

Spring 2027

Full Term Courses

PRIOR TERM ENROLLMENT DEADLINES

Crimson Carts Open	Oct. 21
Course Registration Opens	Nov. 4
Course Registration Closes	Nov. 18
Check-In Open	Jan. 5
Check-in Closes	Jan. 25
Open Add/Drop Opens	Jan. 19
Open Add/Drop Closes	Feb. 1
Spring Term Begins	Jan. 25
Last day to add/drop (no fee)	Feb. 8
Registration for minimum req. credits	Feb. 22
Last day to add/drop <i>(last day to drop a course without a W/D on trans.)</i>	Feb. 22
Spring recess	Mar. 13 – Mar. 21

GSAS ACADEMIC CALENDAR



<https://registrar.fas.harvard.edu/calendars>

REMINDERS

IMPORTANT NOTE: **QC's** are **SPRING 1** and **SPRING 2** courses on the calendar – important dates may vary from HALF course dates.

Prior to ADD/DROP in JANUARY: you **cannot register for or** revise existing courses until you **CHECK-IN** (or go to: <https://registrar.fas.harvard.edu/check-in>)

Register for **16 credits** for full-time student status and health insurance eligibility

Register by going to <https://my.harvard.edu/>

For questions, contact: OGEPHD_Courses@hms.harvard.edu

BCMP 213 Behavioral Pharmacology

Brian Kangas

BCMP 234 Cellular Metabolism and Human Disease

Thomas Michel

BCMP 236 Principles of Drug Action in People

Sara Buhrlage, Catherine I. Dubreuil, Xin Zhou

BCMP 250 Biophysical and Biochemical Mechanisms of Protein Function

Josefina del Marmol

BMIF 203 AIM II - Artificial Intelligence in Medicine II

Marinka Zitnik

BMIF 301 AI in Medicine Clinical Experience I

Gabriel Brat

CELLBIO 201 Principles of Cell Biology

Lucas Farnung

CELLBIO 207/DRB 207 Development, Stem Cells, and Regeneration

Andrew Lassar

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

Alex Toker

GENETIC 216 Advanced Topics in Gene Expression

Fred Winston

HBTM 200 Pathology of Human Disease

Maria Lehtinen, Mark Fleming

IMMUN 202 Immune and Inflammatory Diseases

Wendy Garrett

IMMUN 203 Advances in Immunology

Daniel Lingwood

IMMUN 204 Critical Readings for Immunology

Duane Wesemann

IMMUN 301 Immunology Seminar

Shiv Pillai, Peter Sage

MICROBI 201 Molecular Biology of the Bacterial Cell

David Rudner, Thomas Bernhardt, Simon Dove, Sophie Helaine, Marco Jost, Deepali Ravel

MICROBI 210/ OEB 290 Microbial Sciences: Chemistry, Ecology, and Evolution

Peter Girguis

Microbiology 213: Social Issues in Biology

Nadine Fornelos Martins

NEUROBIO 212 Mathematical Tools for Neuroscience

Kanaka Rajan

NEUROBIO 215B The Discipline of Neuroscience

John Assad, Mark Andermann

SHBT 261 Artificial Intelligence in Medicine

Mengyu Wang, Tobias Elze

VIROLOGY 201 Virology

Benjamin Gewurz

Biological Chemistry & Molecular Pharmacology

BCMP 213 Behavioral Pharmacology

Brian Kangas

4 units. Enrollment limited to 16. Instructor consent required

W., 12:00pm – 2:45pm

Meeting Dates: Jan 27 – April 28

Meeting Location: Cambridge campus – location provided by instructor

This course serves as an introduction to the behavioral pharmacology of psychoactive drugs (e.g., stimulants, cannabinoids, opioids, psychedelics, anxiolytics, antipsychotics). It is organized in a seminar format with emphasis on behavioral methodology (i.e., model and assay development) and pharmacological analysis (i.e., receptor selectivity and efficacy). Special attention is paid to the behavioral processes involved in tolerance, drug dependence, addiction, and treatment.

Recommended Prep: One year of neuroscience, psychology, or biology recommended.

Course Head: Brian Kangas, bkangas@mclean.harvard.edu

BCMP 234 Cellular Metabolism and Human Disease

Thomas Michel

4 units.

