OTHER SCHOOLS THAT HAVE UMBRELLA PROGRAMS

Jefferson Flexible-Entry Pathway

The Ph.D. programs of the Jefferson College of Graduate Studies each have unique features with respect to their curricula and faculty membership, providing both breadth and depth from among which applicants and matriculating students may select a focused area of study. Nevertheless, the programs share a number of common features, and for the applicant who is uncertain as to their specific future course of study and research, the College offers the Flexible-Entry Pathway whereby application may be made to the College without initially specifying a particular Ph.D. program. In the first year, admitted students enroll in the Foundations of Biomedical Science core course as well as subsequent electives appropriate to their potential future course of study. Students also engage in a series of three laboratory rotations with faculty from across any of the existing Ph.D. programs. By the end of the first academic year students are expected to have selected both a Ph.D. thesis advisor as well as matriculate into a specific Ph.D. program, whose policies and procedures will guide the further course of their study while continuing to complete any remaining College requirements.

Biochemistry & Molecular Biology
Cell & Developmental Biology
Genetics
Immunology & Microbial Pathogenesis
Joint Flexible-Entry Program Option
Molecular Pharmacology & Structural Biology
Molecular Physiology and Biophysics
Neuroscience
Tissue Engineering & Regenerative Medicine

Credit and Course Requirements
The Ph.D. degree requires a minimum of 180 credits beyond the bachelor's degree, this usually requires five years of full time study. Full time enrollment in the Fall Semester is 20 credits, Spring I and II combined is 30 credits, and Summer Semester is 10 credits.

54 of the minimum 180 credits must be from a combination of required and elective coursework. At least 18 of these credits must be from outside the major Program. The remaining credits are dissertation research credits.

Course requirements are usually completed during the first two years of study. A student who meets these Program requirements through previous coursework should discuss the possibility of taking alternate courses with the Program Director. The following are general course requirements for all KCC Ph.D. Programs, be sure to check appropriate folder for Program specific requirements.

Foundations in Biomedical Sciences (GC 550), Research Ethics (GC 640), Inference & Study Design (GC 662), Statistics (GC 663), three Research Rotations, and Current Literature / Seminar. Check each program for its specific seminar requirements.

Presentation of Scientific Information

Graduate students present seminars at least twice per year on topics unrelated to their dissertation thesis research during required journal club / seminar courses. The

purpose of this is to develop the ability to communicate scientific information, to develop skills for answering questions in a public forum and to provide training in the critical evaluation of scientific data. Students select a research article from a current journal with the approval of their faculty advisor and a strategy is formulated for the presentation of the article. The student is required to present sufficient background information on the topic of the article, as well as a critique of the scientific information contained in the article in the seminar presentation.

Beginning in their fourth year of enrollment, each student will present his/her progress once a year in the "Research in Progress" Seminar series that occurs on a weekly basis and in which pre- and postdoctoral trainees participate. All students are expected to regularly attend the Research in Progress Seminar Series.

GC 550 Foundations of Biomedical Sciences
Credits 10
Fall
This course is designed to provide a basic knowledge of biochemistry, genetics, molecular biology and
cellular biology to the beginning student. The primary goal is to convey knowledge of the molecular and
cellular mechanisms controlling cell, tissue and organ system function using material drawn from
biochemistry, cell biology, genetics, pharmacology and physiology. The course will familiarize the student
with the powerful technologies used in scientific research and will train the student in the communication of
science through informal sessions on evaluation of published literature, scientific writing, oral presentations,
and information retrieval.

Medical College of Wisconsin Interdisciplinary Programs in Biomedical Sciences

- Bacterial Pathogenesis
- Cancer Biology
- Cardiovascular Biology
- Cell Biology
- Cellular and Molecular Neuroscience
- Developmental Biology
- Enzymology and Metabolism
- Free Radical Biology
- Immunology
- Molecular Genetics
- Molecular Pharmacology
- Signaling and Gene Expression
- Structural Biology
- Virology

During the first two semesters, Ph.D. trainees participate in a core curriculum that integrates molecular, cellular, genetic, and biochemical material. Courses include

lectures, problem solving, and discussion sessions that focus on current research problems. Through faculty member interaction and laboratory rotations, students select a dissertation advisor from the large and diverse graduate faculty and, at the end of 18 months, matriculate into one department for advanced training. Advancement to Ph.D. candidacy occurs after successful completion of a qualifying examination and acceptance of a research plan.

University of Buffalo Interdisciplinary Graduate Program in Biomedical Sciences

1st Semester

- Cell Biology I
- Principles of Biochemistry
- Laboratory Rotation I
- Fundamentals in Biomedical Sciences - Informatics and Literature

2nd Semester

- Laboratory Rotation II
- Laboratory Rotation III
- Fundamentals in Biomedical Sciences - Techniques and Approaches

Electives

You will take two electives in your second semester:

Biochemistry

- BCH 507 Protein Structure and Function
- BCH 508 Gene Expression
- BCH 512 Developmental Genomics
- BCH 519 Bioinformatics and Computational Biology
- BCH 522 Protein-Nucleic Acid Interaction
- BCH 607 DNA Replication and Repair

Biophysics

- BPH 505 Biophysical Basics: Processes

Microbiology and Immunology

- MIC 512 Fundamentals of Immunology
- MIC 522 Protein-Nucleic Acid Interaction

Neuroscience

- NRS 520 Neuroscience I
- NRS 524 Neuroscience III

Oral Biology

- ORB 531 Oral Immunology

Pharmacology

- PMY 512 Principles of Pharmacology
- PMY 516 Mechanism of Drug Action
- PMY 527 Translational Pharmacology

Physiology

- PGY 505 Cell and Membrane Physiology
- PGY 607 Cellular and Molecular Basis of Disease

Structural Biology

- STB 531 Protein Production, Purification and Crystallization

BMS 501, CELL BIOLOGY I
Fall 2010

DATE TOPIC INSTRUCTOR
The Membrane and Cell Architecture
8/30 Compartmentalization, lipid structure, and basic principles Fliesler
9/1 Historical perspectives: "Fluid mosaic" model and beyond Fliesler
9/3 Membrane molecular dynamics, higher-order structure,
and isolation/characterization of membrane fractions Fliesler
9/6 No class: Labor Day
9/8 Conference Fliesler
9/10 The cytoskeleton Hofmann
9/13 Cell junctions in polarized tissues Hofmann
9/15 Conference Hofmann
9/17 **Exam I**
Membrane Transport and Maintenance of Cell Homeostasis
9/20 Membrane potential and cell homeostasis Duffey
9/22 Membrane ion channels Duffey
9/24 The action potential Duffey
9/27 Conference Duffey
9/29 Facilitated diffusion and active transport Duffey
10/1 Transport across polarized tissues Duffey
10/4 Conference Duffey
10/6 **Exam II**
Directing Protein Traffic to Determine Cell Asymmetry and Phenotype
10/8 Intracellular compartments and protein sorting Kosman
10/11 Intracellular compartments and protein sorting Jacobs
10/13 Protein maturation and vesicular trafficking Jacobs
10/15 Conference Jacobs 4

10/18 Exo- and Endocytosis Jacobs
10/20 Establishing cell polarity Duffey
10/22 Secretion in prokaryotes Hakansson
10/25 Conference Duffey
10/27 **Exam III**

Communication between Cells by Extracellular Signals

10/29 Signaling through G-protein coupled receptors Rabin
11/1 Intracellular modulators: cAMP, calcium and NO Rabin
11/3 Signaling through enzyme-coupled receptors Rabin
11/5 Conference Rabin
11/8 Signaling in epithelial tissues Duffey
11/10 Signaling in prokaryotes I Connell
11/12 Signaling in prokaryotes II Connell
11/15 Conference Connell
11/17 **Exam IV**

