Half Courses
Spring 2020

Enrollment deadlines
Check-in               Jan 6-27
Enrollment             Jan 6-31
Add/drop no fee        Feb 10
Last day to add        Mar 9
Last day to drop, no WD Mar 23

GSAS Academic Calendar 2019-20
16 credits for full-time student status

Contact
617-432-0605
dms_courses@hms.harvard.edu
BCMP 213 Behavioral Pharmacology
Jack Bergman, Brian Kangas

BCMP 234 Cellular Metabolism and Human Disease
Thomas Michel, Bruce Levy, David Cohen, D. Branch Moody, Joseph Loscalzo, Raul Mostoslavsky, Sudha Biddinger, Marcia Haigis, Paul Schmidt, Vijay Sankaran, Lisa Henske, Joseph Majzoub, Mark Puder, Lynn Bry

BCMP 250 Biophysical and Biochemical Mechanisms of Protein Function
Andrew Kruse, Stephen Blacklow, Phil Cole, Eric Fischer

CELLBIO 201 Principles of Cell Biology

CELLBIO 207 Development, Stem Cells, and Regeneration
Andrew Lassar (course director), John G. Flanagan, Guillermo Garcia-Cardena, Vandana Gupta, Jordan Kreidberg, Jessica Lehoczky, Sean Megason, Olivier Pourquié

CELLBIO 211 Molecular and Systems Level Cancer Cell Biology
Peter Sicsinski

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

GENETIC 349 Current Tools for Gene Analysis
Neena Haider

HBTM 200 Pathology of Human Disease
Scott Lovitch

IMMUN 202 Immune and Inflammatory Diseases
Filip Swirski, Mikael Pittet

IMMUN 204 Critical Readings for Immunology
Duane Wesemann

IMMUN 301 Immunology Seminar
Shiv Pillai, Galit Alter

MICROBI 201 Molecular Biology of the Bacterial Cell
David Rudner, Thomas Bernhardt, Simon Dove
MICROBI 210 Microbial Sciences: Chemistry, Ecology, and Evolution
Michael Gilmore

MICROBI 213 Social Issues in Biology
Jonathan Beckwith, Stephen Lory, Richard Born, David Glass, Nadine Vincenten, Emily Hamilton, Sarah Richardson, Nancy Hopkins, Kayla Davis

NEUROBIO 215B The Discipline of Neuroscience
Lisa Goodrich, John Assad, Taralyn Tan, Sandeep Robert Datta, Michael Do, David Corey, Rachel Wilson, Richard Born, Jan Drugowitsch, Christopher Harvey, Mark Andermann, Beth Stevens, Dan Polley

SHBT 202 Clinical Aspects of Speech and Hearing
Konstantina Stankovic

SHBT 205 Neural Coding and Perception of Sound
Joshua McDermott, Daniel Polley, Bertrand Delgutte, M. Christian Brown, Anne Takesian, Yoojin Chung, Evelina Fedorenko, John Gabrielli

VIROLOGY 201 Virology
Ben Gewurz, James Cunningham, Aaron Schmidt, Joe Sodroski, Dan Kuritzkes, Sun Hur
Biological Chemistry & Molecular Pharmacology

**BCMP 213 Behavioral Pharmacology**
Jack Bergman, Brian Kangas

4 units.

Tue, 3:00p - 5:45p

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. One year of biology or chemistry or one year of psychology recommended.

Meeting Dates Jan 28 - May 12
Location Cambridge campus, room TBD
Course Heads Jack Bergman, jack_bergman@hms.harvard.edu, Brian Kangas, bkangas@mclean.harvard.edu

**BCMP 234 Cellular Metabolism and Human Disease**
Thomas Michel, Bruce Levy, David Cohen, D. Branch Moody, Joseph Loscalzo, Raul Mostoslavsky, Sudha Biddinger, Marcia Haigis, Paul Schmidt, Vijay Sankaran, Lisa Henske, Joseph Majzoub, Mark Puder, Lynn Bry

4 units.

MWF, 9:00a - 10:20a

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. Open to all HILS graduate students with adequate preparation in cell biology and biochemistry. For undergraduates only: Knowledge of introductory biochemistry, genetics, and cell biology required (MCB 63 or MCB 60 or LIFESCI50, and MCB 64 or equivalent) plus one year of organic chemistry (Chem 17/27 or 20/30).

Meeting Dates Jan 27 - May 8
Location Cannon Room, Building C
Course Head Thomas Michel, thomas_michel@hms.harvard.edu
Curriculum Fellow Brittany Michel, brittany_michel@hms.harvard.edu
BCMP 250 Biophysical and Biochemical Mechanisms of Protein Function
Andrew Kruse, Stephen Blacklow, Phil Cole, Eric Fischer

4 units.

