Division of Medical Sciences

PhD Programs at Harvard Medical School

Quarter Courses

Spring 2020

Enrollment deadlines

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

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GSAS Academic Calendar 2019-20

16 credits for full-time student status

Contact
617-432-0605
dms_courses@hms.harvard.edu

BCMP 305QC Seminars in Molecular and Mechanistic Biology
Madhvi Venkatesh

CELLBIO 304QC Introduction to Human Gross Anatomy
Gerald Greenhouse, Everett Anderson, Mohini Lutchman, Giorgio Giatsidis

CELLBIO 307QC Molecular Aspects of Chromatin Dynamics
Raul Mostoslavsky, Lee Zou, Johnathan Whetstine, Christopher Ott, Danesh Moazed

CELLBIO 309QC The Basics of Translation
Spyros Artavanis-Tsakonas, David Van Vactor

GENETIC 302QC Teaching 101: Bringing Effective Teaching Practices to your Classroom
Gavin Porter, Deepali Ravel

HBTM 305QC Molecular Bases of Eye Disease
Darlene Dartt, Magali Saint-Geniez

HBTM 308QC Experimental Design & Analysis of Eye & Vision Studies
Russell Woods, Lotfi Merabet, Eric YinShan Ng, Christopher Bennett, Magali Saint-Genez, Matthew Bronstad, Daniel Sun, Corinna Bauer, Alex Bowers, Tobias Elze

IMMUN 301QC Autoimmunity
Francisco Quintana

IMMUN 302QC Clinical Sessions tbc
Rachael Clark

IMMUN 305QC Neuro-Immunology Development, Regeneration & Disease
Isaac Chiu, Beth Stevens, Michael Carroll

IMMUN 312QC Applied Statistics & High Throughput Data Analysis for Immunologists
Meromit Singer, Alos Diallo

IMMUN 317QC Strategies to Achieve Durable Anti-Microbial Host Defense
Wayne Marasco, Quan Zhu

MED-SCI 312QC Graduate TA Training in the Biomedical Sciences
Brad Coleman

MICROBI 360QC The Human Microbiome: Comprehensive Experimental Design & Methodologies
Aleksandar Kostic, Abigail Sloan Devlin

NEUROBIO 313QC Cortical Neurodevelopment and Disease
Corey Harwell, Gord Fishell

NEUROBIO 316QC Probabilistic Models for Neural Data: From Single Neurons to Population Dynamics
Jan Drugowitsch

NEUROBIO 317QC Comparative Neuroanatomy
Wei-Chung Lee, Taralyn Tan

NEUROBIO 333QC Careers in Neuroscience
David Ginty, Brendan Lehnert

Biological Chemistry & Molecular Pharmacology

BCMP 305QC Seminars in Molecular and Mechanistic Biology

Madhvi Venkatesh

2 units. Instructor consent required.

Mon, 5:00p - 6:00p

Seminars in Molecular Mechanistic Biology is a series of student work-in-progress talks that meets approximately once a month during the academic year. Students who are presenting will receive feedback from both the faculty and the other students in the Molecular Mechanistic Biology (MMB) program. The peer-to-peer structure of this course (which is only open to students in MMB) should build community and a sense of belonging to the program. It will also help students develop a deeper understanding of the study of molecular mechanisms outside of their own labs and build relationships with faculty.

Course Notes Registration for this class is limited to students who are a part of the Molecular Mechanistic Biology program. Students should contact Madhvi Venkatesh regarding enrollment.

Meeting Dates Feb 3 - May 4
Location Students will be contacted directly with a room
Course Head Madhvi Venkatesh, madhvi_venkatesh@hms.harvard.edu

Cell Biology

CELLBIO 304QC Introduction to Human Gross Anatomy

Gerald Greenhouse, Everett Anderson, Mohini Lutchman

2 units. Enrollment limited to 24.

MWF, 12:00p - 7:00p

Lectures, laboratory dissections, and prosections will provide students an opportunity to explore the gross structure and function of the human body. The course will provide a foundation for the student to acquire practical skills in recognizing, dissecting, and differentiating key anatomical structures. Structure/function relationships will be emphasized and some foundation will be provided for understanding the anatomic basis of diseases. Each of the 13 sessions will include a lecture, 3 hours of dissection, and an evening guest lecturer on clinical or research aspects related to the dissections (supper provided).

Course Notes Open to graduate, undergraduate students, postdoctoral fellows and research assistants. Students **must** enroll during the Spring enrollment period.