Cellular Genetics, Growth and Differentiation

11/19 Cell cycle I Surtees
11/22 Cell cycle II Surtees
11/24 No class: Thanksgiving
11/26 No class: Thanksgiving
11/29 Cell cycle checkpoints to cell damage Surtees
12/1 Conference Surtees
12/3 Proliferation and differentiation in the crypt-villus axis Garrett- Sinha
12/6 Transformation of a basal layer cell into a keratinocyte Garrett- Sinha
12/8 Adhesion, migration and metastasis of keratinocytes Garrett- Sinha
12/10 Conference Garrett- Sinha
TBA (Exam week) **Exam V**

BMS503 – PRINCIPLES OF BIOCHEMISTRY – FALL, 2010

- **LECTURE: MON/WED/FRI, 9-10:15 AM**
- **RECITATION: MONDAY OR FRIDAY, 2-3:30 PM**
- **FARBER 134B**
- **EXAMS WILL BE HELD ON THE DATES IN THE SCHEDULE BELOW**
- **ALL EXAMS ARE HELD IN FARBER 144 FROM 2:00-3:30**
- **PART I – Protein Structure and Function**
- D. Kosman (DK) – 653 BRB (2842) camkos@buffalo.edu (Course Coordinator)
- **PART II – Metabolic Pathways**
- G. Popescu (GP) – 647 BRB (3807) popescu@buffalo.edu
- M. Patel (MP) – 513 BRB (3074) mspatel@buffalo.edu
- **PART III – Nucleic Acid Structure and Function**
- M. Sutton (MS) – 651 BRB (3581) mdsutton@buffalo.edu
- S. Sinha (SS) – B3-305 COE (881-7994) ssinha2@buffalo.edu
- L. Read (LR) – 249 BRB (3307) lread@buffalo.edu
- RECOMMENDED TEXT: **BIOCHEMISTRY,** 3rd Ed., Mathews, van Holde and Ahern.
- **CLASS MEETINGS**
- **Part I – Protein structure and function** (**DK**)
- **August**
- 30 Chemical and physical properties of amino acids, proteins and water
- **September**
- 1 cont.

- 3 Protein structure and stability
- 8 cont.
- **WEDNESDAY RECITATION**
- 10 cont.
- **FRIDAY AFTERNOON RECITATION**
- 13 Enzyme kinetics and catalysis
- **MONDAY AFTERNOON QUIZ**
- 15 cont.
- 17 cont.
- 20 cont. **RECITATION**
- 22 Kinetics as a probe of mechanism
- 24 Mechanisms of catalysis
- **FRIDAY AFTERNOON RECITATION**
- **Part II – Metabolic pathways**
- 27 Metabolic circuitry (**GP**)
- **EXAM I, SEPT. 27 IN PM (through 9/24)**
- 29 Glucose transport and metabolism (**GP**)
- **October**
- 1 Pyruvate metabolism (**GP**)
- 4 The TCA cycle (**GP**) **RECITATION (GP)**
- 6 Electron flow and Ox-Phos (**GP**)
- 8 Glycogen metabolism (**GP**)
- 11 Gluconeogenesis, Pentose Shunt (**G**P) **RECITATION (GP)**
- 13 Fatty acid catabolism (**GP**)
- 15 Fatty acid synthesis (**GP**)
- **EXAM II, OCT. 15 IN PM (through 10/11)**
- 18 Amino acid metabolism (**MP**)
- **RECITATION (GP)**
- 20 The urea cycle (**MP**)
- 22 Integration of metabolism: The fed state (**MP**)
- 25 Integration of metabolism: The fasted state (**MP**)
- **RECITATION (MP)**
- **PART III – Nucleic acid structure and function**
- 27 Structure of nucleic acids (**MS**)
- 29 Physical properties of nucleic acids (**MS**)
- **EXAM III, Oct. 29 IN PM (through 10/25)**

- **November**
- 1 DNA replication and repair (**MS**) **RECITATION**
- 3 cont. (**MS**)
- 5 cont.(**MS**)
- 8 cont. (**MS**) **RECITATION (MS)**
- 10 Transcription and its control (**SS**)
- 12 cont. (**SS**)
- **EXAM IV, NOV. 12 IN PM (through 11/8)**
- 15 cont. (**SS**) **RECITATION**
- 17 cont. (**SS**)
- 19 cont. (**SS**)
- 22 Transcription and development (**SS**)
- 29 cont. (**SS**) **RECITATION** (**SS**)
- **December**
- 1 RNA processing (**LR**)
- 3 cont (**LR**)
- 6 Translation (**LR**) **RECITATION (LR)**
- 8 cont. (**LR**)
- 10 Regulation at the level of RNA (**LR**)
- **RECITATION SCHEDULED BEFORE**
- **EXAM V (LR)**
- **EXAM V: WEDNESDAY, DEC. 15 (THROUGH 12/10, NOT CUMULATIVE) FARBER 144**
- **Exam Format and Policies:** All of the exams are **CLOSED BOOK**. The format will be short-answer, in some cases 'fill in the blanks'. They will be written to be completed in 60 min with 30 min extra time given for students to go through their answers. The six exams will contribute equally to the final grade total.

BMS 511: Informatics and literature
Fall 2010

- **9:00-10:20 (unless otherwise noted)**

- **Coordinator: Laurie Read**
- **2 credits**
-
- The goal of this course is to introduce students to strategies for identifying, generating, reading, and presenting scientific literature.
-
- Date Topic Instructor Location
- 8/31 PubMed Hendrix Abbott Hall
- (1st half of students) Media Instruction Room
-
- 9/2 PubMed Hendrix Abbott Hall
- (2nd half of students) Media Instruction Room

- 9/7 Web of Science Hendrix Abbott Hall
- (1st half of students) Media Instruction Room
- 9/9 Web of Science Hendrix Abbott Hall
- (2nd half of students) Media Instruction Room
- 9/14 EndNote Hendrix Abbott Hall
- (1st half of students) Media Instruction Room
- 9/16 EndNote Hendrix Abbott Hall
- (2nd half of students) Media Instruction Room
- 9/23 BLAST Rein North Campus
- Note: 3 hours (9-noon) 212 Capen Hall
- 9/28 BLAST (cont'd) Rein North Campus
- Note: 3 hours (9-noon) 212 Capen Hall
- 10/5 Adapting internet material to Kosman 134B Farber Hall
- powerpoint presentations
- 10/7 Adapting internet material to Kosman 134B Farber Hall
- powerpoint presentations
- (cont'd)
- 10/9-12/10 Student journal clubs Instructors, time, and rooms TBA

BMS 512, Spring 2011 (2 cr.)
Fundamentals of Biomedical Research: Techniques and Approaches
Syllabus
Monday/Wednesday, 9:00 – 9:50

- **Farber 134B**
- **Class Schedule:**

- **Date Day Topic Instructor**
- 1/19/2011 Wed Overview of the SMBS Confocal Microscopy & Flow