M/W/F, 9:00am – 10:30am

Meeting Dates: Jan 25 – May 5

Meeting Location: Longwood campus - instructor to provide location

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 is open to all HILS graduate students with adequate preparation in cell biology and biochemistry.

Recommended Prep: For undergraduates interested in this course, a knowledge of introductory biochemistry, genetics, and cell biology is 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). Please petition the course instructor for an exemption.

Course Head: Thomas Michel, thomas_michel@hms.harvard.edu

Additional Instructors: Mark Puder, Jorge Plutzky, Lyn Bry, Stefater Richards, Paul Schmidt, Marcia Haigis, Joseph Loscalzo, Margaret Stefeater Richards, Sudha Biddinger, Brendan Manning, Lisa Henske, and Branch Moody

BCMP 236 Principles of Drug Action in People

Sara Buhrlage, Catherine I. Dubreuil, Xin Zhou

4 units.

T/TH, 3:30pm-5:00pm

Meeting Dates: Jan 26 – Apr 29

Meeting Location: Longwood campus - instructor to provide location

This course will discuss principles of early drug discovery, drug modalities, and drug pharmacology. It will discuss fundamental aspects of receptor and enzyme targeting agents, drug mechanism, drug metabolism, pharmacokinetics and pharmacodynamics. Selected examples of small molecule drugs, biologics, nucleic acids, and cell therapies will be utilized through the course. In addition, the pharmacology of therapeutics that act on selected human physiological systems will be highlighted, examples include the cardiovascular, immunologic, and central nervous systems. A range of speakers enlisted from the Harvard faculty and Pharmaceutical scientists will participate in teaching throughout this course.

Course notes: Please note that all sessions will be held in person. All course materials including lecturers PowerPoint presentations will be posted on the course website. Attendance to all in class activities, discussions and journal clubs is mandatory, not attending these without an excused absence can lead to an incomplete grade for the course.

Course Heads: Sara Buhrlage, Catherine Dubreuil, catherine_dubreuil@hms.harvard.edu, Xin Zhou

BCMP 250 Biophysical and Biochemical Mechanisms of Protein Function

Josefina del Mármol

4 units. Enrollment limited to 45. Instructor consent required.

T/TH, 11:00am – 12:00pm

Meeting Dates: Jan 26 – April 29

Meeting Location: Longwood campus - instructor to provide location

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 special seminars focused on relevant cutting-edge methodologies.

Recommended Prep: 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).

Course Head: Josefina del Mármol, josefina_delmarmol@hms.harvard.edu

Additional Instructors: Nicholas Polizzi nicholasf_polizzi@dfci.harvard.edu, Andrew Kruse andrew_kruse@hms.harvard.edu, Stephen Blacklow stephen_blacklow@hms.harvard.edu

Biomedical Informatics

BMIF 203 AIM II - Artificial Intelligence in Medicine II

Marinka Zitnik

4 units. Instructor consent required.

T., 2:00pm – 5:00pm

Meeting Dates: Jan 26 – April 27

Meeting Location: Longwood campus - instructor to provide location

Researchers and clinicians increasingly use AI methods to study biology, generate hypotheses, and support clinical and healthcare decisions. We organize this course around three paradigms in modern AI, namely foundation models, generative models, and AI agents. For each paradigm, we study the underlying architectures and training strategies and examine how design choices affect model performance. Foundation models learn general representations from large datasets, and researchers can adapt them to many downstream tasks. Generative models learn data distributions and generate new samples such as clinical text, images, and molecules. AI agents combine language models with tools, memory, and planning to perform multistep tasks in research and clinical settings. Students apply these models to clinical, imaging, longitudinal, and molecular data and learn to integrate multiple modalities. Evaluation of AI models is a core part of the course, and we also discuss responsible implementation and the requirements for using these systems in research and clinical practice.

Recommended Prep: Intended primarily for graduate students with good programming skills in Python, knowledge of basic statistics and linear algebra, and practical experience with fundamental data science concepts.

Course Head: Marinka Zitnik, marinka@hms.harvard.edu

BMIF 301 AI in Medicine Clinical Experience I

Gabriel Brat

4 units. Instructor consent required.

