



Modern Human Anatomy Program

UNIVERSITY OF COLORADO **ANSCHUTZ MEDICAL CAMPUS**

Approved Electives

(8/23/2021)

ANAT 6260, 3D Modeling and Printing for the Anatomical Sciences (1 credit), CU-Anschutz

This course is an introduction to the applications and technical “hands on” details of the procedures involved in 3D printing for the anatomical sciences and education. Students will learn approaches to acquiring and processing 3D imaging data along with strategies for printing and finishing objects using fused-deposition modeling and stereolithography.

ANAT 6750, Special Topics, Anatomical Animation (2 credits), CU-Anschutz

This course teaches students to use Autodesk Maya to create professional animations illustrating concepts inherent in the study of anatomy and medical science. This is a project-based course.

ANAT 6840, Independent Study (1-6 credits), CU-Anschutz

This course enables the student to pursue an investigation in a modern human anatomical field of choice toward completion of a capstone project with relatively minor supervision from faculty advisors.

BIOE 5420, Rehabilitation and Assistive Technology +Lab (3 credits) – CU-Anschutz

Course Description: This course provides students with an overview of technologies and their use by and for persons with disabilities. Students will attain hands-on experience with existing technologies for power mobility; control systems; environmental controls/smart home automation, augmentative and alternative communication devices and alternate access to computers. Demonstrated competencies and design elements required.

BIOL 5475, Mechanisms of Human Pathology (3 credits) – CU Denver

Studies physiological, cellular and biochemical processes in human diseases. Mechanisms of inflammatory diseases, infectious diseases, neoplastic diseases, and others will be examined. Restriction: Restricted to degree-granting graduate programs.

BIOL 5800, Advanced Exercise Physiology (3 credits) – CU Colorado Springs

This is an advanced course focusing on the integrative physiological responses to exercise, with emphasis on skeletal muscle, biochemical, and cardioventilatory physiology. Laboratory work will be conducted in series with lectures to collect and analyze data that relates to the application of the physiological principles relevant to the effect of exercise on human biological function and the limits of human performance. This course builds upon foundational topics taught in courses such as BIOL 3060 (Human Physiology), BIOL 3300 (Exercise Physiology), and/or CHEM 4211 (Biochemistry), and looks further into key physiological components to help advanced students gain a more complete understanding of human integrative function with exercise.

BIOS 6606, Biostatistics (3 credits), CU-Anschutz

Course Goals: This course provides an overview of applied statistics: data graphics, probability, hypothesis testing, estimation, bootstrap methods, permutation tests, nonparametric methods, regression analysis, and analysis of variance. It incorporates print and online resources, and it emphasizes the hand-on use of statistical packages. Examples from science and medicine illustrate concepts and methods. The primary goal of this course is to help you develop statistical tools to analyze, present, and interpret quantitative information.

BSBT 6064, Scientific Writing, (1 credit), CU-Anschutz

Written communication is an essential research skill, one for which many novice researchers feel underprepared. This short and concentrated course-shop will help trainees gain the skills and confidence they need to start building their research publication portfolio, while taking minimal time away from research training. The topics covered include strategies to engage the reader, principles of psychological linguistics, biomedical journal writing, and two sessions on grant writing. Instruction is supported by a workbook with examples and exercises, and includes lectures, writing exercises, group discussions, and optional workshopping of student writing.

BSBT 6801, Biomedical Entrepreneurship, (3 credit), CU-Anschutz, Spring

This course will examine the process of entrepreneurship in private, academic, government, and corporate settings, and will take the student from the discovery stage of a product or service into business development, and onto the decision of whether to proceed with commercialization.

BSBT 7301, Building Biotechnology, (3 credits), CU-Anschutz, Spring

The course addresses the essential elements of bioscience and health innovation and entrepreneurship. This course is designed to familiarize biomedical scientists and those interested in the business with the basic fundamentals of biomedical and health innovation and entrepreneurship. The emphasis of the course will be on how technology transfer occurs, different technology transfer models, early stage technology finance, basics of intellectual property, and the regulatory and reimbursement environment for commercializing drugs, devices, diagnostic tests and health information software.