- Cytometry Core Facility
- Sigurdson &
- Kelleher
- 1/24 Mon Bioinformatics Campagnari
- 1/26 Wed Bioinformatics Campagnari
- 1/31 Mon Molecular Biology: Cloning Sutton
- 2/2 Wed Molecular Biology: Recombination Sutton
- 2/7 Mon Molecular Biology: Screens & Selections Connell
- 2/9 Wed Molecular Biology: Screens & Selections Connell
- 2/14 Mon Protein Expression & Protein Purification Gulick
- 2/16 Wed Protein Expression & Protein Purification Gulick
- 2/21 Mon Structural Biology & Protein Crystallography Gulick
- 2/23 Wed Structural Biology & Protein Crystallography Gulick
- 2/28 Mon Arrays, Nucleotide Sequencing, & Genomics Buck
- 3/2 Wed Arrays, Nucleotide Sequencing, & Genomics Buck
- 3/7 Mon Introduction to Model Systems & Eukaryotic Genetics Gronostajski
- 3/9 Wed Model Systems & Genetics: Yeast Panepinto
- **3/14–18 Spring Break, no classes**
- 3/21 Mon Model Systems & Genetics: Yeast Panepinto
- 3/23 Wed Model Systems & Genetics: *C. elegans* Gronostajski
- 3/28 Mon Model Systems & Genetics: *C. elegans* Gronostajski
- 3/30 Wed Model Systems & Genetics: Mouse Sim
- 4/4 Mon Model Systems & Genetics: Mouse Sim
- 4/6 Wed Model Systems & Genetics: *Drosophila* Halfon
- 4/11 Mon Model Systems & Genetics: *Drosophila* Halfon
- 4/13 Wed Model Systems & Genetics: Human O'Brian
- 4/18 Mon Model Systems & Genetics: Human O'Brian
- 4/20 Wed Introduction to Cell Biology Surtees
- 4/25 Mon Protein Trafficking & Protein-Protein Interactions Surtees
- 4/27 Wed Protein Trafficking & Protein-Protein Interactions Surtees
- 5/2 Mon Introduction to Translational Research Murphy

Yale Biological and Biomedical Sciences

Eight interest-based "Tracks"

Within BBS, there are approximately 290 participating faculty, several dozen courses, and countless seminars from which to choose. BBS is divided into eight interest-based "Tracks":

1. Computational Biology and Bioinformatics
2. Immunology
3. Microbiology
4. Molecular Biophysics and Biochemistry
5. Molecular Cell Biology, Genetics and Development
6. Neuroscience
7. Pharmacological Sciences and Molecular Medicine
8. Physiology and Integrative Medical Biology

- What is BBS?

- How Does BBS Work?
- News
- B Magazine
    - Submit to B

- Find a Physician
- Calendar
- Contact Us
- Maps & Directions
- Yale Phonebook
- YSM Home

***How** Does BBS Work?*

Students apply to, and upon matriculation, affiliate with one of these eight Tracks. It is important to note that regardless of a student's home Track, all courses, faculty and research opportunities at the university remain available.

Year 1 - Each Track has a faculty Director who helps first-year students select courses and find suitable lab rotations. Students will typically take two to three courses per semester and will conduct two to four lab rotations over the course of the year.

Year 2 – Just prior to the start of the second year, students select a thesis adviser in whose lab they will conduct their doctoral research. They also then leave their BBS Track and formally join one of 12 Ph.D.-granting programs:

- Cell Biology
- Cellular and Molecular Physiology
- Computational Biology and Bioinformatics
- Experimental Pathology
- Genetics
- Immunobiology
- Interdepartmental Neuroscience Program
- Microbiology
- Molecular Biophysics and Biochemistry
- Molecular, Cellular, and Developmental Biology
- Neurobiology
- Pharmacology

Students in Year 2 complete the course requirements for the graduate program they have joined, take a qualifying exam, act as teaching assistants in lecture or lab courses, and begin thesis research.

Year 3 and Beyond – Students focus primarily on thesis research, publishing their results, and presenting their work at scientific meetings.

Students' curricula are tailored to meet their individual backgrounds and interests while at the same time providing essential Track-specific training. Most Tracks have recommended or required courses, but students can choose electives that are outside of these recommendations. It is quite normal to find students from many different Tracks

sitting side-by-side in the same classes. BBS provides an extensive menu of graduate courses covering the full spectrum of research disciplines, and you can download descriptions of our most recent course offerings here.

UMASS Indisciplinary Graduate Program

- a streamlined and flexible graduate curriculum tailored to the specific needs of individual students;
- participation from more than 130 UMMS labs; and
- encouragement of students' rapid initiation into full-time thesis research.

The Interdisciplinary Graduate Program (IGP) was established to support interdisciplinary approaches to graduate training in biomedical research. The more than 130 laboratories that participate in the program are directed by a distinguished group of faculty affiliated with 13 basic science and clinical departments at the Medical School. Program investigators employ a wide range of instrumentation and experimental approaches to their research including: classical and molecular genetics; proteomics and genomics; X-ray crystallography and nuclear magnetic resonance; and digital imaging and laser confocal microscopy of single cells and tissues. Specialized core facilities in gene chip analysis, mass spectroscopy, transgenics, DNA sequencing, analytical ultracentrifugation and biomedical imaging enhance the research capabilities of individual labs.

Characterized by a streamlined and flexible graduate curriculum that is tailored to the specific needs of individual students, the IGP encourages rapid initiation of full-time thesis research. A weekly seminar series, sponsored by the Program in Molecular Medicine, features distinguished lecturers from around the world. IGP students also host one or two of these seminars each semester, and faculty, students and postdoctoral fellows participate in weekly journal clubs and research forums.

Program Requirements

The IGP curriculum allows students the opportunity to become fully engaged in thesis research as early as the end of their first year. Students are encouraged to perform two laboratory rotations per semester in order to ensure that they are exposed to a variety of experimental approaches and laboratory environments. Optimally, rotations will be completed and a thesis laboratory selected by the summer of a student's first year. Advanced coursework, journal clubs and other enrichment activities beyond the graduate core course are tailored to the requirements of each student and are determined after discussion between the faculty advisor and student. In general, a minimum of two Advanced Topics courses are required.

Core Courses

All first year Basic & Biomedical Science (BBS) students engage in a Core Curriculum that provides foundational material for advanced graduate study and research in each of our 8 BBS programs of specialization. The Core Curriculum was founded on the premise that exposure to and immersion in an intensive course that surveys and debates

contemporary topics in biochemistry, molecular genetics and cell biology prepares our students for the rigors of advanced biomedical research.

Biomedical Sciences Block I

Block I covers the biophysics of molecular interactions from thermodynamics through kinetics and examines the structures of water-soluble proteins, membranes, membrane-spanning proteins and nucleic acids.
Catalog Number: BBS611

Biomedical Sciences Block II

Block II covers DNA replication, recombination and transcription, RNA processing, stability and translation, micro RNAs and RNAi, protein synthesis and degradation and genetic systems from bacteria through mice.
Catalog Number: BBS612

Biomedical Sciences Block III

Block III addresses cell structure and the flow of information and material between compartments and between the cell and its environment.
Catalog Number: BBS613

Reading, Analysis and Problem Solving

Each Biomedical Science Block includes lectures with exam-based evaluations and "Reading, Analysis and Problem Solving" (RAPS) sessions, which reinforce and expand on the principles described in lectures.
Catalog Numbers: BBS611R, BBS612R, BBS613R

Responsible Conduct in Research

Required of all students, this course provides participants the opportunity to explore some of the ethical, legal and societal issues involved in the responsible conduct of scientific research in the 21st century. Sessions will include discussions of cases and/or exercises of institutional and national policies, and short presentations by faculty, administrators, postdoctoral fellows and students.
Catalog Number: BBS601

