3 |
| PM 536* | Program Evaluation and Research | 4 |
| PM 537* | Chronic Disease Epidemiology | 3 |

At least 6 units from: PM 511bL, PM 514, PM 517ab, PM 518ab, PM 530, PM 532, PM 536*, PM 542, PM 546, PM 558 (4 unit courses); PM 515, PM 523, PM 527*, PM 537*, PM 538, PM 586 (3 unit courses)

At least 3 units from any 500- or 600-level course

And 8 units of a practicum (PM 593) ending in a final report.

*May not receive credit for both track core and track elective category.

The elective courses will be directed by the student's needs and interests and must be approved by the student's graduate adviser. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

Track 3: Health Communication

| REQUIRED COURSES (8 UNITS) | | UNITS |
|----------------------------|---------------------------------|-------|
| PM 526 | Communications in Public Health | 4 |
| PM 536 | Program Evaluation and Research | 4 |

At least 8 units from:

CMGT 510, CMGT 511, CMGT 528, CMGT 583, CMGT 587 (4 unit courses); PM 530, PM 542, PM 562 (4 unit courses); JOUR 508, JOUR 536 (3 unit courses)

At least 3 units from any 500- or 600-level course

And 8 units of a practicum (PM 593) ending in a final report.

Track 4: Child and Family Health

| REQUIRED COURSES (12 UNITS) | | UNITS |
|-----------------------------|-------------------------------|-------|
| PM 528 | Program Design and Evaluation | 4 |
| PM 580 | Foundations of Child Health | 4 |
| PM 585 | Child Health Policy | 4 |

At least 4 units from: PM 530, PM 540, PM 581, PM 582, PM 583, PM 584, PM 585 (4 unit courses)

At least 3 units from any 500- or 600-level course

And 8 units of a practicum (PM 593) ending in a final report.

Track 5: Global Health Leadership

| REQUIRED COURSES (12 UNITS) | | UNITS |
|-----------------------------|---|-------|
| PM 525 | Culture and Health: An International Perspective | 4 |
| PM 564 | Public Health Leadership and Management | 4 |
| PM 565 | Emerging Trends in Global Health: A Public Health Seminar | 4 |

At least 4 units from:
CMGT 583, PM 530, PM 557, PM 563, PM 566,
PM 567, PM 568 (4 unit courses)

At least 3 units from any 500- or 600-level course

And 8 units of a practicum (PM 593) ending in
a final report.

Track 6: Public Health Policy

| REQUIRED COURSES (16 UNITS) | | UNITS |
|-----------------------------|--|-------|
| PM 547 | Public Health Policy and Politics | 4 |
| PPD 501ab | Economics for Policy, Planning and Development | 2-2 |
| PPD 555 | Public Policy Formulation and Implementation | 4 |
| PPD 560 | Methods for Policy Analysis | 4 |

At least 2 units from: PM 514, PM 528, PM 530,
PM 536, PM 542, PM 548, PM 555, PM 585,
PPD 513, PPD 514, PPD 542, or PPD 560

At least 1 unit from any 500- or 600- level course

And 8 units of a practicum (PM 593) ending in
a final report

Track 7: Environmental Health

| REQUIRED COURSES (12 UNITS) | | UNITS |
|-----------------------------|---|-------|
| PM 553 | Human Exposure Assessment for Public Health | 4 |
| PM 554 | Biological Effects of Environmental Toxins | 4 |
| PM 555 | Environmental Health, Policy and Practice | 4 |

At least 4 units from: PM 530, PM 556, PM 557,
PM 558

At least 3 units from any 500- or 600-level
course

And 8 units of a practicum (PM 593) ending
in a final report

The elective courses will be directed by the
student's needs and interests and must be
approved by the student's graduate adviser.

Practicum Requirement

A practicum, PM 593, is required of all stu-
dents as part of the culminating experience
to the master's program. It is provided by an
internship rotation through an area of public
health practice in a county, state, federal or
community-based agency. The practicum
offers students the opportunity to observe
as well as participate in applying their newly
acquired skills and tools. All students are
expected to participate in at least one inter-
ship and attend a corresponding seminar.
An electronic portfolio describing the project

and evaluating the outcomes completes the
course requirement.

Criteria

Students enrolled in one of the MPH
professional dual degree programs (e.g.,
M.D./MPH, Pharm.D./MPH, DPT/ MPH,
and Ph.D. (Clinical Psychology)/ MPH, MPI/
MPH) may waive 4 units of the practicum
requirement and thus are required a mini-
mum of 43 units to graduate. All other stu-
dents must complete a minimum of 47 units
to graduate.

Doctor of Philosophy in Psychology (Clinical)/Master of Public Health (Health Promotion)

The Ph.D./MPH dual degree combines
knowledge of clinical psychology research
and practice with an understanding of health
from a population perspective. The student
enrolls primarily in the clinical psychology
doctoral program and may apply to the MPH
program during the first year. During the
second and subsequent years, course work
is taken in both programs. The dissertation
is undertaken through the Department of
Psychology.

Pharm.D./Master of Public Health

The School of Pharmacy and the Master of
Public Health program, in recognition of the
rapidly changing health care environment
and in response to the growing demand for
pharmacists who are knowledgeable in both
pharmacy and population-based health care
issues, have developed a dual degree pro-
gram. The joint Pharm.D./MPH degree
will enable graduates to be more responsive
to today's health care needs and will provide
training for pharmacists who seek to be
agents of change within the profession and to
assume leadership roles in the pharmacy field
and in public health at the local, state and
national levels.

The Pharm.D./MPH program spans five
years (four years of pharmacy school courses
and one year of public health courses).
Students begin the core MPH courses follow-
ing the successful completion of the first year
of pharmacy school. The last three years of
the program are devoted to the clinical rota-
tions of the School of Pharmacy and to the
completion of the elective courses and practi-
cum (field experience) of the MPH program.

All students in the Pharm.D./MPH program
must meet course requirements, grade point
average requirements and program residency
requirements of both programs. Students must
have a cumulative GPA of 3.0 in the Pharm.D.
curriculum and a 3.0 in the MPH curriculum
to meet graduation requirements.

The Pharm.D. and the MPH degrees are
awarded simultaneously upon completion of
the School of Pharmacy and the Master of
Public Health requirements.

Application and Admissions Requirements

Students may apply to the dual Pharm.D./
MPH degree program in two ways. First,
they may apply at the time they submit
their Pharm.D. application by concurrently
submitting applications to both programs.
Students who elect this approach must iden-
tify themselves on both applications as poten-
tial dual degree students. Students admitted
to both programs will be offered admission to
the Pharm.D. and will be offered admission
to the dual degree program contingent on
passing all courses in their first year of
the Pharm.D. with a minimum 3.0 G.P.A.
Students who are accepted only by one pro-
gram may choose to attend that program
but will not be eligible for the dual degree.
Second, students can apply to the dual degree
by submitting an application to the MPH
program during their first year of enrollment
in the Pharm.D. prior to the MPH published
application deadline. Students who elect this
approach must apply through the School of
Pharmacy. Students admitted to the MPH
program using this approach will be offered
admission to the dual degree contingent
on passing all courses in their first year of
the Pharm.D. with a minimum 3.0 G.P.A.
Students accepted to the dual degree pro-
gram must maintain a minimum 3.0 G.P.A. in
Public Health and Pharm.D. courses.

