Division of Medical Sciences
Ph.D. Programs at Harvard Medical School

First Meeting of Half Courses
Spring Term 2016-2017

Classes Start: Monday, January 23, 2017

Online Check-In (formerly known as registration):
Wednesday, January 18, 2017 – Tuesday, January 22, 2017
Please visit the Harvard University Knowledge Center website for more information

Deadlines and Holidays: Please visit the GSAS Calendar to view deadlines and holidays for the 16-17 academic year

For information: Call **617-432-4134** or email **dms_courses@hms.harvard.edu**

DIVISION OF MEDICAL SCIENCES
Ph.D. Programs at Harvard Medical School
2016-2017 Spring Term Course Offerings

BCMP 213 Behavioral Pharmacology
Jack Bergman and Brian D. Kangas

BCMP 234 Cellular Metabolism and Human Disease
Thomas Michel
Curriculum Fellow: Christopher Burtner

BCMP 236 Modern Drug Discovery: From Principles to Patients
Timothy Mitchison, Catherine Dubreuil and Nathanael Gray

BCMP 250 Molecular and Biophysical Mechanism in Signal Transduction
Enrollment: Limited to 20
Andrew Kruse, Stephen Blacklow, Michael Eck and Eric Fischer
Curriculum Fellow: Madhvi Venkatesh

Cell Biology 201 Principles of Cell Biology
Danesh Moazed
Curriculum Fellow: Christopher Wood

Cell Biology 207 Vertebrate Developmental and Regenerative Biology
Enrollment: Limited to 18.
Andrew Lassar, John Flanagan, Jordan Kreidberg, Sean Megason, Jessica Whited, Olivier Pourquié, Jayaraj (Jay) Rajagopal, and Yingzi Yang

Cell Biology 212 Biology of the Cancer Cell: From Molecular Mechanisms to Therapeutic Implications
Enrollment: Limited to 36
David Frank and Nikhil Wagle
Curriculum Fellow: Megan Mittelstadt

Genetics 216 Advanced Topics in Gene Expression
Enrollment: Limited to 16
Fred Winston, Robert Kingston, and Stephen Buratowski

Genetics 228 Genetics in Medicine - From Bench to Bedside
Enrollment: Limited to 15
Christopher Newton-Cheh and David Sweetser

HBTM 200 Principles and Practice of Human Pathology
Scott Lovitch

Immunology 202 Immune and Inflammatory Diseases
Filip Swirski and Mikael Pittet

Immunology 204 Critical Readings for Immunology
Duane Wesemann

Immunology 301 Immunology Seminar
Michael Carroll, William Haining and Galit Alter
Enrollment: Limited to 20.

Microbiology 201 Molecular Biology of the Bacterial Cell
David Rudner, Thomas Bernhardt, Simon Dove, and Ann Hochschild
Curriculum Fellow: Bradley Coleman

Microbiology 210 Microbial Sciences: Chemistry, Ecology, and Evolution
Enrollment: Limited to 15
Michael Gilmore

Microbiology 213 Social Issues in Biology
Enrollment: Limited to 18.
Jonathan Beckwith and Louis Guenin

Neurobiology 204 Systems Neuroscience
Rachel Wilson, Richard Born, Mark Andermann, Michael Do, Christopher Harvey, and Margaret Livingstone

Neurobiology 211 Molecular and Developmental Neurobiology
Lisa Goodrich, Sandeep Datta, Maria Lehtinen, Michela Fagiolini, Corey Harwell, Matthew Pecot, Pascal Kaeser, Joshua Kaplan, and Beth Stevens

SHBT 202 Clinical Aspects of Speech and Hearing
Enrollment: Limited to 15
Konstantina Stankovic and Richard Lewis
Teaching Assistant: Jessica Sagers

SHBT 205 Neural Coding and Perception of Sound
Enrollment: Limited to 20
Joshua McDermott, Daniel Polley, Bertrand Delgutte, M. Christian Brown

SHBT 301QC Speech and Hearing Laboratory Visits
Bertrand Delgutte

Virology 201 Virology
Enrollment: Limited to 20
Sean P.J. Whelan and James Cunningham

BCMP 213 Behavioral Pharmacology
Jack Bergman and Brian D. Kangas

4 Units

Tue 2:00 - 5:00

Introduction to behavioral pharmacology of CNS drugs (e.g., psychomotor stimulants, antischizophrenics, opioid analgesics, antianxiety agents); seminar format with emphasis on behavioral methodology (i.e., model and assay development) and pharmacological analysis (i.e., receptor selectivity and efficacy); attention to tolerance, drug dependence/addiction/treatment, and basic behavioral processes.

Course Notes: Offered jointly with the Medical School as BP 719.0.

Recommended Prep: 1 year biology, chemistry or psychology

Spring 2017
First Meeting: Tuesday, January 24, 2017
Final Meeting: Tuesday, April 25, 2017
Location: Room 211 Sever Hall
Course Heads: Jack Bergman, jack_bergman@hms.harvard.edu, and Brian D. Kangas, bkangas@mclean.harvard.edu

BCMP 234 Cellular Metabolism and Human Disease
Thomas Michel

4 units

MWF 9:00AM – 10:20AM

Cellular and organismal metabolism, with focus on interrelationships between key metabolic pathways and human disease states. Genetic and acquired metabolic diseases and functional consequences interactive lectures and critical reading conferences are integrated with clinical encounters;

Course notes: Enrollment may be limited. For undergraduates only: knowledge of introductory biochemistry, genetics, and cell biology required (MCB 52 and 54 or equivalent); one year of organic chemistry.

