IMPORTANT NOTES regarding preclinical subjects (HST.011–HST.185 and HST.191):

Students not enrolled in an HST degree program may take preclinical subjects if space is available. Non-HST students are limited to one HST preclinical course and must provide justification for enrolling in this course. They must obtain permission from the course director and the Associate Master of HST at HMS. Special students are not permitted to enroll in preclinical subjects.

These subjects are scheduled according to the Harvard Medical School academic calendar, which differs from the MIT calendar. Students whose graduation depends upon completing one or more of these subjects should take particular care regarding the schedule.

HST.011 Human Functional Anatomy
(Subject meets with HST.010)
Prereq: Permission of instructor
G (Fall)
3-11-10 H-LEVEL Grad Credit
Lectures, detailed laboratory dissections, and prosections provide a thorough exploration of the gross structure and function of the human body. Fundamental principles of bioengineering are employed to promote analytical approaches to understanding the body’s design. The embryology of major organ systems is presented, together 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. Only HST students may register under HST.010, graded P/D/F. Lab fee. Enrollment limited to graduate students.

L. Gehrke

HST.021 Musculoskeletal Pathophysiology
(Subject meets with HST.020)
Prereq: Permission of Instructor
G (IAP)
3-0-3 H-LEVEL Grad Credit
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. Only HST students may register under HST.020, graded P/D/F. Enrollment limited; restricted to medical and graduate students.

M. Bouxsein, M. Seton

HST.031 Human Pathology
(Subject meets with HST.030)
Prereq: Permission of instructor; Biology (GIR), Physics I (GIR), or Physics II (GIR)
G (Fall)
4-3-8 H-LEVEL Grad Credit
Credit cannot also be received for HST.034, HST.035
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 in humans. Lectures, conferences emphasizing clinical correlations and contemporary experimental biology. Laboratories with examination of microscopic and gross specimens, and autopsy case studies emphasizing modern pathologic practice. Only HST students may register under HST.030, graded P/D/F. Lab fee. Enrollment limited.

R. N. Mitchell, R. Padera

HST.035 Principles and Practice of Human Pathology
(Subject meets with HST.034)
Prereq: 7.05; or permission of instructor
G (Spring)
4-2-10 H-LEVEL Grad Credit
Credit cannot also be received for HST.030, HST.031
Provides a comprehensive overview of human pathology with emphasis on mechanisms of disease and modern diagnostic technologies. Topics include general mechanisms of disease (inflammation, infection, immune injury, transplantation, genetic disorders and neoplasia); pathology of lipids, enzymes, and molecular transporters; pathology of major organ systems; and review of diagnostic tools from surgical pathology to non-invasive techniques such as spectroscopy, imaging, and molecular markers of disease. The objectives of this subject are achieved by 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. Only HST students enrolled in specific degree programs may register under HST.034, graded P/D/F. Credit cannot also be received for HST.030 or HST.031.

R. Drapkin

HST.041 Mechanisms of Microbial Pathogenesis
(Subject meets with HST.040)
Prereq: Biology (GIR), 7.05, permission of instructor
G (Fall)
3-3-6 H-LEVEL Grad Credit
Deals with the mechanisms of pathogenesis of bacteria, viruses, and other microorganisms. Approach spans mechanisms from molecular to clinical aspects of disease. Topics selected for intrinsic interest and cover the demonstrated spectrum of pathophysiologic mechanisms. Only HST students may register under HST.040, graded P/D/F. Lab fee. Enrollment limited.

C. Crumpacker II, H. Simon
HST.061 Endocrinology
(Subject meets with HST.060)
Prereq: Biology (GIR), 7.05, permission of instructor
G (Spring)
4-0-6 H-LEVEL Grad Credit

Physiology and pathophysiology of the human endocrine system. Three hours of lecture and section each week concern individual parts of the endocrine system. Topics include assay techniques, physiological integration, etc. At frequent clinic sessions, patients are presented who demonstrate clinical problems considered in the didactic lectures. Only HST students may register under HST.060, graded P/D/F. Enrollment limited.

W. Kettyle, D. Breault

HST.071 Human Reproductive Biology
(Subject meets with HST.070)
Prereq: 7.05, permission of instructor
G (Fall; first half of term)
4-0-2 H-LEVEL Grad Credit

Lectures and clinical case discussions designed to provide the student with a clear understanding of the physiology, endocrinology, and pathology of human reproduction. Emphasis is on the role of technology in reproductive science. Suggestions for future research contributions in the field are probed. Students become involved in the wider aspects of reproduction, such as prenatal diagnosis, in vitro fertilization, abortion, menopause, contraception and ethics relating to reproductive science. Only HST students may register under HST.070, graded P/D/F.