F., 2:00pm – 5:00pm

Meeting Dates: Jan 29 – April 23

Meeting Location: Longwood campus - instructor to provide location

This course will expose students to the processes and logistics of data collection within the healthcare enterprise. Introduction lectures will explore how data is collected in the operating room, emergency department, intensive care, unit, inpatient hospital units, and ambulatory clinics. Students will have the opportunity to shadow clinicians working in the outpatient and inpatient setting.

Course Note: This course is only open to Biomedical Informatics PhD students in the AI in Medicine track.

Course Head: Gabriel Brat, Gabriel_Brat@hms.harvard.edu

Cell Biology

CELLBIO 201 Principles of Cell Biology

Lucas Farnung

4 units. Instructor consent required.

M/W/F, 10:30am – 12:00pm

Meeting dates: Jan 25 – April 28

Meeting Location: Longwood campus - instructor to provide location

CELLBIO 201 is a graduate level course in which students examine fundamental concepts and methodologies in cell biology with faculty from the field. Through content lectures, methods

lectures, student presentations, and discussion sections, students will explore a broad range of topics including: the cytoskeleton, protein folding and quality control, the ubiquitin-proteasome system, autophagy, protein translocation across membranes, vesicular trafficking, organelle biology, chromosome organization, epigenetics, cell cycle regulation, and signal transduction.

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 evolving approaches used to address those questions
- Design appropriate experimental approaches to address hypotheses related to cell biology
- Analyze and effectively present experimental datasets produced from modern instrumentation

Course Notes: Focus on current paradigms and approaches in cell biology. The structure of this course also includes a discussion component. Any additional details about this component will be provided by the course faculty.

Recommended Prep: Introductory knowledge in biochemistry, genetics, and cell biology.

Course Heads: Lucas Farnung, Lucas_Farnung@hms.harvard.edu

Other Instructors: Danesh Moazed, Dan Finley, Radhika Subramanian, Amy Lee

Discussion Section Faculty: Steve Gygi, Rachel Wolfson, Corey Allard, Pere Puigserver

CELLBIO 207/DRB 207 Development, Stem Cells, and Regeneration

Andrew Lassar

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

M/W, 2:00pm - 4:00pm

Meeting Dates: Jan 25 – April 28

Student Research Proposal Presentation: May 13

Meeting Location: WAB 563

This class 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 signaling, organoid models of nervous system development and their application, axon development and regeneration, neuromuscular development and mechanistic insights for human birth defects, cardiac development, skeletal muscle stem cells in

aging and disease, morphogenesis of branched tubular systems, vasculogenesis, biomechanical regulation of developmental processes, skeletal patterning and development, 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 interesting new research goals in either vertebrate development, stem cell, or regenerative biology and present research proposals to achieve these goals. Thus, the goals of this course are for students to both learn about the molecular tool-kit that evolution has endowed to vertebrates (and other multicellular animals) AND 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: This course is offered as CELLBIO207 and also as DRB207. Includes lectures and conference sessions in which original literature is discussed in depth. A short research proposal is required in lieu of exams.

Recommended Preparation: Introductory graduate-level courses in both Molecular and Cell Biology

Course website: <https://cb207.hms.harvard.edu/>

Course Head: Andrew Lassar, andrew_lassar@hms.harvard.edu

Other Instructors: David Breault, Caroline Burns, John G. Flanagan, Guillermo Garcia-Cardena, Vandana Gupta, Karl Koehler, Sean Megason, Samantha Morris, Olivier Pourquié, Marcos Simoes-Costa

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

Alex Toker

4 units. Enrollment limited to 24. Instructor consent required.

M/W 12:30pm – 2:00pm

Meeting Dates: Jan 25 – Apr 28

Meeting location: Longwood Campus – instructor to provide location

This semester-long course will take you on a molecular-level exploration to examine the basis of human cancer – from a deep dive on genetic aberrations in a cancer cell, through signaling pathways, to big picture cellular and organismal perspectives on cancer. Some of the main concepts 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. Faculty joining us this Spring are experts in the various fields and will provide you with an integrated perspective on past, current, and future approaches in cancer biology research. Many of our faculty are also clinical oncologists and hematologists, offering an insight into how molecular advances are impacting patient care now and are likely to do so in the future. After each part of the course, you will participate in Student Workshops, where you will dissect and learn about the major components of a research proposal and how to successfully write one. You will also engage in an iterative writing and evaluation process with your peers while practicing giving feedback and critique.