Enrollment limited to 45. Instructor consent required.

T/Th, 10:30a - 12:00p

Biophysical and Biochemical Mechanisms of Protein Function focuses on the molecular mechanisms that underlie essential biochemical processes such as signal transduction. Major topics include biochemical thermodynamics and conformational equilibria, protein structure and folding, receptor pharmacology, allostery, and enzymatic mechanisms of signaling. The course includes both content lectures and research frontiers seminars focused on current research in biochemistry with an emphasis on signal transduction in therapeutically relevant pathways.

Course Note A foundational biochemistry course is recommended as a prerequisite (we expect students to have a solid understanding of the core concepts in biochemistry and molecular biology, including knowledge of the amino acids and their properties as well as the central dogma).

Meeting Dates Jan 28 - Apr 30
Location TBD

Course Head Andrew Kruse, andrew_kruse@hms.harvard.edu
Additional Instructors Stephen Blacklow, stephen_blacklow@hms.harvard.edu, Phil Cole, pacole@bwh.harvard.edu, Eric Fischer, eric_fischer@hms.harvard.edu
Curriculum Fellow Madhvi Venkatesh, madhvi_venkatesh@hms.harvard.edu

Cell Biology

CELLBIO 201 Principles of Cell Biology

4 units.

MWF, 10:30a - 12:00p

This is a graduate level course in which students examine both fundamental and novel concepts and methodologies in cell biology with expert faculty from the field. Through content lectures, methods lectures, and discussion sections, students will explore a broad range of topics including: the molecular basis of cellular organization, subcellular compartmentalization, protein trafficking, chromosome organization and epigenetics, regulated ubiquitin-proteasome pathways, cell cycle regulation, cell death, signal transduction, phase separation, and more. By the end of this course, students should be able to:

- Evaluate primary scientific literature from a broad range of topics in cell biology;
• Identify current questions in cell biology and the co-evolving methodologies used to address those questions;
• Design appropriate experimental approaches to address hypotheses related to cell biology.

Course Notes Methodological focus on current approaches in cell biology including quantitative tools. Emphasis on experimental design. Offered jointly with the Medical School as CB 713.0.

Recommended Prep Basic knowledge in biochemistry, genetics, and cell biology.

Meeting Dates Jan 27 - May 1
Location Cannon Room

Class Notes Please note that mandatory methods lectures will be held in addition to regular classes on 2/4, 2/18, 3/24, and 4/14, from 3:30-5:00pm.

Course Head Adrian Salic, adrian_salic@hms.harvard.edu
Curriculum Fellow Saoirse McSharry, saoirse_mcsharry@hms.harvard.edu

CELLBIO 207 Development, Stem Cells, and Regeneration
Andrew Lassar (course director), John G. Flanagan, Guillermo Garcia-Cardena, Vandana Gupta, Jordan Kreidberg, Jessica Lehoczky, Sean Megason, Olivier Pourquié

4 units. Enrollment limited to 12. Instructor consent required.

Mon, 2:00p - 4:00p, Wed, 2:30p - 4:30p

CB207 is evenly divided between lectures and conference sessions which cover the principals that guide vertebrate development and stem cell maintenance in various renewing tissues; in addition, we discuss how these principals can be leveraged to generate cells/tissues for regenerative biology or disease modeling in vitro. Specific topics include a molecular dissection of the signaling pathways, gene regulatory networks, and epigenetic mechanisms that control primary axis formation and regional specification, establishment of cell fate, homeotic genes and patterning, cell migration and cell-cell signalling, organoid models of nervous system development and their application, axon development and regeneration, neuromuscular development and mechanistic insights for human birth defects, skeletal muscle stem cells in aging and disease, morphogenesis of branched tubular systems, vasculogenesis, biomechanical regulation of developmental processes, limb development and regeneration, stem cell maintenance in various renewing tissues, germ cells and pluripotency, and directed differentiation of ES and iPS cells for regeneration and disease modeling. We will discuss how state of the art technologies in iPS organoids, cell lineage labeling, genetic manipulation, and genome wide epigenomic/transcriptomic analyses can be employed to study organ development, stem cells and regeneration.

Students employ the knowledge gained by lectures and conference sessions to identify two interesting new research goals in either vertebrate development, stem cell, or regenerative biology and present research proposals to achieve these goals. Thus, a goal of this course is for students to learn how to synthesize the literature to come up with their own novel research ideas, and develop a strategy to investigate their hypotheses.
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.

Meeting Dates Jan 27 - May 13
First Meeting Location Warren Alpert 563
Course Heads Andrew Lassar, andrew_lassar@hms.harvard.edu, John Flanagan, flanagan@hms.harvard.edu

CELLBIO 211 Molecular and Systems Level Cancer Cell Biology
Peter Sicinski

4 units. Enrollment limited to 32. Instructor consent required.

