

## Department of Anatomy and Cell Biology Curriculum

The graduate program in Anatomy and Cell Biology prepares the student for a research and/or teaching career with concentrations in one or more of the following:

- Cell Biology
- Developmental Biology
- Neuroscience

The program emphasizes research and the skills and knowledge required to perform and communicate the results of research. In addition, because the Anatomy graduate program is in the School of Medicine, students have opportunities to learn aspects of science that are related to important problems in medicine and to take elective courses oriented toward human biology. Modern biomedical researchers/educators must be versed in a number of disciplines, so the course of study in the department is broadly based; students are encouraged, and in some cases required, to enroll in courses offered by other departments. Research opportunities in the department are widely varied and can accommodate many interests.

### **Course Requirements**

All students must take the courses of the Interdisciplinary Graduate Program in Biomedical Sciences or an equivalent set of courses approved by the Department Graduate Studies Committee. After completing IGPBS courses, students must take ANAT 900 (Analysis of Scientific Papers) and ANAT 885 (Seminar) every semester up to the semester in which they defend. Students must also take ANAT 845 (Graduate Histology) during their second year of study. Two additional hours of advanced departmental or interdepartmental courses, based on the student's specialized interests and needs, are required and should be selected with the counsel of their advisor. Students must maintain a B average overall.

### **Research Skills and Responsible Scholarship Requirement**

All students in doctoral programs must meet the research skills and responsible scholarship requirement of the university. Anatomy Ph.D. students meet these requirements during their IGPBS year of study by taking GSMC 857 (Biographics); GSMC 852/GSMC 855 (Introduction to Biomedical Research I and II); and GSMC 856 (Introduction to Research Ethics). Anatomy MDPHD students meet the "responsible research" requirement by taking CORE 800 (biostatistics) and PAON 920/GSMC860 (Introduction to Molecular Medicine) the fall semester of their first year in medical school. They meet the "research ethics" requirement by taking either GSMC 856 (Introduction to Research Ethics) the fall semester of their first year in the graduate

phase or the Stowers Research Integrity Course the spring semester of their first year in the graduate phase.

### **Comprehensive Exam**

Anatomy Ph.D. students must pass a comprehensive exam by the end of the Fall semester of their third year of graduate school. Anatomy MDPHD students must pass a comprehensive exam by the end of the Fall semester of their second year in their graduate phase of study. The comprehensive exam contains a written and an oral portion. The written portion consists of an NIH-style grant application written on the research expected to be performed for the dissertation. The oral portion of the exam is based in part on the written exam, and is contingent upon the comprehensive exam committee's preliminary approval of the written exam.

### **Seminar Presentations**

Two presentations in the regular departmental seminar series, or an equivalent seminar approved by the graduate education director, are to be given in two separate semesters, not including the one in which the student defends.

### **Teaching Expertise**

Each student must gain teaching experience by assisting in selected courses, chosen with the help of the advisor and graduate education director.

### **Dissertation**

The student must complete original research, write a dissertation, and satisfactorily defend it in a final public seminar and oral examination. The dissertation must contain data suitable for publication in appropriate peer-reviewed scientific journals.

### **M.A. Degree Requirements**

Course work and degree requirements for the M.A. are developed on an individual basis by the student, mentor, and the Department of Anatomy and Cell Biology graduate studies committee.

A minimum of 30 credit hours is required. These hours are divided between formal course work and research/thesis. The student must satisfactorily pass a final general examination or prepare and defend a written thesis in an open seminar.

