

## ANA

## Anatomy and Neurobiology

**ANA 109 ANATOMY AND PHYSIOLOGY FOR NURSING I. (4)**

Basic anatomy and physiology integrated to prepare freshman students for nursing. Lecture 3 hours, laboratory 1 hour. **(This course will have a laboratory fee.)**

**ANA 110 ANATOMY AND PHYSIOLOGY FOR NURSING II. (4)**

Basic anatomy and physiology integrated to prepare freshman students for nursing. Lecture 3 hours, laboratory 1 hour. **(This course will have a laboratory fee.)** Prereq: Successful completion of ANA 109 with a C or better.

**ANA 209 PRINCIPLES OF HUMAN ANATOMY. (3)**

The structure of the human body will be examined at various levels: cellular, tissues and organ systems. The gross anatomical arrangement of the body will be studied in a system-by-system format relating structure to function and the fundamentals of human embryology/malformation with adult anatomy. The central nervous system will be emphasized. Prereq: Introductory biology or zoology.

**ANA 305 INTRODUCTION TO NEUROSCIENCE TECHNIQUES. (4)**

This introductory laboratory course will provide students with practical knowledge and hands-on experience in basic behavioral, anatomical and physiological techniques used by laboratory scientists in the investigation of the nervous system. It is designed as a gateway to independent research experiences in working neuroscience laboratories. Prereq: BIO 302 Introduction to Neuroscience or equivalent. (Same as PSY 305.)

**ANA 309 AN INTRODUCTION TO REGIONAL ANATOMY. (5)**

This course is designed to serve as a transition between systems-based undergraduate anatomy and regionally-based medical professional anatomy. The human body will be taught in an online format, including modules for independent study, weekly virtual team-based learning sessions, and formal course and practical examinations. Anatomical organization will be presented in a regional format so that students can assimilate the bones, muscles, vasculature, innervations, and lymphatic pattern for each region of the body, similar to the pedagogical approach used in medical professional programs. Prereq: ANA 209 and mastery of the Second Life program.

**ANA 394 INDEPENDENT RESEARCH IN NEUROBIOLOGY AND NEUROSCIENCE. (1-3)**

ANA 394 is designed to provide students with an intensive experience in laboratory or field research. Participants should take an active role in the design and execution of experiments and in the analysis and interpretation of data. They should be capable of "independent research" in the sense that they can conduct the experiments with little direct supervision. Students are expected to become familiar with related research in the current literature by regularly reading scientific journals. The student is expected to devote at least 3-4 hours per week for each credit hour enrolled to laboratory work, although often more time is necessary.

**ANA 395 INDEPENDENT RESEARCH IN ANATOMY AND NEUROBIOLOGY. (1-3)**

Independent research with faculty members. May be repeated to a maximum of 12 credits. Laboratory, three to nine hours per week. Prereq: Biology or psychology majors with sophomore, junior, or senior standing and consent of a faculty member.

**ANA 410G NEUROBIOLOGY OF BRAIN AND SPINAL CORD DISORDERS. (3)**

ANA 410G is a multidisciplinary discussion of neurodegenerative diseases and neurologic disorders. The course objective is to provide an in depth understanding of the basic science and clinical symptoms of selected neurologic disorders and neurodegenerative diseases, current treatment strategies and new approaches for treatment and potential cure of these devastating illnesses. Included are such topics as the 1) subcellular and molecular basis of the diseases, 2) the role of genetics in aging and neurodegeneration, 3) mechanisms of cell death, and 4) the cellular/molecular basis of neurodegenerative diseases and neurologic disorders. The format of the course will consist of a series of formal lectures and informal discussion sessions. Reference materials will be recent review articles. Graduate students taking the course will present studies from the primary medical literature in a journal club format and will also prepare a paper examining one disorder in detail. This course will be of interest to advanced students from a variety of disciplines whose interests concern brain and spinal cord disorders. Prereq: For undergraduate students: BIO 302 or PSY 312 or consent of course directors. For graduate students: Enrollment in a graduate program in biomedical sciences, gerontological sciences or consent of one of the course directors.