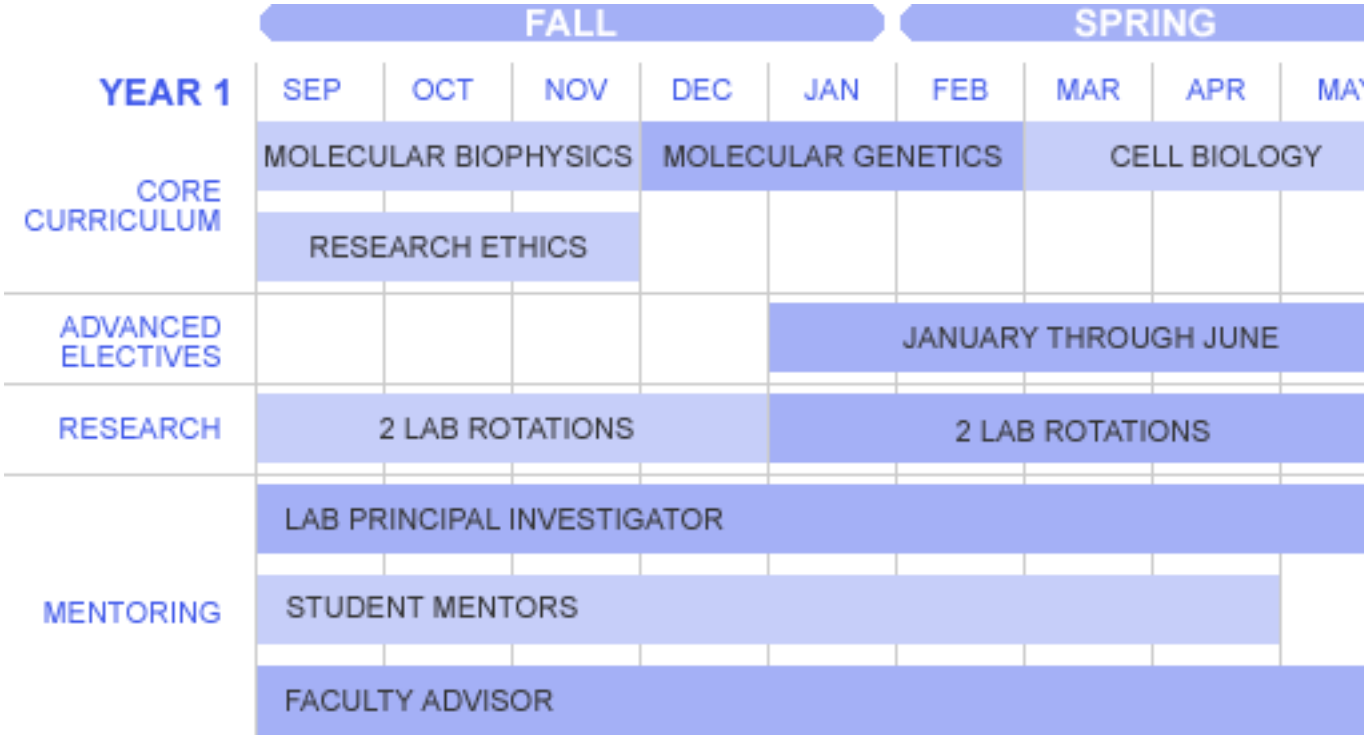
Laboratory Rotation

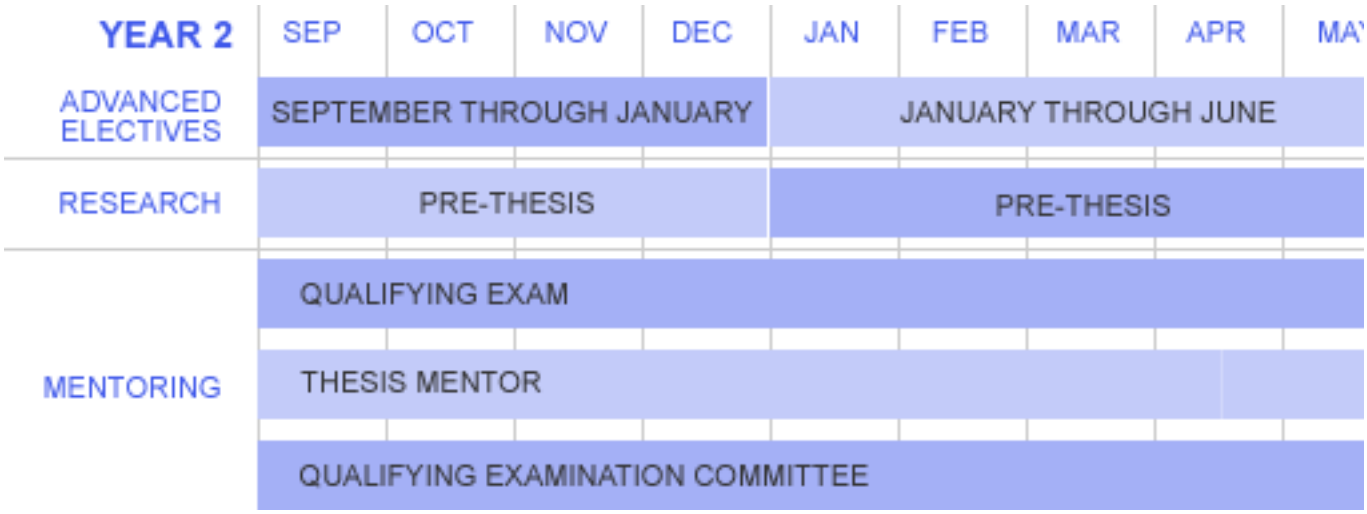
Students are required to participate in at least three laboratory rotations during their first year in the program. They are intended to familiarize the students with the principles of scientific inquiry and the concepts and techniques of several scientific fields. They allow faculty members to observe and evaluate the research aptitudes of students and permit students to evaluate the types of projects that might be developed in to dissertation projects.
Catalog Numbers: BBS850, BBS851

Scientific Writing

Required for all students, this course instructs students in the skills of developing scientific research proposals.
Catalog Number: BBS602

Doctoral Studies Timelines for Students of the Basic & Biomedical Sciences Division





Specialization

Upon completion of the core curriculum, students request acceptance by a GSBS program to pursue advanced course work and thesis research. Students may enter the program with a program of specialization in mind **(biochemistry & molecular pharmacology, biomedical engineering & medical physics, cell biology, cellular & molecular physiology, immunology & virology, interdisciplinary graduate program, molecular genetics & microbiology and neuroscience**), or make that decision before completion of the core curriculum. Advanced courses offered by the programs, interdisciplinary courses, laboratory rotations and courses available through the Colleges of Worcester Consortium can be applied to the requirements for specialization. Opportunities are also available for students to participate in grand rounds, clinical seminars and conferences and clinical science research programs.

Qualifying Exam

Prior to initiating formal doctoral thesis research and no later than the start of their third year, students are required to pass a qualifying examination. This examination is a defense of an original research proposal made before a committee representative of the area of specialization. The examination is used to evaluate the ability of students to pose meaningful scientific questions, to propose experimental methods for answering those questions, and to interpret the validity and significance of probable outcomes of these experiments. Some programs also require students to pass a comprehensive examination in their area of specialization before taking the qualifying examination.

Harvard Biological and Biomedical Sciences

BBS is an interdepartmental graduate training program in cellular and molecular biology. BBS faculty members are drawn from all of the basic science departments of Harvard Medical School –**Biological Chemistry and Molecular Pharmacology (BCMP), Cell Biology, Stem Cell and Regenerative Biology, Genetics, Microbiology and Molecular Genetics, Pathology, Neurobiology and Systems Biology** – and from many of Harvard's affiliated teaching hospitals. BBS has also incorporated faculty from

the Faculty of Arts and Sciences (FAS) as part of its effort to build new initiatives in graduate training.

The BBS graduate research training is interdisciplinary, with a concentration in one or more of the following areas: biochemistry and proteomics, cell and molecular biology, computational biology, developmental biology, genetics and genomics, human biology and disease, immunobiology, microbial biology and pathogenesis, molecular neurosciences, physiology, pharmacology, regenerative biology and structural biology. The methods and experimental approaches used to address questions within these areas range from the techniques of molecular biology, protein chemistry, cell biology and biophysics to those of molecular and developmental genetics. A breakdown of the areas of research is provided in the faculty section of the website.

