

Neuroscience

College of Medicine

The Department of Neuroscience offers a graduate program leading to the Doctor of Philosophy degree in Anatomy and Neurobiology. Graduate study in anatomy and neurobiology is designed to prepare candidates for research careers in academics, industry, and government laboratories. Admission to the graduate program is competitive and is based upon academic background, professional recommendations, performance on the Graduate Record Examination (GRE), experience, and when possible, personal interviews. Students should have completed an undergraduate degree in biology, biochemistry, chemistry, engineering, mathematics, neurosciences, physics, pharmacy or psychology. Some students who have already completed an M.D. or D.M.D. degree may be interested in obtaining specific training in anatomy and neurobiology in order to complete their professional education. For traditional students with only an undergraduate degree, undergraduate courses in organic chemistry, physical chemistry, calculus, physics, and the biological sciences are highly recommended.

Students will have the opportunity to join faculty research programs across a spectrum of topics including: cellular and molecular neurobiology, neurodegenerative diseases and aging, brain and spinal cord injury, neuroendocrinology, and behavioral, cognitive and integrated neuroscience. The program of study is tailored to the individual background and career goals of the student and stresses an interdepartmental approach both in the selection of courses and in the pursuit of research. Students are expected to participate in graduate seminars, journal clubs, research seminars; to interact with visiting scholars; and to present the results of their research at local and national meetings. Teaching opportunities leading to a graduate certificate in Anatomical Sciences Instruction are also available. Financial aid is available to students accepted into the program.

Admission Requirements

Admission to the Ph.D. program in Neuroscience is through the Integrated Biomedical Sciences (IBS) Curriculum. Inquiries regarding admission should be directed to the Director, Integrated Biomedical Sciences Curriculum, University of Kentucky College of Medicine at <http://www.mc.uky.edu/ibs/>. For information about the Ph.D. program in Anatomy and Neurobiology, contact the Director of Graduate Studies, Department of Neuroscience. Information may also be obtained from the department website.

Course Descriptions

ANA 503 INDEPENDENT WORK IN ANATOMY. (3)

Reading and laboratory work in a defined area of anatomy are carried out under the direct supervision of one staff member. Hours of discussion and laboratory work by individual arrangement. May be repeated to a maximum of 12 credits. Prereq: An introductory course in biology, zoology, or botany and consent of instructor.

ANA 511 INTRODUCTION TO HUMAN ANATOMY. (5)

The principles of organization of the human body are presented. Gross anatomy lectures initially follow a systemic plan. This is succeeded by a regional presentation. Several methods of studying anatomy are utilized. These include radiology, palpation of living structures, and the demonstration of prosected fresh and fixed materials. Prereq: Some background in biology, including one or more such courses as biology, zoology, botany, comparative anatomy or embryology, and enrollment in the College of Medicine or a graduate program in the biomedical sciences. In addition, students from graduate programs outside of anatomy must obtain the consent of the course director before registration.

ANA 512 MICROSCOPY AND ULTRASTRUCTURE. (4)

The organization of cells, tissues and organs are presented through lectures and in the laboratory, through the microscopic study of histological sections and illustrations. Prereq: Some background in biology, including one or more such courses as biology, zoology, botany, histological techniques, comparative anatomy or embryology and enrollment in the College of Medicine or a graduate program in the biomedical sciences. In addition, students from graduate programs outside of anatomy must obtain the consent of the course director before registration.

ANA 516 SELECTED TOPICS IN ADVANCED NEUROSCIENCE. (3)

ANA 516 will cover advanced topics in neuroscience. Topics include: neural pathways, development, neuroanatomy, neurobiochemistry, neuropharmacology, neural imaging and molecular neuroscience. Laboratory experiences will be used to complement lectures. Prereq: ANA 511, 512, 513; PGY 511; and enrollment in the College of Medicine or a graduate program in the bio-medical sciences. In addition, students from graduate programs outside of anatomy must obtain the consent of the course director before registration.