CANB 7600, Cancer Biology (3 credits) CU-Anschutz, Spring

This course integrates the examination of cancer at molecular, cellular, tissue and organismal levels. Course open to all graduate students from any program with an interest in mechanisms and models of cancer and will give broad appreciation for current issues/problems.

CBHS 6614, Childhood Obesity (1 credit), CU-Anschutz

This course provides an overview of childhood obesity assessment, prevention, and treatment. Key childhood obesity topics and challenges will be covered within the context of public health.

CBHS 6617, Nutrition and Public Health (1 credit), CU-Anschutz

This survey course begins with an overview of nutrition and its relation to health and disease. The learner will gain experience in reading and evaluating nutrition research articles. The second part of the course focuses on public health nutrition topics including theories and frameworks, food insecurity, food policies and regulations,

and federal programs. For students who are in the Public Health Nutrition Concentration at CSU this course cannot be taken for credit.

CBHS 6627, Maternal Nutrition (1 credit), CU-Anschutz

This course provides an overview of nutrition issues affecting pregnant and breastfeeding women. Using a life course perspective, the course integrates clinical information with public health practice.

At the end of this course the student will be able to:

1. Describe the relationship between the physiological changes associated with pregnancy and lactation, and increased nutritional needs.
2. Develop specific nutritional recommendations that correlate with individual resources and needs.
3. Identify behavior change theories commonly used for nutritional program planning.
4. Identify policies and programs that support improved nutritional status of women.

CBHS 6635, Child Nutrition (1 credit), CU-Anschutz

This course provides an overview of child nutrition from infancy to adolescence. Key child nutrition topics and challenges will be covered within the context of public health.

At the end of this course the student will be able to:

1. Discuss key topics related to child nutrition from infancy to adolescence.
2. Identify common nutritional challenges during childhood.
3. Evaluate published research and lay media related to child nutrition topics.
4. Apply nutrition education theories and frameworks to child nutrition topics.

CHEM 5810, General Biochemistry I (4 credits) CU-Denver, Fall

The course of general biochemistry (Chem5810) is design to teach the chemical and physical properties of cellular components such as proteins, carbohydrates, lipids, and other biomolecules while relating them back to the context of physiological conditions of living organisms and living matters. The course will cover the chemical and physical properties of proteins, carbohydrates and lipids. We will examine chemical and physical properties of enzyme and enzyme-catalyzed reactions. We will also relate the chemical and physical properties of biomolecules to biochemical reactions and the signaling pathways. After completing the course, students should have attained knowledge to explain real-life situations at molecular level.

CHEM 5820, General Biochemistry II (4 credits) CU-Denver, Spring

The course of general biochemistry II (Chem5820) is design to teach the chemical and physical foundations of the genetic information flow and the energy flow and to relate these to living organism. The course will cover the chemical and physical properties of DNA replication and repair, transcriptional synthesis of RNA, protein synthesis and degradation, and gene regulation. The course will also cover the chemical and physical properties of metabolism of carbohydrates, lipids, and amino acids, and how these processes are coordinately regulated in living organism. After completing the course, students should have attained knowledge to explain real-life situations related to the genetic information flow and the energy flow.

CSCi 6118, Software Engineering for Scientists (3 credits) CU-Boulder

Software Engineering for Scientists is a course for upper-level undergraduates and graduate students in the sciences who want to enhance their research by developing custom software. This class will build off basic programming skills to enable the development of robust and reliable software for reproducible science. These skills will sample core elements from both software engineering (e.g., version control, testing and continuous

integration, debugging, benchmarking, documentation, distribution) and software design (e.g., algorithm analysis, sorting and searching, file input and output, text parsing, basic data structures), and will be organized around the ingestion and processing of data for many different scientific domains.

EDHD 6200, Lifespan Development (3 credits), CU-Denver

This course is designed to introduce students to human development as it occurs across the lifespan, including emotional, physical, and cognitive development, and emphasizes personal adjustment and achievement. The course will examine major theories of human development while discussing and critiquing them in terms of application to educational and counseling practice. The study of life span is intriguing because each of us, and everyone we care about, is constantly developing. This course therefore includes both scientific discoveries and personal insights.

