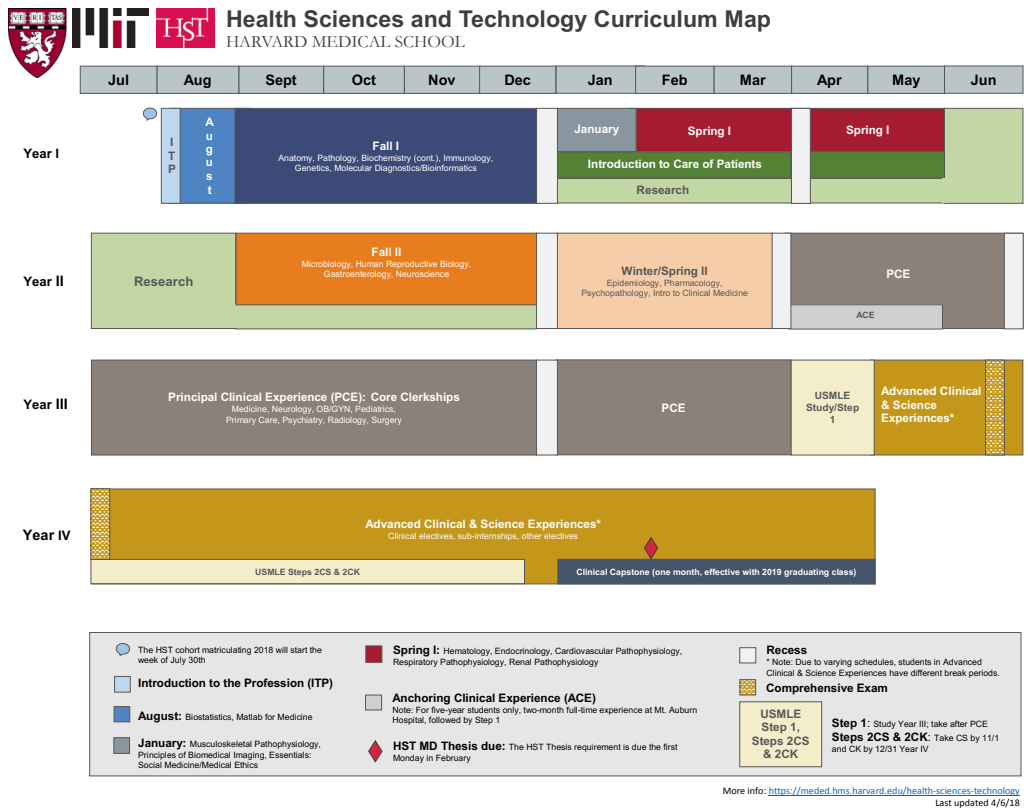


HST COURSE SUMMARIES



Course and Examination Requirements for the MD Degree

HST Course Managers: Patricia Cunningham pat_cunningham@hms.harvard.edu
 Karrol Altarejos karrolrikka_altarejos@hms.harvard.edu

HST Senior Curriculum Manager: Catherine Hodgins catherine_hodgins@hms.harvard.edu

YEAR I – PRECLERKSHIP

AUGUST

IN 555 *Introduction to the Profession*

Course Director: Kate Treadway, MD

Course Manager: Evan Sanders

ktreadway@partners.org

evan@hms.harvard.edu

This is a week long course for all incoming Harvard Medical students designed to introduce students to the duties and responsibilities of being a physician. This includes discussions of the intellectual,

moral, emotional and professional growth that being a physician demands and which begins now as students become physicians in training. Activities include reflection, reading, class discussion and goal setting.

HST 015 *Matlab for Medicine*

Course Director: Matthew P. Frosch, MD, PhD matthew_frosch@hms.harvard.edu

A hands-on introduction to quantitative methods in medicine and health research. Each session will introduce a topic in quantitative techniques applying to medicine that will be modeled in MATLAB. Problem sets applying the lessons learned in this course will be assigned throughout the preclerkship curriculum. Download MATLAB before the course starts.

