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# Keck School of Medicine of USC



*The Keck School of Medicine of USC is among the nation's leaders in innovative clinical care, research and education of future physicians. The school's modern curriculum has placed it at the forefront of medical education. Keck School of Medicine students (l-r) Christen Weber, Shannon Navarro, Sarah Russell and Neda Roosta gather before class at The Marketplace.*

**F**ounded in 1885, the Keck School of Medicine of USC is a major center of medical research, education and patient care with more than 1,200 full-time faculty members and a voluntary faculty of more than 3,800 physicians. Located on the university's 30.8-acre Health Sciences campus three miles northeast of downtown Los Angeles, it is adjacent to the Los Angeles County+USC Medical Center, one of the largest teaching hospitals in the United States. Faculty of the school include national leaders in each of its 25 clinical and basic science departments.

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 Comprehensive Cancer Center and Hospital, USC University Hospital, Doheny Eye Institute, Childrens Hospital Los Angeles, and a network of additional USC-affiliated hospitals throughout Southern California. Several hundred faculty physicians comprise The Doctors of USC, caring for patients with a variety of complex medical needs as well as providing primary care.

The new Harlyne J. Norris Cancer Research Tower and Zilkha Neurogenetic Institute provide state-of-the-art facilities for important scientific discovery. With more than \$135 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, neurogenetics, preventive medicine, transplantation medicine, bioengineering and other key areas have attracted national recognition.

In the educational arena, the Keck School of Medicine 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 real-world experience in patient care from the start of the medical school career.

**Administration**

Carmen A. Puliafito, M.D., M.B.A., *Dean, May S. and John Hooval Dean's Chair in Medicine*

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M. Elizabeth Fini, Ph.D., *Vice Dean, Research Advancement*

Henri Ford, M.D., *Vice Dean, Medical Education*

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Minor W. Anderson, *President and CEO, USC Care Medical Group, Inc.*

Jane Brust, *Associate Senior Vice President for Health Sciences Public Relations and Marketing*

William D. Loadvine, *Senior Executive Director, Development*

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Raquel D. Arias, M.D., *Associate Dean, Educational Affairs (Special Programs)*

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Erin A. Quinn, Ph.D., *Associate Dean, Admissions*

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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:* Erin A. Quinn, Ph.D.

The Keck School of Medicine Committee on Admissions is responsible for selecting members of the entering class of the medical curriculum. The members of the committee represent a cross section of the school — full-time and voluntary faculty, alumni and students. The Committee on Admissions seriously considers candidates whose academic achievement and Medical College Admission Test (MCAT) performance indicate their ability to satisfactorily complete the rigorous curriculum of the medical school. Favorable consideration reflects additional factors which contribute to the breadth and diversity of the entering class. These include but are not limited to motivation and commitment to service, evidence of leadership, personal qualities that are deemed desirable for the study and practice of medicine and potential for significant achievement. This assessment is not influenced by race, creed, gender, nationality, residence, age or disability.

The applicant's undergraduate preparation may have been in any major field from any accredited college or university. Although sound preparation in the basic sciences is essential, a broad background in the humanities and wide exposure to people and their problems are equally necessary. The administration believes that the medical training obtained at USC will make all graduates superbly dedicated physicians.

#### General Admissions Information

The Keck School of Medicine offers 168 places in each entering class; since the number of applicants is far greater (6,310 applications were received in 2008), admission is highly selective. Each application is considered individually. The school does not require a minimum grade point average or minimum MCAT score for applicants; nevertheless, intense competition to enter medical school tends to eliminate applicants with a low GPA and/or MCAT scores.

#### Requirements

All applicants to the entering class must have completed a minimum of four full years or 120 semester hours of academic work at an accredited college or university at the time of matriculation. Course work must have included two semesters or three quarters

of the following subjects: biology, general chemistry and physics — all with laboratory instruction; one semester or two quarters of organic chemistry with laboratory instruction; and one semester or one quarter of biochemistry. Additionally, a course in basic molecular biology is required. Suitable courses may include: molecular biology, molecular genetics, cell and molecular biology, advanced cell biology, or the equivalent. Thirty semester hours (or quarter equivalent) of course work in the social sciences, humanities and English composition are required. Facility in the principles of college mathematics or calculus and in the use of computers as a tool for independent learning is highly recommended. Applicants are strongly encouraged to have their basic science requirements completed at the time of application.

Students from foreign countries must have taken 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 in the spring of the year of application and to have their basic science requirements completed at the time of application. Applicants to the 2010 entering class are required to take the MCAT no earlier than April 2007 and no later than September 2009. Scores from earlier administrations of the examination will not be acceptable.

**Applications**

The school participates in the American Medical College Application Service (AMCAS). This agency of the Association of American Medical Colleges 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 their Web site ([www.aamc.org](http://www.aamc.org)).

**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.

Applications are available after June 1 for the class entering in August of the following year. Although applications to USC must be returned to AMCAS before November 1, earlier application is encouraged. Only one class is admitted each year, with registration shortly after the opening of the school year. The Keck School of Medicine participates in the Early Decision Program. Interested applicants apply between June 1 and August 1 and are notified of the Admissions Committee decision by September 1. Additional information is available in the AMCAS material.

The Committee on Admissions reviews all information submitted on the AMCAS form 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 to appear for personal interviews.

**Personal Interviews**

Personal interviews are a required part of the application procedure when initiated by the committee. Invited candidates meet with

two interviewers who may be faculty, alumni, administrators, or students. Interviews in Los Angeles are required so that applicants have an opportunity to visit the campus and talk with students and faculty members. Interviews are conducted either on the Health Sciences campus or in an off-campus clinical setting in the Los Angeles area.

**Notice of Acceptance**

Notice of acceptance will be sent to successful candidates continually until the class is filled. In no case will an acceptance be offered earlier than one year before anticipated enrollment. Applications are mainly considered during the fall and winter, with review usually complete by May.

Candidates must reply to an offer of acceptance within two weeks, enclosing a \$100 deposit (non-refundable). 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.

**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.

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](mailto:mdphdpgm@hsc.usc.edu).

## Graduate Degree Programs

Admission standards for these curricula are established jointly by the Keck School of Medicine, its participating departments 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 departmental requirements for the Keck School of Medicine's graduate programs are detailed in the Graduate Degree Programs section on page 744.

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, 2009. 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)	\$44,842
Graduate Tuition (per unit)	1,299
Student Health Service Fee (annual)	456
Student Programming Fee (graduate)	62
Student Services Fee	20
Norman Topping Scholarship Fee	16
Health Insurance	985
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 40).

## 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 dean 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 for 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./M.B.A.; joint M.D./M.P.H.; a Master of Academic Medicine; 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.; Pathobiology, Ph.D.; Physiology and Biophysics, M.S., Ph.D.; Psychology and Public Health, Ph.D./M.P.H.; Statistical Genetics and Genetic Epidemiology, Ph.D.; Systems Biology and Disease, Ph.D.

The Department of Family Medicine offers the Master of Physician Assistant Practice. The Department of Preventive Medicine 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); Ph.D. Statistical Genetics and Genetic

Epidemiology; Master of Public Health; and minors in Health Communication, Nutrition and Health Promotion, Public Health and Substance Abuse Prevention. In addition, departments of the school have certificate programs in certain medical specialties.