Development in childhood is seen more readily, because rapid change takes place in physical size, knowledge and social interactions. Heightened public awareness of the problems of aging in our contemporary society has led to new information on the process of growth and change taking place in middle and late adulthood as well. Thus, we will work this semester within a womb to tomb framework. Special attention will be given to multi-cultural issues and the implications and influences of these issues to the understanding of human development.

EDHD 6320, Education & Human Development (3 credits), CU-Denver

An introductory survey into contemporary theory and research in developmental cognitive neurosciences and their potential applications to education, aiming to explore how the brain learns, and what it means for learning and development

EPID 6630, Epidemiology (3 credits), CU-Anschutz

The goal of this course is to provide an introduction to descriptive and analytic methods in epidemiology and their application to research and practice in public health, clinical and preventive medicine.

FINE 5340, Topics in Studio Art: Immersive Media Arts (3 credits), CU-Denver

Immersive media is growing exponentially in the world of business, science, technology, entertainment, and art. This course is an introduction to concepts, tools, techniques, and workflows that are used by people and teams creating immersive media projects. This course will focus specifically on learning to work with the Unity game development platform. Students are not required to have prior knowledge in coding, animation, 3D modeling or interactive design, but the course will touch on all of those areas in order to bring a full understanding of how immersive media projects are developed.

HMGP 7600, Survey of Human Genetics (3 credits), CU-Anschutz

Survey of human genetics, including Mendelian and other types of inheritance, chromosomes and cytogenetics, molecular and biochemical basis of genetic disease, quantitative genetics and gene mapping, developmental and cancer genetics, clinical genetics, and genetic screening and prenatal diagnosis.

HPNU 5600, Biomechanics of Musculoskeletal Injury (3 credits), CU-Colorado Springs

This course provides a comprehensive survey of the biomechanics of musculoskeletal injury. The course explores the various bases of musculoskeletal injury to more fully understand causal mechanisms, the effects of

injury on musculoskeletal tissues, and how current biomechanical, biological, and biomedical sciences contribute to injury management and prevention. Topics will include:

- Injury Classifications (sprains, strains, contusions, lacerations, abrasions, etc.)
- The relevant structures and material properties of the connective tissues (bone, cartilage, tendon and ligament) most involved in musculoskeletal injuries.
- The mechanics of joints that are most often injured.
- How age, gender, nutrition and exercise affect the musculoskeletal system's response to load and its associated predisposition to injury.
- A comprehensive survey of the most prevalent regional bodily injuries

HSMP 6602, Health Equity (2 credits), CU-Anschutz

This course focuses on the achievement of health equity. Health is taken here in its most global sense, as defined by the WHO: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity", which includes the achievement of one's full career potential (e.g. equality of opportunity for minorities to become public health professionals). In this course, we address disparities existing in several populations to include (but not be limited to) low-income, racial and ethnic minorities, women, children, low literacy, disabled, GLBTI, as well as other groups who are victims of health disparities. While the needs of these populations are discussed openly and candidly we vigorously fight stereotyping of specific groups.

We will study the institutionalized, personally-mediated and internalized mechanisms, which cause or perpetuate differences in opportunities, stresses and exposures as well as in health care access and quality. Currently, health disparities represent the most important challenge of public health. This course proposes to unveil the often undetected aspects of health disparities embedded in all aspects of public health. For the elimination of health disparities, it is pivotal that its study and combat be integrated to all public health initiatives.

IDPT 7646, Tissue Biology and Disease Mechanisms (3 credits), CU-Anschutz, Fall

This course provides an overview of organ systems and disease through 1) a survey of the major systems, including the cellular and molecular mechanisms underlying their function and repair, integrated with 2) common diseases, current therapies, and their mechanistic basis.

IDPT 7810, The Microbiome in Health and Disease (2 credits), CU-Anschutz

The Microbiome in Health and Disease will introduce graduate students to basic concepts and techniques used to study the microbiome. This course will address mammalian physiology, immunology and disease pathogenesis within the context of the microbiome and its relationship to biomedical research. Additionally, this course will cover emerging topics and technologies related to the study of the microbiome including nervous system responses, metabolomics, the virome, the mycobiome and transkingdom interactions.