Meeting Dates Jun 15 - Jul 22
Location TMEC 447
Course Director Gerald Greenhouse, gerald_greenhouse@hms.harvard.edu

CELLBIO 307QC Molecular Aspects of Chromatin Dynamics

Raul Mostoslavsky, Lee Zou, Johnathan Whetstine, Christopher Ott, Danesh Moazed

Mon/Thu, 3:00p - 5:00p

This course will discuss the role of chromatin dynamics in modulating molecular and cellular processes. The genetic information encoded in our DNA is organized in a defined set of chromosomes, which are condensed about 10.000 fold in order to fit in the cell nucleus. This compaction occurs through packaging of the DNA around histone proteins, a structure known as chromatin. In what was thought to be a rigid structure, today we know that chromatin is an amazingly dynamic folding that plays a crucial role in controlling accessibility of factors to the DNA, and as such, it regulates a vast number of critical biological functions, including gene transcription, DNA replication, DNA repair and cellular identity. In this course we will attempt to cover some of the basic molecular mechanisms that play a role in regulating chromatin dynamics, and in turn how chromatin itself modulate biological processes, including basic mechanisms of inheritance. We will specifically discuss the role of DNA methylation, histone modifications, nucleosome dynamics and novel epigenetic modulators in the context of different biological processes for which chromatin accessibility appears to play a crucial role.

Meeting Dates Mar 30 - May 21
Location TMEC 446
Course Heads Raul Mostoslavsky, rmostoslavsky@mgh.harvard.edu, Danesh Moazed, danesh_moazed@hms.harvard.edu, Lee Zou, lzou1@partners.org, Johnathan Whetstine, johnathan.whetstine@fccc.edu, Christopher Ott, christopher.ott@mgh.harvard.edu

CELLBIO 309QC The Basics of Translation

David Van Vactor, Spyros Artavanis-Tsakonas

Tue, 5:30p - 7:30p (dinner provided)

The development of two anti-neurodegeneration drugs against Spinal Muscular Atrophy, Amyotrophic Lateral Sclerosis and Alzheimer's Disease

This year, our biotech/drug development course will focus on how a novel therapeutic modality has grown from a scientific curiosity to a promising and indeed proven therapeutic approach. Antisense nucleotides (ASOs) define along with small molecule drugs and biologicals (antibodies) a new therapeutic modality. The efficacy of this modality, the cell biology and chemistry of ASOs as new drug, will be discussed in the context of an ASO that has been shown to be efficacious in addressing two devastating diseases: Spinal Muscular Dystrophy (SMA) and Amyotrophic Lateral Sclerosis (ALS). We will also address the critical issue of clinical trials, including their design, the criteria of success and , using as a paradigm an antibody that in spite of early promise has yet to fulfill the criteria necessary to address Alzheimer's , a disease that unlike SMA where patient numbers are relatively small, it affects hundreds of thousands if not millions of patients worldwide.

This course begins in mid-March, and highlights different topics each week that will illustrate how investigation of basic principles and phenomena in cell and molecular biology open important doorways to understanding of disease mechanisms and how such knowledge can be translated

into drug development and avenues to commercialization. A lively in-depth discussion is the core objective for students in the course; thus the assessment will be entirely based on in-class participation.

Meeting Dates Mar 24 - May 8
Location SGM502
Course Heads David Van Vactor, davie_vanvactor@hms.harvard.edu, Spyros Artavanis-Tsakonas, artavanis@hms.harvard.edu

Genetics

GENETIC 302QC Teaching 101: Bringing Effective Teaching Practices to your Classroom

Gavin Porter, Deepali Ravel

2 units. Enrollment limited to 12.

Wed, 10:00a - 12:00p

A course to develop the skills of effective teaching. Primary focus is hands-on experience with objective-oriented lesson planning and execution, with emphasis on active learning techniques and how they can be applied in both large and small enrollment classes.

Course learning objectives:

- Students will learn to plan lessons with clear goals and objectives.
- Students will distinguish between active and passive learning techniques and create active in-class activities that support their learning objectives.
- Students will become comfortable presenting material to students and gain confidence facilitating learning activities and discussions.

Meeting Dates Feb 12 - Apr 15
Location TMEC 330
Course Head Gavin Porter, gavin_porter@hms.harvard.edu, Deepali Ravel, deepali_ravel@hms.harvard.edu

Human Biology & Translational Medicine

HBTM 305QC Molecular Bases of Eye Disease

Darlene Dartt, Magali Saint-Geniez

2 units.

Mon, 3:00p - 5:00p

This course provides an overview of the pathogenic processes of prevalent ocular diseases. The goals of the course are: (i) to explore the structural and functional aspects of the eye relevant to understanding its pathology, (ii) to review the manifestations of common eye diseases and their

effects on vision, (iii) to discuss current views and research in the pathophysiology, and strategies for therapeutic intervention. For most sessions, the basic science and clinical topics will be presented by two faculty lecturers.