The Educational Policy 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 comprises 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 Cardiothoracic Surgery, Department of Cell and Neurobiology, Department of Colorectal Surgery, 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.

### **Year I-II Continuum (two calendar years – 77 weeks)**

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.

The first year of the Year I-II continuum begins with 19 weeks of Core Principles of Health and Disease followed by 51 weeks of organ system review ending with a seven-week 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 the Patient (described on page 738) and Professionalism and the Practice of Medicine (described on page 738).

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 Health and Disease*

This 19-week introductory system provides the student with the fundamental knowledge necessary for the integrated study of the basic and clinical sciences in the 10 human organ systems. Included in this section are these major themes: cell structure and function; the human organism; disease and the body's responses; prevention and treatment of disease, including evidence-based medicine; and introduction to clinical medicine and the patient. This section is taught in an integrated fashion and includes the use of clinical case studies.

#### *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 and the Patient (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 PPM course runs throughout the first two years of the medical curriculum, meeting on Monday afternoons for two hours per

session. The students meet in groups of 24 with two faculty members who serve as their mentors throughout the two years of their pre-clinical education; at least one mentor is a clinician. The clinical faculty come from multiple disciplines within the Keck Medical School and the local community. While both years have large lectures with small group break-outs, there is a great emphasis on small group learning with community leaders, faculty-mentored small group discussions, student presentations and, in year two, student-led sessions.

The purpose of the PPM course is to create a community and social context to provide, identify and facilitate learning with professional role models for students as well as to help students gain skills and competence in the areas of communication, 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 increase their small group skills to improve participation in Introduction to Clinical Medicine (ICM), Gross Anatomy, MDL laboratories and large group sessions as well as prepare them for the team work of their clinical years.

The PPM course provides students with an opportunity to build professional identity, develop relationships with faculty mentors and increase team and community-building skills. Students are introduced to the nature of professionalism and ethics and the ways it is manifested in their own lives. The PPM course encourages leadership in the process of learning and presenting within small and large groups. It encourages professional development through exposure to multiple professional, ethical and cross-cultural scenarios, cases and providers. Evaluation is provided through student written portfolios, written and verbal self-reflections and response to faculty and peer feedback and evaluations over the course of a two-year longitudinal curriculum. Finally, PPM increases sensitivity and skills in medical professionalism to better prepare students for their transition into the clinical years of the medical 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 Health and Disease.

*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 the 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 advisors and to begin arranging the schedule of clerkships to be taken during the junior/senior continuum. By the end of the fall semester, Year II, each student receives information that describes the curriculum requirements of the junior/senior continuum. Students choose the area of medical practice that they are most likely to pursue and an advisor is assigned from that discipline. The advisor counsels the student on clerkships and opportunities in graduate medical education.

**Junior/Senior Continuum (two calendar 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 of the continuum. Each student's program is designed with the assistance of faculty advisors 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 the junior/senior continuum and pass it before starting their senior year of the continuum. Students must take Step II of the USMLE as a graduation requirement.

During the continuum each student may schedule 16 weeks of vacation 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/Specialty Surgery	12 weeks
Medicine I	6 weeks
Medicine II	4 weeks
Neurology	4 weeks
Obstetrics and Gynecology	6 weeks
Pediatrics	6 weeks
Psychiatry	6 weeks

*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](http://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 advisor, 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.

*Year I-IV – Program in Medical Humanities, Arts and Ethics*

This four-year 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.

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.

The Year IV 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 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 100D) and will be supervised through the Office of the Associate Dean for Student Affairs (KAM 100E). Dean's scholarships are available for selected students pursuing this option.

**Pathways Advising Program**

To assist students with career choices and provide early experiences in an area of interest, the Keck School of Medicine has implemented a Pathways Advising Program consisting of three major areas: academic medicine, clinical specialists and community health.

The goal of the Academic Medicine Pathway is to better prepare graduates for a career in academic medicine. It is for students who wish to learn about the research process and desire an increased exposure to basic or clinical studies. Students enrolled in this pathway will have the opportunity to read and critically evaluate scientific and medical literature, perform and present a mentored research project, receive direct feedback from an expert in the field, and critique the research and presentations of their colleagues in the program. Students in this pathway will be engaged in research activities the summer after Year I and during elective time in Year IV.

The Clinical Specialists Pathway is designed for students who will primarily enter medical practice and who are interested in a career in

clinical medicine. This pathway is designed to expose students to the majority of medical specialties and assist students with the exploration of all career options. Students enrolled in this pathway will have the opportunity to flourish in the clinical setting, interact with experts in various medical specialties, and explore available options to ensure the greatest chance for satisfaction and success in their professional lives.

The Community Health Pathway is designed to expose students to community-based medical settings, especially those that care for the medically underserved and those without health insurance. Students in this pathway will gain an understanding of the socioeconomic and environmental factors which contribute to the distribution problems in health

care resources and disparities in health, the factors outside of medicine that affect health, the importance of prevention and access to care, as well as the financial underpinnings of our health care system. Students' clinical education will be enhanced through electives in public and private community clinics and health centers, public health departments, physicians' offices in low income communities and schools.

The pathway program was designed to augment the existing curriculum and help students focus their career interests.

Questions about this program may be directed to the Office of Student Services at (323) 442-2553.

## 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. It is hoped 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. Information and applications are available from the College Admissions Office, College of Letters, Arts and Sciences, University of Southern California, Los Angeles, CA 90089-0152; (213) 740-5930, FAX: (213) 740-1338.

## 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. 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.

The following graduate programs at the Keck School of Medicine participate in the M.D./Ph.D. program:

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

Selected graduate programs from the University Park campus 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 advisor. 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: mdphdpgm@usc.edu.

## **M.D./M.B.A. 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./M.B.A. program spans five-and-one-half years. Interested students apply during their second year of medical school, and begin core M.B.A. courses following successful completion of the first two years of medical school. The last two-and-one-half years are devoted to the clinical clerkships of the Keck School of Medicine and nine units of elective courses in the Marshall School. At the conclusion of the program, students

will have completed 48 units in the Marshall School of Business 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 Year:* Required M.B.A. core courses.

*Remaining Two and One-Half Years:* Keck School of Medicine core, selective, and elective clerkships and nine units of GSBA elective courses.

### *Admission Requirements*

Students who have a baccalaureate degree from an accredited college or university and have successfully completed two years in the Keck School of Medicine will be considered for admission to the Marshall School of Business (see page 158). All requirements for admission to the regular M.B.A. Program (GPA, GMAT score, etc.) must be fulfilled by the medical student for admission to the Marshall School.

The M.D. and the M.B.A. 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./M.P.H. 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./M.P.H. 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./M.P.H. program spans five years (four years of medical school and one year of public health courses). Students begin the core M.P.H. 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 M.P.H. 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 M.P.H. program must also be fulfilled by dual degree applicants.

All students in the M.D./M.P.H. 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 M.P.H. curriculum to meet graduation requirements.

The M.D. and the M.P.H. 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 M.P.H. Program Office at (626) 457-6677.

## Master of Science in Clinical and Biomedical 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 and Biomedical Investigations is a joint effort to train medical students, fellows or 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 and Biomedical Investigations is specifically tailored to medical students who have completed their second year of medical school, as well as MDs doing their fellowships and faculty interested in advancing their research career at USC. Various tracks are proposed, depending on the research interest of the applicant. 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, and 9) environmental epidemiology. For those trainees who do not wish to pursue an M.S. degree, the school offers a Certificate in Clinical and Biomedical Investigations.