A. Koniaris, J. Yeh

HST.081 Hematology
(Subject meets with HST.080)
Prereq: 7.05, permission of instructor
G (Spring; second half of term)
3-6-4 H-LEVEL Grad Credit

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. Enrollment limited.

H. F. Bunn, N. Berliner

HST.091 Cardiovascular Pathophysiology
(Subject meets with HST.090)
Prereq: HST.030 or HST.031; permission of instructor
G (Spring)
4-3-8 H-LEVEL Grad Credit

Normal and pathologic physiology of the heart and vascular system. Emphasis includes 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. Only HST students may register under HST.090, graded P/D/F. Enrollment limited.

E. Edelman

HST.101 Respiratory Pathophysiology
(Subject meets with HST.100)
Prereq: Biology (GIR), 7.05, Physics I (GIR), permission of instructor
G (Spring)
4-0-8 H-LEVEL Grad Credit

Lectures, seminars, and laboratories cover the histology, cell biology, and physiological function of the lung with multiple examples related to common diseases of the lung. A quantitative approach to the physics of gases, respiratory mechanics, and gas exchange is provided 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. Only HST students may register under HST.100, graded P/D/F. Enrollment limited.

J. Drazen, S. Loring

HST.111 Renal Pathophysiology
(Subject meets with HST.110)
Prereq: Biology (GIR), 7.05, permission of instructor
G (Spring)
4-0-8 H-LEVEL Grad Credit

Considers the normal physiology of the kidney and the pathophysiology of renal disease. Renal regulation of sodium, potassium, acid, and water balance are emphasized as are 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. Only HST students may register under HST.110, graded P/D/F. Enrollment limited.

J. Seifter, A. Lam

HST.121 Gastroenterology
(Subject meets with HST.120)
Prereq: Biology (GIR), 7.05, Physics I (GIR), permission of instructor
G (Fall; second half of term)
3-1-2 H-LEVEL Grad Credit

Presents the anatomy, physiology, biochemistry, biophysics, and bioengineering of the gastrointestinal tract and associated pancreatic, liver, and biliary systems. Emphasis on the molecular and pathophysiological basis of disease where known. Covers gross and microscopic pathology and clinical aspects. Formal lectures given by core faculty, with some guest lectures by local experts. Selected seminars conducted by students with supervision of faculty. Only HST students may register under HST.120, graded P/D/F. Enrollment limited.

A. Rutherford, S. Flier

HST.131 Neuroscience
(Subject meets with HST.130)
Prereq: Permission of instructor
G (Fall)
6-3-6 H-LEVEL Grad Credit

Comprehensive study of neuroscience where students explore the brain on levels ranging from molecules and cells through neural systems, perception, memory, and behavior. Includes some aspects of clinical neuroscience, within neuropharmacology, pathophysiology, and neurology. Lectures supplemented by conferences and labs. Labs review neuroanatomy at the gross and microscopic levels. Only HST students may register under HST.130, graded P/D/F. Limited to 50.

J. Assad, M. Frosch

HST.141 Molecular Medicine (New)
Prereq: 7.05
G (Fall)
2-0-4

Conducted as a seminar to study a variety of human diseases and the underlying molecular, genetic, and biochemical basis for the pathogenesis and pathophysiology of the disorders. 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.147 Human Biochemistry and Metabolic Diseases
(Subject meets with HST.146)
Prereq: Permission of instructor
G (Fall, IAP; partial term)
3-0-3 H-LEVEL Grad Credit

First-year graduate level intensive subject in human biochemistry and physiological chemistry that focuses on intermediary metabolism, structures of key intermediates and enzymes important in human disease. Subject is divided into four areas: carbohydrates, lipids, amino acids and nucleic acids. The importance of these areas is underscored with examples from diseases and clinical correlations that are introduced by clinician-scientists. Only HST students may register under HST.146, graded P/D/F. Students must register for both Fall and IAP sections. Enrollment limited.

D. Cohen, R. Mitchell

HST.151 Principles of Pharmacology
(Subject meets with HST.150)
Prereq: Biology (GIR), 7.05, Physics I (GIR)
G (Spring; first half of term)
6-0-6 H-LEVEL Grad Credit

An introduction to pharmacology. Topics include mechanisms of drug action, dose-response relations, pharmacokinetics, drug delivery systems, drug metabolism, toxicity of pharmaceutical agents, drug interactions, and substance abuse. Selected agents and classes of agents examined in detail. BEP students must register for HST.151 (graded) other HST students may register under HST.150 (P/D/F). Course follows HMS calendar. Restricted to HST MD, HST MEMP or HST BEP students.