ANA 530 COMBINED HISTOLOGY AND SPECIAL ORAL MICROANATOMY. (5)

An analysis of the histological structure and organization of the human body, including an especially detailed treatment of the tissues and organs related to the oral cavity. Prereq: Admission to the College of Dentistry or some background in biology and consent of instructor.

ANA 534 DENTAL GROSS ANATOMY AND EMBRYOLOGY. (6)

Study of human gross and developmental anatomy with particular emphasis on functional anatomy of the head and neck. Lecture/ laboratory course, with dissection being an essential component of the laboratory portion. 140 hours. Prereq: Admission to the College of Dentistry. (Same as OBI 815.)

ANA 536 HUMAN EMBRYOLOGY, AN ABBREVIATED COURSE. (2)

A concise presentation of developmental mechanisms, early development of the embryo, and subsequent development of selected systems and regions of the body. Lecture, one hour. Prereq: Admission to the College of Dentistry.

ANA 538 DENTAL NEUROANATOMY. (2)

Study of human dental neuroanatomy with emphasis on functional neuroanatomy of central nervous system, especially related to cranial nerves 5, 7, 9, and 10, pain, and long tracts. Prereq: Admission to the College of Dentistry.

ANA 600 SEMINAR IN ANATOMY. (1)

A weekly seminar devoted to presentation and discussion of classic and new research in the field. May be repeated to a maximum of four credits. Prereq: Admission to the anatomy graduate program or permission of the course director.

ANA 605 NEUROBIOLOGY OF CNS INJURY AND REPAIR.

The objective of the course will be to provide a general overview of the current state of knowledge concerning the pathophysiology and therapeutic approaches to central nervous system injury. The course will provide a strong working background concerning the issues, techniques and frontiers of neurotrauma therapeutic discovery research aimed at reducing acute post-traumatic neurodegeneration in the injured brain or spinal cord or enabling regeneration and repair. This course is a graduate level course intended for students who are in their second or subsequent years of graduate study and who are pursuing focused research training in neurotrauma research. No special prerequisites, other than graduate standing, are necessary. However, a background in neuroanatomy and neurophysiology is highly recommended. Prereq:

Permission of instructor. (Same as PGY 605.)

ANA 609 EDUCATIONAL STRATEGIES IN THE ANATOMICAL SCIENCES. (3)

This course informs on and examines multiple aspects of teaching the Anatomical Sciences. Classroom and laboratory issues, teaching theory, portfolio development and presentation strategies are among the topics covered. Prereq: Admission to the graduate certificate program in the Anatomical Sciences or the permission of the course director.

ANA 611 REGIONAL HUMAN ANATOMY. (5)

Functional human anatomy covering all regions of the body utilizing dissection techniques with an emphasis on cross-sectional anatomy and normal morphology. Lecture, four hours; laboratory, four hours per week. Prereq: Enrollment in the PAS Program of the College of Allied Health or a graduate program in the biomedical sciences (by consent of course director only).

ANA 612 BIOLOGY OF AGING. (3)

A multidisciplinary discussion of how the process of aging affects biological systems. Coverage will be quite broad and includes topics such as subcellular and cellular aging, genetics, immunology, anatomy and physiology, animal model of aging, etc. Prereq: Enrollment in the doctoral program in Gerontology or a biomedical science department or consent of instructor. (Same as BIO/GRN/PGY 612.)

ANA 625 INTRODUCTION TO FUNCTIONAL MRI. (1)

Hands-on course for practitioners interested in acquiring functional MRI technique(s) as a research tool. Prereq: (1) Introductory statistics (e.g. PSY 610, STA 503, STA 570). (2) Permission of instructor.

ANA 631 ADVANCED HUMAN ANATOMY. (3-5)

The objective of this course is to meet individual student needs for increased knowledge in particular areas of gross human morphology. Investigations of problems involving gross morphology will be carried out. One or several defined areas of the body will be studied in considerable detail by dissection, by intensive use of the pertinent literature, by the use of visual aids, prosected materials and other appropriate learning aids. Prereq: A background in gross human anatomy equivalent to a medical school course in regional anatomy and consent of course director and/or Director of Graduate Studies in Anatomy and Neurobiology.