Spring 2017
First Meeting: Monday, January 23, 2017
Final Meeting: Wednesday, May 3, 2017
Location: Cannon Room
Course Head: Thomas Michel, Thomas_Michel@hms.harvard.edu
Curriculum Fellow: Christopher Burtner, Christopher_Burtner@hms.harvard.edu

BCMP 236 Modern Drug Discovery: From Principles to Patients
Timothy Mitchison, Catherine Dubreuil and Nathanael Gray

4 Units

Tue and Th 3:30-5:00

This course will familiarize students with central concepts in drug action and therapeutics: specifically we will cover concepts surrounding Pharmacokinetics (PK) and the intersection of PK and medicinal chemistry in both lectures and cases based discussions. These concepts are central to modern drug development and evaluation. In the course we will cover drug-target interactions, Pharmacokinetics and Pharmacodynamics. This course will have a focus on modern approaches to therapeutic development for small molecules, protein based therapeutics, nucleic acid based drugs and antibacterial compounds as well new frontiers in therapeutic discovery.

Course Notes: This course is the combination of the BCMP 309qc and 307qc quarter courses, offered as half course. Students who plan to take the two quarters must sign up under BCMP 236.

Spring 2017
First Meeting: Tuesday, January 24, 2017
Final Meeting: Thursday, May 4, 2017
Location: TMEC 250
Course Heads: Timothy Mitchison, timothy_mitchison@hms.harvard.edu and Catherine Dubreuil catherine_dubreuil@hms.harvard.edu
Course Instructors: Nathanael Gray, nathanael_gray@dfci.harvard.edu

BCMP 250 Molecular and Biophysical Mechanism in Signal Transduction
Andrew Kruse, Stephen Blacklow, Michael Eck and Eric Fischer

4 units

Enrollment Limit: Limited to 20, Instructor Consent Required

Tue and Th 10:30am – 12:00pm

Molecular and Biophysical Mechanisms in Signal Transduction focuses on the biochemical and biophysical mechanisms that underlie signal transduction and other essential biochemical processes. Major topics include biochemical thermodynamics and conformational equilibria, the structural basis for signal transduction, receptor pharmacology and allostery, and enzymatic mechanisms in signaling. The course includes both content lectures and research frontiers seminars focused on current research in signal transduction with a particular emphasis on application to therapeutically relevant pathways

Course Note: A foundational biochemistry course

Spring 2017
First Meeting: Tuesday, January 24, 2017
Final Meeting: Tuesday, April 25, 2017
Location: TMEC 333
Course Heads: Andrew Kruse, andrew_kruse@hms.harvard.edu
Course Instructors: Andrew Kruse, Andrew_kruse@hms.harvard.edu , Stephen Blacklow, stephen_blacklow@hms.harvard.edu, Michael Eck, eck@red.dfci.harvard.edu and Eric Fischer, eric_fischer@hms.harvard.edu.

Course Syllabus

Course Description: Molecular and Biophysical Mechanisms in Signal Transduction focuses on the biochemical and biophysical mechanisms that underlie signal transduction and other essential biochemical processes. Major topics include biochemical thermodynamics and conformational equilibria, the structural basis for signal transduction, receptor pharmacology and allostery, and enzymatic mechanisms of signaling. The course includes both content lectures and research frontiers seminars focused on current research in signal transduction with a particular emphasis on applications to therapeutically relevant pathways.

Course Website: (WILL BE PUT IN PLACE WHEN ASSIGNED)

Course Details & Information

Lecture Days and Times: TuTh 10:30 am – 12:00 pm
Tuesday January 24, 2017 – Tuesday April 25, 2017

Meeting Space: TMEC 333 (*for lectures*)
TMEC 342 and 346 (*for discussions*)

Course Director:	Andrew Kruse, Ph.D.	
Course Lecturers:	Mike Eck, M.D., Ph.D.	eck@crystal.harvard.edu
	Eric Fischer, Ph.D.	eric_fischer@dfci.havard.edu
	Andrew Kruse, Ph.D.	andrew_kruse@hms.harvard.edu
	Steve Blacklow, M.D.,	stephen_blacklow@hms.harvard.ed
	Note: Faculty are available for office hours by appointment	
Frontiers Lecturers:	Hari Arthanari, Ph.D.	hari_arthanari@hms.harvard.edu
	William Shih, Ph.D.	william.shih@wyss.harvard.edu
	Wesley Wong, Ph.D.	wesley.wong@childrens.harvard.eu
	Adrian Salic, Ph.D.	adrian_salic@hms.harvard.edu
	Sun Hur, Ph.D.	sun.hur@childrens.harvard.edu
	Nathanael Gray, Ph.D.	nathanael_gray@dfci.harvard.edu
Curriculum Fellow:	Madhvi Venkatesh, Ph.D.	madhvi_venkatesh@hms.harvard.edu
Teaching Assistant:	Hayden Schmidt	haydenschmidt@g.harvard.edu
Recommended Textbook:	TBD	
Grading:	60% Problem Sets (4 problem sets, 15% each) 30% Paper Analysis (6 analyses, 5% each) 10% Participation	

Policies & Clarifying Information

Course Objectives

Through completion of this course, students gain

1. Understanding of core concepts of biochemistry and biophysical chemistry including protein folding, entropy and enthalpy
2. Quantitative skills in analysis of protein-ligand interactions and receptor pharmacology, enzyme kinetics, and mechanisms of inhibition
3. Understanding of the connections between mechanistic biochemistry and signal transduction processes
4. Understanding of experimental methods in modern biophysical chemistry, their strengths, and their limitations
5. Knowledge of current cutting-edge research in signal transduction within the HMS community
6. Practice in reading and critically evaluating current primary literature on the mechanisms of signal transduction

Prerequisites

We expect students will have a solid understanding of core concepts in biochemistry and molecular biology, including knowledge of the amino acids and their properties as well as the central dogma.