Master of Planning/Master of Public Health

The Master of Planning/ Master of Public
Health (MPI/MPH) dual degree is designed
for individuals who envision a career that
combines urban planning and public health
disciplines. This dual degree combines the
knowledge of urban planning with an under-
standing of health from a population perspec-
tive. It will provide training for planning,
evaluating and guiding healthy community
and urban development, and will enable
graduates who seek to be agents of change
within the profession to assume leadership
roles in planning and in public health at
the local, state and national levels. A total
of 79 units are required for the dual degree.
For further information about dual degree
requirements, see the Price School of Public
Policy, page 897.

Master of Social Work/Master of Public Health

The Master of Social Work/Master of Public
Health (MSW/MPH) dual degree offers the
student interdisciplinary preparation in the
fields of public health and social work lead-
ing to the Master of Social Work (MSW) and
Master of Public Health (MPH) degrees.

The dual degree program is a collaborative effort between the School of Social Work and the Department of Preventive Medicine in the Keck School of Medicine. The objectives of the program are to provide students with the knowledge and skills necessary to promote health, prevent disease, and enhance the delivery of health and social services in the community. Students will build interdisciplinary skills and an interdisciplinary professional identity by developing an understanding of the breadth of each field and their interface, while permitting concentration in particular specialization areas. The program prepares graduates for work in a variety of interdisciplinary settings; and for some, it will provide the basis for doctoral study.

Students must complete a minimum of 81 units: 45 units in social work and 36 units in preventive medicine; 16 of these units fulfill requirements for both degrees. Depending on specific social work concentration and public health track requirements, there may be additional courses and an increase in the total number of units. Most students complete both program requirements over three years for full-time students; however, the program can be completed in two years if the student takes a full course load during the two summer sessions. Dual degree students in this program complete the standard foundation year courses during the first year in the School of Social Work with the exception of SOWK 562 Social Work Research. Students may select any one of the social work concentrations: community organization, planning and administration (COPA); families and children; health; mental health; and work and life and any one of the public health tracks: health education and promotion; biostatistics/epidemiology; health communication; child and family health; global health leadership; and public health policy.

M.D./Master of Public Health

The joint M.D./MPH program at the Keck School of Medicine is designed for individuals who envision a medical career that combines public health and medical disciplines. For further information about the joint program, refer to page 760.

Doctor of Physical Therapy/Master of Public Health

The Post Professional Doctor of Physical Therapy (DPT) and the Master of Public Health (MPH) dual degree program offers the opportunity for physical therapy clinicians to pursue a doctoral-level education in combination with an integrated approach to health care. The program spans four years. Students begin the first one to two years completing MPH core and elective course work in the Department of Preventive Medicine. The remaining two years are devoted to program requirements in physical therapy.

Doctor of Philosophy in Biostatistics

The department offers a degree program leading to the Ph.D. in biostatistics. The program is designed to produce biostatisticians who will have in-depth knowledge of statistical theory and methodology and the ability to apply this knowledge creatively to statistical problems in the biological and health sciences.

Course Requirements

A minimum of 60 units of graduate study is required for the Ph.D. degree; a maximum of 19 of these units may be from research and dissertation. In preparation for the screening examination, all students must take the required and elective courses for the M.S. in Biostatistics (33 units). In preparation for the qualifying examination, all students are required to take PM 610 (at least two semesters). The student is also required to take at least six units from the following sequence: PM 543L, PM 544L, PM 550 or PM 552.

Screening Procedure

A student failing the screening examination will either terminate or will terminate with the M.S. degree upon completion of an acceptable thesis.

Guidance Committee

A formal guidance committee consisting of five faculty members — four from within the department (one of whom is designated as chair), and one from an outside department offering the Ph.D. degree — will recommend courses in preparation for the qualifying examination.

Qualifying Examination

The qualifying examination will test the student's integration of knowledge in biostatistics, mathematical statistics and the health sciences. An oral examination will ascertain the student's competence in orally communicating this knowledge. Students must pass the written portions and the oral portions in order to pass the qualifying examination.

Dissertation and Oral Defense

Upon passing the qualifying examination the Ph.D. candidate and his or her chair will recommend a three-member dissertation committee. The dissertation should be completed within two years and should be oriented toward a theoretical-methodological application to a problem area in the biological or health sciences. The oral defense is based on a rough draft or final version of the dissertation. The defense is administered by the dissertation committee, with other faculty invited to attend.

Doctor of Philosophy in Epidemiology

The department offers a degree leading to the Ph.D. in epidemiology. This program may be an extension of the applied biostatistics and epidemiology M.S. program and is especially aimed at persons with a strong background in medicine: in particular, students enrolled in the M.D. program of the Keck School of Medicine who wish to interrupt their M.D. studies after two years to complete a Ph.D. degree. This program is designed to produce an epidemiologist with in-depth statistical skills. The program requires a solid core of courses in methodological aspects of statistics and in statistical thinking as applied to medicine, as well as a solid grounding in epidemiological methods and in certain medical disciplines.

Course Requirements

A minimum of 60 course units with a maximum of 20 units of research and dissertation; passing of screening and qualifying examinations; and completion of dissertation and final oral are required. In preparation for the screening examination the student must take the required core course and elective 33 units of master's level applied biostatistics and epidemiology courses. A student failing the screening examination will either terminate or terminate with the M.S. degree upon satisfactory completion of a master's thesis. In preparation for the qualifying examination, the student is required to join an on-going research project under the direction of the chair of the guidance committee and directly participate in the conduct of that project. Credit will be given as PM 790 (4 units, two semesters). In addition, it is recommended that the student take PM 610 (at least two semesters). Electives may be selected with the approval of the chair of the guidance committee from courses in the biological sciences or from the medical school. For students in the M.D./Ph.D. program in epidemiology, satisfactory completion of the first two years of the M.D. program will be considered to provide 20 units toward the Ph.D. degree.

Guidance Committee

A formal guidance committee, consisting of five faculty members, with at least three from the Department of Preventive Medicine (one designated as chair) and one from a department offering a Ph.D. outside of the Department of Preventive Medicine, will recommend courses in preparation for the qualifying examination.

Qualifying Examination

The written portion of the qualifying examination will test the student's integration of knowledge in biostatistics and medicine. In general, the qualifying examination will present plans for implementation and completion of three components: an independent and complete data analysis arising from ongoing epidemiological study, a "review" paper on an area of epidemiological research, and a grant application for a new epidemiological study.