HST 190 *Introduction to Biostatistics*

Course Director: Sebastien Haneuse, PhD shaneuse@hsph.harvard.edu

Comprehension, critique, and communication of findings from the biomedical literature using the fundamentals of biostatistics. Topics include probability theory, chi-squared and t-tests, ANOVA, linear and logistic regression, survival analysis, and how to perform statistical analysis using MATLAB, together with critical readings of studies published in the medical literature. Students also learn how to assess the importance of chance in the interpretation of experimental data.

FALL

HST 010 *Human Functional Anatomy*

Course Director: Lee Gehrke, PhD lgehrke@mit.edu

Lectures, detailed laboratory dissections, and prosections provide a thorough exploration of the gross structure and function of the human body. Fundamental bioengineering principles are employed to promote analytical approaches to understanding the body's design. The embryology of major organ systems is presented with certain references to phylogenetic development as a basis for comprehending anatomical complexity. Correlation clinics stress both normal and abnormal functions of the body and present evolving knowledge of genes responsible for normal and abnormal anatomy. Lecturers focus on current problems in organ system research.

HST 030 *Human Pathology*

Course Directors: Richard N. Mitchell, MD, PhD rmitchell@partners.org
Robert F. Padera, Jr., MD, PhD rpadera@partners.org

Introduction to the functional structure of normal cells and tissues, pathologic principles of cellular adaptation and injury, inflammation, circulatory disorders, immunologic injury, infection, genetic disorders, and neoplasia, emphasizing clinical correlations and contemporary experimental biology. Includes laboratories with examination of microscopic and gross specimens, and autopsy case studies emphasizing modern pathology practice.

HST 146 *Biochemistry* and Metabolism

Course Director: Sudha Biddinger, MD, PhD sudha.biddinger@childrens.harvard.edu

Intensive study of human biochemistry focusing on intermediary metabolism and structures of key intermediates and enzymes important in human disease for first-year students. Course provides basic understanding of human intermediary metabolism related to disease and therapeutic impact. Focus on four topics: lipids, amino acids, carbohydrates and nucleic acids, underscored with examples from diseases and clinical correlations. Sessions focus on the basics, then later delves into more advanced topics and patient correlates.

HST 160 *Genetics in Modern Medicine*

Course Directors: Sahar Nissim, MD, PhD snissim@partners.org
Salil Garg, MD, PhD salilg@mit.edu

The relationship between molecular biology, genetics, and medicine. Introduction to molecular genetics followed by the genetic basis of diseases, including chromosomal, mitochondrial and epigenetic disease, and the strategies and methods of genetic analysis. Includes diagnostics (prenatal and adult), cancer genetics, and the development of genetic therapies (RNA, viral, and genome editing). Clinical relevance is underscored with patient presentations.

HST 162 *Molecular Diagnostics and Bioinformatics*

Course Directors: Georg K. Gerber, MD, PhD ggerber@partners.org
Long P. Le, MD, PhD lple@partners.org

Introduction to molecular diagnostic methods in medicine and relevant bioinformatics methods. Discussion of principles of molecular testing for diagnosis of somatic and germline diseases using FISH, genotyping, array CGH, next generation sequencing, and other technologies. Case conferences emphasize clinical correlation and integration of information from multiple diagnostic tests. Lectures, problem sets, and laboratory sessions will introduce key concepts in biological sequence analysis and provide experience with bioinformatics tools.

HST 175 *Cellular and Molecular Immunology*

Course Directors: Shiv S. Pillai, MD, PhD pillai@helix.mgh.harvard.edu
Bobby J. Cherayil, MD cherayil@helix.mgh.harvard.edu

Cells and tissues of the immune system, lymphocyte development, structure and function of antigen receptors, cell biology of antigen processing and presentation including molecular structure and assembly of MHC molecules, lymphocyte activation, the biology of cytokines, leukocyte-endothelial interactions, and the pathogenesis of immunologically mediated diseases. Consists of lectures and tutorials in which clinical cases are discussed with faculty tutors. Details of each case covering a number of immunological issues in the context of disease are posted on a student website.