Lecture and Discussion Section Format

Class is held on Tuesdays and Thursdays from 10:30am – 12:00pm. There are four modules in the course and each module will consist of three lectures and one or two frontiers lectures. Each frontiers lecture will be followed by a frontiers discussion where one or more recent papers in the field of the frontiers lecturer will be discussed.

Lectures: Students are expected to attend and participate in all lectures. **Note:** Videos of class lectures and discussion sections are not made available online. Your attendance at class is important.

Frontiers Lectures: Each Frontiers lecture will take the form of a research seminar from an investigator in the Harvard community. Students are expected to attend and participate by asking questions.

Frontiers Discussions: You should come to section having attended the Frontiers lecture and read the associated paper(s). In addition, prior to each discussion students are required to prepare a one page written report in the format of a peer review analysis of the paper to be discussed. At each section, the section leader will first lead a discussion on the work, including analysis of the approaches taken and their strengths and weaknesses. Contributions to discussions will be considered as a part of the "participation" component in the overall course grade.

Grades and Assessments

Problem Sets: Problem sets for each module are due one week after the first frontiers discussion for that module. Problem sets will test your synthesis of the experimental techniques and your application of the principles discussed in that module. **Note:** Each problem set turned in late will be penalized -10% for each day (including weekends) that it is late. For example, for an assignment worth 40 points that is submitted 4 days late, 16 points will be subtracted from the final grade irrespective of the grade that would otherwise be awarded.

Paper Analyses: At the beginning of each frontiers discussion, students are expected to submit a one-page review of the paper to be discussed. The review will involve a short summary of the major conclusions and their significance as well as a discussion of the strengths and weaknesses. This is designed to aid students in critically evaluating the paper in preparation for participation during the frontiers discussion.

Participation: Students are encouraged to ask questions during lectures and are expected to make informed comments during frontiers discussions. Participation points will be awarded for contributing to the frontiers discussions and for completing pre-course and post-course assessments.

Course Website Access

All students must be officially registered in the class or have full access to the course website. This is necessary for students to be assigned to a discussion section and to access all the course materials. If

you are not officially enrolled in the course, please e-mail the course Curriculum Fellow, **Madhvi Venkatesh** (madhvi_venkatesh@hms.harvard.edu) for permission to attend class and to get access to the site. Please note that grades will be accessible through the CANVAS website. If you note any inaccuracies in your recorded grades (after you receive back graded assignments), please contact the Curriculum Fellow. **If grades are posted before you receive graded assignments, please wait until you receive the written feedback before writing to request re-grades or to challenge the grade assigned.**

Academic Integrity

Please be reminded that all work submitted for credit in BCMP 250 should reflect individual scholarship and mastery of the related course material. **Violations of academic integrity in the course are considered to be major offenses and will be treated very seriously.** If a student submits an assignment that clearly or implicitly violates this code of conduct, a grade of 0 will be awarded for the entire assignment – at a minimum! While we encourage teamwork in learning theory and concepts we expect that all students have individually mastered the material. To that end, we recommend the following considerations.

For problem sets, we encourage students to work together in developing strategies to answering problems and in sharing ideas. However, the answers documented on your individually-submitted problem sets, should be in each student's own wording and each student should be able to understand and explain the problem and the proposed solution. In short, do not copy an answer directly from your peer! Similarly, we encourage you refer to the primary literature to learn more about the topics being covered; however, under no circumstances should you be copying sentences or parts of sentences from published works. **In short, all of your answers have to be in your own words.** For each problem set, you will be asked to provide the names of all students in the class with whom you worked. For a complete description of the Harvard policy on Academic Integrity, you can visit http://handbook.gsas.harvard.edu/academic-dishonesty-and-plagiarism.

Special Support and Services

Students with Disabilities: Be assured that services for persons with health conditions or disabilities are available to all Harvard students who need them, by way of the Accessible Education Office (www.aeo.fas.harvard.edu). With information from you, along with proper confidential clinical documentation, they are able to plan with you to provide reasonable accommodation of course materials, classrooms and other aspects of student life, as appropriate. For more information, please contact aeo@fas.harvard.edu or call 617-496-8707.

Additional Help & Tutoring: Questions are always welcome during and after the lectures (don't be shy!!). However, of you need one-on-one help, get in touch with your section TAs or the relevant

faculty member. If you need extensive help, there is also a tutoring program run by the BBS office. This program is OPEN TO ALL DMS students, even if they are not BBS students.

Course Schedule

There will be not classes on Tuesday March 14, 2017, or Thursday March 16, 2017, during Spring Break.

A full schedule of class meeting and topics covered are included below.

Lecture	Date		Faculty	Topic / Lecture Title
1	Tues	Jan 24	AK	Course Introduction
			ME	**Mike Eck -- Module 1 (Forces, Folding, & Structure)** Module 1 Lecture 1
	Wed	Jan 25		Pre-Course Assessment Due
2	Thurs	Jan 26	ME	Module 1 Lecture 2
3	Tues	Jan 31	ME	Module 1 Lecture 3
4	Thurs	Feb 2	HA	**Frontiers Lecture 1: Hari Arthanari**
5	Tues	Feb 7		**Frontiers Discussion 1** Paper Analysis #1 Due
6	Thurs	Feb 9	EF	**Eric Fischer -- Module 2 (Thermodynamics & PTMs)** Module 2 Lecture 1 *Thermodynamics and Molecular Interactions* Problem Set #1 Due
7	Tues	Feb 14	EF	Module 2 Lecture 2 *Introduction to Post-Translational Modifications*
8	Thurs	Feb 16	EF	Module 2 Lecture 3 *Proteins as PTM's: Ubiquitin and Beyond*
8	Tues	Feb 21	WS	**Frontiers Lecture 2: William Shih**
9	Thurs	Feb 23		**Frontiers Discussion 2** Paper Analysis #2 Due
10	Tues	Feb 28	WW	**Frontiers Lecture 3: Wesley Wong** Problem Set #2 Due
11	Thurs	Mar 2		**Frontiers Discussion 3** Paper Analysis #3 Due
12	Tues	Mar 7	AK	**Andrew Kruse -- Module 3 (Binding Pharmacology & Allostery)**