Dissertation

Upon passing the qualifying examination, the Ph.D. candidate and his or her chair will recommend a three-member dissertation committee. The dissertation should be completed within two years and should be oriented toward a methodological application to a problem area in the biological or health sciences.

The Oral Defense

This examination is based on a draft or final version of the dissertation and will be administered by the dissertation committee with other faculty invited to attend.

Language and Other Requirements

Proficiency in the English language is essential.

Doctor of Philosophy in Molecular Epidemiology

The Doctor of Philosophy in molecular epidemiology combines molecular and population-based research. The objective of the Ph.D. program is to produce a molecular epidemiologist with in-depth laboratory, statistical and analytical skills in both epidemiology and the molecular biosciences. Applicants who have undergraduate or master's degrees in quantitative biological sciences or other related fields and graduate students in the PIBBS program at USC are encouraged to apply. The program is jointly administered by the Departments of Preventive Medicine and Biochemistry and Molecular Biology.

Course Requirements

Students must complete a minimum of 60 units, with a maximum of 20 units of research and dissertation; pass screening and qualifying examinations; complete the dissertation and the dissertation defense examination. In addition the student is required to join a research project under the direction of one or both of the chairs of the guidance committee and directly participate in the conduct of that project. Credit will be given by the department (DPT) conducting the research project DPT 790 Research (4 units, 2 semesters). In addition, at least two semesters of PM 610 is recommended.

Prerequisites: PM 510 Principles of Biostatistics or the equivalent. INTD 571 Biochemistry or the equivalent.

Biochemistry and Molecular Biology Core Courses (16 units): BIOC 543, INTD 531, INTD 561, INTD 504 or INTD 555.

Preventive Medicine Core Courses (17 units): PM 522aL, PM 512, PM 517a, PM 518a, PM 533.

Suggested Electives (at least 7 units) from: MICB 551, PM 511bL, PM 517b, PM 523, PM 527, PM 529 and PM 534.

Preparation for Screening Examination

The screening examination will be taken after two years in the program. Prior to the screening examination a mentor who will serve on the guidance committee must be identified. The screening examination will consist of a written component and an oral component. The written component will be drawn from the core courses. A student failing the screening examination may be given a second opportunity to retake either one or both portions. Students failing the examination for the second time will terminate with the M.S. degree upon satisfactory completion of 37 units and an acceptable master's thesis.

Annual Research Appraisal (ARA)

Beginning in the second year, each student must register for PM 610 (1 unit) and present an annual progress report to the program oversight committee. Once a dissertation topic has been selected, the annual progress report is presented to the student's guidance committee. Once the student has passed the qualifying examination and is appointed to candidacy, the annual progress report is presented to the student's dissertation committee. The student will meet annually with the dissertation committee, until he or she graduates from the program. The oral portion of the screening examination as well as the qualifying examination and the defense examination will count as ARAs.

Guidance Committee

A formal guidance committee will be formed, consisting of five faculty members: two from the Department of Preventive Medicine (one member designated as co-chair); two from the basic science departments (one designated as co-chair with an appointment in biochemistry and molecular biology) and one from an outside department offering a Ph.D. degree (neither preventive medicine or biochemistry and molecular biology). The guidance committee will recommend courses in preparation for the qualifying examination based on the student's research and dissertation topic.

Qualifying Examination

The dissertation topic should be both population-based and functional-based; the molecular/epidemiological nature of the dissertation topic must be agreed on by the guidance committee co-chairs.

Dissertation and Oral Defense

Upon passing the qualifying examination, the Ph.D. candidate and his or her chair will recommend a dissertation committee (typically all five members of the guidance committee). However, the university requires only three members; a three-member dissertation committee must consist of the co-chairs and the outside member. The dissertation should be completed within two years of the qualifying examination. The oral defense examination is based on the final version of the dissertation and will be administered by the dissertation committee and other invited faculty and students. The defense examination should contain a summary of the review article, the completed research and data analyses and the finalized grant proposal.

Doctor of Philosophy in Preventive Medicine (Health Behavior Research)

The Department of Preventive Medicine, Division of Health Behavior Research, offers a degree program in preventive medicine (health behavior), leading to attainment of the Ph.D. The program is designed to train exceptional researchers and scholars in the multidisciplinary field of health behavior research. Students receive a thorough grounding in academic and research experience, encompassing theoretical and methodological training in such allied fields as communication, psychology, preventive medicine, biostatistics, public health and epidemiology. Students receive research experience by participating in projects conducted through the USC Institute for Health Promotion and Disease Prevention Research (IPR). The doctoral program is full-time: students are expected to enroll for fall, spring and summer semesters.

Assistantships

Financial and educational support is provided to qualified doctoral students in health behavior research. Graduate (research and/or teaching) assistantships are half-time (20 hours per week) and provide tuition remission as well as a monthly stipend.

Computer Language Requirement

Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

Course Requirements

The doctoral program in health behavior research is structured as a four to five year course of study for students entering with a bachelor's degree. Time requirements are subject to review and approval by the division's Graduate Program Committee and the Graduate School.

A total of 60 units of graduate study is required for the Ph.D. in health behavior research. Students are required to complete nine core courses: PM 500, PM 511abL, PM 515, PM 530, PM 601, PM 602, PM 604 and PM 756 (total of 37 units). Other requirements include: two elective PM courses, one not offered by health behavior faculty (minimum of 7 units); and a minimum of 4 units each in PM 590, PM 690abcdz, PM 790 and PM 794abcdz.

For students entering with a bachelor's degree, one of the directed research projects will be equivalent in scope to a master's thesis. All research experiences/projects must be completed before registering for 794abcdz Doctoral Dissertation.

Screening Procedure

The progress of each student is reviewed at the end of every academic year. At the end of the second year of study, students who have not made satisfactory progress are advised that they will be dropped from the program unless their progress improves during their second year.

Guidance Committee

Each student's guidance committee consists of five members, including: no more than three health behavior faculty members; one other member from the Department of Preventive Medicine; and one member from a doctorate-granting program outside the Department of Preventive Medicine, representing the student's minor field.

Qualifying Examination

Following course work and prior to beginning the dissertation, students must demonstrate written and oral mastery of the general field of health behavior research as well as of their chosen area of specialization. The qualifying process includes a written examination on theory and literature relevant to a selected content area. The examination is administered by the student's guidance committee.

In addition to the qualifying examination, each student is expected to produce the following as evidence of qualification to conduct dissertation research: an academic dossier consisting of a summary of the student's academic record, teaching and research experience, and professional presentations and publications; at least one original empirical research paper of publishable quality,

produced in connection with one of the student's courses or research experiences or developed independently; a dissertation proposal; and an oral defense of all the preceding materials.