The Keck School of Medicine administers this program in conjunction with the Departments of Preventive Medicine, Cell and Neurobiology, Family Medicine and the General Clinical Research Center. The program oversight committee consists of faculty members representing these departments.

The M.S. in Clinical and Biomedical 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, one to two members of the program oversight committee 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 full oversight committee. 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 advisor 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 and Biomedical 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
		<u>19</u>

**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
		<u>16</u>

**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
		<u>18</u>

**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
		<u>17</u>

**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
		<u>16</u>

**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
		<u>16</u>

**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
		<u>15</u>

**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
		<u>21-24</u>

**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
		<u>17-18</u>

**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.

## 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](mailto:pibbs@usc.edu)  
[www.usc.edu/pibbs](http://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) offer opportunities for 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 advisor 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](http://www.usc.edu/pibbs)).

### Participating Schools and Graduate Programs

College of Letters, Arts and Sciences  
Department of Biological Sciences  
Marine and Environmental Biology  
Molecular and Computational Biology  
Integrative and Evolutionary Biology  
Neuroscience  
School of Dentistry  
Craniofacial Biology  
Viterbi School of Engineering  
Biomedical Engineering  
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 Web site for information: [www.usc.edu/pibbs](http://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.

### 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 advisor and will choose a specific Ph.D. program from the list of participating programs.

## 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, pathobiology, physiology and biophysics and preventive medicine. In addition, individual departments offer degrees in biochemistry and molecular biology, cell and neurobiology, molecular microbiology and immunology, pathobiology, physiology and biophysics.

The Departments of Preventive Medicine and Cell and Neurobiology along with the School of Policy, Planning, and Development 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, 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 specific departments or contact: Office of the Associate Dean for Scientific Affairs, Keck School of Medicine, 1975 Zonal Avenue (KAM 110), Los Angeles, CA 90089-9023; (323) 442-1607, FAX: (323) 442-1610.

### 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](mailto: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](http://www.usc.edu/pibbs), or can be obtained from the PIBBS program, Office of the Associate Dean for Research, University of Southern California Keck School of Medicine, KAM B-16, 1975 Zonal Ave., Los Angeles, CA 90089-9031; email [pibbs@usc.edu](mailto:pibbs@usc.edu).

#### *Degree Requirements*

These degrees are awarded under the jurisdiction of the Graduate School. Refer to the Requirements for Graduation section, page 83, and the Graduate School section, page 93, 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 advisor 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 advisors). 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 advisor.

In the first year, students are also required to take two, 4-unit graduate-level courses each semester, including one in each of the following areas: biochemistry, cell biology, molecular genetics, and 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 of Scientific 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
INTD 549	Protein Chemistry – Structure and Function	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>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. In the second and subsequent years, students are required to take BIOC 573 Optimal Research Presentations by Ph.D. students. 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 (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.

#### *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  
Office of Scientific Affairs  
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](http://www.usc.edu/pibbs). Additional information can be obtained from the PIBBS program, Office of the Associate Dean for Research, University of Southern California Keck School of Medicine, KAM B-16, 1975 Zonal Ave., Los Angeles, CA 90089-9031; email [pibbs@usc.edu](mailto:pibbs@usc.edu).

#### *Degree Requirements*

These degrees are awarded under the jurisdiction of the Graduate School. Refer to the Requirements for Graduation section, page 83, and the Graduate School section, page 93, 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 advisor 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 advisors). 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 advisor.

In the first year, 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 of Scientific 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	Advanced Pathology	6
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. *Prerequisite:* MICB 501.

**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 (2, Fa)**

Normal histology emphasizing relationship between morphological and functional characteristics. Focuses on human, but differences between human and common laboratory animals are also covered.

**INTD 551 Advanced Pathology (6, Sp)**

Mechanisms of disease processes including inflammation, tissue injury and cell death, atherosclerosis, infectious diseases, diseases of the immune system, cancer, diseases of aging, and pollution. (Duplicates credit in former PATH 550bL.) *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. *Corequisite:* INTD 531; *recommended preparation:* undergraduate degree in a biological science.

**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. *Corequisite:* INTD 531; *recommended preparation:* undergraduate degree in a biological science.

**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 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 218**

1975 Zonal Avenue  
Los Angeles, CA 90089-9023  
(323) 442-2374  
FAX: (323) 442-2051  
Email: nyquist@usc.edu

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

**Faculty**

*Professors:* 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*); Donna Elliott, M.D., Ed.D. (*Pediatrics*); Jerry Gates, Ph.D. (*Family Medicine*); Robert G. Keim, D.D.S., Ed.D. (*Dentistry*); Win May, M.D., Ph.D. (*Pediatrics/Medical Education*)

*Assistant Professors:* Dixie Fisher, Ph.D. (*Pediatrics/Medical Education*); Maura Sullivan, Ph.D., M.S.N. (*Surgery*); 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 healthcare 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 six-semester program, the majority of sessions will be delivered using interactive computerized delivery methods, as well as within the new classrooms on the Health Sciences

campus specially equipped for blended education, allowing for on-campus attendance as well as synchronous and asynchronous streaming video to those at a distance. All students will also be on campus twice for one-week intensive sessions, in the spring of each year, that will 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., D.D.S., D.P.T., R.N., M.S.N., P.A., D.V.M., D.O., Pharm.D., D.C., D.O.M.). 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 Educational Affairs, (323) 442-2374.

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 Educational Affairs, 1975 Zonal Avenue, KAM 218, Los Angeles, CA 90089-9023, telephone (323) 442-2374.

### 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 (CDP) of physicians and other health care professionals; trends, needs, strategies, assessing outcomes, examining effectiveness of CDP programs.

## Master of Science in Global Medicine

The Master of Science in Global Medicine is offered by the Departments of Preventive Medicine and 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 M.S. in Global Medicine 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 Systems I and GM 504L Core Principles Systems II course requirements.

The program responds to the Institute of Medicine's recommendation that health professional training include course work resulting in literacy in global medicine. The M.S. in Global Medicine provides the knowledge and training necessary to address current and future global medical challenges. In addition to gaining the strong medical science foundation needed for critical analysis of the global burden of disease, courses examining methods used to create programming, solutions and innovative responses to global health challenges furnish students of the program with problem-solving skills and analytical frameworks, which will aid them in future career paths.

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

United Nations Joint Programme on HIV/AIDS (UNAIDS), United Nations Children's Fund (UNICEF), World Health Organization (WHO), World Bank and the Centers for Disease Control and Prevention (CDC).

### Admission

Applicants for admission to the M.S. in Global Medicine must have a bachelor's degree or its equivalent from an accredited institution and have earned a grade point average 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 an evaluator qualified to evaluate the applicant's 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 only considered for enrollment beginning in the fall semester. For further information contact: Dr. Elahe Nezami, USC Institute for Health Promotion and Disease Prevention Research, 3375 S. Hoover St., Suite E 210, Los Angeles, CA 90089-7798, (213) 821-1600, (213) 821-1733 FAX.

### Advisement

Students are required to meet with the academic advisor 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 (20 UNITS)		UNITS
GM 500	Basic Concepts in Global Health	4
GM 501	Critical Issues in Global Health	4
GM 502	Global Epidemiology of Diseases and Risk Factors	4
GM 503L	Core Principles System I	4
GM 504L	Core Principles System II	4
ELECTIVE COURSES (AT LEAST 12 UNITS)		UNITS
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

## 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, FaSp)** 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. *Prerequisite:* GM 500.