Examines the molecular basis of cancer formation including topics such as cancer epigenetic, tumor heterogeneity, systems biology proteomic approaches to study cancer, immune therapies in cancer, and therapeutic development.

Course Notes Offered in alternate years with Cell Biology 212. Offered jointly with the Medical School as CB 704.0.

Recommended Prep General knowledge of biochemistry, molecular genetics, and cell biology.

Meeting Dates Jan 27 - Apr 29
Location TBA
Course Head Peter Sicinski
Curriculum Fellow Jelena Patrnogic, jelena_patrnogic@hms.harvard.edu

Genetics

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

4 units. Enrollment limited to 16. Instructor consent required.

Tue, 1:30p - 5:30p

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.

Recommended Prep 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. The readings can be downloaded from the course website.

Dates Jan 28 - May 5
Location TMEC 130
Course Head Fred Winston, winston@genetics.med.harvard.edu
Course Instructors Robert Kingston, kingston@molbio.mgh.harvard.edu, Stephen Buratowski, steve_buratowski@hms.harvard.edu

**GENETIC 349 Current Tools for Gene Analysis**
Neena Haider

4 units. Enrollment limited to 15. Instructor consent required.

Tue/Thu, 10:00a – 12:00p

The goal of this course is to apply a number of genomic tools over the course of a semester-long guided research project, learn how to utilize the complimentary statistical tools for analysis, and to discuss the strategies and final data presentation from published papers. Using example sequence datasets, students will analyze differential gene expression and changes. The class will explore the featured tool, related statistical methods together in an interactive manner followed by a discussion of the tools/stats as seen in published work. After taking this class students will be able to apply each online tool to their own research and will be able to identify and use new genomic resources to address future research directions.

**Course Notes** Students will need to bring a laptop to class each day.

**Recommended Prep** Genetics 201 or with permission from the instructor.

**Meeting Dates** Feb 4 - Apr 9
**Location** TMEC 445
**Course Head** Neena Haider
**Curriculum Fellow** Kale Hartmann, kale_hartmann@hms.harvard.edu

**Human Biology & Translational Medicine**

**HBTM 200 Pathology of Human Disease**
Scott Lovitch

4 units.

Tue, 9:00a - 11:00a, Thu, 9:00a - 1:00p

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.
**Immunology**

**IMMUN 202 Immune and Inflammatory Diseases**
Filip Swirski, Mikael Pittet

4 units.

T/Th, 1:30p - 4:00p

IMMUN 202 builds on IMMUN 201 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.

**Meeting Dates** Jan 28 - May 7
**Location** Modell 100A
**Course Heads** Filip Swirski, fswirski@mgh.harvard.edu, Mikael Pittet, mpittet@mgh.harvard.edu

**IMMUN 204 Critical Readings for Immunology**
Duane Wesemann

4 units.

Thu, 10:00a - 1:00p

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.

**Meeting Dates** Jan 30 - Apr 30
**Location** Modell 100A
**Course Head** Duane Wesemann, dwesemann@bwh.harvard.edu
**IMMUN 301 Immunology Seminar**  
Shiv Pillai, Galit Alter

4 Units. Enrollment limited to 20. Instructor consent required.

Wed, 12:00p - 1:00p, 2:30p - 4:00p

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.

**Course Note** Required for, and limited to, first-year Immunology graduate students. All others will be evaluated for enrollment on a case by case basis.

**Meeting Dates** Jan 29 - Apr 22  
**Location** Modell 100A  
**Course Head** Shiv Pillai, pillai@helix.mgh.harvard.edu

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**Microbiology**

**MICROBI 201 Molecular Biology of the Bacterial Cell**  
David Rudner, Thomas Bernhardt, Simon Dove

4 units.

Tue, Th 10:00a - 12:00p

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.

**Meeting Dates** Jan 28 - Apr 28  
**Location** NRB 1031  
**Course Heads** David Rudner, rudner@hms.harvard.edu, Thomas Bernhardt, thomas_bernhardt@hms.harvard.edu  
**Course Instructor** Simon Dove, simon.dove@childrens.harvard.edu  
**Curriculum Fellow** Deepali Ravel, deepali_ravel@hms.harvard.edu

**MICROBI 210 Microbial Sciences: Chemistry, Ecology, and Evolution**  
Michael Gilmore

4 units. Enrollment limited to 20.

Fri, 8:45a - 12:00p

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. Check course site for meeting dates and location.

Prerequisite For graduate and advanced undergraduate students, Life Sciences 1a and 1b or their equivalent are required, or permission of instructor. MCB 52 or equivalent is recommended.