JANUARY

HST 020 *Musculoskeletal Pathophysiology*

Course Director: Mary L. Bouxsein, PhD

mbouxsei@bidmc.harvard.edu

Growth and development of normal bone and joints, the process of mineralization, the biophysics of bone and response to stress and fracture, calcium and phosphate homeostasis and regulation by parathyroid hormone and vitamin D, and the pathogenesis of metabolic bone diseases and disease of connective tissue, joints, and muscles, with consideration of possible mechanisms and underlying metabolic derangements.

HST 164 *Principles of Biomedical Imaging*

Course Directors: Susie Y. Huang, MD, PhD
David E. Sosnovik, MD

syhuang@nmr.mgh.harvard.edu
sosnovik@nmr.mgh.harvard.edu

HST 164 reviews the fundamental principles and techniques underlying biomedical imaging and their application in modern medicine. Emphasis is placed on magnetic resonance but ultrasound, computed tomography, positron emission tomography and optical techniques are covered as well. The course focuses on the quantitative aspects of biomedical imaging and requires a knowledge of differential equations, MATLAB, and intermediate-level physics.

HST 192 *Medical Decision Analysis and Probabilistic Medical Inference* (elective)

Course Directors: M. Brandon Westover, MD, PhD
Pooyan Kazemian, PhD

mwestover@partners.org
pkazemian1@mgh.harvard.edu

Teaches the essentials of quantitative diagnostic reasoning and medical decision analysis. Guides participants through the process of choosing an appropriate contemporary medical problem in which risk-benefit tradeoffs play a prominent role, conducting a decision analysis, and ultimately publishing results in a medical journal. Topics include decision trees, influence diagrams, Markov decision models and Monte Carlo simulation, methods for quantifying patient values, Bayesian inference, decision thresholds, and the cognitive science of medical decision making.

HST 220 *Introduction to the Care of Patients*

Course Director: Howard Heller, MD

helh@med.mit.edu

Introduction to the care of patients through observation and participation in doctor-patient interaction in an outpatient, office-based environment and through patient-oriented seminars. Topics include basic interviewing, issues of ethics and confidentiality, and other aspects of the doctor-patient relationship. Requirements include regular attendance and a short paper on patient care.

SPRING

HST 060 *Endocrinology*

Course Directors: David T. Breault, MD, PhD david.breault@childrens.harvard.edu
William M. Kettyle, MD kettyle@mit.edu
Victor M. Navarro, PhD vnavarro@partners.org

Physiology and pathophysiology of the human endocrine system. Three hours of lecture and section each week. Topics include assay techniques, physiological integration, etc. At frequent clinic sessions, patients are presented who demonstrate clinical problems considered in the didactic lectures.

HST 080 *Hematology*

Course Directors: Nancy Berliner, MD nberliner@partners.org
Edward J. Benz, Jr., MD Edward_benz@dfci.harvard.edu

Intensive survey of the biology, physiology and pathophysiology of blood with systematic consideration of hematopoiesis, white blood cells, red blood cells, platelets, coagulation, plasma proteins, and hematologic malignancies. Emphasis given equally to didactic discussion and analysis of clinical problems.

HST 090 *Cardiovascular Pathophysiology*

Course Director: Elazer R. Edelman, MD, PhD ere@mit.edu

Normal and pathologic physiology of the heart and vascular system. Hemodynamics, electrophysiology, gross pathology, and clinical correlates of cardiovascular function in normal and in a variety of disease states. Special attention given to congenital, rheumatic, valvular heart disease and cardiomyopathy.