#### GM 502 Global Epidemiology of Diseases

**and Risk Factors (4, Sp)** Survey of major populations' crises and risk factors accounting for global health challenges. Evaluation of case studies of global health interventions and effective methodologies. *Prerequisite:* GM 500.

#### 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)

Continuation of GM 512. In-depth examination of women's health issues; health promotion and policy efforts to improve women's health globally. *Prerequisite:* GM 512.

#### 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. *Prerequisite:* GM 500, GM 501, GM 502.

#### 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. *Prerequisite:* GM 500, GM 501, GM 502.

## Department of Anesthesiology

### Nurse Anesthesia Program

1540 Alcazar Street  
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Los Angeles 90089-9012  
(323) 442-2037  
FAX: (323) 442-1701  
Email: [uscnap@usc.edu](mailto:uscnap@usc.edu)  
[www.usc.edu/medicine/anesthesia](http://www.usc.edu/medicine/anesthesia)

*Program Director:* Michele E. Gold

*Assistant Program Director:* Teresa Norris

### Faculty

*Chair and Professor:* Philip Lumb

*Professor of Pediatrics and Anesthesiology:*  
Randall Wetzel

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

*Associate Professor:* Wynne Waugaman

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

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

*Instructors of Clinical Anesthesiology:* Roberta Ashley; Deborah Avnet; James Carey; Nancy Christiano; Karen Embrey; Judy Franco; Charlotte Garcia; David Godden; Monique Jabbour; Arthur Norcliffe; Lou Rauso; Ilene Richards; Kim Tang; Heather Wilson; Jennifer Woolley; 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 and the Department of Physiology and Biophysics 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, Arrowhead Regional Medical Center, 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, Childrens Hospital of Los Angeles, Hudson Comprehensive Care Center, 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, 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 roles 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](http://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.

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
<i>Residency Courses</i>		
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
<i>Optional Course</i>		
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

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Los Angeles, CA 90089-9151  
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FAX: (323) 442-1224  
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[www.usc.edu/medicine/biochemistry](http://www.usc.edu/medicine/biochemistry)  
[www.usc.edu/pibbs](http://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, Ph.D.

*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:* Lawrence H. Kedes

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

*Salerni Collegium Professor of Medicine:* Robert E. Maxson

*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*); C.L. Hsieh (*Urology*); D. Johnson; P.A. Jones (*Urology*); M. Kahn; V.K. Kalra; L.H. Kedes; A.S. Lee; D. Levy; M. Lieber (*Pathology*); F.S. Markland, Jr.; R.E. Maxson; M.E. Nimni (*Pediatrics*); P. Patel; P. Roy-Burman (*Pathology*); M.R. Stallcup; Z. Tokes; A. Warshel (*Chemistry*)

*Associate Professors:* P. Cannon (*Pediatrics*); I.S. Haworth (*Pharmacy*); B. Frenkel (*Orthopaedics*); J. Hacia; I. Laird-Offringa (*Surgery*); P. Laird (*Surgery*); R. Langen; R.D. Mosteller; M. Muschen (*Pediatrics*); S. Reddy; H. Sucov (*Cell and Neurobiology*)

*Assistant Professors:* W. An; J. Chan; A. Kobielski (*Otolaryngology*); J. Rice; T. Ulmer; W. Lu; Y. Hong (*Surgery*)

*Research Associate Professor:* Q.S. Zhu

*Assistant Professors of Research:* R. Mehrian; C. Poizat; S. Swenson

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 2006, the department received approximately \$12 million in research funding for its primary faculty members.

Altogether, the department numbers 47 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), Broad Institute for Stem Cell and Regenerative Medicine and Children's Hospital Los Angeles (CHLA).

The 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 bio-reagent and cell culture, genomics, confocal microscopy, mass pectroscopy transgenic, flow cytometry and biostatistical 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 Web site ([www.usc.edu/pibbs](http://www.usc.edu/pibbs)).

Applications should be submitted before the application due date specified on the PIBBS Web site. 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 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 777 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 745) and SYBD (page 746).

*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 advisor.

*Guidance Committee* To assist students in selecting their research advisors, 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 advisor. Shortly afterward the student should form a five-member guidance committee. Members of the committee must include the student's research advisor, 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 advisor, 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 771.

## 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 401ab Medical Biochemistry (5, 3)**

Introduction to biochemistry emphasizing human and medical aspects, including the specific biochemistry of various human organ systems. Discussion groups in fall semester.

**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)**

(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. (Frenkel)

**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](mailto:cnb@hsc.usc.edu)

*Graduate Advisory Committee Chair:* Thomas McNeill (323) 442-1625

### Faculty

*Professor and Interim Chair:* Mikel H. Snow

*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; J.A. Garner\*; R. Gopalakrishna\*; J.D. Miller; P. Elyse Schauwecker; B.G. Slavin\*; H. Sucoy\*; Z.Z. Wang

*Assistant Professors:* G. Crump; S. D'Souza; L. Ma; Q. Ying; Francesca Mariani

*Associate Professor Clinical:* J.D. Miller\*

*Assistant Professor Clinical:* M. Winfield

*Adjunct Professor:* Vijaya Kumari

*Emeritus Professors:* D.A. Berman\*; R.L. Wood

*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 23 primary faculty members, including 10 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 and Biomedical Investigations

Refer to page 742, 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 94, 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 advisor 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 advisor 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 advisor 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 advisor 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 a 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 advisor as soon as possible but no later than 18 months after entering the graduate program in this department. The dissertation advisor 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 advisor 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 551ab Approaches to Teaching and Research in Cell and Neurobiology (1-1, 2 years, Fa)** Sequence of seminars devised to supplement graduate training in literature analysis, oral communication, research techniques and philosophy of teaching. (Duplicates credit in former ANCB 551.)

**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 601L Advanced Regional Dissections (2, FaSp)** Advanced dissection of various anatomical regions of the adult human body. Lab, 8-12 hours a week. *Prerequisite:* CNB 501ab.

**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 (2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Department of Family Medicine

**Primary Care Physician Assistant Program**  
1000 South Fremont Avenue  
Unit 7  
Building A6, Room 6429  
Alhambra, CA 91803  
(626) 457-4240  
FAX: (626) 457-4245  
[www.usc.edu/pa](http://www.usc.edu/pa)

*Program Director:* Roslynn S. Byous, D.P.A., P.A.C.

*Medical Director:* Katrina Miller, M.D.

### Faculty

*Assistant Professors of Clinical Family Medicine:* R. Byous; I. DeArtola; C. Forest; L. Landry-Taylor; J. Mabee

*Instructor of Clinical Family Medicine:* A. Schultz

*Clinical Instructors in Family Medicine:* L. Kirakosian; J. Tramel; J. Wegler

The faculty listed above are core 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. 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. Clinical training occurs at various clinical sites throughout the greater Los Angeles region, including Los Angeles County+USC Medical Center, Arrowhead Regional Medical Center (San Bernardino County Medical Center), Ventura County Medical Center, 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 and urgent care, family medicine, internal medicine/geriatrics, women's health, orthopaedics/occupational medicine, pediatrics and general surgery. These clerkships emphasize obtaining necessary clinical skills as well as learning to work as part of a health care team. The 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 a National Certifying Examination 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 an 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 personal 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](http://www.usc.edu/pa).