C. Rosow

HST.161 Molecular Biology and Genetics in Modern Medicine
Prereq: 7.05
G (Fall; partial term)
6-0-6 H-LEVEL Grad Credit

Foundation for understanding the relationship between molecular biology, developmental biology, genetics, genomics, bioinformatics, and medicine. Develops explicit connections between basic research, medical understanding, and the perspective of patients. Principles of human genetics reviewed. Translation of clinical understanding into analysis at the level of the gene, chromosome and molecule; the concepts and techniques of molecular biology and genomics; and the strategies and methods of genetic analysis, including an introduction to bioinformatics. Extends beyond basic principles to current research activity in human genetics.

Only HST students may register under HST.160, graded P/D/F.

K. Musunuru

HST.176 Cellular and Molecular Immunology
(Subject meets with HST.175)
Prereq: 7.05
G (Fall)
5-0-7 H-LEVEL Grad Credit

Covers cells and tissues of the immune system, lymphocyte development, the structure and function of antigen receptors, the 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. Only HST students may register under HST.175, graded P/D/F. Limited to 45.

S. Pillai, B. Cherayil

HST.191 Introduction to Biostatistics and Epidemiology
(Subject meets with HST.190)
Prereq: Calculus II (GIR)
G (IAP)
3-0-3 H-LEVEL Grad Credit

Fundamentals of biostatistics and epidemiology. Trains students how to comprehend, critique and communicate findings from biomedical literature. How to assess the importance of chance in the interpretation of experimental data. Topics include probability theory, normal sampling, chi-squared and t-tests, analysis of variance, linear regression and survival analysis, as well as how to perform elementary calculations using the statistical package STATA. How to identify and prevent bias in observational studies. Causal inference, types of bias (confounding, selection and information bias), key study designs (randomized trials, cohort and case-control studies, and screening programs). Only HST students may register under HST.190, graded P/D/F. Enrollment limited; restricted to medical and graduate students.

R. Betensky, M. Hernandez

HST.192 Medical Decision Analysis and Probabilistic Medical Inference
Prereq: Permission of instructor; HST.191 recommended
G (IAP)
2-0-2 [P/D/F]

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 the 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. Limited to 8; preference to HST students.

M. B. Westover, M. Bianchi, S. Cash

HST.196 Teaching Health Sciences and Technology
Prereq: None
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit

For teaching assistants in HST where the teaching assignment is approved for academic credit by the department.

Staff

HST.198 Independent Study in Health Sciences and Technology
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged H-LEVEL Grad Credit
Can be repeated for credit

Opportunity for independent study of health sciences and technology under regular supervision by an HST faculty member. Projects require prior approval, as well as a substantive paper. Minimum 12 units required.

Consult HST Faculty

HST.199 Research in Health Sciences and Technology
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit

For research assistants in HST where the assigned research is approved for academic credit by the department. Hours are arranged with research supervisor.

S. S. Pillai, R. L. Maas, S. P. Balk, M. L. Bulyk, A. Rosenzweig
HST.200 Introduction to Clinical Medicine
Prereq: Permission of instructor
G (Spring)
9-19-12 [P/D/F] H-LEVEL Grad Credit
February through May, Monday, Wednesday, Friday. Students learn the basic skills involved in examination of the patient and are introduced to history taking and patient interview. Students exposed 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. An intensive subject serving as prerequisite to clinical clerkships. Restricted to MEMP program students.
W. Goessling

HST.201 Introduction to Clinical Medicine and Medical Engineering I
Prereq: Permission of instructor
G (Summer)
0-20-0 [P/D/F] H-LEVEL Grad Credit
Develop skills in patient interviewing and physical examination; become proficient at organizing and communicating clinical information in both written and oral forms; begin integrating history, physical, and laboratory data with pathophysiologic principles; and become familiar with the clinical decision-making process and broad economic, ethical, and sociological issues involved in patient care. There are two sections: one at Mount Auburn Hospital during IAP, and one at West Roxbury VA Hospital beginning in summer. Restricted to MEMP students.
R. G. Mark, J. Strymish

HST.202 Introduction to Clinical Medicine and Medical Engineering II
Prereq: HST.201
G (Fall, IAP, Spring, Summer)
0-20-0 [P/D/F] H-LEVEL Grad Credit
Strengthens the skills developed in HST.201 through a six-week clerkship in medicine at a Harvard-affiliated teaching hospital. Students serve as full-time members of a ward team and participate in longitudinal patient care. In addition, students participate in regularly scheduled teaching conferences focused on principles of patient management. Restricted to MEMP students.
R. G. Mark, J. Strymish

HST.203 Clinical Experience in Medical Engineering and Medical Physics
Prereq: HST.201, HST.202
G (Fall, IAP, Spring, Summer)
0-12-0 [P/D/F] H-LEVEL Grad Credit
An individually arranged full-time one-month directed study in a clinical environment where active medical engineering/medical physics investigation is in progress. Students engage in patient care, particularly those aspects that interface closely with technology. Students also focus on in-depth exploration of the technical and research area. A project proposal is required at time of registration. Term paper required.
HST Faculty