IMMU 7630, Overview of Immunology (2 credits), CU-Anschutz

An overview course in immunology for non-Immunology-program graduate students. The focus is human relevance and the practical use of immunology in a variety of fields. Students gain experience applying immunological knowledge to their own area of interest

INTE 5000, Design Thinking and Educational Innovation (3 credits), CU-Denver

Design thinking is a creative, human-centered approach to exploring and solving professional and community-based problems of practice. In this studio-based course students will cultivate academic and community partnerships, design innovative media and experiences, and support diverse learning opportunities across settings

INTE 5100, Planning and Designing for Instruction (3 credits), CU-Denver

Instructional design is the process used to analyze, design, develop, and evaluate learning solutions. You will identify a gap in learning or performance and design a learning solution in the form of courses units, modules, and other instructional resources.

INTE 5200, Crafting eLearning Experience (3 credits), CU-Denver

This course helps educators transition to teaching online. Create online learning activities, assessments, and resources. Learn how to establish a strong online teaching presence. Explore blended learning environments, use of set curriculum, open educational resources (OER), family support, communication strategies, digital citizenship, and accessibility concerns.

INTE 5320, Games and Learning (3 credits), CU-Denver

This course examines the use of games for learning and education across formal and informal environments. Students will survey contemporary learning theory, media, trends, and challenges related to designing and playing games in informal, community-based, online, and school settings.

INTE 5660, Self-Paced E-Learning Modules (3 credits) CU-Denver

Self-paced tutorials and modules are a common form for e-learning, especially in corporate and adult learning settings. These packaged resources are tremendously useful because they can be conveniently accessed at point of need (anytime/anywhere), and when delivered via an LMS (Learning Management System), they provide useful data to the hosting organization (e.g., a company's compliance department can document that all employees have completed a course required by law, managers can track their employees' progress on individual learning plans).

In this course, you will use a variety of authoring tools and resources to design and create a self-paced e-learning module, applying graphic, web-design, and instructional principles from designers such as Marty Tessmer, Will Horton, and Ruth Colvin Clark.

INTE 5680, Producing Media for eLearning (3 credits), CU-Denver

Students develop and integrate media resources into eLearning environments, applying principles of media selection and multimedia learning. Students explore a variety of tools for producing audio, video, and multimedia content and examine ways to enhance eLearning courses through multimedia presentation and engagement resources. Restriction: Restricted to graduate level students.

IPHY 7800, Comprehensive Physiology (6 credits), CU-Anschutz

The course will provide an understanding of the function, regulation and integration of human organ systems. Content will include introductory to cell physiology and all major organ systems and will be taught by experts in each organ system.

ISMG 6480, Text Data Analytics (3 credits), CU-Denver

This course covers the concepts, algorithms, and tools for quantitative analyses of unstructured text data. It will cover the techniques necessary to pre-process unstructured text data, visualize, and present the result of analyses. This class covers concepts and algorithms required for the analyses of text data such as Zipf's Law, Pattern Discovery (using such algorithms as TF-IDF), topic modeling, sentiment analysis, cluster analysis, and prediction modeling etc. Upon the completion of this class, students will be able to (1) understand theories, algorithms and tools necessary to analyze unstructured text data, (2) visualize and uncover underlying topics, sentiments and concepts, and (3) run prediction models with a corpus of unstructured text documents. The free open-source R and RStudio software will be used as practice tools for this class.

IWKS 5100, Intro to Human-Centered Design, Innovation and Prototyping (3 credits)

Introduces students to a design methodology known as human-centered design, which can be harnessed to stimulate innovation in various career fields and industries. Through in-class activities and learning an array of prototyping tools in the Inworks lab, students will build up the skills necessary to develop their own projects in the second half of the course. Team projects apply the design process and culminate in a product, service, or system that is designed from scratch.

IWKS 5170, 3D Design Computation & Prototyping (3 credits), CU-Denver

Introduces the design and computer-controlled fabrication of three dimensional objects using both additive (3D printing) and subtractive (laser cutter, CNC router / milling machine) processes. Various commercial and open-source software tools for 3D design (CAD), manufacturing (CAM) and visualization will be explored. Increasingly complex projects throughout the semester will be used to illustrate fabrication techniques. The course will culminate in a final project.