Doctor of Philosophy in Statistical Genetics and Genetic Epidemiology

The program gives students a solid background in the methodological aspects of biostatistics and statistical genetics as well as solid grounding in molecular/laboratory science. The objective of the Ph.D. program is to produce a statistical geneticist or genetic epidemiologist with in-depth statistical and analytic skills in biostatistics, computational methods and the molecular biosciences. The program combines biostatistics, epidemiology, statistical and molecular genetics and computational methods in order to develop new and cutting-edge statistical methodology appropriate for human genomic studies.

Course Requirements

Graduation requires the completion of a minimum of 60 units, with a maximum of 20 units of research and dissertation, passing of screening and qualifying examinations, completion of the dissertation and the dissertation defense examination. Because the background of applicants varies widely, the program oversight committee consults with each student to design an individualized schedule of recommended courses. Electives may be selected (with the approval of the chair) from courses in preventive medicine, biological sciences, mathematics, and computational biology. For students in the M.D./Ph.D. program in statistical genetics and genetic epidemiology, satisfactory completion of the first two years of the M.D. program will be considered to provide 20 units toward the Ph.D. degree. After passing the screening examination, each student should register for at least two semesters of PM 610. Prior to passing the qualifying exam, each student must present an annual progress report (the Annual Research Appraisal, ARA) to the program oversight committee.

| CORE COURSES (25-26 UNITS) | | UNITS |
|----------------------------|---|-------|
| PM 511abL | Data Analysis | 4-4 |
| PM 518a | Statistical Methods for Epidemiological Studies I | 3 |
| PM 522a | Introduction to Theory of Biostatistics (E), or | 4 |
| MATH 541a | Introduction to Mathematical Statistics (S) | 3 |
| PM 533 | Genetic and Molecular Epidemiology | 3 |
| PM 534 | Statistical Genetics | 4 |
| PM 570 | Statistical Methods in Human Genetics | 4 |

| RECOMMENDED ELECTIVE COURSES | | UNITS |
|------------------------------|---|-------|
| BISC 478 | Computational Genome Analysis (S, E) | 4 |
| BISC 505 | Genomics and Molecular Genetics (S, E) | 4 |
| BIOC 543 | Human Molecular Genetics (S, E) | 4 |
| INTD 504 | Molecular Biology of Cancer (E) | 4 |
| INTD 531 | Cell Biology (E) | 4 |
| INTD 555 | Biochemical and Molecular Bases of Disease (E) | 4 |
| INTD 561 | Molecular Genetics (E) | 4 |
| INTD 571 | Biochemistry (E) | 4 |
| MATH 505a | Applied Probability (S) | 3 |
| MATH 541ab | Introduction to Mathematical Statistics (S) | 3-3 |
| MATH 577ab | Computational Molecular Biology Laboratory (S) | 2-2 |
| MATH 578 | DNA and Protein Sequence Analysis (S) | 3 |
| PM 510L | Principles of Biostatistics (S, E) | 4 |
| PM 512 | Principles of Epidemiology (S, E) | 4 |
| PM 517ab | Research Methods in Epidemiology (E) | 3-3 |
| PM 520L | Advanced Statistical Computing (S) | 3 |
| PM 538 | Introduction to Biomedical Informatics (S, E) | 3 |
| PM 544L | Multivariate Analysis (S) | 3 |
| PM 610 | Seminar in Biostatistics/Epidemiology (S, E) 1, max 4 | |
| PM 611 | Advanced Topics in Epidemiology (S, E) | 3 |

(S) Statistical genetics track
(E) Genetic epidemiology track

Screening Procedure

The screening examination will be taken after two years in the program. Prior to the screening examination, a mentor who will serve on the guidance committee must be identified. The screening examination will consist of a written and oral component. The written component is a two-day examination that tests the student's knowledge of both theory and applications, drawn from the core courses. The oral portion comprises a one-hour presentation of a research plan that encompasses the student's own ideas and will constitute the annual research appraisal. A student failing the screening examination may be given a second opportunity to retake either one or both portions of the screening examination. Students failing the examination for the second time will terminate with the M.S. in Applied Biostatistics and Epidemiology upon satisfactory completion of 37 units (33 course units and 4 units of PM 594ab) and an acceptable master's thesis.

Guidance Committee

A formal guidance committee will be formed, consisting of five faculty members; at least one member from the Department of Preventive Medicine designated as chair, and one from an outside department offering a Ph.D. degree. The guidance committee will recommend courses in preparation for the qualifying examination based on the student's research and dissertation topic.

Qualifying Examination

Prior to the qualifying examination, a written draft of the dissertation proposal must be submitted to the Guidance Committee. The dissertation topic should be both population-based and functionally-based. The dissertation for the statistical genetics track will typically consist of (a) a "review" paper on current statistical genetic methods, (b) a proposal for a new methodological approach, (c) evaluation of the new methodological

approach from a theoretical and/or computational perspective, and (d) application to real data arising from genetic research. Typically, the dissertation proposal should contain a near-completed draft of (a) and (b) and preliminary results from (c) and (d).

The dissertation for the genetic epidemiology track will typically consist of: (a) a "review" paper on an area of genetic epidemiological research, (b) an independent and complete data analysis arising from an ongoing genetic epidemiological study and (c) a grant application for a new genetic epidemiological study. The review paper (a) typically will provide the rationale and context for the data analysis (b). Typically, the dissertation proposal should contain a nearly completed draft of (a), preliminary results from (b) and preliminary plans for (c).

Dissertation and Oral Defense

Upon passing the qualifying examination, the Ph.D. candidate and his or her chair will recommend a dissertation committee (typically all five members of the guidance committee; however, the university requires only three members. (A three-member dissertation committee must consist of the chair and the outside members). The dissertation should be completed within two years of the qualifying examination. The oral defense examination is based on the final version of the dissertation and will be administered by the dissertation committee and other invited faculty and students.

Courses of Instruction

HEALTH PROMOTION AND DISEASE PREVENTION STUDIES (HP)

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

HP 101 Current Issues in Medical Education and Healthcare (2, Sp) Current critical issues in healthcare delivery; strategies to succeed in medical school and as physicians.

HP 200 Introduction to Health Promotion and Disease Prevention (4, Fa) Introduction to strategies for promoting health and wellness. Includes self monitoring of health risk behavior, goal setting, and behavior changes.

HP 230 Nutrition and Health (4, FaSp) Nutrition as it relates to health promotion across the lifespan and disease prevention. Discussion of nutrients, factors affecting food choices, food safety and global nutrition issues.

HP 270 Introduction to Global Health (4, Fa) Introduction to concepts of global health and disease control. Issues of globalization, global governance, emerging diseases, infectious disease treatment, and outbreak challenges.

HP 290 Introduction to Research Apprenticeship (2, max 8, FaSp) Individual research apprenticeship in health related fields under supervision of a departmental faculty member. Graded CR/NC.