Meeting Dates Jan 27 - May 18
Location Schepens Eye Research Institute, 2nd Floor Conference Room
Course Heads Darlene Dartt, dartt@vision.eri.harvard.edu, Magali Saint-Geniez, magali@vision.eri.harvard.edu
Course Coordinator Keisha James, keisha_james@meei.harvard.edu

HBTM 308QC Experimental Design and Analysis of Eye and Vision Studies

Russell Woods, Lotfi Merabet, Tatjana Jacobs, Eric YinShan Ng, Christopher Bennett, Eleftherios Paschalis Ilios, Daniel Sun, Corinna Bauer, Alex Bowers, Tobias Elze, Alice Lorch

2 units. Enrollment limited to 16.

Tue, 2:00p - 4:00p (every 2 weeks)

This course will be a series of workshops in which the design and analysis of experiments conducted within vision and eye research will be considered. At each session, a faculty member will provide and introduce data from a real study that they have conducted as an example. Issues around experimental design will be discussed. Then, using the participant's own software on their computer, we will work through analyses of that data, guided by two faculty members. Thus, participants will handle real data and address real experimental design and data issues.

Course Notes Participants must bring a laptop computer with a statistical analysis package with which they are familiar. Data will be available for download in advance of each session.

Recommended Prep An assignment will be provided before each session and participants will be expected to complete that assignment before the session. The assignment will be reviewed at the start of the workshop. Another assignment will be given at the end of each workshop. Participants will have one week to complete and submit. Grading and feedback will be provided.

Meeting Dates Feb 5 - Apr 28
Location 2W Common Room, Schepens Eye Research Institute, 20 Staniford Street, Boston
Course Head Russell Woods, russell_woods@meei.harvard.edu, Lotfi Merabet, lotfi_merabet@meei.harvard.edu

Immunology

IMMUN 301QC Autoimmunity

Francisco Quintana

2 units.

Mon, 4:00p - 6:00p

This course will focus on basic immunological mechanisms of autoimmune diseases, with an emphasis on recent advances in the field. At each session, we will focus on a particular topic and discuss three important publications.

Meeting Dates TBC
Location TBC
Course Head Francisco Quintana, franquin@broadinstitute.org

IMMUN 302QC Clinical Sessions tbc

Rachael Clark

2 units.

Tue, 12:00p - 1:00p

Lectures by physician scientists and clinical exposure to patients with immunologically mediated diseases. The goal is to foster translational research into human immunologic disease.

Course Notes Only first-year Harvard Immunology PhD and master's students.

Meeting Dates TBC
Location Modell 258
Course Head Rachael Clark, rclark@bwh.harvard.edu

IMMUN 305QC Neuro-Immunology in Development, Regeneration & Disease

Isaac Chiu, Beth Stevens, Jun Huh, Michael Carroll

2 units.

Thu, 4:00p - 6:30p

It is increasingly clear that the nervous system and immune system share parallel molecular pathways, and communication between neurons and immune cells play significant roles in homeostasis and disease. This course will investigate current topics in neuro-immunology: CNS development, chronic pain, neuro-degeneration, aging, axon regeneration, auto-immunity and infection. We will focus our discussions on molecular mechanisms shared by the immune and nervous systems and the molecular cross-talk between these two systems.

Each class will cover a specific topic in neuro-immunology. Students should be prepared to lead discussions on pre-selected papers for each session.

Meeting Dates Mar 18 - May 6
Location TMEC 330

Course Heads Isaac Chiu, isaac_chiu@hms.harvard.edu, Beth Stevens, beth.stevens@childrens.harvard.edu, Michael Carroll, michael.carroll@childrens.harvard.edu, Jun Huh, jun_huh@hms.harvard.edu

IMMUN 312QC Applied Statistics and High Throughput Data Analysis for Immunologists

Meromit Singer, Alos Diallo

2 units.

Mon, 2:00p - 3:30p workshops
Fri, 2:00p - 3:30p lectures

This course will provide a friendly, fun, and exciting entry point for students who wish to build confidence in data analysis and the application of statistical tools and packages. Lecture topics will include fundamentals of statistical analysis (e.g., hypothesis testing, inferring the mean, experiment design), modeling, and classification.

Course Notes Workshops are designed specifically for Immunology PhD students and are not open for enrollment without prior instructor consent. The lectures are open for enrollment to all Immunology graduate students, no consent required.