				Paradigms in Transmembrane Receptor Signaling
14	Thurs	Mar 9	AK	Module 3 lecture 2 *Molecular Pharmacology of Ligand-Receptor Interactions*
	Tues	*Mar 14*	*No Class*	*Spring Break*
	Thurs	*Mar 16*	*No Class*	*Spring Break*
15	Tues	Mar 21	AK	Module 3 Lecture 3 *Allostery*
16	Thurs	Mar 23	AS	**Frontiers Lecture 4: Adrian Salic**
17	Tues	Mar 28		**Frontiers Discussion 4** Paper Analysis #4 Due
18	Thurs	Mar 30	SH	**Frontiers Lecture 5: Sun Hur** Problem Set #3 Due
19	Tues	Apr 4		**Frontiers Discussion 5** Paper Analysis #5 Due
20	Thurs	Apr 6	SB	**Steve Blacklow -- Module 4 (Enzymology & Molecular Mechanisms)** *Fundamentals of Catalysis*
21	Tues	Apr 11	SB	Module 4 Lecture 2 *Proteolysis*
22	Thurs	Apr 13	SB	Module 4 Lecture 3 *Kinase Inhibition*
23	Tues	Apr 18	NG	**Frontiers Lecture 6: Nathanael Gray**
24	Thurs	Apr 20		**Frontiers Discussion 6** Paper Analysis #6 Due
25	Tues	Apr 25	AK	Course debriefing and feedback session Problem Set #4 Due
26	Fri	Apr 28		Post-Course Assessment Due

Cell Biology 201 Principles of Cell Biology
Danesh Moazed

Units 4

Lectures: Mon, Wed, and Fri 10:30-12:00

Discussion Sections: Fri at 10:30-12:00

CB201 is a graduate level course intended to teach critical concepts in cell biology, and expose students to current and quantitative approaches in cell biology research. Topics include the molecular basis of cellular dynamics, subcellular compartmentalization, protein trafficking, chromosome biology and epigenetics, regulated ubiquitin-proteasome pathways, cell cycle regulation, cytoskeleton and motor dynamics, signal transduction, cell-cell interactions, and programmed cell death.

Spring 2017
First Meeting: Monday January 23
Final Meeting: Friday April 28
Friday Discussion Sections: begin on Friday February 3 and end on Friday April 14
Location: Cannon room, Building C 114 (lectures), to be announced (discussion sections)
Course Head: Danesh Moazed, Danesh_Moazed@hms.harvard.edu
Curriculum Fellow: Christopher Wood, Christopher_Wood@hms.harvard.edu

Cell Biology 207 Vertebrate Developmental and Regenerative Biology

Andrew Lassar, John G. Flanagan, Jordan Kreidberg, Sean Megason, Olivier Pourquié, Jayaraj (Jay) Rajagopal, Jessica Whited, Yingzi Yang

4 Units

Enrollment: Limited to 18, instructor consent required.

Lecture: Mon and Wed 2:00-4:00

Analyzes the developmental programs of frog, chick, zebrafish, and mouse embryos, emphasizing experimental strategies for understanding the responsible molecular mechanisms that pattern the vertebrate embryo. Signaling pathways controlling morphogenesis, organogenesis, stem cells and regeneration will be discussed in detail.

Course Notes: Offered jointly with the Medical School as CB 710.0. Includes lectures and conference sessions in which original literature is discussed in depth. Short research proposals are required in lieu of exams.

Spring 2017

First Meeting: Monday, January 23, 2017
Final Meeting: Wednesday, May 10, 2017
First Meeting Location: TMEC 448
Location: TMEC 342, TMEC 346
Course Head: Andrew Lassar, andrew_lassar@hms.harvard.edu and John Flanagan flanagan@hms.harvard.edu

Find syllabus for Cell Biology 207 below:

		CB207 - Vertebrate Developmental and Regenerative Biology		
			Tentative Course Schedule, Spring 2017	
			Lectures and conferences will be in TMEC 448. Student proposals will take place in TMEC 342 and TMEC 346. Class meets 2-4pm.	
Signaling pathways in development and establishment of the body plan				
23-Jan-17	Mon	Lecture	A tool box to tinker an embryo and the vertebrate game plan	Lassar
25-Jan-17	Wed	Lecture	Molecular signals that control cell fate specification through gastrulation	Megason
30-Jan-17	Mon	Conference	Morphogens and mesoderm/neural induction	Megason/Lassar
1-Feb-17	Wed	Lecture	Wnt signaling and the regulation of tissue morphogenesis and EMT	Yang
6-Feb-17	Mon	Conference	Gastrulation, Wnt signaling and the molecular basis for tissue morphogenes	Megason/Yang
8-Feb-17	Wed	Lecture	Positional specification of cells in the developing neural tube	Lassar
13-Feb-17	Mon	Lecture	Hox code and segmentation	Pourquie
15-Feb-17	Wed	Conference	Hox codes and anteroposterior axis specification	Lassar/Pourquie
20-Feb-17	Mon	President's Day!		
22-Feb-17	Wed	Conference	Patterning the neural tube	Lassar/Flanagan
27-Feb-17	Mon	Lecture	Placode and neural crest development	Megason
1-Mar-17	Wed	Student presentations	Discussion rooms are reserved from 2-5	Lassar/Megason
				Yang/Whited
Elaboration of the body plan				
6-Mar-17	Mon	Lecture	Limb patterning	Whited
8-Mar-17	Wed	Conference	Limb regeneration	Whited/Lassar
13-Mar-17	Mon	Spring Vacation		
15-Mar-17	Wed	Spring Vacation		
20-Mar-17	Mon	Lecture	Axonal connections	Flanagan
22-Mar-17	Wed	Conference	Axonal connections	Flanagan/Whited
27-Mar-17	Mon	Lecture	Metamerization of paraxial mesoderm	Pourquie
29-Mar-17	Wed	Lecture	Skeletal muscle formation and regeneration	Lassar
3-Apr-17	Mon	Conference	Skeletal muscle stem cells	Lassar/Pourquie
5-Apr-17	Wed	Student Presentations	Discussion rooms are reserved from 2-5	Whited/Lassar
				Flanagan/Rajagopal
Principles of organogenesis, stem cells and regeneration				
10-Apr-17	Mon	Lecture	Branching Morphogenesis and Lung Development/Regeneration	Rajagopal
12-Apr-17	Wed	Conference	Modeling development with epithelial organoids	Rajagopal/Whited
17-Apr-17	Mon	Lecture	Chondrogenesis, Osteogenesis, and formation of the skeleton	Yang
19-Apr-17	Wed	Conference	Developmental diseases in skeletal biology	Yang/Kreidberg
24-Apr-17	Mon	Lecture	Urogenital Development and Sexual Differentiation	Kreidberg
26-Apr-17	Wed	Conference	Regulation in patterning, growth, and differentiation in the intestinal crypt	Kreidberg/Megason
1-May-17	Mon	Lecture	Embryological origins of the iPS revolution	Pourquie
3-May-17	Wed	Conference	Modeling development and disease with iPS technology	Pourquie/Kreidberg
8-May-17	Mon	Conference	Zen and the Art of Embryo Construction	Lassar and colleagues
10-May-17	Wed	Student presentations	Discussion rooms are reserved from 2-5	Megason/Yang
				Kreidberg/Whited
Web site: http://cb207.med.harvard.edu				
user name: cb207				
password: gastrula				

Cell Biology 212 Biology of the Cancer Cell: From Molecular Mechanisms to Therapeutic Implications

David Frank and Nikhil Wagle

Units 4

Enrollment: Limited to 36

Mon and Wed 12:30-2:00

This semester long course takes a molecular approach to examine the basis of human cancer. The main concepts that we will cover include: Cancer genetics and epigenetics, tumor suppressor genes and oncogenes, signal transduction, DNA damage and repair, angiogenesis, metastasis and invasion, apoptosis, cancer stem cells, and tumor immunology and immunotherapy. Lectures will be delivered by experts in the various fields to provide an integrated perspective on past, current, and future approaches in cancer biology research. In addition, students will participate in workshops in which they will delve more deeply into the primary literature of several of these topics.

Course Evaluation: Participation 20%
Student Presentation / Workshop 40%
Letter of Intent 40%

Note: Given alternate years with Cell Biology 211.

Recommended Prep: Advanced biochemistry, molecular genetics, and cell biology.

Spring Session 2017

First Meeting: Monday, January 23, 2017
Final Meeting: Monday, April 26, 2017
Location: TMEC 447
Course Directors: David Frank david_frank@dfci.harvard.edu and Nikhil Wagle Nikhil_Wagle@dfci.harvard.edu
Instructors: David Frank, Nikhil Wagle, Matthew Meyerson, Matt Freedman, Bill Kaelin, Alan D'Andrea, Frank Slack, Huma Rana, Kevin Haigis, and Alice Shaw.
Curriculum Fellow: Megan Mittelstadt, megan_mittelstadt@hms.harvard.edu

Genetics 216 Advanced Topics in Gene Expression
Fred Winston, Robert Kingston, and Stephen Buratowski

4 Units

Enrollment: Limited to 16, instructor consent required.

Tue 2:00-5:00

This course covers different topics in gene regulation, covering genetic, genomic, biochemical, and molecular approaches. A small number of topics are discussed in depth, using the primary literature. Topics range from prokaryotic transcription to eukaryotic development.

Course Notes: Offered jointly with the Medical School as GN 703.0.**BCMP 310qc, *Eukaryotic Gene Regulation*, has merged into Genetics 216**.

Prerequisite: Genetics 201 and BCMP 200 or equivalent. All students taking Genetics 216 should read and be prepared to discuss the papers for the first meeting on January 24. The readings can be downloaded from the course web site.

Spring 2017
First Meeting: Tuesday, January 24, 2017
Final Meeting: Tuesday, May 9, 2017
Location: TMEC 128
Course Head: Fred Winston, winston@genetics.med.harvard.edu
Course Instructors: Robert Kingston, kingston@molbio.mgh.harvard.edu, and Stephen Buratowski, steve_buratowski@hms.harvard.edu

Genetics 228 Genetics in Medicine - From Bench to Bedside

Christopher Newton-Cheh and David Sweetser

4 Units

Enrollment: Limited to 15, instructor consent required.

Fri 2:00-5:00

Focus on translational medicine: the application of basic genetic discoveries to human disease. Each three-hour class will focus on a specific genetic disorder and the approaches currently used to speed the transfer of knowledge from the laboratory to the clinic. Each class will include a clinical discussion, a patient presentation if appropriate, followed by lectures, a detailed discussion of recent laboratory findings and a student led journal club. Lecturers will highlight current molecular, technological, bioinformatic and statistical approaches that are being used to advance the study of human disease. There is no exam. Students will present one paper per session in a journal club style. Attendance and active participation for the duration of all class meetings is required. If you are unable to attend class, or cannot be present for the entire session you are expected to contact the course instructor. Two incomplete or missed sessions will result in a failing grade.