HP 300 Theoretical Principles of Health Behavior (4, FaSp) Overview and analysis of predictors and consequences of health-related behaviors; theoretical viewpoints and strategies for behavior change. *Recommended preparation:* HP 200; *prerequisite:* PSYC 100.

HP 320 Biological and Behavioral Basis of Disease (4, FaSp) Examination of the major systems of the human body; disease processes and behavioral risk factors. *Prerequisite:* BISC 220L or BISC 221L.

HP 340L Health Behavior Statistical Methods (4, FaSp) Intermediate statistics for health behavior studies; topics include descriptive statistics, hypothesis testing, correlation and regression, and use of computer software in data analysis.

HP 345 Health Issues in Entertainment Media (4, FaSpSm) Study of major chronic illnesses and their risk factors as a foundation for discussions about the portrayal of health and illness in entertainment media. (Duplicates credit in the former CNTV 345.)

HP 350L Health Behavior Research Methods (4, FaSp) Introduction to the design, conduct and evaluation of health behavior research studies; quantitative and qualitative approaches to research and analysis. *Recommended preparation:* HP 340L.

HP 370 Introduction to Epidemiology: Methods and Applications (4) Examines the primary goals and methods of epidemiology, the study of factors that influence health and disease in individuals and populations.

HP 400m Culture, Lifestyle, and Health (4, Sp) Comparison of national and international differences in health status as influenced by cultural practices and lifestyles within geographic, economic and political environments.

HP 401 Cultural Competence in Medicine (4, Fa) Systematic development of specific professional skills for providing effective, culturally sensitive health services to diverse populations. *Recommended preparation:* ANTH 101.

HP 402 Maternal and Child Health (4, Sp) Health issues of women of childbearing age from pre-pregnancy through the postpartum period, and of children from their development in utero through early adolescence. *Recommended preparation:* PSYC 100.

HP 403 Behavioral Medicine (4, Sp) Examines behavioral risk factors for illness, health-enhancing and health-compromising behaviors, stress/coping in promoting health and preventing illness, and behavioral management of chronic illness. *Prerequisite:* PSYC 100.

HP 404 Religion and Health (4, Fa) Differential relationships of religiosity and spirituality with health and risk behaviors, physical and mental health outcomes, coping skills and well-being across cultures and religions.

HP 405 Sexually Transmitted Diseases:

A Global Public Health Priority (4) An overview of the magnitude and impact of STDs including prevention, diagnosis, and treatment of common STDs, STD/HIV inter-relationship, global burden, trends, public health challenges, and STD/HIV prevention and control strategies and programs worldwide.

HP 408 Environmental Health in the Community (4)

Survey of occupational and environmental health. Introduction to epidemiology, exposure assessment, toxicology, policy development, risk assessment, and effects of urban development on health.

HP 410 Issues in Prevention and Cessation of Drug Abuse (4, Sp)

Examination of factors related to drug abuse behaviors; overview and assessment of drug abuse prevention and cessation programs; relapse prevention programs. *Recommended preparation:* HP 300.

HP 411 Drug Intervention Program Design and Evaluation (4, Sp)

Strategies for drug abuse prevention and intervention; introduction to techniques and research methods used in designing, conducting, and evaluating drug abuse prevention programs. *Recommended preparation:* HP 410.

HP 412 Health Promotion and Prevention Policy (4, Sp)

Overview of health promotion and drug prevention policy at local, state, and federal levels; methods for evaluating policy effectiveness and cost effectiveness.

HP 420m Gender and Minority Health Issues (4, Fa)

Examines the nature and roots of health disparities among women, men, and different ethnic and age groups; methods for reducing such disparities; strategies for prevention services.

HP 421 Violence as a Public Health Issue (4, Fa)

Patterns and prevalence of violence; psychosocial, environmental, and biological influences on violent behavior; youth gangs; drugs and violence; family violence; and prevention and intervention strategies.

HP 422 AIDS in Society (4, Sp) Provides a broad examination of issues in HIV/AIDS, including behavioral, social, biological, clinical and ethical dimensions of the pandemic in the U.S. and elsewhere.

HP 430 Obesity and Health (4, Fa) Examination of causes and consequences of obesity, with emphasis on health risks of type II diabetes and cardiovascular disease. *Recommended preparation:* HP 230.

HP 431 Behavior and Education Strategies for Nutrition and Fitness (4, Sp)

Examination of dietary intake and exercise behaviors as they relate to health and illness; methods for measuring diet and exercise. *Recommended preparation:* HP 430.

HP 432 Clinical Nutrition (4, Irregular)

Metabolism of carbohydrates, fats and protein; introduction to vitamins, minerals and dietary modifications in various pathological conditions. *Prerequisite:* CHEM 105a; *recommended preparation:* HP 230.

HP 433 Advanced Topics in Nutrition (4, Sp)

In-depth discussion of vitamins and minerals and their role in human nutrition; introduction to the role of vitamins and minerals in selected pathological conditions. *Prerequisite:* HP 432.

HP 434 Physical Activity and Health (4, FaSpSm)

Examination of the health impacts of physical inactivity; participation rates across subgroups; physical activity determinants; and interventions, programs, and policies to promote physical activity. *Recommended preparation:* HP 200.

HP 440 Happiness, Well-Being, and Health (4, Sp)

Explores human strengths that promote happiness/well-being and whether they influence physical health; mind-body relationships; and strategies for promoting hope, resilience, and quality of life. *Recommended preparation:* HP 200, PSYC 100.

HP 441 Health Promotion in the Workplace (4, Fa)

Covers phases of worksite health promotion; research, design, implementation and evaluation; concerns regarding escalating medical costs and the role of health promotion in offering solutions.

HP 442 Chronic Disease Epidemiology (4, Sp)

Overview of causative factors and demographic distributions of the major chronic diseases in the western world; epidemiologic concepts and research designs. *Recommended preparation:* HP 320.

HP 443 Communicating Health Messages and Medical Issues (4)

(Enroll in COMM 443)

HP 450 Traditional Eastern Medicine and Modern Health (4, Fa)

Overview of traditional Eastern approaches toward health and disease; relevance to modern health issues, emphasizing a comparison between traditional Chinese and modern Western medicine. *Recommended preparation:* fundamentals of medicine.

HP 460 Adolescent Health (4, Fa) Survey of the development of healthy and the prevention of health-risk behaviors during adolescence. Prevention and promotion techniques will be explored emphasizing cultural differences.

HP 465 Health Status of Indigenous Peoples of America (4, FaSpSm)

Survey of indigenous people's health, including health conditions, special cultural and ethical considerations, the Indian health system, and the politics of indigenous health.

HP 470 Case Studies in Global Health (4, Sp)

Case study examination of programs and organizational structure underlying current international efforts addressing problems related to infection disease, chronic disease, global environmental change, emergencies and emerging disease epidemics. *Prerequisite:* HP 270.

