FALL 2023 QC'S

HARVARD
DIVISION OF MEDICAL SCIENCES

Fall 2023
Quarter Courses (QC)

Referred to as "Half Term" in Academic Calendar

Fall Session 1 (Half-Term QC's): 09/05/23 – 10/13/23
Fall Session 2 (Half-Term QC's): 10/16/23 – 12/05/23

ENROLLMENT DEADLINES

Check-in Opens	**Aug. 9**
Check-in Deadline	**Aug. 21**
Full Term/Fall 1 Course Reg.	**Aug. 21**
Fall 1 Course Reg. Deadline	**Aug. 31**
Fall 1 Begins	**Sept. 5**
Fall 1 Add/Drop Deadline	**Sept. 7**
Fall 1 Withdraw Deadline (no fees)	**Oct. 13**
Fall 2 Begins	**Oct. 16**
Fall 2 Course Reg. Deadline	**Oct. 20**
Fall 2 Add/Drop Deadline	**Nov. 2**
Fall 2 Withdraw Deadline (no fees)	**Nov. 10**

ACADEMIC CALENDAR

https://registrar.fas.harvard.edu/gsas-academic-calendar

REMINDERS

You **cannot register** for courses until you CHECK-IN (or go to: https://gsas.harvard.edu/policy/check-and-registration-resident-students#:~:text=Resident%20students%20must%20check%20in,the%20Academic%20Calendar%20for%20deadlines

Register for **16 credits is required** for full-time student status and health insurance eligibility. Register by going to https://my.harvard.edu/

Due to the new Prior Term Enrollment process, students will enroll in Spring 2024 courses in November 2023. For more information visit: https://registrar.fas.harvard.edu/prior-term-registration

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

Revised 9/1/23

CELLBIO 306QC Teaching 100: The Theory & Science of Teaching
Taralyn Tan

HBTM 302QC Imaging and Microscopy Methods in Biology & Medicine
Lev Perelman

IMMUN 306QC Systems Immunology
Nir Hacohen, Christophe Benoist, Martin Hemberg

IMMUN 307QC Cancer Immunology
Kai Wucherpfennig, Stephanie Dougan, Philip Kranzusch, Judith Agudo

IMMUN 315QC Therapeutic Antibody Engineering – From Bench to Bedside
Wayne Marasco

IMMUN 319QC Mechanisms and therapeutics of inflammation and resolution
Timothy Hla

MED-SCI 300QC Responsible Conduct of Science (REQUIRED for G2 Students)
Rosalind Segal

MED-SCI 302QC Responsible Conduct of Science Refresher (REQUIRED for G6 Students)
Rosalind Segal

NEUROBIO 306QC Quantitative Methods for Biologists (AUGUST BOOTCAMP)
Michael Springer, Richard T. Born, Ella R. Batty

NEUROBIO 309QC The Molecular Pathology and Current Therapies for Eye Diseases
Dong Feng Chen

NEUROBIO 315QC Human Neuroanatomy & Neuropathology
Matthew Frosch, Jean Augustinack

SHBT 301QC Introduction to Speech & Hearing Laboratories
Gwen Geleoc

SHBT 361QC Artificial Intelligence in Medicine
Mengyu Wang, Tobias Elze

Cell Biology

CELLBIO 306QC: Teaching 100: The Theory & Science of Teaching

Taralyn Tan

2 units. Enrollment limited to 20 per section (total enrollment 40). Instructor consent required.

In-person section
M., 2:00pm - 4:00pm
Meeting Dates: September 18 – November 6
Meeting Location: Tosteson Medical Education Center (TMEC), Rm. 250 **(9/18)** and Rm. 128 (duration of course)

Remote section (only for Master's students)
W., 8:00am - 10:00am
Meeting Dates: September 20 – November 8
Meeting Location: Zoom information provided by instructor

Course materials to be released beginning Sept. 6. The course wraps up the end of November.

For many graduate students and medical educators, teaching will be part of their career, whether as mentoring, formal classroom teaching, or teaching in the hospital. In addition, the theory and research evidence accumulating in the disciplines of cognitive psychology, neuroscience, and from STEM classrooms, has turned the question of "How do we best teach science and medicine?" into its own scientific discipline. The Theory and Science of Teaching focuses on understanding why certain teaching methods are effective by examining the scientific research and theoretical frameworks that support these methods. We will read and discuss foundational educational and cognitive psychology texts and primary literature, and then develop course materials that allow us to put these ideas into practice.