### Transfer Students

The Physician Assistant Program does not accept transfer students. Every 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.

### Preparation in Education Program

The Preparation in Education Program (PEP) is designed to enhance the mission of the USC Physician Assistant Program by strengthening the application of students who are from educationally or economically disadvantaged backgrounds. For further information, contact the PEP coordinator at (626) 457-4247 or (626) 457-4245 (FAX).

### Registration

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

*Advisement*

A monthly information session is available for prospective students who would like to receive more information regarding the program. Students who are interested in applying to the program are encouraged to visit the PA Program Web site at [www.usc.edu/pa](http://www.usc.edu/pa) or call the PA Admission Office at (626) 457-4247.

*Degree Prerequisites*

A bachelor's degree from an 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; physiology with lab; and microbiology with lab.

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).

Three semester units or 4 quarter units each: general (introduction to) psychology.

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

Six semester units or 8 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.

*Clinical Experience Prerequisite*

A minimum of 1,000 hours of "hands-on" patient care experience is highly 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 technologist, military medical corpsman, paramedic, psychiatric technician, radiological technician, respiratory therapist, registered nurse or medical assistant. Other health care experience is equally acceptable as long as the experience is "hands-on" in nature.

*Community Service Prerequisite*

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

*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.

*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 Physician Assistant Program, Keck School of Medicine, University of Southern California, 1000 South Fremont Avenue, Unit 7, Building A6, Room 6429, Alhambra, CA 91803.

## 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)** 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)** 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)** 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)** 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)** 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)** 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)** 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)** 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)** 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)** 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)** 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)** 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

Hoffman Medical Research Center 401  
2011 Zonal Avenue, Los Angeles  
90089-9094  
(323) 442-2337  
FAX: (323) 442-1713  
Email: [microbio@usc.edu](mailto:microbio@usc.edu)  
[www.usc.edu/go/medicine](http://www.usc.edu/go/medicine)

### Faculty

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

*Richard Angus Grant, Sr., Chair in Neurology:*  
Leslie P. Weiner

*Walter A. Richter Chair in Cancer Research:*  
W. Martin Kast

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

*Professors:* S. Chen; L. Comai; D. A. Horwitz (*Medicine*); C.O. Jacob (*Medicine*); M. Lieber (*Pathology, Biochemistry and Molecular Biology*); M. McMillan; J.-H. Ou; P. K. Pattengale (*Pathology*)

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

*Assistant Professors:* K. Machida; W. Yuan

*Professor of Research:* M.D. Trousdale (*Ophthalmology*)

*Associate Professor of Research:* G.M. Shackleford (*Pediatrics*)

*Assistant Professors of Research:* Hyeong-Nam (Joseph) Jeong; Chengyu Liang

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

*Clinical Assistant Professor:* Jie Li

*Research Assistant Professor:* X. Huang

*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, McKibben Hall, and the Norris Cancer Hospital and Research Institute. Faculty guidance and specialized facilities are available for advanced research in animal virology, eucaryotic cell biology and cellular differentiation, molecular and cellular immunology, microbial and molecular genetics, control of gene expression, control of protein synthesis, 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. Foreign students are supported by research assistantships.

#### Master of Science

The primary objectives of this program are to provide the necessary theoretical preparation for microbiological and immunological careers and to expose students to microbiological and immunological research activities culminating with the master of science degree. Goals of the program are to train students in preparation for (1) microbiological and immunological positions in industry and academia, (2) teaching positions at the community college level and (3) further doctoral study.

Admission requirements are the same as for the doctor of philosophy degree. The prerequisite for applicants to the graduate program in molecular microbiology and immunology 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 (biology, chemistry 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. Students admitted for studies leading to the Ph.D. may request a change in degree objective to the M.S. with the permission of the faculty.

#### 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 advisor 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 advisor.

**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. advisor. Appointment of the chair is subject to approval of the student's research advisor, the department chair and the graduate advisory committee. Other committee members must include three faculty from within the department 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 advisor, 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 advisor 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 advisor. 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 typing. 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 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 (2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.



## Department of Pathology

**Hoffman Medical Research Center 204**  
2011 Zonal Avenue, Los Angeles 90089-9092

*M.S. Student Advisor:* Cheng-Ming Chuong,  
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### Faculty

Clive R. Taylor, 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, Ph.D.

*Kenneth T. Norris Chair in Medicine:* Edward D. Crandall, M.D., Ph.D.

*Rita and Edward Polusky Chair in Basic Cancer Research:* Michael Lieber, Ph.D., 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*); 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; 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*)\*; 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*); A. Erdreich-Epstein (*Pediatrics*); B.H. Gross (*Psychiatry and Behavioral Sciences, Medicine*); J.P. Handlers (*Dentistry*); 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:* K. Asahina; S. Asgharzadeh (*Pediatrics*); E.P. Kartalov; Y.M. Kim (*Pediatrics*); K. Kobiela; R.D. Ladner; E.R. Lawlor (*Pediatrics*); M. Russell (*Emergency Medicine*); B. Stiles (*Pharmacology and Pharmaceutical Sciences*); J. F. Zhong

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

*Clinical Professors:* A.M. Abrams (*Dentistry*); M.D. Appleman; C.A. Bell; K.J. Bloom; H.N. Canawati; J.N. Carberry; J. Ciccirelli (*Urology*); J. De La Torre-Bueno; K.A. Frankel; B. Gottlieb (*Medicine*); T.S. Greaves; R. Green; D.N. Halikis; D.S. Harrington; D.V. Hoang; R.E. Horowitz; L. Khawli; D.V. Kon; O.T. Kuzma (*Medicine*); D.H. Mills; J.M. Mirra; D.L. Moyer; G.C. Ponto; C. Rogers; A.A. Roscher; L. Sathyavagiswaran (*Medicine*); K. Sheibani; S.-R. Shi; S.V. Sostrin

*Clinical Associate Professors:* M.I. Abbott; J.S. Allan; H.M. Bauer; W.F. Burgos; M.H. Cheng; C. J. Cobb; M.M. Cosgrove; B.D. Florentine; J.T. Gmelich; C.I. Goldsmith; C.J. Hanna; R.M. Hathout; T.E. Howard; P.C. Hsieh; P. Malik (*Pediatrics*); L.G. McCarthy; J.M. McDonnell; H. Muensch; C.C. Osborn; H.Y. Pak; G. Pezeshkpour; M. Pietruszka; R.M. Protzel; A.S.S. Raza; J.K. Ribe; K. Saeger; S.F. Selser; R.M. Siltan; J.S. Wollman

*Clinical Assistant Professors:* A.R. Abrams; I.S. Arulanantham; A. Baltayan; B. Bodey; S.G. Brodie; J. Bonadio X. Bu; E. Carpenter, Jr.; J.A. Chan; L.-S. Chen; W. Chick; O. Chinwah; P.D. Colman; D.K. Darvish; E.C. Dinovo; K.A. Fagin; P.L. Fitzgibbons; R. Gellibolian; M.D. Haimowitz; N.V. Heard; A.M. Hieshima; R. Karjoo; T.M. Kim; M.T. Kiyabu; D.L. Krasne; B.J. Le Berthon; K. Matsuda; J. Nachazel; C.M. Nadelman; V. Nelson; M. Osby; J.A. Pachiarz; L.A. Pena; L.M. Petrovic; G. Pinsky; B.E. Platz; B.J. Poletti; A.K. Rechdouni; S.K. Reddy; J. Rice; V. Richters; S. Sadeghi; S. Sahgal; L.A. Scheinin; R.K. Schmidt; W.M. Schultheis; T.A. Sherwood; R.A. Soni; S.D. Stewart; J. Toh; C. Toms; D.D. Tschirhart, Jr.; R.R. Turner; E.A. Wagar; V. Willoughby; C. Williams; P. Yetur; K. Young; S.M. Zneimer