HP 480 Internship in Health Promotion and Disease Prevention (2-4, max 4, FaSpSm)

Field placement in a community agency such as a county health services agency, a not for profit voluntary agency or a health care setting. Open to majors only. Graded CR/NC. *Prerequisite:* completion or concurrent registration in required core courses.

HP 483 Global Health and Aging (4, Fa)

(Enroll in GERO 483.)

HP 485 Global Health: Obesity and Nutrition (4, FaSpSm)

Overview of the epidemiology of obesity and related diseases and the etiology of obesity, including genetic, biological, behavioral, environmental and socio-cultural correlations.

HP 490x Directed Research (2-8, max 8, FaSpSm)

Individual research and readings. Not available for graduate credit. Open to HP majors only. *Corequisite:* HP 340L; *recommended preparation:* HP 350L.

HP 499 Special Topics (2-4, max 8)

Lecture and discussion focused on specific topics within health promotion and disease prevention. Course topic will vary from semester to semester.

PREVENTIVE MEDICINE (PM)**PM 500 Foundations of Health Behavior (4, Fa)**

Overview of behavioral theory and research in disease prevention and health promotion and in adaptation of chronic disease, including an introduction to measures of outcomes. *Prerequisite:* admission to Ph.D. in Preventive Medicine.

PM 501 Foundations in Health Education and Promotion (4, FaSpSm) Overview and application of behavioral theories to the field of health education and promotion. Examines the determinants of health behavior and strategies for change at the individual, group and community level.

PM 505 Training and Curriculum Design in Public Health (4, Sm) Curriculum writing and training skills applied to public health needs and settings. Covers adult learning theories, assessment of learning needs, curriculum design, training design, conduct and evaluation. *Recommended preparation:* PM 500.

PM 508 Health Service Delivery in the U.S. (4, FaSpSm) Historical development of the American health care system; determinants of health care utilization; role of health care providers; health policy; public health services; and health care finance.

PM 509 Comparative Health Care Systems (4, Sp) Macro-level analysis of the structure and delivery of health care services around the world, including an examination and comparison of health system performance.

PM 510L Principles of Biostatistics (4, FaSp) Concepts of biostatistics; appropriate uses and common misuses of health statistics; practice in the application of statistical procedures; introduction to statistical software including EXCEL, SPSS, nQuery. Laboratory.

PM 511abCL Data Analysis (4-4-4, a: FaSp, b: Sp, c: FaSpSm) *a:* Major parametric and nonparametric statistical tools used in biomedical research, computer packages including SAS. Includes laboratory. Lecture, 3 hours; laboratory, 1 hour. *Prerequisite:* PM 510L. *b:* Exploratory data analysis, detection of outliers, robust methods, fitting data with linear and nonlinear regression models, computer packages including BMDP. Includes laboratory. Lecture, 3 hours; laboratory, 1 hour. *c:* Methods and applications for modeling longitudinal, time-to-event and multi-level data. Includes laboratory using R package. Lecture, 2 hours; laboratory, 2 hours.

PM 512 Principles of Epidemiology (4, FaSp) Terminology/uses of epidemiology and demography; sources/uses of population data; types of epidemiologic studies; risk assessment; common sources of bias in population studies; principles of screening. *Recommended preparation:* algebra.

PM 513 Experimental Designs (3, Sp) Statistical methods for analysis of various experimental designs. Parametric analysis of variance (ANOVA), repeated measures methods, crossover designs, non-parametric ANOVA. *Prerequisite:* PM 510L.

PM 514 Detection and Control of Sexually Transmitted Infections (4, Sm) Overview of issues concerning the design and implementation of STI prevention and control programs. Epidemiology, diagnosis, treatment and partner management strategies for common STIs in the U.S. *Recommended preparation:* PM 501, PM 512.

PM 515 Behavioral Epidemiology (3, 2 years, Sp) Basic understanding of behavioral risk factors in chronic disease and premature mortality; epidemiological methods for studying behavioral risk factors. *Recommended preparation:* PM 511ab, PM 512.

PM 516ab Statistical Problem Solving (1-1, FaSpSm) An overview of the tools used by statisticians for solving statistical problems. *Prerequisite:* PM 510L.

PM 517ab Research Methods in Epidemiology (a: 3, Fa, b: 3, Sp) *a:* Study design, ascertainment of study objects, questionnaire development, various methodological issues in data analysis and interpretation including bias, measurement error, confounding and effect modification. *Prerequisite:* PM 511aL, PM 518a. *b:* Overview of epidemiologic research in cancer. Selected cancer sites will be covered to highlight study design and conduct, exposure assessment, data analysis and interpretation. *Prerequisite:* PM 517a.

PM 518ab Statistical Methods for Epidemiological Studies I, II (3-3, Sp) *a:* Principles and methods used in epidemiology for comparing disease frequencies between groups. Restricted to the analysis of binary outcome variables. *Prerequisite:* PM 512. *b:* Statistical methods for binary outcomes by introducing techniques for cross classified risks and rates and regression models for individual data. *Prerequisite:* PM 518a.

PM 519 Introduction to Human Nutrition (4, Sp) Dietary role of carbohydrates, proteins, lipids, vitamins, and minerals in metabolism; nutritional assessment; nutritional deficiencies. Focus on the role of nutrition in the prevention and treatment of chronic disease. (Duplicates credit in former PHNU 527.) *Recommended preparation:* PM 530.

PM 520L Advanced Statistical Computing (3, SpSm) Techniques for the solution of statistical problems through intensive computing; iterative techniques, randomization tests, the bootstrap, Monte Carlo methods.

PM 521ab Seminar in Nutrition (2-2, FaSp) (Duplicates credit in former PHNU 520ab.)

PM 522ab Introduction to the Theory of Biostatistics (a: 4, Fa; b: 4) *a:* Density distribution and hazard functions; normal, chi-square, student's t and F distributions; and sampling procedures for single factor and multiple factor designs, distributions. *Prerequisite:* undergraduate differential and integral calculus. *b:* Theory of estimation and testing, determining structure in data, and sampling methods. *Prerequisite:* PM 522a.

PM 523 Design of Clinical Studies (3, Sp) Design, conduct, and interpretation of results of clinical trials; emphasis on principles affecting structure, size, duration of a trial, and the impact of ethical and practical considerations. *Prerequisite:* PM 511abL, PM 513.

PM 524abc Practicum in Health Behavior (2-2-2, FaSpSm) Practical experience in a variety of field settings to gain a certain type of skill such as curriculum development, media production, and patient education. *a:* Practicum in prevention; *b:* practicum in compliance; *c:* practicum in health behavior topics. *Recommended preparation:* PM 500.

PM 525 Culture and Health: An International Perspective (4, Fa) International variations in health status with a focus on the impact of socioeconomic status, politics, environment, education and gender in etiology of illness, access to health care, progression of disease, and recovery.