## Graduate Courses offered

**Catalog Title:** GSMC 850 Proteins and Metabolism (2)  
**Description:** This course is the first of four lecture units in the first year curriculum of the Interdisciplinary Graduate Program in the Biomedical Sciences. It will cover basic principles of metabolism, protein structure and an introduction to nucleic acids.  
**Prerequisites:** Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences. Students must co-enroll in GSMC 852 (Introduction to Biomedical Research).  
**Last offered:** Fall, 2013  
**Number of students enrolled:** 23

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**Catalog Title:** GSMC 851 Molecular Genetics (2)  
**Description:** This course is the second of four lecture units in the first year curriculum of the Interdisciplinary Graduate Program in the Biomedical Sciences. It will cover basic principles of molecular genetics, DNA replication, DNA repair, transcription and translation.  
**Prerequisites:** Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences. Students must co-enroll in GSMC 852 (Introduction to Biomedical Research).  
**Last Offered:** Fall, 2013  
**Number of students enrolled:** 24

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**Catalog Title:** GSMC 852 Introduction to Biomedical Research (2)  
**Description:** This is the first semester of a one year series in the Interdisciplinary Graduate Program in the Biomedical Sciences. The course is composed of weekly meetings to discuss research problems, methods and current literature. The course will interface with the lectures and students will learn to critically evaluate our scientific knowledge base. The students will be introduced to the tools that are available to obtain and evaluate information. The students will be challenged to identify areas of our scientific knowledge that require further experimentation and clarification.  
**Prerequisites:** Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences. Students must co-enroll in GSMC 850 (Proteins and Metabolism) and GSMC 851 (Molecular Genetics).  
**Last Offered:** Fall, 2013  
**Number of students enrolled:** 23

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Catalog Title: GSMC 853 Cellular Structure (2)  
Description: This course is the third of four lecture units in the first year curriculum of the Interdisciplinary Graduate Program in the Biomedical Sciences. It will cover basic principles of cellular structure and function. Topics include the lipid bilayer, membrane proteins, and cellular organelles.  
Prerequisites: Prerequisites: Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences. Students must co-enroll in GSMC 855 (Introduction to Biomedical Research).  
Last Offered: Spring, 2013  
Number of students enrolled: 27

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Catalog Title: GSMC 854 Cell Communication (2)  
Description: This course is the fourth of four lecture units in the first year curriculum of the Interdisciplinary Graduate Program in the Biomedical Sciences. It will cover basic principles of cell communication. Topics include G-protein-coupled signaling, cellular cytoskeleton; cell cycle control; cell death; extracellular matrix; and cancer.  
Prerequisites: Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences. Students must co-enroll in GSMC 855 (Introduction to Biomedical Research).  
Last Offered: Spring, 2013  
Number of students enrolled: 27

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Catalog Title: GSMC 855 Introduction to Biomedical Research II (2)  
Description: This is the second semester of a one year series in the Interdisciplinary Graduate Program in the Biomedical Sciences. The course is composed of weekly meetings to discuss research problems, methods and current literature. The course will interface with the lectures and students will learn to critically evaluate our scientific knowledge base. The students will be introduced to the tools that are available to obtain and evaluate information. The students will be challenged to identify areas of our scientific knowledge that require further experimentation and clarification.  
Prerequisites: Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences. Students must co-enroll in GSMC 853 (Cellular Structure) and GSMC 854 (Cell Communication).  
Last Offered: Spring, 2013  
Number of students enrolled: 27

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Catalog Title: GSMC 856 Introduction to Research Ethics (1)  
Description: The objective of this course is to introduce students to research ethics. Students will learn and discuss some of the following areas of ethics in research: 1) sources of errors in science, 2) Scientific Fraud, 3) plagiarism and misrepresentation, 4) conflicts of interest and 5) confidentiality.  
Prerequisites: Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences.  
Last Offered: Fall, 2013  
Number of students enrolled: 30

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Catalog Title: GSMC 857 (1) Biographics  
Description: The objective of the course is to teach students how to organize and present data in a clear and concise manner at national meetings. Students are taught basic principles of organizing data for presentation and then learn through the actual presentation of data in simulated platform sessions held in the course. Videotapes are made of the presentations, and students are then given a constructive critique of their presentation by the instructor and fellow students.  
Prerequisites: Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences.  
Last Offered: Fall, 2013  
Number of students enrolled: 21