*Clinical Instructors:* P. Javaherbin; K.K.Y. Lai; G.N. Pontrelli

*Professors of Clinical:* R.K. Brynes; K.-M. Chan; D.B. Endres; J.C. Felix (*Obstetrics and Gynecology*); E.M. Gomperts (*Pediatrics*); A.L. Hiti; C.B. Inderlied (*Molecular Microbiology and Immunology*); Y. Iwaki (*Urology, Surgery*); G.C. Kanel; A.J. Keyser; W.Y. Naritoku; J.M. Nelson; P.W. Nichols; S. Saxena; A.E. Sherrod; H. Shimada; S. Wu (*Pediatrics*)

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

*Associate Professors of Clinical:* R. Atkinson (*Neurology*); N.J. Barr; D.B. Casebolt; D.L. Commins; A.N. Fedenko (*Orthopaedic Surgery*); Y. Ma; R.D. MacPhee; G.D. Zeger

*Visiting Professor of Clinical:* L.M. Petrovic

*Associate Professor of Clinical:* Y. Ma

*Visiting Associate Professors of Clinical:*  
L.S. Ellis; J.L. Fridley

*Assistant Professors of Clinical:* M. Burnett (*Neurology*); A.J. Correa; I. Gonzales-Gomez; D. Hawes; S. He (*Ophthalmology*); L.K. Kelly; N.E. Klipfel; M.E. Sibug Saber; R.G. Simental-Pizarro; K.D. Tsoulas; L. Wang; L.L. Wang; Y. Wang; W. Xing; J. Zheng

*Visiting Assistant Professors of Clinical:*  
G.H. Kim; K.A. Rich

*Visiting Clinical Professors:* A.M. Gown; G.A. Pangalis

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

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

*Assistant Professors of Research:* M.J. Anderson; Y.-P. Han (*Surgery*); P. Hu; T. Jiang; R.A. Moats (*Radiology*); K.A. Nash

*Assistant Professors of Research:* K. Asahina; J.F. Zhong

*Visiting Assistant Professor of Research:* P. Wu

*Research Associate Professor:* S.M. Brennan

*Research Assistant Professors:* N.W. Marten; E. Ojo-Amaize; Y. Ouyang; A. T'Ang

*Visiting Research Professor:* T. Oki

*Visiting Research Assistant Professor:*  
T. Shichinohe

*Resident Clinical Instructors:* L. Abramyan; S. Acree; W. Bishop; T.N. Brown; R. Chan; A. Chen; D. Cortez; S. Das; A. D'Auria; W. Elatre; P. Jinadasa; V. Knez; B. Kwok; A. Liu; C. Lorenzo; C. Lwin; L. Nguyen; J. Oblad; F. Ough; R.K. Pillai; N. Ree; D. Rhee; D. Shen; S. Song; K. Stevenson; X. Su; A.Z. Tan; S. Verma; R. Wardeh; C.-A. Wong; Y. Xu; G. Yang; S. Young; L. Zamis; S. Zhou

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

*Emeritus Associate Professors:* A.D. Cramer; R.M. Nakamura

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

*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, USC University Hospital and 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 both a Master of Science and a Ph.D. 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. The Ph.D. program provides the student with training to be an independent scientist. Faculty members provide a cutting-edge scientific environment in the fields of cancer research, neurodegenerative disorders, AIDS and other disease processes.

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 radioimmunoimaging 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 Norris Cancer Hospital, the Doheny Eye Hospital, USC University Hospital 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 Norris Cancer Hospital and Research Institute and USC University Hospital 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, consultancies 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 (2), INTD 551 Advanced Pathology (6), INTD 561 Molecular Genetics (4) or BIOC 510 Introductory Molecular Biology (2), 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 a thesis or non-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 non-thesis course of study. Students also have an opportunity to register for directed research (PATH 590). For the thesis option, the student must take PATH 594ab Master's Thesis. For the non-thesis option, the student must take GRSC 810 Studies for Master's Examination the semester they plan to graduate.

#### *Doctor of Philosophy in Pathobiology*

The Pathology Department's graduate program in pathobiology prepares individuals for careers in research and teaching and leads to conferment of the Ph.D. degree. The program seeks to develop scientists who have a sound understanding of disease and are capable of creating experimental approaches to investigate its mechanisms with a goal of either basic science or translational research. The program can be varied to fit individual requirements and goals. Areas of research include cancer, neurodegenerative diseases, molecular biology, stem cell, virology and developmental biology.

**Course Requirements** The Ph.D. course work consists of 30 credits of required courses and a minimum of 30 units of elective credits. The elective courses may be chosen from those offered within and outside the department; the student must make up any prerequisite deficiencies before taking a required or elective course for which that background is necessary. Required courses include INTD 522 Infection and Host Responses (4), INTD 531 Cell Biology (4), INTD 550 Introduction to Pathology (2), INTD 551 Advanced Pathology (6), INTD 561 Molecular Genetics (4), INTD 571 Biochemistry (4) or prior equivalent, PATH 570ab Seminar in Pathology (2), PATH 794ab Doctoral Dissertation (4). The remaining 30 units will consist of 8 units from the courses listed below, or any other graduate level course of interest to the student, research credits (not to exceed 14 units), and up to an additional 4 units of dissertation research: BIOC 542, INTD 504, INTD 555, MICB 502, MICB 542, MICB 551, MPTX 500, PATH 552ab, PATH 570cd, PATH 575, PATH 580, PATH 581, PATH 599, PATH 630, PHBI 562, PM 510L. During years I and II, students are advised to rotate through at least two research laboratories. The student must maintain at least a 3.0 GPA for all course work, exclusive of research credits.

The Ph.D. advisor is available to advise each newly admitted student regarding educational objectives and research interests, to acquaint the student with the research activities of the department, and to recommend a program of graduate courses and research. The Ph.D. advisor must approve the student's program before the student may register for any courses, evaluate the performance of each first-year student and approve the student's progress before the student may register for the second year. The student's guidance committee should evaluate yearly progress. This may be a written or oral screening examination.

**Guidance Committee** Not later than one month after being approved to register for the second year, each student must file for formation of a five-member guidance committee, one member of which must be from a department other than pathology. This committee guides and advises the student during preparation for the qualifying examination and writing of a research proposal. This committee may

also serve as a dissertation committee, or the student may request changes in membership. The dissertation committee must have at least three members: chairman, tenured Pathology faculty, and tenured faculty outside the Pathology Department. The dissertation committee advises the student once the qualifying examination has been successfully completed, throughout the research period and concluding with the evaluation of the dissertation.