Course Notes: Course will be held at MGH (transportation provided to MGH). Offered jointly with the Medical School as GN 711.0. For more information visit http://www2.massgeneral.org/bbs/gen228/gen228.htm

Recommended Prep: Genetics 201 or equivalent.

Spring 2017
First Meeting Date: Friday, January 27, 2017
Final Meeting Date: Friday, April 21, 2017
Location: Simches Research Center, MGH 3rd floor, Room 3120
Course Head: Christopher Newton-Cheh, CNEWTONCHEH@mgh.harvard.edu
Course Instructors: David Sweetser, DSWEETSER@mgh.harvard.edu

HBTM 200: Principles and Practice of Human Pathology
Scott Lovitch

4 Units

Tue 9:00-11:00 and Th 9:00-1:00

This course provides a comprehensive overview of human pathology with emphasis on mechanisms of disease and modern diagnostic technologies. Topics include (1) general mechanisms of disease (inflammation, infection, immune injury, host response to foreign materials, transplantation, genetic disorders and neoplasia), (2) pathology of major organ systems, and (3) review of diagnostic tools from invasive surgical pathology to non-invasive techniques such as diagnostic imaging and molecular pathology. The objectives of this course are achieved through a set of integrated lectures and laboratories, as well as a student-driven term project leading to a formal presentation on a medical, socioeconomic, or technological issue in human pathology.

Course Notes: Enrollment may be limited. Jointly offered with HMS as HT035.0.

Prerequisites: General biology.

Spring 2017
First Meeting: Tuesday, January 31, 2017
Final Meeting: Thursday, May 11, 2017
Location: TMEC 250
Course Head*:* Scott Lovitch, slovitch@partners.org
Course Website*:* https://canvas.harvard.edu/courses/8871

Immunology 202 Immune and Inflammatory Diseases
Filip Swirski and Mikael Pittet

4 Units

Tue and Th 1:30-4:00 (Lecture: 1:30-2:30 Break: 2:30-2:45 Discussion: 2:45-4:00)

IMM202 builds on IMM201 and explores fundamental principles of immunology in the context of immune and inflammatory diseases. Through a series of lectures and discussion, students will survey a broad range of diseases in which the immune system is essential. Topics will include not only diseases that mobilize classical immunity but also conditions to which we now know the immune systems contributes. Students will use oral and written exercises to learn how to evaluate and synthesize major concepts and tools germane to immunology's relationship to bioscience.

Course Notes: Offered jointly with the Medical School as IM 712.0.

Prerequisite: Immunology 201 or its equivalent.

Spring 2017
First Meeting: Tuesday, January 24, 2017
Final Meeting: Thursday, May 4, 2017
Location: Jeffrey Modell Immunology Center, Rooms 100A
Course Co-Heads: Filip Swirski, fswirski@mgh.harvard.edu, and Mikael Pittet, mpittet@mgh.harvard.edu

Immunology 204 Critical Readings for Immunology
Duane Wesemann

4 Units

Th 10:00-1:00

Original research articles from fields including immunology, biochemistry, genetics, and cell and developmental biology will be critically analyzed in an intensive small group format. Grading will be based on class participation and oral presentations.

Course Notes: Required for first-year immunology students, open to second-year immunology students. No auditors. Offered jointly with the Medical School as IM 703.0.

Spring 2017
First Meeting: Thursday, January 23, 2017
Final Meeting: Thursday, April 26, 2017
Location: Jeffrey Modell Immunology Center, Rooms 100A
Course Head: Duane Wesemann, dwesemann@bwh.harvard.edu

Immunology 301 Immunology Seminar
Michael Carroll, William Haining and Galit Alter

4 Units

Enrollment: Limited to 20, instructor consent required.

Wed 3:30-5:00

Gives students exposure to research topics in Immunology. Students prepare for the weekly seminar through readings, discussions, and preparing brief write-ups. These discussions are facilitated by members of the Committee on Immunology.

Spring 2017
First Meeting: Wednesday, January 25, 2017
Final Meeting: Wednesday, May 3, 2017
Location: Modell Center, Room 100A
Course Head: Michael Carroll, Michael.Carroll@childrens.harvard.edu
Course Instructor: William Haining, Nicholas_Haining@dfci.harvard.edu

Microbiology

Microbiology 201 Molecular Biology of the Bacterial Cell
David Rudner, Thomas Bernhardt, Simon Dove, and Ann Hochschild

4 Units

Tue and Th 10:00-12:00

This course is devoted to bacterial structure, physiology, genetics, and regulatory mechanisms. The class consists of lectures and group discussions emphasizing methods, results, and interpretations of classic and contemporary literature.

Spring 2017
First Meeting: Tuesday, January 24, 2017
Final Meeting: Thursday, May 4, 2017
Location: NRB 1031
Course Head: David Rudner, rudner@hms.harvard.edu, Thomas Bernhardt, thomas_bernhardt@hms.harvard.edu
Course Instructors: Simon Dove, simon.dove@childrens.harvard.edu, and Ann Hochschild, ahochschild@hms.harvard.edu
Curriculum Fellow: Bradley Coleman, bradley_coleman@hms.harvard.edu

Microbiology 210 Microbial Sciences: Chemistry, Ecology, and Evolution
Michael Gilmore

4 Units

Enrollment: Limited to 15

Fri 8:30-11:45 (Lecture 8:30-9:30; Discussion 9:45 – 11:45)

This is an interdisciplinary graduate-level and advanced undergraduate-level course in which students explore topics in molecular microbiology, microbial diversity, and microbially-mediated geochemistry in depth. This course will be taught by faculty from the Microbial Sciences Initiative. Topics include the origins of life, biogeochemical cycles, microbial diversity, and ecology.