Class Note: Class will meet for 2 hours of synchronous discussion and learning activities each week. The in-person section will meet Mondays from 2:00-4:00 pm in Longwood and is intended for PhD students who must take their classes in-person. The remote section will meet Wednesdays from 8:00-10:00 am over Zoom and is reserved for master's students. The content of the sections will be the same and both will share identical asynchronous learning components. This will include watching videos, reading a variety of materials, participating in discussion boards, creating sample materials, and writing learning reflections. The synchronous and asynchronous components combine to meet the course objectives and are equally important to students' learning.

Class begins September 6th with the release of the first asynchronous module, which students will complete and discuss in short, individually scheduled small group meetings with the course instructor prior to the start of synchronous class sessions. The first synchronous class meeting is September 18th (in-person section) and September 20 (remote section). The final synchronous class meetings will be held November 6th/8th. The capstone course syllabus assignment will be due the following week (November 13th/15th) and the course will conclude with individually scheduled small group meetings with the course instructor at the end of November.

Course Note: The course has been designed as a companion to GENETIC 302QC: Teaching 101, but neither course is a prerequisite of the other.
Required Prep: Make It Stick, by Brown, Roediger and McDaniel is required pre-reading and should be completed before the first day of class on September 18th/20th. A required asynchronous 'module 0' will be released on Canvas on September 6th.

Course Head: Taralyn Tan, Taralyn_Tan@hms.harvard.edu

Human Biology & Translational Medicine

HBTM 302QC Imaging and Microscopy Methods in Biology & Medicine

Lev Perelman

Fall 1 QC
2 units. Enrollment limited to 15. Instructor consent required.
TH, 3:00pm - 5:00pm
Meeting Dates: September 21 – December 7
Meeting Location: Countway, L1-024
(Note: if applicable, breakout rooms vary by date - instructor to provide details)

This quarter course will introduce students to modern imaging modalities used in biology and medicine, with emphasis on modalities most frequently employed in cellular and molecular biology. The course will offer an overview of the basic principles of light and electron microscopy and explain their resolution limits and sources of contrast. We will discuss modality-specific functionally relevant fluorescence molecular probes which can be used for live cell imaging. The course will provide a detailed review and theory of operation of modern advanced light microscopy techniques such as confocal, line-scanning, light sheet, STED, light scattering, multi-photon and superresolution microscopy. We will then discuss Raman and light scattering spectroscopy methods for monitoring induced pluripotent stem cell differentiation, genetic targeting in microscopy and CRISPR-based photoactivatable transcription systems and basic

concepts of optogenetics. We will review specific optogenetic actuators and sensors, modern light delivery techniques and various applications from investigating brain functions to cardiac optogenetics. We will also offer an overview of medical imaging techniques, such as ultrasound, X-ray CT, MRI, PET/SPECT, and ultrasound imaging, along with emerging optical imaging and spectroscopy methods. Lectures will be supplemented by visual demonstrations of the microscopy systems and hands-on laboratory work and discussions of the operation principles of those systems.

Course Head: Lev Perelman, lperelman@fas.harvard.edu

Immunology

IMMUN 306QC Systems Immunology

Nir Hacohen, Christophe Benoist, Martin Hemberg

2 units. Instructor consent required.
Fall 1 QC

F., 9:00am – 12:00pm
Meeting Dates: September 15 – December 1
Lecture/Discussion: 9:00am – 10:00am
Meeting Location: Tosteson Medical Education Center (TMEC) – Rm 423
Hands-on Computational Workshop: 10:00am-12:00pm
Meeting Location: Tosteson Medical Education Center (TMEC) – Rm 423

The focus in this course is on the emerging area of systems immunology. We will learn how leading-edge approaches in genetics, transcriptomics, epigenomics, proteomics, genetic perturbation screens, T/B repertoires, microbiomes, and tissue architecture can be used to understand immune cell types and states, intracellular and intercellular circuits underlying immunity, and mechanisms of immune diseases. Classes will consist of pre-recorded lectures, live sessions to discuss leading-edge studies, followed by a companion workshop for hands-on computational analysis of data related to key topics. Note: For Fall 2023, the course will be shortened to only include a few lectures on computational methods and transcriptomics and the hands-on workshops. In 2024, we will return to the full course.