**Qualifying Examination** To be admitted to candidacy for the Ph.D. degree, each student is required to pass both the written and oral portions of a qualifying examination, usually taken no later than the fifth semester of graduate standing. The examination is designed to test the student's core knowledge in pathobiology and to determine fitness and competence to undertake independent research. The written portion of the examination is prepared by the Pathology Graduate Committee and is offered once each year.

The oral examination is administered by the student's guidance committee and is based in part on a written proposal which the student must submit two weeks prior to the oral examination. The written proposal follows the NIH application guidelines, and must consist of an original research project.

**Dissertation and Oral Defense** The written dissertation is prepared in a format commonly used by major peer-reviewed scientific journals that publish similar experimental results. When the student has substantially completed the research and writing of the dissertation, the department requires that the student orally defend the dissertation's research conclusions. Although attendance at the oral defense is open to all members of the department and other interested faculty, the examination is conducted and evaluated solely by the candidate's dissertation committee. The student may defend the dissertation at any time in the year mutually agreeable to the dissertation committee. It should be noted that the Master of Science degree is not automatically awarded to Ph.D. students who do not finish the Ph.D. program.

## 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 (2, Fa)** (Enroll in INTD 550)

**PATH 551 Advanced Pathology (6)** (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 560 Ultrastructural Pathology (4, Sp)** Didactic presentation of pathological alterations in cells and tissues as seen with the electron microscope. Laboratory in techniques of electron microscopy. *Prerequisite*: INTD 550.

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

**PATH 565 Techniques in Tissue Culture (2, Fa)** Methods used in tissue culture; their application to the study of diseased cells and tissues.

**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 711abc Surgical Pathology (2-2-2, FaSp)** Gross and microscopic features of surgical material, principally of neoplastic disease in the mouth and jaws; correlation of clinical aspects with pathology.

**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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### 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 healthcare 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 healthcare 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.

### 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 748.

### 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.

## Department of Physiology and Biophysics

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(323) 442-1040  
FAX: (323) 442-2283  
Email: [physiol@hsc.usc.edu](mailto:physiol@hsc.usc.edu)

*Student Advisor:* H. Kaslow  
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### Faculty

Richard N. Bergman, Ph.D., *Chair of Physiology and Biophysics and W.M. Keck Chair in Medicine*

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

*USC Associates/Thomas H. Brem Chair in Medicine:* Neil Kaplowitz (*Medicine/GI Liver Patient Care*)

*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*); Kwang Jin Kim (*Medicine, Biomedical Engineering*); Herbert J. Meiselman; Austin K. Mircheff; Dennis O'Leary (*Otolaryngology*); Alan G. Watts

*Associate Professors:* Marilyn Ader; Robert H. Chow; Harvey R. Kaslow; R.M. Nakamura (*Obstetrics and Gynecology, Pathology*); Richard L. Lubman (*Medicine/Pulmonary Patient Care*); Janos Peti-Peterdi; Jang-Hyun Youn; Alan S.L. Yu

*Assistant Professors:* Tamas Alexy; Steven Mittelman; Joyce Richey; Alapakkam P. Sampath; Richard Watanabe; Samuel Yiu; Li Zhang

*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.

## 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 advisor. 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 advisor, guidance committee and the department faculty. There is no foreign language requirement.

**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 advisor.

**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.

## 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.

**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 Transport in Animal Cells (2, alt Sp)** A comprehensive examination of ion transport pathways, covering kinetic and structural analysis, physiological regulation, and theoretical treatments of ion pumps, channels, exchange pathways, and model compounds. *Prerequisite:* BIOC 441.

**PHBI 660 Diseases of Ion Transport (2, Sp)**

Analysis of ion channel function by electrophysiology, regulation of transporter biosynthesis, structure-function relationships in transport proteins, and identifying genes for genetic disorders. Diseases to be studied include cystic fibrosis, Bartter's syndrome, Liddle's syndrome, epilepsy and other neurological disorders, malignant hyperthermia, and long QT syndrome. *Recommended preparation:* graduate-level courses in biochemistry and cell biology.

**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**

**(2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Department of Preventive Medicine

**Biostatistics Division**  
Center for Health Professions 222  
1540 Alcazar Street  
Los Angeles 90089-9010  
Co-Directors: Stanley P. Azen,  
Duncan Thomas  
(323) 442-1810  
FAX: (323) 442-2993  
Email: mtrujill@usc.edu  
[www.usc.edu/medicine/biostats](http://www.usc.edu/medicine/biostats)

**Health Behavior Research Division**  
c/o USC/IPR  
1000 S. Fremont Avenue, Box #8  
Alhambra, CA 91803  
(626) 457-6600  
FAX: (626) 457-4012  
Director: Mary Ann Pentz  
(626) 457-6648  
Email: barovich@hsc.usc.edu  
[www.usc.edu/medicine/hbrphd](http://www.usc.edu/medicine/hbrphd)

**Environmental Health Division**  
Center for Health Professions 236  
1540 Alcazar Street  
Los Angeles 90089-9013  
Director: Frank D. Gilliland  
(323) 442-1096  
FAX: (323) 442-3272

**Master of Public Health Program**  
1000 S. Fremont Avenue, Building A-5,  
Room 5128  
Alhambra, CA 91803  
Director: Thomas W. Valente, Ph.D.  
(626) 457-4139  
FAX: (626) 457-6699  
Email: mphusc@usc.edu

**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](http://www.usc.edu/medicine/hp)

### Faculty

Jonathan M. Samet, M.D., Ph.D., *Professor and Flora L. Thornton Chair in Preventive Medicine*

John M. Peters, *Vice Chair and Hastings Professor of Medicine*

*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.

*Sidney R. Garfield Chair in Health Sciences:* C. Anderson Johnson, Ph.D.

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

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

*Harry J. Bauer and Dorothy Bauer Rawlins Professor of Cardiology:* Howard N. Hodis

*Professors:* S.P. Azen (*Biokinesiology and Physical Therapy, Ophthalmology, Occupational Science*); P. Clarke (*Communication*); G. Coetzee (*Urology, Microbiology*); W.J. Gauderman; F.D. Gilliland; M. Goran (*Physiology, Biophysics and Pediatrics [CHLA]*); R. Haile; B.E. Henderson; H. Hodis (*Medicine*); T.M. Mack (*Pathology*); Wendy Mack; R. McConnell; B. Meyerowitz (*Psychology*); M.A. Pentz; J.M. Peters; M.C. Pike; B. Portnoy (*Pediatrics*); J. Richardson; J.M. Samet; D. Stram; S. Sussman; S. Tavaré (*Mathematics*); T. Valente; D.C. Thomas; A. Wu

*Associate Professors:* L. Baezconde-Garbanati; K. Berhane; C. Haiman; S. Ingles; T. Seeman (*Gerontology*); K. Siegmund; G. Ursin; R. Watanabe (*Physiology/Biophysics*)

*Assistant Professors:* H. Allayee; D. Conti; V. Cortessis; C.L. Pearce; N. Riggs; F. Schumacher; M. Stern; H. Wipfli

*Professors of Clinical:* E.L. Avol; D. Deapen

*Associate Professors of Clinical:* A. Hricko; E. Nezami

*Assistant Professors of Clinical:* T. Boley-Cruz; C. Koprowski; L. Liu; K. Monroe; P. Palmer

*Clinical Associate Professors:* J.T. Casagrande; W.S. Linn; J.N. Weitzel

*Clinical Assistant Professor:* K. Dwyer

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

*Associate Professors of Research:* T. Alonzo; M. Cockburn; W. Cozen (*Pathology*); A. Hamilton; P. Marjoram; L. Rohrbach; D. Spruijt-Metz; A. Xiang

*Assistant Professors of Research:* G. Chen; L. Chen; J. Davis; S. Fruin; M. Gago; R. McKean-Cowdin; J. Milam; N. W. Setiawan; P. Sun; 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:* 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  
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/Doctor of Physical Therapy  
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 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](mailto:bhealthy@usc.edu)  
[www.usc.edu/medicine/hp](http://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 60 and 245 for more information.