HST 100 *Respiratory Pathophysiology*

Course Directors: C. Corey Hardin, MD, PhD chardin@partners.org
Ellen Roche, PhD etr@mit.edu

Histology, cell biology, and physiological function of the lung with multiple examples related to common diseases of the lung. Quantitative approach to the physics of gases, respiratory mechanics, and gas exchange used to explain pathological mechanisms. Use of medical ventilators is discussed in lecture and in laboratory experiences. For MD candidates and other students with background in science.

HST 110 *Renal Pathophysiology*

Course Directors: Julian L. Seifter, MD jseifter@partners.org
Albert Lam, MD aqlam@partners.org

The normal physiology of the kidney and the pathophysiology of renal disease. Emphasis on renal regulation of sodium, potassium, acid, and water balance along with the mechanism and consequences of renal failure. Included also are the pathology and pathophysiology of clinical renal disorders such as acute and chronic glomerulonephritis, pyelonephritis, and vascular disease. New molecular insights into transporter mutations and renal disease are discussed.

HST 220 *Introduction to the Care of Patients*

Course Director: Howard Heller, MD

helh@med.mit.edu

Introduction to the care of patients through observation and participation in doctor-patient interaction in an outpatient, office-based environment and through patient-oriented seminars. Topics include basic interviewing, issues of ethics and confidentiality, and other aspects of the doctor-patient relationship. Requirements include regular attendance and a short paper on patient care.

HST 527 *Blood Vessels and Endothelial Phenotypes in Health and Disease* (elective)

Course Directors: William C. Aird, MD

waird@bidmc.harvard.edu

Guillermo Garcia-Cardena, PhD

ggarcia-cardena@rics.bwh.harvard.edu

The barriers that have traditionally existed between disciplines are rapidly eroding. This is especially true in the field of endothelial cell biology. As a cell layer that traverses virtually every organ in the body, and one that is highly vulnerable to dysfunction and disease, the endothelium has far-reaching impact on human physiology and pathophysiology. This course provides an overview of the endothelium as a model system for understanding biological complexity in health and disease. Emphasis on mechanisms of endothelial cell heterogeneity, the role of endothelial cell function in physiology, and the role of endothelial cell dysfunction in disease, including tumors, sickle cell disease, pulmonary hypertension, and xenotransplantation. Additional topics include novel proteomic and genomic strategies for mapping endothelial cell phenotypes, evolutionary (Darwinian) principles, and complexity theory.

PWY 120 *Essentials of the Profession*

Course Directors: David Jones, MD, PhD

dsjones@harvard.edu

Edward M. Hundert, MD

Edward_hundert@hms.harvard.edu

Course Manager: Rob McCabe

rob@hms.harvard.edu

Social and population science relevant to the practice of medicine: clinical epidemiology, population health, health care policy, social medicine, medical ethics, and professionalism.

YEAR II – PRECLERKSHIP

FALL

HST 040 *Mechanisms of Microbial Pathogenesis*

Course Directors: Clyde S. Crumpacker, II, MD

ccrumpac@bidmc.harvard.edu

Harvey B. Simon, MD

hsimon@partners.org

The mechanisms of pathogenesis of bacteria, viruses, and other microorganisms, spanning molecular to clinical aspects of disease. Topics selected for intrinsic interest and cover the demonstrated spectrum of pathophysiologic mechanisms.

HST 070 *Human Reproductive Biology*

Course Directors: Anastasia H. Koniaris, MD
David C. Page, MD

hst070@gmail.com
page_admin@wi.mit.edu

Lectures and clinical case discussions designed to provide a clear understanding of the physiology, endocrinology, and pathology of human reproduction. Emphasis on the role of technology in reproductive science. Suggestions for future research contributions. Students become involved in the wider aspects of reproduction, such as prenatal diagnosis, in vitro fertilization, abortion, menopause, contraception, and ethics relation to reproductive science.