Course Notes: Also offered as Organismic and Evolutionary Biology 290.

Prerequisite: For advanced undergraduates, Life Sciences 1a and 1b are required, or permission of instructor. MCB 52 is recommended.

Spring 2017
First Meeting: Friday, January 27, 2017
Final Meeting: Friday, April 21, 2017
Location: Harvard Natural History Museum 418
Course Head: Michael Gilmore, michael_gilmore@meei.harvard.edu
Course Instructors: Michael Gilmore

Microbiology 213 Social Issues in Biology
Jonathan Beckwith and Louis Guenin

4 Units

Enrollment: Limited to 18, instructor consent required.

Th 1:00-4:00

Discussion course on topics selected from the following: history, philosophy of science; evolution vs. creationism; genetics and race; women and science; genetic testing; genetic enhancement; science journalism; genetics and criminality; science in wartime; scientists and social responsibility; theater and the public presentation of science.

Course Notes: Offered jointly with the Medical School as MG 722.0. Alternates yearly between the Longwood and the Cambridge Campuses.

Prerequisite: Some background in genetics.

Spring 2017
First Meeting: Thursday, January 26, 2017
Final Meeting: Thursday, April 27, 2017
Location: Room 2062, Biological Laboratories, Harvard's Cambridge Campus
Course Head: Jonathan Beckwith, jbeckwith@hms.harvard.edu and Louis Guenin, guenin@hms.harvard.edu

Neurobiology 204 Systems Neuroscience
Rachel Wilson, Richard Born, Mark Andermann, Michael Do, Christopher Harvey, and Margaret Livingstone

4 Units

Mon and Wed 9:00-11:00

This course introduces major themes and fundamental concepts underlying current research in systems neuroscience. Each week covers a different theme, and draws on research from different sensorimotor modalities and model organisms.

Course Notes: Offered jointly with the Medical School as NB 721.0.

Prerequisite: Neuro 200 / HST 130 or permission of instructor.

Spring 2017
First Meeting: Wednesday, January 27, 2017
Final Meeting: Monday, April 25, 2017
Location: Goldenson building, Room 229
Course Head: Rachel Wilson, rachel_wilson@hms.harvard.edu, Richard Born, richard_born@hms.harvard.edu
Course Instructors: Mark Andermann, mark_andermann@hms.harvard.edu, Michael Do, michaeltri.do@childrens.harvard.edu, Christopher Harvey, Christopher_Harvey@hms.harvard.edu, and Margaret Livingstone, margaret_livingstone@hms.harvard.edu

Neurobiology 211 Molecular and Developmental Neurobiology

Lisa Goodrich, Sandeep Datta, Maria Lehtinen, Michela Fagiolini, Corey Harwell, Matthew Pecot, Pascal Kaeser, Joshua Kaplan, and Beth Stevens

4 Units

Tue, Th, and Fri 9:00-11:00

Integrated introduction to the molecular events that govern development and function of neural circuits. Topics include neurogenesis, circuit assembly, synaptic transmission, and the associated signaling pathways. Lectures, discussion of primary literature, and original research proposal.

Course Notes: This is an advanced course that assumes prior knowledge of the nervous system. Only students who have completed Neuro200 or its equivalent will be allowed to enroll, as determined by the Course Director.

Spring 2017

First Meeting: Tuesday, January 24, 2017
Final Meeting: Friday, April 21, 2017
Location: Goldenson Building Room 422
Course Head: Lisa Goodrich, lisa_goodrich@hms.harvard.edu
Course Instructors: Sandeep Datta, srdatta@hms.harvard.edu, Michela Fagiolini, michela.fagiolini@childrens.harvard.edu, Pascal Kaeser, kaeser@hms.harvard.edu, Joshua Kaplan, kaplan@molbio.mgh.harvard.edu, Maria Lehtinen, Corey Harwell, corey_harwell@hms.harvard.edu; Matthew Pecot, matthew_pecot@hms.harvard.edu; maria.lehtinen@childrens.harvard.edu, and Beth Stevens, Beth.Stevens@childrens.harvard.edu

Course Schedule

Date	Class	Lecturer	Homework	Methods Workshop
Unit 1: The Basics of Molecular Neuroscience				
Tues Jan 24	Introduction to model organisms and experimental approaches	Goodrich		
Thurs Jan 26	The central dogma for systems neuroscientists	Datta		
Fri Jan 27	Manipulating gene expression in the mouse brain	Kaeser		Gene Expression
Tues Jan 31	*Discussion*	Kaeser/Goodrich	**Summary 1**†	
Thurs Feb 2 Fri Feb 3 Tues Feb 7	Epigenetic regulation of gene expression Grant writing *Mock Study Section*	Gray Goodrich Goodrich	 **Grant Critiques**	
Unit 2: Wiring the Nervous System				
Thurs Feb 9	Cortical development and neurogenesis	Lehtinen/Harwell		
Fri Feb 10	Adult neurogenesis and stem cells	Harwell/Lehtinen		Imaging/Microscopy
Tues Feb 14	*Discussion*	Lehtinen/Harwell	**Summary 2**	
Thurs Feb 16	Neuronal morphogenesis	Goodrich		
Fri Feb 17	Mechanisms of axon guidance	Pecot	**Topics Due**	
Tues Feb 21	*Discussion*	Goodrich	**Summary 3**	
Thurs Feb 23	Target selection	Pecot		
Fri Feb 24	Regulation of the actin cytoskeleton	Segal		*In Vitro* Assays

Tues Feb 28	*Discussion*	Goodrich	**Summary 4**	
Unit 3: Grant Writing				
Thurs Mar 2	Grant Brainstorming	Goodrich		
Fri Mar 3	Presentations	TBA	**1st Draft of Specific Aims (due at presentation)**	
Tues Mar 7	Presentations	TBA		
Thurs Mar 9	Presentations	TBA		
Fri Mar 10	Presentations	TBA		Biochemistry
Spring Break				

† All students must complete 5 of the 8 possible summaries. Grant Critiques are required.