#### *Requirements for the Major (66 units)*

The program is divided into core and elective components.

The following core component (46 units) is required of all students.

NON-HP COURSES (24 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
PPD 230	Introduction to Health Policy and Management	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 20 units of electives are required of all students (at least 12 of the 20 must be HP courses).

ELECTIVES (20 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	Nutrition and Exercise Epidemiology	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 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
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 330	Introduction to Health Care Systems	4
PSYC 336L	Developmental Psychology	4
PSYC 355	Social Psychology	4
PSYC 437	Adolescent Development	4
SOCI 350	Deviant Behavior	4
SOCI 475	Medical Sociology	4

**Bachelor of Science in Global Health**

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, global health, 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 60 and 245 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, 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-Governmental Organizations 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 84.

### Minor in Cinema-Television for the Health Professions

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 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. The minor will provide a foundation for students who want to be able to function as consultants to the entertainment industry in their roles as researchers and clinicians. 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
CNTV 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 will provide a foundation for students who want to be able to function as effective health care providers in our 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 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 including 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	Nutrition and Exercise Epidemiology	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	Nutrition and Exercise Epidemiology	4
HP 441	Health Promotion in the Workplace	4
HP 442	Chronic Disease Epidemiology	4
HP 460*	Adolescent Health	4

\*Prerequisite required

**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 M.P.H. program has five tracks: Health Education and Health Promotion, Biostatistics/Epidemiology, Health Communication, Child and Family Health, and Global Health Leadership. 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 M.P.H. 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. An MCAT score of 30 may be substituted for the GRE requirement.

#### *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. MCAT scores may be substituted for the GRE. 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
PM 510L	Principles of Biostatistics	4
PM 511aL	Data Analysis	4
PM 512	Principles of Epidemiology	4
PM 517a	Research Methods in Epidemiology	3
PM 518a	Statistical Methods for Epidemiological Studies	3
PM 523	Design of Clinical Studies	3
PM 527	Epidemiology of Infectious Disease	3
ELECTIVES (AT LEAST 9 UNITS)		UNITS
PM 511bL	Data Analysis	4
PM 515	Behavioral Epidemiology	3
PM 516ab	Statistical Problem Solving	1-1
PM 517b	Research Methods in Epidemiology	3
PM 529	Environmental Health	3
PM 530	Biological Basis of Disease	4
PM 533	Genetic and Molecular Epidemiology	3
PM 590	Directed Research	1-12
PM 611	Advanced Topics in Epidemiology	3

**THESIS (4 UNITS)**

PM 594ab	Thesis	2-2
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Electives will be determined by the student's needs and interests and will be approved by the student's advisor. When appropriate, courses not listed above may be chosen with approval of the student's advisor. 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.

CORE COURSES (26 UNITS)		UNITS
PM 510L	Principles of Biostatistics	4
PM 511abL	Data Analysis	4-4
PM 512	Principles of Epidemiology	4
PM 513	Experimental Designs	3
PM 518a	Statistical Methods for Epidemiological Studies	3
PM 522a	Introduction to the Theory of Biostatistics	4
ELECTIVES (AT LEAST 7 UNITS)		UNITS
PM 516ab	Statistical Problem Solving	1-1
PM 518b	Statistical Methods for Epidemiological Studies	3
PM 520	Advanced Statistical Computing	3
PM 522b	Introduction to the Theory of Biostatistics	4
PM 523	Design of Clinical Studies	3
PM 534	Statistical Genetics	3
PM 544L	Multivariate Analysis	3
PM 552	Survival Methods in Clinical Trials	3
PM 590	Directed Research	1-12
PM 603	Structural Equation Modeling	4
PM 604	Health Behavior Research Methods (or MATH 506, MATH 542, MATH 543, MATH 545L, MATH 547, MATH 548, MATH 549, MATH 550)	4

**THESIS (4 UNITS)**

PM 594ab	Thesis	2-2
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The student's choice of elective courses will be directed by needs and interests and must be approved by the student's graduate advisor. When appropriate, elective courses not listed above may be substituted with approval of the advisor. 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 (M.P.H.) 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, or global health leadership.

#### 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 532, PM 536, PM 542, PM 546\* (4 unit courses); PM 515, PM 523\*, PM 527\*, PM 537\*, PM 538 (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.

#### 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 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 581	Quality and Inequality in Health Care: Examination of Health Services	4

At least 4 units from: PM 540, 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	4

At least 4 units from: CMGT 583, PM 563, PM 566, PM 567, PM 568

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 advisor. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

#### Practicum Requirement

A practicum, PM 593, is required of all students 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 internship 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 M.P.H. professional dual degree programs (e.g., M.D./M.P.H., Pharm.D./M.P.H., D.P.T./M.P.H., and Ph.D. (Clinical Psychology)/M.P.H.) may waive 4 units of the practicum requirement.

#### Doctor of Philosophy in Psychology (Clinical)/Master of Public Health (Health Promotion)

The Ph.D./M.P.H. 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 M.P.H. 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 program. The joint Pharm.D./M.P.H. 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./M.P.H. program spans five years (four years of pharmacy school courses and one year of public health courses). Students begin the core M.P.H. courses following the successful completion of the first year of pharmacy school. The last three years of the program are devoted to the clinical rotations of the School of Pharmacy and to the completion of the elective courses and practicum (field experience) of the M.P.H. program.

All students in the Pharm.D./M.P.H. 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 M.P.H. curriculum to meet graduation requirements.

The Pharm.D. and the M.P.H. 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./M.P.H. 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 identify themselves on both applications as potential 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 program 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 M.P.H. program during their first year of enrollment in the Pharm.D. prior to the M.P.H. published application deadline.

Students who elect this approach must apply through the School of Pharmacy. Students admitted to the M.P.H. 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 program must maintain a minimum 3.0 G.P.A. in Public Health and Pharm.D. courses.

### M.D./Master of Public Health

The joint M.D./M.P.H. 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 742.

### Doctor of Physical Therapy/Master of Public Health

The Post Professional Doctor of Physical Therapy (D.P.T.) and the Master of Public (M.P.H.) 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 M.P.H. 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	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.
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.

#### 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)** Current critical issues in healthcare delivery; strategies to succeed in medical school and as physicians. Graded C/NC.

**HP 200 Introduction to Health Promotion and Disease Prevention (4, FaSp)** 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, FaSp)** 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 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 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 Health Communication Strategies and Evaluation (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. *Prerequisites:* HP 200, PSYC 100.

**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 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 511abL Data Analysis (4-4, a: FaSp, b: Sp)**

*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. *Prerequisite:* PM 511aL.

**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 T<sup>2</sup>, 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 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 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 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 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 592abz Directed Field Research in Health Behavior (1-12, Sm)** Research leading to the advanced degree. 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 (2-2-2-0, 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 (2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.