COURSE OBJECTIVES

- Understand foundational discoveries that led to major concepts in the field
- Describe the molecular basis of cancer formation
- Identify big open questions in the research areas around these topics
- Synthesize and implement content knowledge while practicing writing skills
- Identify the main components of a research proposal
- Write a research proposal draft
- Practice your peer evaluation and critique skills

Course Notes: Given alternate years with Cell Biology 211.

Recommended Preparation: Advanced biochemistry, molecular genetics, and cell biology

Course Head: Alex Toker, atoker@bidmc.harvard.edu

Other Instructors: Andrew Aguirre, Jon Aster, Alan D'Andrea, Stephen Elledge, Naama Kanarek, Carla Kim, Pasi Jänne, Brendan Manning, Matthew Meyerson, Taru Muranen, Zuzana Tothova, Peter Tsvetkov, Frank Slack, Jessalyn Ubellacker, Eliezer Van Allen, Catherine Wu

Curriculum Advisor: Jelena Patrnogić, jelena_patrnogic@hms.harvard.edu

Genetics

GENETIC 216 Advanced Topics in Gene Expression

Fred Winston

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

T., 2:00pm – 5:00pm

Meeting Dates: Jan 26 – April 27

Meeting location: Longwood campus - instructor to provide location

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.

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.

Course Head: Fred Winston, winston@genetics.med.harvard.edu

Course Instructors: Scott Kennedy, kennedy@genetics.med.harvard.edu, Stephen Buratowski, steve_buratowski@hms.harvard.edu

Human Biology & Translational Medicine

HBTM 200 Pathology of Human Disease

Maria Lehtinen, Mark Fleming

4 units.

Lecture: T/TH 9:00am - 11:00am

Lab: TH, 11:00am - 1:00pm

Meeting Dates: Jan 25 – April 28

Meeting location: Longwood campus - instructor to provide location

This course provides a comprehensive overview of human pathology, with emphasis on mechanisms of disease and modern diagnostic methods. 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. Course objectives 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.

Recommended Preparation: General biology

Course Head: Maria Lehtinen, maria.lehtinen@childrens.harvard.edu, Mark Fleming, Mark.Fleming@childrens.harvard.edu

Immunology

IMMUN 202 Immune and Inflammatory Diseases

Wendy Garrett

4 units. Instructor consent required.

T/TH, 1:30pm – 3:30pm

Meeting dates: Jan 26 – Apr 28

Meeting location: Longwood campus - instructor to provide location

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 (paper discussions) and written exercises (problem sets) to learn how to critically evaluate and synthesize major concepts and tools essential for the study of immunology.

Recommended Preparation: Immunology 201 or its equivalent.

Course Head: Wendy Garrett, wgarrett@hsph.harvard.edu

Additional Instructors: Information provided in syllabus

IMMUN 203 Advances in Immunology

Daniel Lingwood

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

T/TH

T (lecture): 2:30pm – 3:30pm

TH (journal club): 3:00pm – 4:00pm

Meeting Dates: Feb 2 – April 22

Meeting Location: The Ragon Institute of MGH, MIT and Harvard, 600 Main Street, Cambridge

Semester long course, intended for graduate students at Harvard and MIT, jointly taught by Harvard and MIT faculty members at the Ragon Institute of MGH, MIT, and Harvard.

Recommended Prep: Students should have completed or be concurrently enrolled in a basic immunology course.

Course Head: Daniel Lingwood, dlingwood@mgh.harvard.edu

IMMUN 204 Critical Readings for Immunology

Duane Wesemann

4 units.

TH, 10:00am – 1:00pm

Meeting Dates: Jan 28 – Apr 29

Meeting location: Longwood campus - instructor to provide location

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.

Course Head: Duane Wesemann, dwesemann@bwh.harvard.edu

IMMUN 301 Immunology Seminar

Shiv Pillai, Peter Sage

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

Wednesdays

Meet and Greet: 12:00pm – 1:00pm

Discussion Class: 2:00pm – 3:30pm

301 Seminars: 4:00pm – 5:15pm

Wine and Cheese Reception: 5:15pm – 6:15pm

Meeting Dates: Jan 27 – Apr 29

Meeting Locations:

Meet and Greet/Discussion Class: Longwood campus - instructor to provide location

301 Seminars: Longwood campus - instructor to provide location

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. Attendance is required at the Meet and Greets, the discussions and the seminars.