**ANA 417G FUNCTIONAL HUMAN NEUROANATOMY. (3)**

This course provides an introductory level of understanding of human central nervous system (CNS) anatomy and function. Lecture topics will explore the CNS based on structures that make up functional systems (e.g., motor, sensory, visual, etc.), how these systems interact, and examples of how a loss of function results in disease conditions. Prereq: BIO 302 Introduction to Neuroscience.

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**ANA 442 MOLECULAR AND CELLULAR NEUROBIOLOGY. (3)**

This 3 credit hour course is designed to be an introductory course for undergraduate students aimed at providing an overview of major principles and techniques associated with cellular and molecular neurobiology. Subject matter is intended to range from molecular mechanisms underlying neuronal signaling and cellular function to how these properties are invoked across simple networks, neural systems and behavior. Prereq: BIO 152 or an equivalent; BIO 302 or PSY 312, or consent of course director.

**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.

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**ANA 605 NEUROBIOLOGY OF CNS INJURY AND REPAIR. (3)**

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.

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**ANA 660 BIOLOGY OF REPRODUCTION.****(3)**

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 768 RESIDENCE CREDIT FOR THE MASTER'S DEGREE.****(1-6)**

May be repeated to a maximum of 12 hours.

**ANA 769 RESIDENCE CREDIT FOR THE DOCTOR'S DEGREE.****(0-12)**

May be repeated indefinitely.

**ANA 780 SPECIAL TOPICS IN NEUROBIOLOGY.****(1-3)**

A lecture/seminar course offered based on contemporary topics in neurobiology. Course is designed to offer different emphasis in a given year and to cover timely topics. Prereq: Consent of the course director.

**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.

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**ANA 802 NEUROANATOMY FOR PHYSICAL THERAPY STUDENTS. (2)**

A concise account of the functional anatomy of the central nervous system. The anatomical organization is correlated with physiological activity. Emphasis is placed upon the morphological basis for progressively higher levels of control of activity from the simple reflex to voluntary motor activities controlled by the cerebral cortex. This type of knowledge is required for proper understanding and performance of physical therapy technicians in the treatment of medical and surgical disease.

**ANA 811 HUMAN ANATOMY FOR ALLIED HEALTH PROFESSIONS. (5)**

A dissection-based gross anatomy course designed to present the principles of the human body in a regional format with special emphasis on functional/clinical anatomical relationships. Prereq: Enrollment in the PT program of the College of Allied Health Professions.

**ANA 814 HUMAN STRUCTURE/GROSS ANATOMY. (6)**

The course consists of lecture, small group, laboratory, and palpation exercises that provide a basic understanding of anatomical principles, organization and development. Anatomical structures are introduced as a basis for future functional correlates and principles are taught via laboratory discussions, prosections, dissections, films and skeletal materials. Lecture, 20 hours per week. Prereq: Admission to Medical School (first year). (Same as MD 814.)

**ANA 815 FIRST-YEAR ELECTIVE, ANATOMY. (1-3)**

With the advice and approval of his or her faculty adviser, the first-year student may choose approved electives offered by the Department of Anatomy and Neurobiology. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the first-year curriculum. Pass-fail only. Prereq: Admission to first year, College of Medicine.

**ANA 825 SECOND-YEAR ELECTIVE, ANATOMY. (1-4)**

With the advice and approval of his or her faculty adviser, the second-year student may choose approved electives offered by the Department of Anatomy and Neurobiology. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the second-year curriculum. Pass-fail only. Prereq: Admission to second-year medical curriculum and approval of adviser.

**ANA 850-899 FOURTH-YEAR ELECTIVE FOR MEDICAL STUDENTS. (1-6)**

With the advice and approval of the faculty adviser and the Student Progress and Promotions Committee, the fourth-year student may choose approved electives offered by the various departments in the College of Medicine. The intent is to provide the student an opportunity to develop his/her fund of knowledge and clinical competence. Prereq: Admission to the fourth year, College of Medicine and/or by the permission of the Student Progress and Promotions Committee.

**Approved elective:**

**\*ANA 850 ELECTIVE: APPLIED HUMAN ANATOMY**