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Catalog Title: GSMC 858 (1) Introduction to Faculty Research  
Description: This course was created to provide students with sufficient introduction to the research conducted at KUMC. To facilitate this point, the course is designed as a seminar series. In each session of the series, three faculty members present a brief 20-minute overview of their research programs. The series will help students to select faculty for research rotations and ultimately help them determine which faculty member they will select as a research adviser for their doctoral research.  
Prerequisites: Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences.  
Last Offered: Fall, 2013  
Number of students enrolled: 16

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Catalog Title: GSMC 859 (1 to 4 units) Research Rotations  
Description: The course will introduce students to research methods, experimental design, and the types of biomedical research conducted at KUMC. The first research rotation begins halfway through the first

semester; the second and third research rotations will occur in the second semester. It is designed to help students determine which faculty member they will select as a research adviser for their doctoral research.

Prerequisites: Permission of Instructors. Students must be admitted into the Interdisciplinary Graduate Program in the Biomedical Sciences.

Last Offered: Fall, 2013

Number of students enrolled: 16

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Catalog Title: ANAT 832: Electron Microscopy Techniques (3 )  
Description: Basic methods in preparation of tissues and cells for ultrastructural studies; use of electron microscopy in specific research problems; interpretation of biological ultrastructure; reading assignments and discussion sessions.

Prerequisite: ANAT 830, or consent of course instructor. LEC

Last Offered: Summer, 2013

Number of students enrolled: 2

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Catalog Title: ANAT 840: Genetics and Neurobiology of Mental Disorders (2 )  
Description: Analysis of the genetic causes and molecular mechanisms underlying mental disorders: an introduction to the principles and applications of medical genetics and syndromes associated with mental disorders. Topics to be covered include, but are not limited to, autism spectrum disorders (ASD), schizophrenia, an introduction to imprinting mechanisms and disorders including Prader-Willi and Angelman syndromes. An overview of the disorders, candidate genes and mutations linked to these disorders will be presented.  
Prerequisite: Introductory course in cell biology, development neurobiology, and/or neuroscience. LEC

Last Offered: Spring, 2006

Number of students enrolled: 4

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Catalog Title: ANAT 845: Graduate Histology (2 )  
Description: This course will bridge student knowledge of systems/organs with cellular histology and is designed as an accelerated introduction to histological techniques, microscope/optics, and histology. The course will be held within a one month period in the summer. Individual tissues will be covered by a brief 30 minute lecture followed by a 90 minute session of observing the tissues under the microscope.  
Prerequisite: Advanced course in cell biology (IGPBS module 4 or equivalent) or consent of instructor. LEC

Last Offered: Summer, 2012

Number of

students enrolled: 16

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Catalog Title: ANAT 846: Advanced Neuroscience (5 )  
Description: Team taught, in-depth neuroscience course focusing on normal and diseased brain function at the molecular, cellular and systems levels. Lectures and discussions will emphasize current issues in neuroscience research. (Same as PHCL 846, PHSL 846 and NURO 846). Prerequisite: Permission of course director. LEC  
Last Offered: Summer, 2013  
Number of students enrolled: 4

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Catalog Title: ANAT 847: Developmental Neurobiology (2 )  
Description: Development of the nervous system from early induction to the development of learning and memory. Topics include: Induction; Cellular Differentiation; Axon Growth and Guidance; Target Selection; Cell Survival and Growth; Synapse Formation; Synapse Elimination; and Development of Behavior. (Same as NURO 847 and PHSL 847.)  
Prerequisite: Advanced Neuroscience (ANAT 846; NURO 846; PHSL 846) or consent of instructor. LEC  
Last Offered: Spring, 2010  
Number of students enrolled: 7

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Catalog Title: ANAT 848: Molecular Mechanisms of Neurological Disorders (3 )  
Description: An in-depth coverage of pathogenic mechanisms in neurological diseases; cellular and molecular responses to brain injury and disease, neuroinflammatory diseases (e.g., multiple sclerosis), neurodegenerative diseases (e.g., Alzheimer's, Parkinson's, Huntington's, amyotrophic lateral sclerosis, and prion diseases), neurogenetic diseases (e.g., lysosomal and peroxisomal disorders, Down's syndrome and fragile X), trauma, stroke, and viral diseases (e.g., HIV encephalitis). (Same as NURO 848, PHCL 848, and PHSL 848.)  
Prerequisite: Advanced Neuroscience (ANAT 846, PHCL 846 or PHSL 846) or an equivalent course and consent of instructor. LEC  
Last Offered: Fall, 2012  
Number of students enrolled: 2