PM 526 Communications in Public Health (4, Sp) Application of communication theories and methods to community health problems. Includes background assessment, program design, evaluation, social marketing, media advocacy, review of major health campaigns. *Recommended preparation:* PM 500.

PM 527 Epidemiology of Infectious Disease (3, Sp) Survey of natural history of infectious disease, methods of disease control and outbreak investigation. *Prerequisite:* PM 512.

PM 528 Program Design and Evaluation (4, Sp) Core concepts, methods and values of public health program planning and evaluation, including community needs assessment, writing objectives, designing health promotion programs, process and outcome evaluation. *Recommended preparation:* PM 500.

PM 529 Environmental Health: An Epidemiological Approach (4, FaSp) An overview of environmental health, identifying issues in assessing effects of exposure on health and potential interventions for reducing adverse health risks. *Prerequisite:* PM 510L, PM 512.

PM 530 Biological Basis of Disease (4, 2 years, Sp) With a physiological overview, differentiates genetic and environmental disease; emphasis on the relationships between lifestyle, behavior, and health. *Prerequisite:* admission to Ph.D. in Preventive Medicine, Health Behavior Research or basic biology.

PM 531 Research Methods in Nutrition (4, Fa) In-depth discussion of nutrition research including nutrition assessment, measurement of dietary intake, study design, statistical issues, critical appraisal, and translation into practice. Open to M.P.H. nutrition track students only. *Prerequisite:* PM 510, PM 512.

PM 532 Genetics in Public Health and Preventive Medicine (4, Sm) History and philosophy of public health genetics and mechanisms of genetic diseases. Epidemiologic methods used to identify genetic diseases in individuals, families, and populations. Emphasis on prevention and relevant ethical issues. *Recommended preparation:* PM 512.

PM 533 Genetic and Molecular Epidemiology (3, 2 year, Fa) Genetic principles; design and analysis of family studies; introduction to likelihood estimation; segregation and linkage analysis; biomarkers of exposure, susceptibility, and disease; laboratory methods; susceptibility genes; association and linkage disequilibrium. *Prerequisite:* PM 510L, PM 511a, PM 512, PM 518a.

PM 534 Statistical Genetics (4, Sp) Familial aggregation, segregation analysis, linkage analysis, association, regressive models, gene-environment interactions, genetic heterogeneity and linkage disequilibrium. *Prerequisite:* PM 518a, PM 522a.

PM 535 Nutrition in Public Health (4, Fa) Principles related to developing effective programs and services to improve the health and nutrition within a community. Attaining and maintaining nutritional health related to biology, lifestyle choices, environments, and health care delivery systems. (Duplicates credit in former PHNU 523.) *Recommended preparation:* PM 530.

PM 536 Program Evaluation and Research (4, Fa) Overview of concepts, tools, data collection, analysis methods and designs used to evaluate health promotion programs. Examples from substance abuse prevention, family planning and reproductive health programs.

PM 537 Chronic Disease Epidemiology (3) Overview of causative factors and demographic distribution of major chronic diseases in the western world. Epidemiologic concepts, methods and research design as applied to chronic disease prevention will be emphasized. *Prerequisite:* PM 512; *recommended preparation:* PM 527.

PM 538 Introduction to Biomedical Informatics (3, Sm) Overview of current topics, enabling technologies, research initiatives, and practical considerations in biomedical informatics.

PM 539 Nutrient-Drug Interactions (2, Sm) Examines the various ways foods, and the nutrients contained in them, interact with medications used to treat chronic health conditions.

PM 540 Maternal and Child Nutrition (4) Physiological basis for good nutrition during pregnancy and childhood through adolescence. Design, implementation and evaluation of public health nutrition programs serving women and children. *Recommended preparation:* PM 530.

PM 541 Obesity, Metabolism and Health (4, Fa) Overview of the epidemiology of obesity, related health conditions and mechanisms related to energy balance, food intake and genetics. Discussion of prevention and treatment strategies. *Recommended preparation:* PM 530.

PM 542 Social Network Analysis (4, Sp) Theory, methods and procedures of network analysis with emphasis on applications to public health programs.

PM 543L Nonparametric Statistics (3) (Enroll in MATH 543L)

PM 544L Multivariate Analysis (3, 2 years, SpSm) Exploratory and inferential techniques for multivariate data, Hotelling's T², multivariate analysis of variance, classification analysis, principle components, cluster analysis, factor analysis. Involves computer use. *Prerequisite:* PM 510L, PM 522a.

PM 545L Introduction to Time Series (3) (Enroll in MATH 545L)

PM 546 Biological Threats and Terrorism (4, Fa) History of biowarfare and bioterrorism; proper surveillance techniques, capacity building for public health and medical communities, and the importance of effective communications. Methods of preparedness, prevention and response are examined. *Recommended preparation:* PM 512.

PM 547 Public Health Policy and Politics (4, FaSp) Examination of major policy issues in the U.S. health care delivery system to understand policy options in reforming health care and reducing health care disparities. *Prerequisite:* PM 508.

PM 548 Prevention and Public Policy (2, FaSp) Introduction to prevention policy framework; examination of how the application of epidemiology and behavioral aspects of diseases shapes the development of public health policy. *Prerequisite:* PM 508, PM 512.

PM 549 Human Molecular Genetics (4, FaSpSm) (Enroll in BIOC 543)

PM 550 Sample Surveys (3) (Enroll in MATH 550)

PM 552 Statistical Methods in Clinical Trials (3, 2 years, Sp) Stochastic failure process; parametric models for survival data; sample size estimation procedures for clinical trials; multivariate regression models for binary outcome and censored survival data; computer programs; multiple failure modes and competing risks. *Prerequisite:* PM 518a, MATH 408.

PM 553 Human Exposure Assessment for Public Health (4, FaSpSm) Examination of important routes of exposure to toxic materials; how to measure exposure; strengths and weaknesses of different measurement techniques; design of exposure assessment studies. *Prerequisite:* PM 510; *recommended preparation:* one semester of statistics and background in science or engineering for graduate students not in MPH.

PM 554 Biological Effects of Environmental Toxins (4, FaSp) Overview of how environmental exposures affect various biological systems and lead to observed health outcomes in populations. *Prerequisite:* PM 512; *recommended preparation:* PM 529.

PM 555 Environmental Health, Policy and Practice (4, FaSp) Examination of environmental public health policies/regulations, the role of science in assessment and policy initiatives, barriers to change, and competing interests that influence policy adoption. *Prerequisite:* PM 529.

PM 556 Environment and the Brain (4, FaSpSm) An examination of the effects of environmental exposures on the brain, addressing both human health and neurobiologic correlates throughout the lifespan.

PM 557 Global Environmental Health

(4, Sp) Examination of the health effects of global environmental changes, including climate change, globalization, food safety, air pollution, water pollution, and radiation.