IWKS 5930, Special Topics: Prototype Health Innovations (3 credits), CU-Denver

Explore prototyping as a vital design process to rapidly develop health innovations and in doing so: 1) foster interdisciplinary project development 2) prototype to aid communication, collaboration, and co-design with end-users 3) exercise physical prototyping and virtual machining with fabrication shops utilizing CNC equipment. Coursework is real-world and project-based; choose from topics that Inworks is currently progressing on for the Anschutz Medical Campus' response to COVID and further community health topics.

Participants will attend virtual meetings with clinicians, researchers and other end-users as necessary as well as tour and work virtually with local fabrication shops to prototype to the needs of our local health ecosystem. Participants are expected to be highly motivated & capable of self-directed learning (akin to traditional internships) Participants can also rely on receiving a plethora of technical and strategic lessons on prototyping-to-production.

MATH 5387, Applied Regression (3 credits) CU-Denver

Topics include simple and multiple linear regression, model diagnostics and remediation, and model selection. Emphasis is on practical aspects and applications of linear models to the analysis of data in business, engineering and behavioral, biological and physical sciences.

MICB 7703, Molecular Mechanisms of Bacterial Disease (3 credits), CU-Anschutz

MICB7703 is a 7 week lecture and primary literature discussion course. The course covers pathogenic bacteria and an in-depth discussion of several paradigms of bacterial disease that illustrate important concepts and

molecular mechanisms of bacterial pathogens and evasion of host defenses. Topics include adherence and invasion, bacterial biofilms, bacterial toxins, antiphagocytic mechanisms, bacterial secretion systems, avoidance and activation of host defenses and intracellular survival. Select medically important bacteria will be discussed, including *E. coli*, streptococci and staphylococci, *Pseudomonas aeruginosa*, *Vibrio cholerae*, shigellae, Legionella, Salmonella, Francisella and mycobacteria as paradigm organisms for these topics. The course is designed to accommodate graduate students, fellows and others from all departments in the School of Medicine. Course grades will be based on a mid-term (20%) and final exam (40%), student presentations and participation in discussions (40%). No previous coursework in bacteriology or microbiology is required, but students will be expected to have a good foundation in biochemistry and molecular cell biology.

NRSC 5032, The Neuroscience of Learning and Memory, CU-Boulder

As a scientific enterprise, the field of learning and memory has existed for a little over 100 years. For about the first 80 years, this field was essentially the sole province of experimental/cognitive psychologists. However, in the last 20 years the methods and concepts of biology and its sub-discipline, neuroscience, have been increasingly applied to the study of learning and memory. Scientists working in this multidiscipline field have produced a staggering amount of information about where and how experience leaves its mark on the brain, and new discoveries are made every week. So, we now have an exciting field that can be called the Neurobiology of Learning and Memory.

I created this course to introduce you to the methods, facts and concepts that are central to this field. This was a challenging task because it requires the integration of psychological methods, facts, and theory with the methods, facts and concept of neuroscience. The primary goal of this field of science is to reduce personal experience to brain products. It is fundamentally about where and how the brain stores the wealth of experiences that make us who we are as individuals.

NRSC 7000, Cellular & Molecular Neurobiology (3 credits), CU-Anschutz

A comprehensive, in-depth, discussion-based course intended for candidates for the PhD in Neuroscience. Topics include ion channel structure and function, ionic basis of the resting and action potential, and the biochemistry and physiology of direct and indirect synaptic transmission.

NRSC 7614, Biological Basis of Psychiatric and Neurological Disorders (2 credits), CU-Anschutz

This elective, for basic sciences graduate students and medical students, provides a survey of current clinical and molecular aspects of human neuropsychiatric disorders. Both movement disorders and DSMIV diagnoses will be covered. Contact Course Director for a list of topics.

PBHL 6920, Statistical Software Lab, CSU/Colorado School of Public Health

This lab-based course is designed to give students a brief introduction to common statistical software programs used in public health research and practice. We will primarily focus on Excel, SPSS and SAS software; other applications will be briefly introduced. The purpose of this course is not to teach students statistical concepts and theories, but rather to help students build basic competence related to data management, analysis, and visualization across the different programs.

NRSC 7618, Biology of the Eye (1 credit), CU-Anschutz, Fall Semester

This one credit course is intended to introduce medical and graduate students to contemporary topics in vision science and ophthalmology. The course will integrate cutting-edge basic science with translational research and

clinical advances. The overall objective of this course is to familiarize students with the core concepts and challenges in clinical ophthalmology and vision research. The learning objectives for each class are detailed in the schedule.