Course Heads: Nir Hacohen, nhacohen@mgh.harvard.edu, Christophe Benoist, cb@hms.harvard.edu, Martin Hemberg, mhemberg@bwh.harvard.edu

IMMUN 307QC Cancer Immunology

Kai Wucherpfennig, Stephanie Dougan, Philip Kranzusch, Judith Agudo

Fall 2 QC
2 units. Enrollment limited to 20. Instructor consent required.
M, 4:00pm - 6:00pm
Meeting Dates: October 30 – December 11 (7 sessions)
Meeting Location: Modell 100A

There have been many exciting recent developments in the cancer immunology field, and multiple therapeutic approaches have shown efficacy against diverse types of cancer. This course will emphasize new mechanistic insights, specifically on the following topics: mechanisms of spontaneous protective anti-tumor immunity; key effector cell populations of anti-tumor immunity; innate immune pathways in tumor immunity; inflammation and tumor microenvironment; immunosuppressive mechanisms in tumor immunity; targeting of inhibitory receptors; cancer vaccines.

Course Note: Must be PhD student at Harvard or postdoctoral fellow

Course Head: Kai Wucherpfennig, kai_wucherpfennig@dfci.harvard.edu
Other Instructors: Dougan, Stephanie, Kranzusch, Philip, Agudo, Judith

IMMUN 315QC Therapeutic Antibody Engineering – From Bench to Bedside

Wayne Marasco

Fall 2 QC
2 units. Enrollment limited to 15. Instructor consent required.
T, 10:00am - 12:00pm

Meeting Dates: September 5 – November 28
Meeting Location: Modell 100A

This quarter course will focus on all aspects of therapeutic antibody (Ab) engineering from bench to bedside with an emphasis on translational research. Each class will focus on a different aspect of Ab engineering and will start with short didactic lectures followed by discussion of 2-3 seminal papers that are assigned readings. Students are expected to present assigned papers and lead discussions. Ab discovery will include readings on generation of diverse Ab repertoires, in vitro microbial discovery platforms such as Ab-phagemid and Ab yeast display as well as single B cell cloning strategies. Current state of the art of human Ig locus

transgenic mice and gene-editing strategies will be discussed. Engineering strategies will include chimeric, humanized and human Abs, and different formats including single chain Abs (scFvs), domain Abs, BITES and Bi-specific Abs. Human Fc engineering to increase or decrease immune-mediated clearance will be discussed including glycan engineering. Manipulating engineered Ab in vivo clearance through size and FcRn interactions will be discussed. We will also discuss nanobodies, antibody drug conjugates and immunotoxins and chimeric antigen receptors as well as the necessary steps to move from bench to bedside will be discussed. A final exam will be an engineering project using an unknown antibody sequence. Lots to learn, it's good stuff!

Course Notes: Must be a MS or PhD student at Harvard or postdoctoral fellow; otherwise course director permission will be needed to enroll.
Recommended Prep: Immunology 201. Background in genetics and biochemistry strongly recommended.

Course Head: Wayne Marasco, wayne_marasco@dfci.harvard.edu

IMMUN 319QC Mechanisms and therapeutics of inflammation and resolution

Timothy Hla

Fall 2 QC
2 units

TH, 10:00am – 12:00pm
Meeting Dates: October 9 – December 14
Meeting Location: Modell 100A

Physiologic inflammation is followed by active resolution mechanisms to return the tissues to normal homeostasis. Uncontrolled inflammation and/or defective resolution mechanisms lead to many diseases, including asthma, fibrosis, cancer, autoimmunity, neurodegeneration and cardiovascular diseases. This course will cover multicellular interaction networks that involve immune, vascular and parenchymal cells, lipid mediators, signaling pathways and organ system-specific mechanisms. Discrete lipid mediator networks, namely, eicosanoids, SPMs, S1P, and LPA that are therapeutically employed to treat diseases will be highlighted. In addition, development of novel therapeutics to control inflammatory and resolution pathology will be discussed.

The course will have an hour of didactic lectures given by expert faculty. The second hour will feature a student-led discussion of a recent journal article in the area of the lecture. Students will also have an opportunity for synthesizing the lecture and/or the journal club in a social

media format (i.e. Tweetorial, You Tube video, minipodcast) for the purpose of communication/ dissemination of scientific information.

Course Head: Timothy Hla, Timothy.Hla@childrens.harvard.edu
Other Instructors: Charles Serhan, cserhan@bwh.harvard.edu, Matt Spite, MSPITE@BWH.HARVARD.EDU

Medical Sciences

MED-SCI 300QC Responsible Conduct of Science (REQUIRED for G2 students)

Rosalind Segal

2 units
Section Meeting Dates and Locations: To be determined by specific section leaders
Lecture Dates and Locations: See canvas page

The 2023 Fall RCoS course will run for 10 weeks. There will be 7 in-person classes, and 3 Zoom lectures. Each class and lecture will be scheduled for an hour and a half. Section meeting dates and locations will be determined by specific section leaders, and announced to students prior to the start of the course.