Course Head: Shiv Pillai, pillai@helix.mgh.harvard.edu, Peter Sage, peter_sage@hms.harvard.edu

Microbiology

MICROBI 201 Molecular Biology of the Bacterial Cell

David Rudner, Thomas Bernhardt

4 units. Enrollment limited to 30. Instructor consent required.

T/TH, 9:30am – 11:30am

Meeting Dates: Jan 28 – April 27

Meeting Location: VSC Rm. 1031

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.

Course Notes: This course will include **in person** lectures and paper discussions as well as asynchronous paper reading and problem set assignments.

Course Heads: David Rudner, rudner@hms.harvard.edu, Thomas Bernhardt, thomas_bernhardt@hms.harvard.edu

Course Instructors: Marco Jost (marco_jost@hms.harvard.edu), Simon Dove (simon.dove@childrens.harvard.edu), Sophie Helaine (sophie_helaine@hms.harvard.edu), Tim Van Opijnen (tim.vanopijnen@childrens.harvard.edu), Deepali Ravel (deepali_ravel@hms.harvard.edu)

MICROBI 210/OEB 290 Microbial Sciences: Chemistry, Ecology, and Evolution

Peter Girguis

4 units.

Fri., 9:45am – 11:45am

Meeting Dates: Jan 29 – Apr 23

Meeting Location: Natural History Museum / Museum of Comparative Zoology, MCZ 202, 26 Oxford Street, Cambridge, Harvard College Campus

This is an interdisciplinary graduate-level and advanced undergraduate-level course in which students explore topics in molecular microbiology, microbial diversity, host-microbe associations in health and disease, 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 graduate and advanced undergraduate students, Life Sciences 1a and 1b or their equivalent are required, or permission of instructor. MCB 60 or equivalent is recommended.

Course Head: Peter Girguis, pgirguis@oeb.harvard.edu

Microbiology 213: Social Issues in Biology

Nadine Fornelos Martins

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

W., 5:00pm – 7:00pm

Meeting Dates: Jan 27 – April 28

Meeting Location: Longwood campus - instructor to provide location

This reading and discussion course tackles the kinds of questions that increasingly shape careers in academic and industry research, medicine, public health, and science policy, but are often pushed to the margins of technical training.

The course has two main goals: (1) to equip future scientists, clinicians, and health-sector leaders to think critically about the ethical, social, and economic dimensions of biology and medicine, and (2) to provide a forum for open, rigorous, and respectful discussion of difficult topics that students will encounter in real-world practice. Classes are discussion-based: students read historical and contemporary work on controversial issues in the life sciences and debate them together, guided by subject-matter experts.

Topics typically include:

- Racial and socioeconomic considerations in biomedical research, clinical trials, and access to new therapies
- Public trust, misinformation, and societal responses to vaccination and outbreak
- Emerging neurotechnologies and psychedelics in psychiatry: promise, hype, and regulation
- Consumer genetic testing and genome sequencing: personalization, misinterpretation, and ethical pitfalls
- Ethics of animal experimentation, organoids, and increasingly realistic in vitro and in silico models
- The biology of sex, gender variation, and debates about fairness and exclusion in sports and medicine
- AI and big data in health care: bias, surveillance, and the future of clinical decision-making
- Gene editing, reproductive technologies, and the ethics of “enhancement” versus therapy

By the end of the course, students will:

- Sharpen skills in critically reading and analyzing scientific and popular texts
- Learn to connect biological and medical research to broader social, historical, and technological contexts
- Practice articulating and defending positions on complex ethical questions in writing and in live discussion
- Be better prepared to identify and navigate ethical issues in their own research, clinical practice, policy, or leadership roles

Recommended Preparation: Students from all disciplines are welcome, and no prerequisite courses are required.

Course Notes: Grades will be based on attendance, participation in class discussions, and brief written reflections assigned after each discussion. Required reading materials will be provided one week before each class. Written assignments will be minimal, vary from week to week, and generally will be assigned only in cases of missed classes. There will be no exams.