Required Courses

All students in BBS are required to have a graduate level background in cell biology, biochemistry, genetics, and molecular biology. All BBS students are required to take a total of 8 courses. The only specific course required of all BBS students is “Analysis of the Biological Literature” (Micro 230); it is a critical reading course held during the fall semester of year 1. Fulfillment of the remaining course requirements can be satisfied from a wide variety of core courses as well as a number of specialized courses in pharmacological sciences.

Core Courses in BBS

Fall of Year 1

Required

Microbiology 230. Analysis of the Biological Literature

Critical analysis of original research articles in an intensive small group discussions. Analyze range of papers in biochemistry, genetics, microbiology, and cell and developmental biology, in terms of context, hypothesis, methods, and objective interpretation of results. Note: Limited to and required of all first year BBS students. Half course (fall term).

Core Courses - Recommended

Genetics 201. Principles of Genetics

An in-depth survey of genetics, beginning with basic principles and extending to modern approaches and special topics. We will draw on examples from various systems, including yeast, Drosophila, C. elegans, mouse, human and bacteria.

Note: Intended for first-year graduate students.

Half course (fall term).

BCMP 200. Molecular Biology

An advanced treatment of molecular biology's Central Dogma. Considers the molecular basis of genetic information transfer from DNA to RNA to protein, using examples from eukaryotic and prokaryotic systems. Prerequisite: Intended primarily for graduate students familiar with basic molecular biology or with strong biology/chemistry background. Half course (fall term).

Spring of Year1

Core Courses - Recommended

Cell Biology 201. Molecular Biology of the Cell

Topics include the molecular basis of cellular compartmentalization, protein trafficking, cytoskeleton dynamics, mitosis, cell locomotion, cell cycle regulation, signal transduction, cell-cell interaction, and the cellular/biochemical basis of diseases. Methods covered include protein purification, mass spectrometry, and microscopy.
Note: Offered jointly with the Medical School as CB 713.0
Prerequisite: Basic knowledge in biochemistry and genetics.
Half course (Spring term).

ADDITIONAL COURSES SHOULD BE TAKEN DURING SPRING OF YEAR 1 AND EITHER SEMESTER OF YEAR 2

University of North Caroline Chapel Hill Graduate Studies in Interdisciplinary Biology

The Curriculum in Genetics and Molecular Biology is an interdepartmental pre doctoral

In interdisciplinary biology, tools or questions aimed one level of biological organization are used to infor organization. For example, just as phylogenetic approaches to genomic data can be used to understand these data shed new light on functional traits of an organism s genome. On this page, you will find some approaches used in our department. Because these areas of interest span the two graduate programs in interested in these fields can join through either the Evolution, Ecology and Organismal Biology or the M Biology program. Which route you chose depends on your interests and the primary affiliation of the facu common.

training program leading to a Ph.D. degree in Genetics and Molecular Biology. The goal of this program is to train students to be creative, sophisticated research scientists within the disciplines of genetics and molecular biology.

Curriculum Requirements
The training program requires all students to:

- *Pass* one course in Advanced Molecular Biology
- *Pass* one course in Advanced Genetic Analysis
- *Pass* one course in Genomics and Bioinformatics
- *Pass* one elective course in Genetics, Molecular Biology, Developmental Biology or Bioinformatics
- *Attend* sessions on responsible conduct of research

- *Attend* weekly Curriculum seminars
- *Act as a teaching assistant* for one semester
- *Participate* in a student seminar series
- *Present* a poster each year at the Curriculum Retreat
- *Pass* a written qualifying examination after completion of the Core Curriculum, usually at the end of the first academic year
- *Pass* an oral preliminary examination for the dissertation project by the end of year 3
- *Publish* at least one first author paper
- *Write* a dissertation, present a public seminar of the research results and pass a final oral examination

Vanderbilt Interdisciplinary Graduate Program in the Biological Sciences

Students entering the IGP take two semesters of core coursework and rotate through four laboratories of their choice. The main goal of the IGP year is not to absorb vast quantities of facts, but to learn how to be a creative and analytical thinker who can gain information as needed from the scientific literature. At the end of the IGP year, students select a training program in one of the participating departments or programs, which include **Biochemistry**, **Biological Sciences**, **Cancer Biology**, **Cell & Developmental Biology**, **Chemical and Physical Biology**, **Human Genetics**, **Microbiology & Immunology**, **Molecular Physiology & Biophysics**, **Neuroscience**, **Pathology**, **and Pharmacology**.

One of the greatest benefits of the IGP is the flexibility it offers. New graduate students have nine months to explore their interests in multiple areas before selecting a thesis advisor. The comprehensive nature of the IGP training sometimes leads students to explore departments they hadn't considered previously. Moreover, research faculty often have appointments in more than one department, and students can use the entire IGP year to determine which department most suits their individual interests and career goals.

Coursework

During the IGP year, students take a two semester course entitled Bioregulation. This course surveys key biological processes and principles. The first semester focuses on biological processes within a cell, from macromolecular structure and function to cell biology and the regulation of cell growth. In the Spring session of the Bioregulation course, students tailor their coursework to their individual research interests through the selection of mini-electives. All students will take a total of six modules that serve as these mini-electives in the Spring semester. Students will be required to take one **Quantitative module** and it is recommended that they take a second **Quantitative module** if possible. Each module lasts about 5 weeks.

- Spring, 2011 Module offerings:

dule Title	Faculty Team Leader(s)

vanced Topics in Genome Maintenance	David Cortez
giogenesis: The Good and The Bad	Mary Zutter
olied Bioinformatics	Bing Zhang
osanoids and Related Lipid Mediators	Sean Davies
netics of Neurodevelopmental Disorders	Tricia Thomton-Wells
netics, cell biology, biochem of Parkinson's disease	Ariel Deutch and Bruce Carter
tting Hooked: The Biology of Addiction	Randy Blakely
nunobiology	Dean Ballard
oduction to Structural Biology	Walter Chazin
id Metabolism in Physiology and Disease	Adam Seegmiller
lecular Basis of Microbial Pathogenesis	Mark Denison
thobiology: mechanism for research models	Kelli Boyd and Andries Zijlstra
ceptor Theory and Enzyme Kinetics	Seva Gurevich
all Molecule Design for Biologists	Craig Lindsley
dies in Ocular Genomics	Jonathan Haines
e RNA World	Ron Emeson and Jim Patton

FOCUS

One of the key objectives in the first year graduate program is for our students to become proficient in reading and critically analyzing the primary scientific literature. As a method for instruction in developing these skills, students in the Bioregulation course are divided into small groups each with a faculty, postdoc and graduate student leaders to facilitate discussion of seminal papers in the field of biomedical sciences. Discussions are centered around identifying the central hypothesis being tested, various experimental methods and technologies used, key experimental controls, analyzing the authors' interpretations of the data, and using this discussion as a springboard to identify future directions.

Advising-IMPACT

Students are organized into small groups for mentoring during the first year through the IMPACT (Intensive Mentoring Program to Accelerate Career Transitions) program. IMPACT is designed to give students and faculty the opportunity to interact in a smaller setting. Groups are comprised of about 10 students to 1 faculty mentor. Discussion topics range from students concerns during the first year, managing coursework, and effective student-faculty communication to funding and careers in the biomedical sciences. Students meet with their IMPACT mentors weekly during the fall semester in the first year and biweekly in the spring.

Electives

In the spring semester, students take elective courses as they begin to extend their knowledge into a specialty area of interest. These electives typically fulfill required credit hours in the department that the student chooses to join after their IGP year. For a

current listing of courses offered by each department, click on the departmental links above.