Meeting Dates Jan 31 - Mar 13
Location Modell 100A lectures, Modell 258 workshops
Course Heads Meromit Singer, msinger@ds.dfci.harvard.edu, Alos Diallo, alos_diallo@hms.harvard.edu

IMMUN 317QC Strategies to Achieve Durable Anti-Microbial Host Defense

Wayne Marasco, Quan Zhu

2 units. Enrollment limited to 15.

Tue, 10:00a - 12:00p

Achieving long term immunity in humans to emerging viral pathogens is an important component of global health for which there are broad socioeconomic and geopolitical implications. Yet this effort has been thwarted because of genetic variability of circulating strains and ease of undergoing antibody neutralization escape. In addition, zoonotic transfer of viruses to humans can lead to emergence of new viruses into the human population that can lead to pandemics in the absence of anti-viral herd immunity. This course will primarily focus on broadly neutralizing and protective anti-viral antibody responses and how critical epitope selection on viral glycoproteins that can help to achieve long-term immunity. We will examine through classical and contemporary readings several principles that can be used to design vaccines and anti-viral antibodies to target the virus's Achilles heel. Critical teachings in this class will include studying how immunoediting of viruses can drive neutralization escape and zoonotic transfer across species. We will discuss the molecular characteristics of bone marrow derived long-lived plasma cells. We will also discuss how to interrogate the broadly neutralizing antibody response to natural infection and vaccines using modern molecular techniques such as NGS and Ab RepSeq. There is also much effort in the field to

engineer broadly neutralizing antibodies for passive immunotherapy as prophylactic, preemptive and therapeutic agents. These treatments include therapeutic antibody gene transfer and bi-and trispecific anti-viral monoclonal antibodies. Numerous viruses will be discussed including HIV and emerging influenza, coronaviruses, flaviviruses, alpha viruses, Ebola and others. We will touch on intracellular microbial pathogens. The course will be structured with 20-30 min didactic lectures by Dr. Marasco and other lecturers followed by discussion of 3-5 published papers on the assigned topic of the day.

Course Notes There has been explosive growth of our understanding of host defense against microbial infections. However, our immune responses are not always protective and in fact, can promote microbial evolution. The most dramatic examples of this comes from the study of RNA viruses where immune editing by the viruses results in neutralization escape which is commonly seen. Is this different from what cancer cells do? This course will be primarily immunology based but will provide a strong understanding of how to select the viral proteins that can be targeted to block virus attachment, uncoating and egress. We will focus on how we can establish durable antiviral immunity through active and passive immunization. We will get the pulse of the class and see what directions and topics we want to cover and some of the course readings can be tailored to this interest.

Recommended Prep Background in immunology and virology is strongly recommended. Must be a PhD student at Harvard or postdoctoral fellow; otherwise, course director permission required.

Meeting Dates Jan 28 - Mar 31
Location Modell 100A
Course Head Wayne Marasco, wayne_marasco@dfci.harvard.edu

Dates and Tentative Topics (subject to change)

Schedule 1 (1/28): In vitro neutralization vs in vivo protection

Schedule 2 (2/4): Finding a viruses Achilles Heel

Schedule 3 (2/11): Long term immunologic memory

Week of 2/17- No Class (Marasco)

Schedule 4 (2/25): Vaccine and therapeutic strategies against HIV

Schedule 5 (3/3): Vaccine and therapeutic strategies against influenza

Schedule 6 (3/10): Vaccine and therapeutic strategies against flaviviruses, Denge, WNV, Zika, etc

Schedule 7 (3/17): Vaccine and therapeutic strategies against coronaviruses including SARS and MERS. What did we learn?

Schedule 8 (3/24): Therapeutic antibody gene transfer coming to age

Schedule 9 (3/31): Alpha viruses, Ebola and one mycobacterium of global interest, TB

Medical Sciences

MED-SCI 312QC Graduate TA Training in the Biomedical Sciences tbc

Bradley Coleman, Taralyn Tan

2 units. Enrollment limited to 50. Instructor consent required.

MED-SCI 312QC is designed to be an 'on the ground' training for Longwood-based teaching assistants. The course instructs graduate student teaching assistants in the pedagogy and course management skills required to be an effective TA. The course begins with three two-hour class sessions that focus on the basics of evidence-based teaching practice and practical strategies for working with students. As the semester progresses, students use their work as TAs as the basis for continued instruction and reflection on teaching best practices and the challenges of their application in real-world settings.

Course Notes Open to any HILS graduate student serving as a Teaching Assistant in the fall semester, pending approval of the Curriculum Fellow working in their course (or by special arrangement approved by the Director of the Curriculum Fellows Program).