This course is a required course for all DMS students and all who receive support from NIH training grants. The goal of this course is to inform students about the appropriate conduct of research and the many ethical and social problems that they may encounter during their research career in graduate school. The course consists of three lectures for the entire class and several highly interactive sessions with a small group of fellow students moderated by a faculty member. Some of the issues that will be discussed in this course include experimental design and practices, equity in research, conflict of interest, research misconduct, interactions with members of the laboratory and the mentor, and the ethical role of the scientist in society.

Course Notes: All current G2 students must register for this course on their Fall Semester study cards. Specific enrollment instructions will be sent to current G2s and other eligible students prior to the first day of class. Please contact Bethany_Krevat@hms.harvard.edu, for enrollment inquiries. **Restricted to HILS graduate students within programs on the Longwood campus.**

Course Head: Rosalind Segal, Rosalind_Segal@dfci.harvard.edu
Co-Course Head: Aimee Hollander, Aimee_Hollander@hms.harvard.edu
Course Administrator: Bethany Krevat, Bethany_Krevat@hms.harvard.edu

MED-SCI 302QC Responsible Conduct of Science Refresher (REQUIRED for G6 students)

Rosalind Segal

2 units
Section Meeting Dates and Locations: To be determined by specific section leaders
Lecture Dates and Locations: See canvas page

The 2023 Fall RCoS course will run for 10 weeks. There will be 7 in-person classes, and 3 Zoom lectures. Each class and lecture will be scheduled for an hour and a half. Section meeting dates and locations will be determined by specific section leaders, and announced to students prior to the start of the course.

This course is a required course for all DMS students and all who receive support from NIH training grants. The goal of this course is to inform students about the appropriate conduct of research and the many ethical and social problems that they may encounter during their research career in graduate school. The course consists of three lectures for the entire class and several highly interactive sessions with a small group of fellow students moderated by a faculty member. Some of the issues that will be discussed in this course include experimental design and practices, equity in research, conflict of interest, research misconduct, interactions with members of the laboratory and the mentor, and the ethical role of the scientist in society.

Course Notes: All current G6 students must register for this course on their Fall Semester study cards. Specific enrollment instructions will be sent to current G6s and other eligible students prior to the first day of class. Please contact Bethany_Krevat@hms.harvard.edu, for enrollment inquiries. **Restricted to HILS graduate students within programs on the Longwood campus.**

Course Head: Rosalind Segal, Rosalind_Segal@dfci.harvard.edu
Co-Course Head: Aimee Hollander, Aimee_Hollander@hms.harvard.edu
Course Administrator: Bethany Krevat, Bethany_Krevat@hms.harvard.edu

Neurobiology

NEUROBIO 306QC Quantitative Methods for Biologists (August bootcamp)

Michael Springer, Richard T. Born, Ella R. Batty

Fall 1 QC
2 units. Enrollment limited to 80. Instructor consent required.
M/W/F, 10:00am-4:00pm (one-hour break from 2pm-3pm) EST
T/Th, 2:00pm-4:00pm (drop-in/homework) EST
Meeting Dates: August 14 – August 25

Meeting Locations:
M/W/F: Maxwell Dworkin G115 Robert and Naida Lessin Forum (8/21 location, Pierce Hall 301)
T/TH: Tosteson Medical Education Center (TMEC), Rm 227

The goal of this camp is to introduce you to programming in the PYTHON environment and to show you the power this provides for analyzing data and for gaining intuition about the behavior of complex systems through the use of numerical simulations. Some of you, upon encountering in the previous sentence words like "programming" and "numerical simulations," will feel the cold hand of fear grip your stomach, because you have never done any programming and, in fact, have tried to avoid math as much as possible. If so, YOU ARE PRECISELY THE PERSON WE HAD IN MIND as we were planning the course. We are aiming to help you break through this barrier of darkness and fear into the radiant sunshine of quantitative enlightenment. The true beauty of PYTHON, as we will personally demonstrate, is that it allows people who are not mathematically adept (e.g. some of the instructors of this course) to use powerful numerical methods and visualization tools to gain an understanding of concepts that are very difficult to grasp analytically.

Course Notes: The camp is primarily designed for those of you with no prior programming experience. If you fit this description, you should definitely plan to take the course. It is critical to be familiar with a scientific programming language with which to improve your quantitative literacy throughout graduate school.

Sign up here.

Please put this course on your fall term study card if you wish to receive credit for it.
Email Kelsey_Luckenbill@hms.harvard.edu with enquiries.