Responsible Conduct of Research

In August, students in the IGP attend a session where they have an introduction to "Responsible Conduct of Research." In May, students in the IGP attend a one-day "Responsible Conduct of Research" workshop. The workshop is designed to help scientists identify and deal with ethical issues and dilemmas. Formal lectures, small group discussions and study analyses address topics such as institutional and NIH policies regarding scientific misconduct and conflicts of interest, ethical use of human and animal subjects in research, and data management and intellectual property.

Laboratory Research

A key element of the IGP year is laboratory research, and every effort is made to speed up the process of choosing a preceptor.

At the beginning of the first year, students begin the first of four sequential eight week rotations in the lab of their choice. Students can sample different research areas and experience the excitement of working in a particular laboratory. By May of the IGP year, students will choose a mentor, enter one of the participating departments, and begin their thesis research.

University of Florida College of Medicine Interdisciplinary Program in Biomedical Sciences

Biochemistry and Molecular Biology
Genetics
Immunology and Microbiology
Molecular Cell Biology
Neuroscience
Physiology and Pharmacology

Fall
Core
Fundamentals of Biomedical Science I - 8 credits 1 *Semester*

See http://idp.med.ufl.edu/Core/INDEX.html for complete syllabus

Essentials of Graduate Research & Professional Development

1 semester 1 credit

Electives

Course No. Course Title Credits Course Type Module Days / Time / Room Course Director(s) GMS 7001 Fundamentals of Biomedical Science Education 2 Semester 1-3 *credits*

Spring
Core

Responsible Conduct of Biomedical Research **– 1 credit**
Lab rotation 2 credits
Principles of Drug Action 2 credits
Fundamentals of Cancer Biology 2 credits
Fundamentals of Physiology and Functional Genomics I and II 2 credits
Fundamentals of Physiology and Functional Genomics III 1 credit
Prinicpals of Neuroscience I: Organization and Development of the Nervous System 2 credit
Infectious Disease 3 credits
Principles of Immunology 3 credits
Special Topics in Infectious Disease and Immunology 1 credit

Electives
Design and Analysis of Translational Research in Biomedical Sciences 2 credits
Current Topics in Exercise and Sport Sciences: Grant Writing/Professional Skills 3 credit
Write Club 2 – 1 credit

UT Health Science Center Integrated Multidisciplinary Graduate Program

Biology of Aging
Cancer Biology
Cell & Molecular Biology
Diabetes & Metabolic Disorders
Genetics, Genomics, & Development
Microbiology & Immunology
Molecular Biophysics & Biochemistry
Molecular, Cellular & Integrative Physiology
Neuroscience
Pharmacology

Curricula

Students are enrolled "undifferentiated" into the IMGP, that is, without admission into a specific track. All entering students take an interdisciplinary core course in Fundamentals of Biomedical Sciences and participate in laboratory rotations in the first semester. Students may choose to do rotations and their eventual dissertation research in laboratories of over 200 faculty members. In the second semester students select a specific track and a dissertation supervising professor for further training through course work and research. Also, in the second semester, students will enroll in track-specific courses and electives and in Ethics in Research. The curriculum is interdisciplinary in nature such that students in a particular track may take courses in other tracks. In the second year, students continue taking track-specific electives and journal clubs, participating in seminars, and engaging in research. Major milestones are the advancement to PhD candidacy exam and formal approval of a dissertation supervising committee. Students register for a minimum of 9 semester credit hours in the Fall and Spring semesters and 6 semester credit hours in the Summer term.

COURSE CALENDAR

Lecturer Day Date Time Topic

Intro Kraig M Aug 23 8:30-9:30 Course orientation and introduction
B 1 Hart M Aug 23 9:45-10:45 Overview, the logic of life, interactions in water
tutorial Hart M Aug 23 1:00-2:00 Acids, bases, and pH (optional tutorial for students without chem bkg)
B 2 Hart Tu Aug 24 8:30-9:30 Amino acids
B 3 Hart Tu Aug 24 9:45-10:45 Proteins (general), prot analysis/characterization, protein structure (intro)
B 4 Hart W Aug 25 8:30-9:30 Protein primary and secondary structure
B 5 Hart W Aug 25 9:45-10:45 Protein tertiary and quaternary structure
B 6 Hart Th Aug 26 8:30-9:30 Protein folding
B 7 Sousa Th Aug 26 9:45-10:45 Enzymes (introduction)-concepts in catalysis
B 8 Sousa F Aug 27 8:30-9:30 Enzymes-molecular mechanisms
B 9 Sousa F Aug 27 9:45-10:45 Enzymes-kinetics
B 10 Sousa M Aug 30 8:30-9:30 Enzymes-inhibition
B 11 Sousa M Aug 30 9:45-10:45 Enzymes-regulation
M1 Kolodrubetz Tu Aug 31 8:30-9:30 Nucleic acid structures (A, B, Z DNA, methylation, supercoiling), function
M2 Kraig Tu Aug 31 9:45-10:45 Prokaryotic vs. Eukaryotic gene organization and characterization
Enrich Kolodrubetz/
Kraig Tu Aug 31 1:00-2:30
AAB 108-12
Enrichment-DNA model building (Optional enrichment)
M3 Kolodrubetz W Sep 1 8:30-9:30 Whole genome analysis
M4 Kolodrubetz W Sep 1 9:45-10:45 Molecular analysis of RNA expression (single gene, microarrays)
M5 Kraig Th Sep 2 8:30-9:30 Complex RNA expression and protein expression/localization
M6 Kolodrubetz Th Sep 2 9:45-10:45 Prokaryotic genetics, homol recomb (recA), DNA-protein interactions
Tutorial Kraig Th Sep 2 1:00-3:00 Genetics tutorial – for students who have no bkg in Mendel/pedigrees
Review F Sep 3 8:30-9:30 Covers Biochemistry lectures B 1-11
LABOR DAY HOLIDAY M Sep 6
M7 Kraig T Sep 7 8:30-9:30 Molecular genetics and gene function (euk transfection & transgenics)
M8 Kraig T Sep 7 9:45-10:45 Molecular genetics and gene function (dominant negative, antisense)
M9 Kraig W Sep 8 8:30-9:30 Molecular genetics and gene function (knockouts, knock-ins)
M10 Kraig W Sep 8 9:45-10:45 Molecular genetics and gene mapping (eukaryotic)
Exam 1 Th Sep 9 8:00-11:45 Covers Biochemistry lectures B 1-11
M11 Kolodrubetz F Sep 10 8:30-9:30 DNA replication (origins, centromeres, functions of polymerases,)
M12 Kolodrubetz F Sep 10 9:45-10:45 DNA replication (prokaryotic initiation and elongation)
Enrich Lechleiter F Sep 10 1:00 – 2:00 Enrichment- microscopy
M13 Kolo/Kraig M Sep 13 8:30-9:30 DNA replication (eukaryotic proteins and model)and Amplification

M14 Kraig M Sep 13 9:45-10:45 Transposable elements / rearrangements
M15 Kraig Tu Sep 14 8:30-9:30 DNA rearrangements (antibody genes, tumors)
B 12 Henn Tu Sep 14 9:45-10:45 Introduction to metabolism
Take home due Tu Sep 14 by 5:00 pm Covers Molecular lectures M 3-4 (Kolodrubetz genome lectures)
B 13 Henn W Sep 15 8:30-9:30 Carbohydrate structures and chemistry
M16 Bishop W Sep 15 9:45-10:45 DNA damage (ways in which DNA can be damaged) and DNA repair
M17 Bishop Th Sep 16 8:30-9:30 DNA repair pathways
3
M18 Bishop Th Sep 16 9:45-10:45 How mutations (≠ DNA damage) arise and are identified
B 14 Henn F Sep 17 8:30-9:30 Glycolysis and fates of pyruvate
B 15 Henn F Sep 17 9:45-10:45 Hexose monophosphate pathway
Review M Sep 20 8:30-9:30
Exam 2 Tu Sep 21 8:00-11:45
Covers Molecular lectures M1-2, 5-15
B 16 Henn W Sep 22 8:30-9:30 Pyruvate dehydrogenase complex; TCA cycle