Course Head: Nadine Fornelos Martins

Neurobiology

NEUROBIO 212 Mathematical Tools for Neuroscience

Kanaka Rajan

4 units. Enrollment limited to 30. Instructor consent required.

W/TH, 10:00am – 11:30am

Meeting Dates: Jan 27 – April 28

Meeting Location: Longwood campus - instructor to provide location

This course aims to equip graduate students with the fundamental quantitative skills necessary for neuroscience research and to serve as a solid foundation for further computational neuroscience classes. The course is aimed at first-, second- or third-year students in the Neuroscience PhD program, and is open to other graduate students in the biosciences. This course will cover the basics of linear algebra, differential equations, probability/statistics, and machine learning (focusing on areas applicable to neuroscience). You will not need any math experience beyond high school calculus. Some amount of coding in Python is necessary for this class. This course will be a flipped classroom course with prerecorded lectures and students working together on problem sets & programming exercises during class time.

Recommended Preparation: There will be some programming exercises in Python so some coding experience will be necessary (email instructor for advice on how to prepare).

Course Heads: Kanaka Rajan, kanaka_rajan@hms.harvard.edu

Additional Instructors: TBD

NEUROBIO 215B The Discipline of Neuroscience

John Assad, Mark Andermann

4 units. Enrollment limited to 30. Instructor consent required.

T/TH, 9:00am – 12:00pm

Meeting Dates: Jan 26 – Apr 27

Meeting Location: Longwood campus - instructor to provide location

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 discussions, 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 (NB215A), 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 (NB215B) 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 anatomically defined structural networks. The course culminates with students writing a grant proposal in the style of the NIH NRSA.

Course Notes: 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. Please note that Program in Neuroscience (PiN) students must take both semesters to fulfill the requirement.

Recommended Prep: Students must successfully complete the Fall semester of course (NEUROBIO 215A).

Course Head: John Assad, john_assad@hms.harvard.edu, Mark Andermann

Additional Instructors: TBD

Speech & Hearing Sciences

SHBT 261 Artificial Intelligence in Medicine

Mengyu Wang, Tobias Elze

4 units.

T., 1:00pm – 3:30pm

Meeting Dates: Jan 26 – Apr 27

Meeting Location: Meeting Location: Longwood campus - instructor to provide location

This course will serve as an introduction to artificial intelligence (AI), with an emphasis on its applications in medicine. It will begin with classical machine learning and then progress to convolutional neural networks. Next, the course will cover key AI topics, including self-supervised foundation models, generative AI for computer vision, recurrent neural networks and transformers, multimodal large language models, visual segmentation, understanding, and grounding, reinforcement learning and multi-agent systems, interpretable and trustworthy AI, and efficient AI. Finally, there will be three special sessions covering: (1) world models and spatial reasoning; (2) AI for science, genomics, and proteomics; and (3) AI for robotics and self-driving. Course assignments will include two coding mini-projects and one final coding project.

Course Notes: Students should be familiar with Python. The course will include a discussion component, with additional details to be provided by the course faculty.

Course Heads: Mengyu Wang, Mengyu_Wang@meei.harvard.edu, Tobias Elze, Tobias_Elze@MEEI.HARVARD.EDU

Other Instructors: Jie Yang; Mohammad Eslami; Yan Luo; Kaichen Zhou; Yue Zhang; Zichang Su; Honghao Liu; Mousa Moradi; Jooyoung Chang; Milen Raytchev

Virology

VIROLOGY 201 Virology

Benjamin Gewurz

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

T/TH, 9:30am-10:50am

Meeting Dates: Jan 26 – May 7

Meeting Location: Longwood campus - instructor to provide location

The course focuses on the following areas of virology: (i) RNA and DNA virus replication mechanisms, (ii) innate responses to viral infection (iii) adaptive immune responses to viral infection, (iv) viral latency and reactivation, (v) 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.

Prerequisite: Virology 200, graduate standing and permission required.

Course Head: Ben Gewurz, bgewurz@bwh.harvard.edu

Other instructors: Aaron Schmidt, Pablo Penaloza, Shira Weingarten-Gabbay, Athe Tsibris, Jon Li, Hao Wu, Jonathan Abraham, Alex Balasz, Jeremie le Pen