Course Head Michael Gilmore, michael_gilmore@meei.harvard.edu

MICROBI 213 Social Issues in Biology
Jonathan Beckwith, Stephen Lory, Richard Born, David Glass, Nadine Vincenten, Emily Hamilton, Sarah Richardson, Nancy Hopkins, Kayla Davis

4 units. Enrollment limited to 18. Instructor consent required.

Thu, 2:00p - 5:00p

This discussion course covers historical and contemporary readings about controversial issues related to biology and social responsibility of scientists. The topics are selected from amongst the following: Eugenics: past, present and future; Reproducibility, probability and truth in science; Pros and cons of DNA use in forensics; Social activism in science; Women and minorities in science; Biology of sex and gender; History and public perception of vaccinations; Animals in research; Science communication to the public(s); Controversies in biology and medicine re: issues of race, ethnicity and gender; How science is taught. The course can provide future scientists with a background in anticipating and considering present and future ethical and social implications of biology.

Course Notes Offered jointly with the Medical School as MG 722.0

Recommended Prep Some background in genetics

Meeting Dates Jan 30 - Apr 23
Location TBD
Course Head Jonathan Beckwith, jon_beckwith@hms.harvard.edu
Teaching Assistant Kayla Davis, kayladavis@g.harvard.edu

Neurobiology

NEUROBIO 215B The Discipline of Neuroscience
Lisa Goodrich, John Assad, Taralyn Tan, Sandeep Robert Datta, Michael Do, David Corey, Rachel Wilson, Richard Born, Jan Drugowitsch, Christopher Harvey, Mark Andermann, Beth Stevens, Dan Polley

4 units. Enrollment limited to 25. Instructor consent required.

T/Th, 9:00a - 12:00p

This course will endow students with the broad conceptual fluency in the discipline of neuroscience required to relate genes to circuit function, metabolism to neurological disease, and cell biology to neural computations. Through a combination of lectures and in-class activities, students will learn to design, quantitatively analyze, and interpret experiments that address a variety of questions
spanning molecular to systems neuroscience. During the first semester, students will think critically about the fundamental units of the nervous system within the context of cellular function, electrical conduction, and chemical signaling. The second half of the course builds upon this foundation to focus on broadly defined “networks of neural function” as related to coordinated neural activity, the concerted execution of genetic programs, and anatomic ally defined structural networks. The course culminates with students writing a grant proposal in the style of the NIH NRSA.

Course Note Full year course. Students may not enroll for the second semester unless they have completed the first semester; however, students may elect to take just the first semester.

Recommended Prep Students must successfully complete 1st semester of course (NEUROBIO 215A).

Meeting Dates Jan 28 - May 7
Location Warren Alpert 236
Course Heads Lisa Goodrich, lisa_goodrich@hms.harvard.edu, John Assad, john_assad@hms.harvard.edu, Taralyn Tan, taralyn_tan@hms.harvard.edu

Speech & Hearing Sciences

SHBT 202 Clinical Aspects of Speech and Hearing
Konstantina Stankovic
4 units.
MW, 5:00p - 7:00p

Clinical approach to speech and hearing disorders as practiced by physicians, audiologists, speech clinicians, and rehabilitation specialists. Includes observation of patient care in clinic and operating rooms, as well as lectures, discussion groups, and laboratory experience in audiological and vestibular testing.

Course Notes Offered jointly with HST 724 at MIT. Classes to be held at Massachusetts Eye and Ear (MEE). Class meeting times may change according to physician OR and clinic schedules.

Recommended Prep Anatomy of Speech and Hearing, Acoustics of Speech and Hearing, or permission of the course director.

Meeting Dates Jan 31 - Apr 27
Location Eaton-Peabody Laboratories, Massachusetts Eye and Ear, 4th floor
Course Head Konstantina Stankovic, konstantina_stankovic@meei.harvard.edu
Teaching Assistant Janani Iyer, jiyer@g.harvard.edu

SHBT 205 Neural Coding and Perception of Sound
Joshua McDermott, Daniel Polley, Bertrand Delgutte, M. Christian Brown, Anne Takesian, Yoojin Chung, Evelina Fedorenko, John Gabrielli

4 units. Enrollment limited to 20. Instructor consent required.

MWF, 9:30a - 11:30a
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 NEUROBIO 200 or permission of the instructor.

Meeting Dates Jan 27 - May 4
First Meeting Massachusetts Eye & Ear, 4th floor Conference Room
Course Heads 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

Virology

VIROLOGY 201 Virology
Ben Gewurz, James Cunningham, Aaron Schmidt, Joe Sodroski, Dan Kuritzkes, Sun Hur

4 units. Enrollment limited to 20.

MW, 2:30p - 4:00p

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.

Meeting Dates Jan 27 - May 6
Location TMEC 321
Course Head Ben Gewurz, bgewurz@partners.org
Course Instructor James Cunningham, jcunningham@rics.bwh.harvard.edu