HST 120 *Gastroenterology*

Course Director(s): Anna Rutherford, MD
Sarah Flier, MD

arutherford@partners.org
sflier1@bidmc.harvard.edu

The anatomy, physiology, biochemistry, biophysics, and bioengineering of the gastrointestinal tract and associated pancreatic, liver, and biliary systems. Emphasis on molecular and pathophysiological basis of disease where known. Covers gross and microscopic pathology and clinical aspects. Formal lectures given by core faculty with guest lectures by local experts. Selected seminars conducted by students with supervision of faculty.

HST 130 *Neuroscience*

Course Directors: John A. Assad, PhD
Matthew P. Frosch, MD, PhD

jassad@hms.harvard.edu
matthew_frosch@hms.harvard.edu

Comprehensive introductory course in neuroscience, exploring the brain on levels ranging from molecules and cells through neural systems, perception, memory, and behavior. Aspects of clinical neuroscience within neuropharmacology, pathophysiology, and neurology. Lectures supplemented by conferences and labs. Labs review neuroanatomy at the gross and microscopic levels.

HST 140 *Molecular Medicine* (elective)

Course Directors: Irving M. London, MD
Vijay Sankaran, MD, PhD
Suneet Agarwal, MD, PhD

imlondon@mit.edu
vsankaran@partners.org
suneet.agarwal@childrens.harvard.edu

Seminar studying a variety of human diseases and the underlying molecular, genetic, and biochemical basis for pathogenesis and pathophysiology. Lectures by faculty and seminars conducted by students, with tutorials and supervision by faculty. Patients presented when feasible. Appropriate for students who have had a course in biochemistry and/or molecular biology.

HST 312 *Clinical Reasoning through CPCs* (elective)

Course Director: Thomas N. Byrne, MD

tnbyrne@partners.org

This longitudinal course will allow students in research labs to maintain clinical connections while developing and refining clinical reasoning through discussion and dissection of New England Journal of Medicine Clinical Pathologic Conferences (CPCs). Targets MD students who are taking a "5th year" to do research, as well as MD/PhD students who have already completed their qualifying exams. Students will read a case presentation before each class meeting, discuss the case presentation

in class, arrive at a differential diagnosis, and discuss the NEJM expert's differential diagnosis and management before evaluating the pathological diagnosis. Though cases will be principally neurological presentations, clinical entities will involve a broad spectrum of diseases including inflammatory, toxic-metabolic, infectious, vascular, neoplastic, endocrine, genetic and degenerative, and students will, thereby, have a superior overview of multiple pathogenic entities over the course of a year. Each session will involve two hours in class in the early evening in the TMEC; the frequency will be twice a month to begin between 4:00 and 6:30 pm. The course is offered for credit with evaluations based on attendance and participation.

WINTER/SPRING

HST 150 *Principles of Pharmacology*

Course Directors: Carl E. Rosow, MD, PhD crosow@partners.org
Stuart A. Forman, MD, PhD saforman@partners.org

Introduction to pharmacology. Mechanisms of drug action, dose-response relations, pharmacokinetics, drug delivery systems, drug metabolism, toxicity of pharmacological agents, drug interactions, and substance abuse. Selected agents and classes of agents examined in detail.

HST 194 *Clinical Epidemiology*

Course Director: Miguel Hernan, PhD mhernan@hsph.harvard.edu

Clinical research is used to describe, predict, and make causal inferences. This course introduces the methods for the generation, analysis, and interpretation of data for clinical research. Major topics include the design of surveys, predictive models, randomized trials, clinical cohorts, and analyses of electronic health records. Students will learn to formulate well-defined research questions, to design data collection, to evaluate algorithms for clinical prediction, to design studies for causal inference, and to identify and prevent biases in clinical research. Familiarity with regression modeling and basic statistical theory is a pre-requisite.

HST 200 *Introduction to Clinical Medicine*

Course Director: Wolfram Goessling, MD, PhD wgoessling@partners.org

Basic skills involved in examination of the patient and introduction to history taking and patient interview. Exposure to clinical problems in medicine, surgery, and pediatrics in groups of two or three students under one faculty member. Findings reported through history taking and oral presentation of the cases to the class. Prerequisite to clinical clerkships.