PM 558 Environmental Epidemiology: Concepts, Methods, and Practice (4, FaSp)

Examine epidemiologic methods, concepts, and statistical approaches; case-study seminars with structured critiques of current literature on human-environment interactions affecting public health. *Prerequisite:* PM 510 and PM 512.

PM 561 Promoting Dietary Change (3, Sp)

Development, implementation, and evaluation of dietary interventions at community and individual levels. Discussion of lifespan, culture, socioeconomic, and environmental factors. Open to M.P.H. nutrition track students only. *Prerequisite:* PM 501.

PM 562 Intervention Approaches for Health Promotion and Disease Prevention (4, Sp)

Approaches for modifying health behavior in various settings and within diverse populations. Emphasis on practical considerations necessary to design and implement interventions with demonstrated effectiveness.

PM 563 Organizing and Mobilizing Communities for Global Health (4, Fa)

Survey of effective community organizing and mobilization efforts in the U.S. and abroad, using participatory, organizational, community empowerment and public-private partnership models.

PM 564 Public Health Leadership and Management (4, Fa)

Examination of future-focused leadership principles with applications to public health systems. Formulation and implementation of strategy, organizational management and change, and development of public health organizations.

PM 565 Emerging Trends In Global Health: A Public Health Seminar (4, Sp)

Current public health issues and research topics relating to 21st century challenges and threats. Lessons learned and best practices to strengthen public health systems and enhance public health readiness and preparedness.

PM 566 Public Health in China: A System and Country in Transition (4, Fa)

Scientific, political, economic, social, and historical influences affecting Chinese public health policy and practice. *Prerequisite:* PM 501, PM 510L; *recommended preparation:* PM 512.

PM 567 Floods, Quakes and Human Folly: An Interdisciplinary Approach to Disaster Study (4, Sp)

Definition and chronology of natural and man-made disasters and their effects on the global community. Structure and organization of disaster management systems and the role of humanitarian organizations. *Recommended preparation:* PM 501, PM 512.

PM 568 Ethical Issues in International Health Research: Promotion and Intervention (4, Fa)

Ethical principles in the distribution of health resources, the conduct of global public health research, and the implementation of public health initiatives and practices across different nations, cultures, religions. *Recommended preparation:* PM 501.

PM 570 Statistical Methods in Human Genetics (4, Sp)

An introductory course in the statistical methods used in the analysis of human genetic data. *Prerequisite:* PM 533.

PM 571 Applied Logistic Regression (3, Sm)

An introduction to the logistic regression model, emphasizing practical data analysis techniques. *Prerequisite:* PM 510L; PM 512; and PM 511aL or PM 518a.

PM 572 Systems Physiology and Disease I (4, Fa)

(Enroll in INTD 572)

PM 573 Systems Physiology and Disease II (4, Sp)

(Enroll in INTD 573)

PM 574 Programming In Modern Statistical Software (2, FaSpSm)

Programming using SAS Software, including branching, sub-setting, PDV, looping, by-group processing, array, combining data functions, ODS, and macros.

PM 575 Statistical Methods in Environmental Epidemiology (3, FaSpSm)

Study designs, exposure-time response, longitudinal, spatial, ecologic correlation and mechanistic models, measurement error interactions, measurement error, public policy implications. *Prerequisite:* PM 511b and PM 518a.

PM 580 Foundations of Child Health (4, Sp)

Overview of issues related to infant, child and adolescent health, including special health considerations at different points in the developmental cycle, health care systems and policies and health disparities.

PM 581 Quality and Inequality in Health Care: Examination of Health Services (4, Fa)

Social inequalities, including racial/ethnic disparities and income related inequalities are examined in the context of access and delivery of health care in the U.S.

PM 582 Epidemiology and Prevention of Pediatric Injuries (4, Fa) Examines the incidence and causes of injuries to children from birth to adolescence, risk factor distributions and approaches to prevention.

PM 583 Foundations of Early Childhood Mental Health (4, Fa)

Overview of major infant and early childhood mental health issues, relating to the status of child mental health and the importance of comprehensive systems of care for children that support resilience and respond to biological and psychosocial mental health risks.

PM 584 Systems of Care for Children with Special Needs (4, Sm)

Examines and evaluates principles, policies, programs and practices (systems) that have evolved to identify, assess and meet the special needs of children and families. Includes both historical and current perspectives.

PM 585 Child Health Policy (4, Sp)

History of child health and social welfare programs during the past century. Issues examining health status and health service delivery, the role of health care financing and health policy.

PM 586 Reproductive and Perinatal Epidemiology (3, FaSpSm)

Introduction to reproductive health, from preconception to the neonatal and early period of human development. Heavy emphasis on the methods and public health implications. *Prerequisite:* PM 510L and PM 512.

PM 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.

PM 593 Public Health Practicum (4 or 8, FaSpSm)

Field placement in a community agency, such as a county health department or community-based organization. Open to MPH candidates only. Graded CR/NC. *Recommended preparation:* completion of all course work.

PM 594abz Master's Thesis (2-2-0, FaSpSm)

Credit on acceptance of thesis. Graded IP/CR/NC.

PM 599 Special Topics (2-4, max 8, Irregular)

Special topics relevant to the study of selected issues and areas of health behavior research or other aspects of preventive medicine.

PM 601 Basic Theory and Strategies in Prevention (4, 2 years, Fa)

Psychosocial basis of health-hazardous lifestyle behaviors and preventive strategies. *Recommended preparation:* PM 500, PM 515.

PM 602 Basic Theory and Strategies for Compliance/Adaptation (4, 2 years, Fa)

Behavioral and psychosocial demands of acute and chronic diseases. Comparison of theoretical models of compliance and adaptation with intervention methods to improve compliance and adaptation. *Recommended preparation:* PM 500, PM 515.

PM 603 Structural Equation Modeling (4, 2 years, Fa)

Factor analytic and structural equation modeling approaches to health behavior research – conceptual, practical and mathematical. *Prerequisite:* PM 511b.

PM 604 Health Behavior Research Methods (4, Sp)

Health research/evaluation philosophies, approaches, and development of skills for development and critique of health behavior research projects/studies. *Recommended preparation:* PM 511.

PM 610 Seminar in Biostatistics and Epidemiology (1, max 4, FaSpSm) Special topics of current interest to provide background for research in biostatistics and epidemiology. Based largely on student dissertation research. Graded CR/NC. *Prerequisite:* Ph.D. level.

PM 611 Advanced Topics in Epidemiology (3, Irregular) Review of current epidemiologic research contained in recent medical literature; emphasis on critique of studies and interpretation of findings.

PM 690abcdz Directed Research in Health Behavior (2-2-2-2-0, FaSpSm) Independent research at an advanced level on a problem in the field of Health Behavior. Graded CR/NC. *Recommended preparation:* PM 604.

PM 756 Research Seminar in Health Behavior (1, max 6, FaSp) Short seminar presentations and discussions on issues accompanying the development of the field of health behavior and implementation of research in this field. Graded CR/NC.

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

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