B 17 Henn W Sep 22 9:45-10:45 Mitochondrial electron transport, oxidative phosphor

Enrich Hornsby W Sep 22 1:00 – 2:00 Enrichment- tissue culture techniques and cell in culture
M19 Haldenwang Th Sep 23 8:30-9:30 Prokaryotic transcription-polymerases, promoters
M20 Haldenwang Th Sep 23 9:45-10:45 Prokaryotic transcription -positive and negative regulation
M21 Haldenwang F Sep 24 8:30-9:30 Prok transcription-enhancers, 2 component systems, regulatory RNAs
B 18 Henn F Sep 24 9:45-10:45 Gluconeogenesis; anaplerotic reactions and pathways
B 19 Henn M Sep 27 8:30-9:30 Glycogen metabolism
B 20 Henn M Sep 27 9:45-10:45 Flux control: tissue specific metabolism
Take home due M Sep 27 by 5:00 pm Covers Molecular lectures M 16-18 (Bishop)
B 21 Shiio Tu Sep 28 8:30-9:30 General amino acid metabolism
B 22 Shiio Tu Sep 28 9:45-10:45 Purine and pyrimidine metabolism
B 23 Shiio W Sep 29 8:30-9:30 Importance of amino acids, nucleotides, and their metabolites
M22 Kolodrubetz W Sep 29 9:45-10:45 Higher order DNA structure (nucleosomes, chromatin, compacting DNA)
M23 Kadosh Th Sep 30 8:30-9:30 Euk transcription (RNA pol II; cis elements; basal & activated transc.)
M24 Kadosh Th Sep 30 9:45-10:45 Eukaryotic transcription (regulation of RNA pol II transcription)
M25 Kadosh Fri Oct 1 8:30-9:30 Eukaryotic transcription (termination, transcription regulatory networks)
Kadosh Fri Oct 1 9:30-10:00 Finish Eukaryotic transcription (regulatory networks)
M26
Kolodrubetz Fri Oct 1 10:15-10:45 Role of chromatin in transcription (beginning)
Review M Oct 4 8:30-9:30
Exam 3 Tu Oct 5 8:00-11:45
Covers Biochemistry lectures B 12-23
M27 Kolodrubetz W Oct 6 8:30-9:30 Chromatin remodeling complexes and transcription

M28 Kolodrubetz W Oct 6 9:45-10:45 Chromatin Modification, DNA Methylation and Epigenetics
B 24 Weintraub Th Oct 7 8:30-9:30 Chemical and physical properties of lipids; digestion and absorption
B 25 Weintraub Th Oct 7 9:45-10:45 Lipid transport, fatty acid oxidation
M29 Dong F Oct 8 8:30-9:30 Translation (mechanisms, prokaryotic vs. eukaryotic, basic regulation)
M30 Dong F Oct 8 9:45-10:45 Micro RNAs (synthesis and functions)
M31 Dong M Oct 11 8:30-9:30 RNA interference, siRNA
B 26 Weintraub M Oct 11 9:45-10:45 Ketone bodies, fatty acid synthesis
B 27 Weintraub Tu Oct 12 8:30-9:30 Fatty acid synthesis (cont.); regulation of fatty acid metabolism
M32 Penalva Tu Oct 12 9:45-10:45 RNA-Splicing mechanisms and basic regulation
M33 Penalva W Oct 13 8:30-9:30 RNA-alternative splicing and editing
M34 Penalva W Oct 13 9:45-10:45 RNA-stability, transport and localization
B 28 Weintraub Th Oct 14 8:30-9:30 Phospholipids; inositol phosphate; eicosanoids
B 29 Weintraub Th Oct 14 9:45-10:45 Steroid synthesis, metabolism, regulation, and steroid hormones
B 30 Weintraub F Oct 15 8:30-9:30 Steroid synthesis, metabolism, regulation, and steroid hormones
Review F Oct 15 9:45-10:45
Exam 4 M Oct 18 8:00-11:45
Covers Molecular lectures M 19-31
4
C1 Dong / Lech Tu Oct 19 8:30-9:30 Introduction of Cell Biology and Visualizing cells (microscopy & imaging)
C2 Lechleiter Tu Oct 19 9:45 – 10:45 Cell membrane structure and membrane transport
C3 Lechleiter W Oct 20 8:30 – 9:30 Membranes potential and ion movement
C4 Lindsey W Oct 20 9:45 – 10:45 Extracellular Matrix
C5 Bai Th Oct 21 8:30 – 9:30 Mitochondria and chloroplasts
C6 Bai Th Oct 21 9:45 – 10:45 Peroxisomes, endosomes, lysosomes and Proteasomes
C7 Lafer F Oct 22 8:30 – 9:30 The secretory and endocytic pathways
C8 Lafer F Oct 22 9:45 – 10:45 The secretory and endocytic pathways
Take home due F Oct 22 by 5:00 pm Covers Molecular lectures M 32-34 (Penalva)
C9 Nicholson M Oct 25 8:30 – 9:30 Cell junctions
C10 Nicholson M Oct 25 9:45 – 10:45 Gap junction (Give C9-C10 take-home exam questions to the students)
C11 Bai Tu Oct 26 8:30 – 9:30 Nuclear structure and Nuclear cytoplasmic transport
P 1 Buffenstein Tu Oct 26 9:45-10:45 Overview: Energy balance in health and disease
P 2 Buffenstein W Oct 27 8:30-9:30 Appetite can be hard to control. Hormonal drive to survive.
P3 Buffenstein W Oct 27 9:45-10:45 Energy expenditure – basal metabolism, thermoregulation and exercise
Take home due W Oct 27 by 5:00 pm Covers Biochemistry lectures B 24-30 (Weintraub)
P 4 Hornsby Th Oct 28 8:30-9:30 Positive Energy Balance – Lecture 1. Storage and growth
P 5 Hornsby Th Oct 28 9:45-10:45 Positive Energy Balance – Lecture 2. Obesity, health, and disease
P 6 Nelson F Oct 29 8:30-9:30 Negative Energy Balance – Pros and cons of dietary restriction