Course Schedule

Date	Class	Lecturer	Homework	Workshop
Unit 4: Synapse Development and Function				
Tues Mar 21	Approaches to study the genetics of neurological disorders in humans	McCarroll		
Thurs Mar 23	Synapse Formation	Stevens		
Fri Mar 25	Genetic approaches to synapse formation and neuronal maturation	Schwarz		
Tues Mar 28	*Discussion*	TBA	**Summary 5**	
Thurs Mar 30	Neurotransmitter Release	Kaeser		
Fri Mar 31	Dissecting complex molecular assemblies: the neuronal secretory apparatus	Kaeser		
Tues Apr 4	*Discussion*	Kaeser	**Summary 6**	
Thurs Apr 6	Protein processing in the ER	Kaplan		
Fri Apr 7	Receptor trafficking	Kaplan		
Tues Apr 11	*Discussion*	Kaplan	**Summary 7**	
Unit 5: Activity-dependent refinement				
Thurs April 13	Synapse elimination	Stevens		
Fri April 14	Signaling mechanisms underlying neuronal survival	Ginty		
Tues April 18	*Discussion*	Fagiolini	**Summary 8**	
Thurs April 20	Critical Periods	Fagiolini		
Fri April 21	Neurodevelopmental Disorders: from synapse to circuit	Fagiolini		
Wed April 26 Mon May 8			**GRANT DUE (A0)** **REVISED GRANT DUE (A1)**	

SHBT 202 Clinical Aspects of Speech and Hearing
Konstantina Stankovic

4 Units

Enrollment: Limited to 15, instructor consent required

Mon and Wed 5:00-7:00

Clinical approach to speech and hearing disorders as practiced by physicians, audiologists, speech clinicians, rehabilitation specialists, and bioengineers. Includes observation of patient care in clinic and operating room, experience in audiology and balance disorders, and lectures and discussion groups.

Course Notes: Offered jointly with HST 724 at MIT. Classes to be held at the Massachusetts Eye and Ear Infirmary (MEEI).

Prerequisite: Anatomy of Speech and Hearing, Acoustics of Speech and Hearing or permission of the course director.

Spring 2017
First Meeting: Tuesday, January 26, 2017
Final Meeting: Wednesday, April 27, 2017
Location: Eaton Peabody Laboratories, MEEI, 243 Charles Street, Boston 02114
Course Head: Konstantina Stankovic, konstantina.stankovic@mgh.harvard.edu
Teaching Assistant: Jessica Sagers, jsagers@g.harvard.edu

SHBT 205 Neural Coding and Perception of Sound
Joshua McDermott, Daniel Polley, Bertrand Delgutte and M. Christian Brown

4 Units

Enrollment: Limited to 20, instructor consent required.

Mon, Wed and Fri 9:30-11:30

Neural structures and mechanisms mediating the detection, localization and recognition of sounds. General principles are conveyed by theme discussions of auditory masking, sound localization, musical pitch, cochlear implants, cortical plasticity and auditory scene analysis.

Course Notes: Offered jointly with MIT HST.723J.

Prerequisite: Neurobiology 200 or permission of instructor

Spring 2017
First Meeting: Monday, January 23, 2017
Final Meeting: Wednesday, April 26, 2017
Location: Massachusetts Eye & Ear, 4th floor Conference Room (Room 406)
Course Head: Joshua McDermott, jhm@mit.edu Daniel Polley, daniel_polley@meei.harvard.edu
Course Instructors: Bertrand Delgutte, bertrand_delgutte@meei.harvard.edu, M. Christian Brown, chris_brown@meei.harvard.edu

SHBT 301QC Speech and Hearing Laboratory Visits
Bertrand Delgutte

2 Units

W

Research on topics in theoretical, experimental, clinical, or translational aspects of Speech and Hearing Sciences arranged on an individual basis with a research supervisor.

Spring 2017
First Meeting: Wednesday January 27, 2017
Final Meeting: Wednesday April 27, 2017
Location: Varies, please contact instructor
Course Head: Bertrand Delgutte, bertrand_delgutte@meei.harvard.edu

Virology

Virology 201 Virology
Sean P.J. Whelan and James Cunningham

4 Units

Enrollment: Limited to 20

Mon and Wed 2:30-4:00

The course focuses on the following areas of virology: (i) epigenetic regulation, (ii) RNA virus replication mechanisms, (iii) innate responses to viral infection and (iv) inhibition of viral infection. The course will comprise lectures as well as reviewing literature that describes fundamental breakthroughs relevant to these areas. Within those areas, the class will read and discuss papers dealing with virus structure, replication, pathogenesis, evolution, emerging viruses, chronic infection, innate and adaptive immunity, anti-viral drugs/vaccines. Special emphasis will be placed on preparing students to critically evaluate the literature, formulate hypotheses and design experiments.

Course Notes: Course format will be lectures, literature-based critical reading and discussion. Prepare and defend a written research proposal. Offered jointly with the Medical School as MG 723.0.

Prerequisite: Virology 200**,** graduate standing and permission required.

Spring 2017
First Meeting: Monday, January 23, 2017
Final Meeting: Wednesday, May 10, 2017
First Meeting: TMEC 328
Location: TMEC 426
Course Head: Sean P.J. Whelan, sean_whelan@hms.harvard.edu
Course Instructor: James Cunningham, jcunningham@rics.bwh.harvard.edu