ANA 636 ADVANCED NEUROSCIENCE. (3-5)

This course will consist of a comprehensive examination of the nervous system. Emphasis will be placed on structure-function relationships, neurotransmitters, chemical constituents of the nervous system, neuronal as well as non-neuronal cells, plasticity of the nervous system and developmental biology. The detailed content and emphasis will depend on both the background and goals of the students. Depending on the number of credits a student registers for, and the topic and course orientation, laboratory work, library work, written and/or oral presentations may be a course requirement. Prereq: Enrollment in a graduate program in the biomedical sciences, or consent of the instructor.

ANA 638 DEVELOPMENTAL NEUROBIOLOGY. (3)

An explanation of the processes which contribute to the development of the nervous system. Neurophysiological, cell biological and molecular approaches to cell differentiation, neuronal pathfinding and synapse formation and stabilization will be explored and discussed. Examples will be drawn from both vertebrate and invertebrate preparations. Prereq: BIO 535 or consent of instructor. (Same as BIO/PGY/PSY 638.)

ANA 655 INTRODUCTION TO MAGNETIC RESONANCE IMAGING. (3)

Survey of basic concepts and applications in magnetic resonance imaging: physics and chemistry, basic

mathematical foundations, workings of a modern MRI scanner, image reconstruction, biology with emphasis on neurobiology, medical applications in the brain and heart. Covers basic functional imaging and spectroscopy. Prereq: Undergraduate major in a science or engineering discipline.

ANA 660 BIOLOGY OF REPRODUCTION.

Advanced study of current topics in reproductive biology. The course is comprised equally of student-led discussions and lectures given by faculty with research expertise in selected topics. Readings will be taken from current and classic literature. Topics covered include (but are not limited to) molecular and cellular endocrinology, hormone receptors and mechanism of action, reproductive neuroendocrinology, reproductive behavior, gametogenesis, fertilization, sexual differentiation, puberty, menopause and environmental effects on reproduction. Emphasis will be placed on the analysis and understanding of the experimental basis for current concepts in reproductive biology. Prereq: ASC/PGY 601 and ASC 364 or BIO/PGY 502 or consent of instructor. (Same as ASC 660 and PGY 660).

ANA 662 ULTRASTRUCTURAL ANATOMY. (2-5)

The objectives of this course are to advance the students' knowledge of the submicroscopic structure of cells and tissues. Correlation of intra- and extracellular morphology and function will be emphasized. Students will do detailed laboratory work in the techniques of electron microscopy. Depending on the number of credits a student registers for, and the topic and course orientation, laboratory work, library work, written and/or oral presentations may be a course requirement. Prereq: ANA 512, previous work in microscopy including histology or cytology, or equivalents, and consent of instructor.

ANA 710 AGING OF THE NERVOUS SYSTEM. (3)

This course will examine the alterations in the brain that occur with aging and in neurodegenerative disorders such as Alzheimer's disease. The emphasis will be on human aging although the relevance of animal models to studies of human aging will be a recurrent theme. The course will examine aging at several levels, including molecular, cellular, organismic, and behavioral. A strong background in the basic sciences is encouraged. (Same as GRN/PGY/PHA 710.)

ANA 748 MASTER'S THESIS RESEARCH. (0)

Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

ANA 749 DISSERTATION RESEARCH. (0)

Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

ANA 767 DISSERTATION RESIDENCY CREDIT. (2)

Residency credit for dissertation research after the qualifying examination. Students may register for this course in the semester of the qualifying examination. A minimum of two semesters are required as well as continuous enrollment (Fall and Spring) until the dissertation is completed and defended.

ANA 790 RESEARCH IN ANATOMY. (1-12)

Individualized laboratory and research experience under the supervision of a faculty member. May be repeated to a maximum of 12 credits. Prereq: Consent of the instructor.

ANA 801 HISTOLOGY FOR PHYSICAL THERAPY STUDENTS. (1)

A survey of selected basic and specialized mammalian tissues most commonly involved in diseases treated by physical therapists. The course provides information required for understanding the cellular

mechanisms behind the various diseases and the rationale for subsequent treatment. Prereq: Admission to the College of Allied Health.