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Catalog Title: ANAT 868: Advanced Developmental Biology (2 )  
Description: Detailed analysis of developmental mechanisms in key vertebrate systems. Fertilization, cleavage, morphogenesis and gastrulation, axis determination, and organogenesis, with special attention to the most recent advances.

Prerequisite: IGPBS Module 4 or consent of instructors. LEC  
Last Offered: Spring, 2012  
Number of students enrolled: 2

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Catalog Title: ANAT 869: Grant Writing (3 )  
Description: All aspects of preparing grant applications are covered. This includes writing an actual grant application containing all the usual elements of grants - budgets, biosketches, resources, and scientific text. In addition, different funding agencies, building research teams, the review process, responding to reviewers, and resubmitting grants will be covered. (Same as HP&M 878 and NRSG 889.)  
Prerequisite: Appropriate research methods and statistics courses in student's current graduate program; and permission of the instructor. For students in the Outcomes Management and Research concentration, HP&M 821. LEC  
Last Offered: Spring, 2003  
Number of students enrolled: 3

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Catalog Title: ANAT 870: Techniques in Anatomy and Cell Biology (1-3 )  
Description: Advanced study allowing a student to pursue a particular research or educational skill through directed laboratory work.  
Prerequisite: Consent of instructor. LEC  
Last Offered: unknown  
Number of students enrolled: unknown

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Catalog Title: ANAT 880: Advanced Topics: \_\_\_\_\_ (1-5 )  
Description: Special study allowing a student to pursue a particular subject through readings, laboratory work, and conferences with a faculty member.  
Prerequisite: Consent of instructor. IND  
Last Offered: Summer, 2005  
Number of students enrolled: 1

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Catalog Title: ANAT 885: Seminar (1 )  
Description: Research-oriented presentations in a seminar format by students, faculty, and guests. LEC  
Last Offered: Fall, 2013  
Number of students enrolled: 18

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Catalog Title: ANAT 890: Master's Research (1-10 )

Description: Independent laboratory investigation approved by and under the supervision of the student's advisor, and in partial fulfillment of the requirements for the M.A. degree.

Prerequisite: Consent of advisor. RSH

Last Offered: unknown

Number of students enrolled: unknown

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Catalog Title: ANAT 899: Master's Thesis (1-6 )

Description: Preparation of the formal thesis based upon independent research and in partial fulfillment of the requirements for the M.A. degree. Credits will be given only after the thesis has been accepted by the department.

Prerequisite: Consent of advisor. THE

Last Offered: Summer, 2013

Number of students enrolled: 1

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Catalog Title: ANAT 900: Analysis of Scientific Papers (1 )

Description: Research articles are analyzed by the student with the guidance of an instructor in terms of quality of scientific content and mechanics of the presentation. One or more articles are discussed in each tutorial session. The research topics and the instructor are chosen in accordance with the research interest of the student. LAB

Last Offered: Fall, 2013

Number of students enrolled: 18

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Catalog Title: ANAT 990: Doctoral Research (1-12 )

Description: Original and independent laboratory investigation, approved by and conducted under the supervision of the students' advisor and advisory committee, in partial fulfillment of the requirements for the Ph.D. degree.

Prerequisite: Consent of advisor. LEC

Last Offered: Fall, 2013

Number of students enrolled: 19

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Catalog Title: ANAT 999: Doctoral Dissertation (1-12 )

Description: Preparation of the dissertation based upon original research and in partial fulfillment of the requirements for the Ph.D. degree. Credits will be given only after the dissertation has been accepted by the student's dissertation committee.

Prerequisite: Consent of advisor. THE

Last Offered: Fall, 2013

Number of

students enrolled: 3

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