NRSC 7700, Drugs and the Brain (1 credit), CU-Anschutz, Spring Semester

Drs. Jamie Peters and Jasper Heinsbroek from the Department of Anesthesiology are co-directing this new elective course for PhD students called “Drugs and the Brain.” This course (1 credit) will be held over a 6- to 7-week period in the Spring 2021 semester from mid-March to late April. It will cover advanced topics in addiction neuroscience, with a focus on the effects of various drugs of abuse on the brain. Each student will give an oral presentation on their drug of choice at the end of the course for a letter grade.

PHRD 7801 / PHRD 7802, Principles of Clinical Pharmacology (3 credits), CU-Anschutz

The course provides students with a foundational knowledge of clinical pharmacology, including pharmacokinetics, drug metabolism, assessment of drug effects, optimizing patient therapy and drug discovery and development. It is grounded in weekly topical lectures emanating from the NIH Principles of Clinical Pharmacology lecture series, supplemented by readings, discussion and assignments. This course continues as PHRD7802 in the Spring semester; in past years those completing requirements have earned an NIH certificate for participation in the NIH Principles of Clinical Pharmacology course.

PHSC/PCSM 6720, Cannabis Therapeutics: Emphasis in Pain, Oncology Supportive Care and At-Risk Populations (2 credits) CU-Anschutz

This course considers the science and therapeutics of cannabis in pain, supportive cancer care, and special populations. Specifically, it will examine the therapeutic potentials of cannabinoids for a variety of conditions such as neuropathic pain, cancer-related pain, and other cancer-related symptoms. Cannabis use in special populations, including pregnant and breastfeeding women, adolescents, and older adults will be evaluated. Literature review and evidence-based medicine will be used to incorporate knowledge gained from the best available research, evidence, and clinical expertise, and apply this to individual patient circumstances and cases.

PUBH 6670: Special Topics: The SARS-CoV-2 virus, COVID-19, and Public Health: Lessons that We are Learning (1-credit), CU-Anschutz

The COVID-19 pandemic is an unprecedented public health event that will remain in play for the foreseeable future. While the course of the pandemic may be uncertain, it is clear that there will be many twists and turns of its path that are certain to involve issues that cover all of public health sciences, from molecular epidemiology to global policy. Accordingly, the syllabus will be organic, building each week on the most useful current events for didactic purposes.

RSPC 7801, Molecular Mechanisms of Reproductive Endocrinology and Metabolism (3 credits), CU-Anschutz

Endocrine systems will be covered from the molecule to the systems level. Pituitary secretions actions/regulation, regulation of water, ion, calcium balance, regulation of metabolism including insulin secretion/action will be discussed, the context of normal physiology, the mechanisms of endocrine dysfunction.

STBB/PHCL 7609, Biophysics and Spectroscopy, (3 credits), CU-Anschutz, Spring

The course will cover fundamental aspects of biophysical approaches to elucidating and studying the properties of biomolecules. It will mainly cover various aspects of spectroscopy/spectrometry, with key underpinnings in

the basic physical principles that are common to different types of spectroscopy/spectrometry and the differences between them. Experimental aspects will be discussed and the different frequencies/dynamic time scales that they address. In addition, concatenated types of spectroscopies/spectrometries and commonalities among higher-dimensional spectroscopies will be addressed.

TXCL 7323 Environmental and Target Organ Toxicology (2 credits), CU-Anschutz

This course is designed to provide a fundamental understanding of target organ toxicology and environmental-related toxicants (e.g. solvents, pesticides, metals) with emphasis on the molecular mechanisms underlying their organ specific toxicity and on risk assessment. Current research papers from the literature and readings in Casarett and Doull's Toxicology will be assigned. Readings should be completed prior to class and quizzes may be administered at the discretion of the faculty member.

TXCL 7751, NeuroToxicology (2 credits), CU-Anschutz

This course is designed to provide a foundation in Neurotoxicology. Neurological mechanisms underlying toxicity will be analyzed and integrated with discussions of the toxicity arising from metals, pharmaceuticals, biologicals (plant and animal), organic industrials, radiation and nerve agents.