All students interested in registering for MED-SCI 312QC should also register for the Graduate TA Training in the Biomedical Sciences nanocourse. Any interested student may attend the first three sessions of MED-SCI 312QC and receive nanocourse credit, regardless of whether they are a current TA.

Course Meetings TBD
Location TBD
Course Director Bradley Coleman, bradley_coleman@hms.harvard.edu

Microbiology & Immunobiology

MICROBI 360QC The Human Microbiome: Comprehensive Experimental Design and Methodologies

Aleksandar Kostic, Abigail Sloan Devlin

2 units. Enrollment limited to 15.

MW, 1:00p - 2:30p

This is a comprehensive introduction to the study of human microbial communities and their functions relevant to human physiology. Topics covered include metagenomics, mechanistic interactions of the microbiome with metabolism, the immune system, and the gut-brain axis. Rather than lectures, this course is primarily a critical discussion of the literature

Meeting Dates Jan 27 - Mar 11
Location Folin Wu Room, C Building, HMS Longwood Campus
Course Heads Aleksandar Kostic, aleksandar.kostic@joslin.harvard.edu, Sloan Devlin, sloan_devlin@hms.harvard.edu

Neurobiology

NEUROBIO 313QC Cortical Neurodevelopment and Disease

Corey Harwell, Gord Fishell

2 units.

Wed/Fri, 3:00p - 4:30p

This course considers the production and assembly of the diverse circuits of the cerebral cortex. Topics include neurogenesis, cell lineage and fate determination, neuronal migration, axon guidance, synapse formation and stabilization, and the human neurodevelopmental disorders that arise when these processes are disrupted.

Class Notes No class weeks of Feb 17 and Mar 16.

Meeting Dates Feb 5 - Mar 27
Location Armenise 330
Course Heads Corey Harwell, corey_harwell@hms.harvard.edu, Gord Fishell, gordon_fishell@hms.harvard.edu

NEUROBIO 316QC Probabilistic Models for Neural Data: From Single Neurons to Population Dynamics

Jan Drugowitsch

2 units.

Wed, 5:00p - 7:00p

Probabilistic models are a powerful approach for gaining an understanding of what drives the activity of individual neurons and neural populations. This course will dissect their modular, plug-and-play structure, from single-neuron models over generalized linear models to state space models for population dynamics. Students will learn their basic building blocks, and how to flexibly assemble them to suit their own data analysis needs. Upon completion of the course, students should be able to (i) identify the model structure and associated assumptions of common models in the literature; (ii) apply existing probabilistic models to neural datasets; and (iii) flexibly design new models by re-using existing model components.

Recommended Prep The course has no hard prerequisites, but students are expected to have some understanding of linear algebra, calculus, and (Bayesian) probability theory. Furthermore, they should be comfortable with Python, which will be used for exercises.

Meeting Dates Jan 29 - Mar 25
Location Goldenson 318
Course Heads Jan Drugowitsch, jan_drugowitsch@hms.harvard.edu

NEUROBIO 317QC Comparative Neuroanatomy

Wei-Chung Lee, Taralyn Tan

2 Units. Enrollment limited to 25. Instructor consent required.

T, Th, 3:30p - 5:00p

Neuroscientists employ diverse model systems and experimental approaches to study nervous system structure and function. Through a combination of lectures, hands-on activities and paper discussions, this quarter course will introduce students to principles of nervous system organization and will provide a conceptual understanding of the spatial and functional relationships among components of the nervous system. Modern experimental methods and online resources to study neural circuit structure and function across model organisms will also be highlighted.

Meeting Dates Feb 18 - Apr 9
Location TMEC 332
Course Head Wei-Chung Lee, wei-chung_lee@hms.harvard.edu, Taralyn Tan, taralyn_tan@hms.harvard.edu

NEUROBIO 333QC Careers in Neuroscience

David Ginty, Brendan Lehnert

2 Units. Enrollment limited to 25. Instructor consent required.

Th, 5:30p - 7:00p (every other week)

This course is intended to provide PiN PhD candidates with a structured introduction to career skills that enable success after the completion of the PhD, and is directed to those considering both academic and non-academic paths. There will be ten sessions in total, and each session will feature one or more invited discussion leaders who can relate the merits and challenges of particular career paths and the skills required to be successful.

Class Notes The course meets in WAB 236 from 5:30 to 7:00pm, beginning January 30, and continues every other Thursday, though meeting dates may change subject to speaker availability. Dinner is provided.

Meeting Dates Jan 30 - Jun 4 (every other week)
Location Warren Alpert 236
Course Head David Ginty, david_ginty@hms.harvard.edu
Teaching Assistant Brendan Peltonen Lehnert, blehnert@hms.harvard.edu