PS 700M.J *Psychopathology*

Course Director: Steven Schlozman, MD sschlozman@partners.org
Joshua Roffman, MD jroffman@partners.org

Introduction to the clinical features, scientific understanding, and most effective treatments of the major mental health disorders that characterize medical practice. Psychiatric disorders such as mood disorders, schizophrenia, anxiety disorders, trauma and personality disorders will be discussed in depth in both lecture formats and in small group discussions. Sessions will alternate with smaller group sessions at Departments of Psychiatry clinical sites, where students will learn to assess patients

with a range of psychiatric disorders.

Principal Clinical Experience (PCE)

Beth Israel Deaconess Medical Center

PCE Director:	Katharyn Meredith Atkins, MD	katkins@bidmc.harvard.edu
PCE Coordinator:	Liz Langley	ealangle@bidmc.harvard.edu

Brigham and Women's Hospital

PCE Director:	Erik Karl Alexander, MD	ekalexander@partners.org
PCE Manager:	Britt Simonson	Bsimonson1@partners.org
PCE Coordinator:	Preeti Sharma	psharma7@partners.org

Cambridge Health Alliance

PCE Director:	David Alan Hirsh, MD	david_hirsh@hms.harvard.edu
CIC Coordinator:	Shawn Merritt	spmerritt@challiance.org

Massachusetts General Hospital

PCE Director:	Alberto Puig, MD, PhD	apuig@partners.org
PCE Coordinator:	Lisa Neville	lmneville@mgh.harvard.edu

A year-long clinical immersion experience that exposes students to the medical disciplines and experiences essential to becoming a physician. The year consists of 1-month to 3-month clinical rotations in medicine, surgery, pediatrics, obstetrics and gynecology, neurology, psychiatry, and radiology at a single site, supplemented by mentoring and assessment. Students also complete the longitudinal experiences: the multidisciplinary PCE case conferences, the Primary Care Clerkship, and the Developing Physician course.

Anchoring Clinical Experience (ACE)

Mount Auburn Hospital

Course Directors:	Alexandra V. Chabrerie, MD	achabrer@mah.harvard.edu
	Daniel A. Solomon, MD	dasolomo@mah.harvard.edu

A two-month clerkship designed to ground the clinical skills learned in Introduction to Clinical Medicine for HST students doing a research project between their second and third years of medical school. The clerkship is divided into one month of outpatient/ambulatory medicine split between a primary care site as well as subspecialty clinics, and one month of inpatient medicine on the hospital wards. In addition to attending daily hospital based teaching conferences for internal medicine residents, students will have a case-based didactic curriculum that will focus on core topics in internal medicine. Students will be expected to complete a case presentation with a focus on applying primary basic science and clinical trials literature into a discussion of clinical reasoning and decision-making.

HST Thesis Requirement and HST Student Forum Presentation

HST Thesis Committee Chair: Richard N. Mitchell, MD, PhD rmitchell@partners.org
HST Thesis Committee Coordinator: Karrol Altarejos karrolrikka_altarejos@hms.harvard.edu

HST MD students are required to become actively involved in independent research under the direction of a faculty member. Such research may be conducted longitudinally throughout a student's medical studies, if carefully planned. Students are also encouraged to slow the rate of progress through the formal curriculum and take an extra year in order to devote more time to research. As a requirement for graduation, every HST student must present evidence of original, scholarly and creative work in the form of a thesis based on laboratory research or clinical investigation. The thesis topic is to be chosen with the advice of a member of the Faculty, who agrees to act as the thesis supervisor. During their tenure, students are expected to present a poster of their research at the HST Student Forum, an annual event that celebrates the depth and breadth of HST student research effort and scholarly work.

Please note that the curriculum is undergoing continuous review and improvement and is subject to change at any time.