Course Instructors: Michael Springer, Michael_Springer@hms.harvard.edu, Rick Born, richard_born@hms.harvard.edu, Ella R. Batty, Eleanor_Batty@hms.harvard.edu

NEUROBIO 309QC The Molecular Pathology and Current Therapies for Eye Diseases

Dong Feng Chen, Petr Baranov, Sirois Cheri, Kin-Sang Cho, Shelley Fried, Daniel Sun, Mengyu Wang, Menglu Yang

Fall 2
2 units. Enrollment limited to 20. Instructor consent required.
M. 3:00pm – 5:00pm
Meeting Dates: September 11 – December 4
Meeting Location: Schepens Eye Research Institute Starr Center Breakout Room, 185 Cambridge St., Boston, MA 02114

The eye, as a window to the brain, presents an excellent model system to the study, diagnosis and evaluation of treatment strategies for neurodegenerative disorders in the central nervous system. A surge of progress resulting from studies in the disease mechanisms and the development of new imaging technology have led to a huge step forward in the therapies for diagnosing and treating retinal diseases and preventing blindness. This course will offer students an in-depth examination of current knowledge regarding ocular imaging, diagnosis, molecular pathology, and therapy, with an emphasis on recent breakthroughs and discussion of key literature in the field. The class consists of lectures and group discussions that focus on seminal papers selected from both the basic science and clinical ophthalmology, which will serve as a basis for teaching students basic concepts of ophthalmology and becoming familiar with advanced imaging tools and animal models of retinal diseases. Each session will review the landmark publications on a particular topic or disease. The class will foster discussion on the implications of studies in eye and other disease mechanisms and therapies.

Course Notes: Offered in alternate years
Recommended Prep: Basic understanding for the anatomy of the eye

Course Head: Dong Feng Chen, dongfeng_chen@meei.harvard.edu
Other Instructors: Petr Baranov, Sirois Cheri, Kin-Sang Cho, Shelley Fried, Daniel Sun, Mengyu Wang, Menglu Yang

NEUROBIO 315QC Human Neuroanatomy & Neuropathology

Matthew Frosch, Jean Augustinack

Fall 2 QC
2 units. Enrollment limited to 20. Instructor consent required.
M/W, 8:30am – 12:00pm
F, 8:30am – 10:30am
Meeting Dates: September 25 – October 30
Meeting Location: TMEC 209/HST lab in TMEC

This course will cover human neuroanatomy in depth, with an emphasis on the functional implications of structure and medical implications of lesions. Teaching occurs through lectures, small group sessions, brain dissection and homework assignments.

Course Notes: Restricted to Graduate Students only. This course is offered as part of HT130. Students may not co-register for both courses.

Course Heads: Matthew Frosch, mfrosch@mgh.harvard.edu, Jean Augustinack, jaugustinack@mgh.harvard.edu

Speech & Hearing Bioscience Technology

SHBT 301QC Introduction to Speech & Hearing Laboratories

Gwen Geleoc

2 units
Meeting Dates: Contact instructor
Meeting Location: Contact instructor

Short research presentations by faculty in the Speech and Hearing Bioscience and Technology to help students select a laboratory for research rotations. Some meetings include an on-site laboratory visit.

Course Head: Gwen Geleoc, Gwenaelle.Geleoc@childrens.harvard.edu

SHBT 361QC Artificial Intelligence in Medicine

Mengyu Wang, Tobias Elze

2 units.

T., 1:00pm – 3:00pm
Meeting Dates: September 5 – December 12
Meeting Location: Schepens Eye Research Institute, 20 Staniford Street, Boston, MA 02114; Room: Second Floor Conference Room

This course offered at Schepens Eye Research Institute will serve as an introduction to artificial intelligence (AI) with an emphasis on their applications in medicine. The course will start from classical linear and non-linear regression models, and then move to classical machine learning models including matrix decomposition methods, random forest, support vector machine and traditional neural network based on multilayer perceptron and finally dive into latest deep neural networks such as convolutional neural networks and transformers. The class will be taught with homework in the form of six mini projects and one final project mainly using medical imaging data along with other medical tests and diagnostic information. We will have three special sessions as the last three classes to overview latest developments on common medical AI modeling topics including segmentation, few-shot learning and anomaly detection.

Course Notes: The prospective students should be familiar with at least one programming language such as MATLAB, R or Python.

Course Heads: Mengyu Wang, Mengyu_Wang@meei.harvard.edu, Tobias Elze, Tobias_Elze@MEEI.HARVARD.EDU
Other Instructors: Mohammad Eslami; Saber Kazeminasab; Ava Kouhana; Yan Luo; Min Shi; Yu Tian