P 7 Nelson F Oct 29 9:45-10:45 Changes in energy balance with age
Review M Nov 1 8:30 – 9:30 Cover Cell Biology Lectures: C1-6 and C11
Review M Nov 1 9:45-10:45 Covers Physiology P1-7
Exam 5 Tu Nov 2 8:00 – 9:45 Cover Cell Biology Lectures: C1-6 and C11
Exam 6 Tu Nov 2 10:00-11:45 Covers Physiology P1-7
C12 Clarke W Nov 3 8:30 – 9:30 G-protein-coupled receptor
C13 Clarke W Nov 3 9:45 – 10:45 Ca++ signaling
C14 Dong Th Nov 4 8:30 – 9:30 Protein kinase receptors and the downstream signaling regulation
C15 Dong Th Nov 4 9:45 – 10:45 Nuclear receptors
C16 Dong F Nov 5 8:30 – 9:30 Cytoskeleton and motor proteins
C17 Hornsby F Nov 5 9:45 – 10:45 Regulation of Cell Mass and mTOR signaling
Take home exam due to
Dean's office (414A) F Nov 5 by 5:00 pm Covers Lectures C7 and C8 (Dr. Lafer)
C18 Sun M Nov 8 8:30 – 9:30 Progression of cell cycle
C19 Sun M Nov 8 9:45 – 10:45 Cell cycle checkpoints
Take home exam due to
Dean's office (414A) M Nov 8 By 5:00 pm Covers Lectures C9 and C10 (Dr. Nicholson)
C20 Hornsby Tu Nov 9 8:30 – 9:30 Cell senescence, telomeres and telomerase
C21 Sun Tu Nov 9 9:45 – 10:45 The mechanics of M phase
C22 Sun W Nov 10 8:30 – 9:30 Molecular basis of carcinogenesis
C23 Saikumar W Nov 10 9:45 – 10:45 Cell death (necrosis, Autophagy, paratosis and entosis)
C24 Saikumar Th Nov 11 8:30 – 9:30 Apoptosis
C25 Walter Th Nov 11 9:45 – 10:45 Stem cells and cell differentiation
C26 Rao F Nov 12 8:30 – 9:30 Meiosis, Germ cells, and fertilization
C27 Rao F Nov 12 9:45 – 10:45 Fertilization and development
5
P 8 Toney M Nov 15 8:30-9:30 Cardiovascular system structure
P 9 Toney M Nov 15 9:45-10:45 Cardiovascular system function
Take home exam due to
Dean's office (414A) M Nov 15 By 5:00 pm Covers Lectures C17 and C20 (Dr. Hornsby)
P 10 Toney T Nov 16 8:30-9:30 Peripheral Vascular Control
P 11 Toney T Nov 16 9:45-10:45 Neural control of cardiovascular function
P 12 Stockand W Nov 17 8:30-9:30 Renal physiology: Hemodynamics and GFR
P 13 Stockand W Nov 17 9:45-10:45 Renal physiology: Electrolyte handling
Review Th Nov 18 8:30 – 10:45
Exam 7 F Nov 19 8:00 – 11:45
Cover Cell Biology Lectures: C12-16, C18-19, C21-22 and C25-27
MI 1 Dube M Nov 22 8:30-9:30 Host-Pathogen interactions and immune evasion in human disease
MI 2 Zhong M Nov 22 9:45-10:45 Innate Immunity I
MI 3 Berton Tu Nov 23 8:30-9:30 Humoral immunity I
MI 4 Berton Tu Nov 23 9:45-10:45 Humoral immunity II
MI 5 Krolick W Nov 24 8:30-9:30 Cell-mediated immunity I
MI 6 Krolick W Nov 24 9:45-10:45 Cell-mediated immunity II
Take home exam due to
Dean's office (414A) W Nov 24 By 5:00 pm Covers Lectures C23 and C24 (Dr. Saikumar)

THANKSGIVING Th/F Nov 25/26
P 14 Macleod M Nov 29 8:30-9:30 Synaptic potentials
P 15 Macleod M Nov 29 9:45-10:45 Neurotransmitters
P 16 Macleod Tu Nov 30 8:30-9:30 The action potential
P 17 Eaton Tu Nov 30 9:45-10:45 Muscle excitation and contraction
P 18 Eaton W Dec 1 8:30-9:30 Synaptogenesis and plasticity: Neuromuscular junction
P 19 Oddo W Dec 1 9:45-10:45 Synaptic & cognitive dysfunction in aging & neurodegeneration (part I)
P 20 Oddo Th Dec 2 8:30-9:30 Synaptic & cognitive dysfunction in aging & neurodegeneration (part II)
E Kraig/Berton Th Dec 2 9:45-10:45 Enrichment-Antibody uses in the lab
MI 7 F Dec 3 8:30-9:30 Immunopathology I-myasthenia gravis
MI 8
Kraig/Infante/
Krolick F Dec 3 9:45-10:45 Immunopathololgy II-myasthenia gravis
Review M Dec 6 8:30-9:30
Exam 8 Tu Dec 7 8:00-11:45
Covers Physiology P8-20
MI 9 Dube W Dec 8 8:30-9:30 The microbial world
MI 10 Dube W Dec 8 9:45-10:45 Mechanisms of Immune evasion I-bacterial infections
MI 11 Dube Th Dec 9 8:30-9:30 Mechanisms of Immune evasion II-bacterial infections
MI 12 Xiang Th Dec 9 9:45-10:45 Mechanisms of Immune evasion III-viral infections
MI 13 Bose F Dec 10 8:30-9:30 Mechanisms of Immune evasion IV-viral infections
MI 14 Kadosh F Dec 10 9:45-10:45 Mechanisms of Immune evasion V-fungal infections
Review M Dec 13 8:30-9:30
Exam 9 Tu Dec 14 8:00-11:45
Covers Microbiology and Immunology lectures MI 1-14
M35 Kraig W Dec 15 8:30-9:30 Gene therapy (required attendance)
M36 Kraig W Dec 15 9:45-10:45 Gene therapy (required attendance)
P 21 McManus Th Dec 16 8:30 – 10:45 Pathology in action **(mandatory attendance)**

Take home exam due F Dec 17 by 5:00 pm Covers Molecular lectures M 35-36
(Kraig – gene therapy

Kansas Medical Center Interdisciplinary Graduate Program

The IGPBS provides the first year core curriculum for PhD graduate students interested in becoming biomedical researchers. At the beginning of year two, students select a thesis and research advisor. Depending upon the faculty member chosen, a student will receive a PhD in one of eight doctoral degree granting programs. Students admitted to the IGPBS receive an annual stipend of at least $24,000 plus a tuition waiver, with similar financial support throughout their PhD program. Students may also apply for fellowships that in some cases provide a larger annual stipend (e.g. Madison and Lila Self Graduate Fellowship, Kansas University Training Program in Neurological and Rehabilitation Sciences).

Students admitted to the IGPBS may choose among the following PhD programs in which to receive their degrees.

- Department of Anatomy & Cell Biology

- Department of Biochemistry & Molecular Biology
- Department of Microbiology, Molecular Genetics & Immunology
- Department of Pathology & Laboratory Medicine
- Department of Molecular & Integrative Physiology
- Department of Pharmacology, Toxicology & Therapeutics
- Neuroscience Graduate Program
- Training Program in Environmental Toxicology
- **IGPBS 896**
  BioGraphics (1 credit hour)
  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.
- **IGPBS 897**
  Research Rotations (2-4 credit hours)
  T he 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.
- **IGPBS 898**
  Introduction to Faculty Research (1 credit hour)
  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.
- **GSMC 850**
  Proteins and Metabolism (2 credit hours)
  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).
- **GSMC 851**
  Molecular Genetics (2 credit hours)
  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).
- **GSMC 852**
  Introduction to Biomedical Research (2 credit hours)

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).
- **GSMC 853**
  Cellular Structure (2 credit hours)
  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: 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).
- **GSMC 854**
  Cell Communication (2 credit hours)
  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).
- **GSMC 855**
  Introduction to Biomedical Research II (2 credit hours)
  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).
- **GSMC 856**
  Introduction to Research Ethics (1 credit hour)
  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.
- **IGPBS Core Curriculum**

Fall 2009

	1st quarter	2nd quarter
M/W 9-11	Proteins and Metabolism	Molecular Genetics
F 9-11	Introduction to Biomedical Research	
T-F 11 -12	Faculty Research Series	
Th 9-10	Ethics	
M 11 -12	Biographics	
T 10-11 W 11-12	Data analysis, graphing and presentation	
		Rotation 1

Spring 2010

	3rd quarter	4th quarter
M/W 9-11	Cellular Structure	Cell Communication
F 9-11	Introduction to Biomedical Research	
	Rotation 2	Rotation 3

First Quarter

	Monday	Tuesday	Wednesday	Thursday	Fr
9 a.m.	Lecture		Lecture		Disc
10 a.m.	Lecture	Stats/Graphing	Lecture	Ethics	Disc
11 a.m.	Biographics	Faculty Research	Faculty Research	Faculty Research	Faculty
			Departmental Interactions		

All other Quarters

	Monday	Tuesday	Wednesday	Thursday	Fr
9 a.m.	Lecture		Lecture		Disc