HST.211 Biomedical Inventions: Clinical Introduction
Prereq: Permission of instructor
G (IAP)
3-0-3 H-LEVEL Grad Credit
Provides students with an understanding of modern biomedicine. Explores the clinical areas where medical practice and biomedical enterprise intersect. Hear and interact with academic physicians engaged in care and treatment of patients, in the wards, ICUs, ORs and outpatient areas, and develop the knowledge base needed to obtain elective clinical experiences. Learn to interact with patients and clinicians. Focus is on the various needs of medical specialties, both device, IT and pharma to better treat common medical diseases.
W. Zapol, R. Anderson

HST.212 Biomedical Inventions: Clinical Experience and Selected Success Analysis
Prereq: HST.211
G (Spring)
3-0-3 H-LEVEL Grad Credit
Provides students with a survey of key biomedical research needs by lecture-discussions and facilitating interaction with academic-clinicians and scientists active in medical care/research. Both drug and technology development in the various medical and surgical specialties are examined. Students develop the knowledge base needed to obtain elective clinical experiences. Unsolved clinical problems are sought by each student in a biomedical area of their interest and presented to the class. Interactions with academic physicians who have successfully developed technologies and drugs that are approved by the FDA and in widespread clinical use. How, where, when and why biomedical enterprise and medical practice can successfully intersect is explored. Students can interact with academic physicians engaged in the development of novel technology and drugs, analyze successes and autopsy failed biomedical enterprises.
W. Zapol, R. Anderson

HST.220 Introduction to the Care of Patients
Prereq: Permission of instructor
G (IAP, Spring)
2-0-2 [P/D/F] H-LEVEL Grad Credit
E elective subject for HST/MD candidates only. Provides an introduction to the care of patients through opportunities to observe and participate in doctor-patient interaction in an outpatient, office-based environment, and through patient-oriented seminars. Students are exposed to some of the practical realities of providing patient care. 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. Limited to 15.
W. M. Kettyle, MIT Medical Department Staff

HST.240 Translational Medicine Preceptorship
Prereq: HST.035
G (Fall, Spring)
0-12-0 H-LEVEL Grad Credit
Individually designed preceptorship joins together scientific research and clinical medicine. Students devote approximately half of their time to clinical experiences, and the remaining part to scholarly work in basic or clinical science. The two might run concomitantly or in series. Follow a clinical preceptor’s daily activity, including aspects of patient care, attending rounds, conferences, and seminars. Research involves formal investigation of a focused and directed issue related to selected clinical area. Final paper required. Limited to students in the GEMS Program.
E. Edelman

HST.299 Research in Health Sciences and Technology
Prereq: Permission of instructor
G (Fall, Spring, Summer)
Units arranged [P/D/F]
For research assistants in HST where the assigned research is approved for academic credit by the department. Hours are arranged with research supervisor. Restricted to HST MD students in clinical phase of program.
HST Staff
A project-based introduction to manipulating and characterizing cells and biological molecules using microfabricated tools. In the first half of the term, students perform laboratory exercises designed to introduce the design, manufacture, and use of microfluidic channels; techniques for sorting and manipulating cells and biomolecules; and making quantitative measurements using optical detection and fluorescent labeling. In the second half of the term, students work in small groups to design and test a microfluidic device to solve a real-world problem of their choosing. Includes exercises in written and oral communication and team building. Limited to 20; preference to freshmen.

D. Freeman, M. Gray, A. Aranyosi

HST.450J Biological Physics
(Same subject as 8.593J)
Prereq: 8.044 recommended but not necessary
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Spring)
4-0-8 H-LEVEL Grad Credit
See description under subject 8.593J.
G. Benedek

HST.452J Statistical Physics in Biology
(Same subject as 8.592J)
Prereq: 8.333 or permission of instructor
Acad Year 2014–2015: G (Spring)
Acad Year 2015–2016: Not offered
3-0-9 H-LEVEL Grad Credit
M. Kardar, L. Mirny

HST.460J Statistics for Neuroscience Research
(Same subject as 9.073J)
Prereq: Permission of instructor
Acad Year 2014–2015: G (Spring)
Acad Year 2015–2016: Not offered
3-0-9
See description under subject 9.073J.
E. N. Brown

HST.500 Frontiers in (Bio)Medical Engineering and Physics
Prereq: None
G (Spring)
3-0-9
Provides a framework for mapping research topics at the intersection of medicine and engineering/physics in the Harvard-MIT community and covers the different research areas in MEMP (for example, regenerative biomedical technologies, biomedical imaging and biooptics). Lectures provide fundamental concepts and consider what’s hot, and why, in each area. Training in scientific proposal writing (thesis proposals, fellowship applications, or research grant applications) through writing workshops. Topics include how to structure a novel research project, how to position research within the scientific community, how to present preliminary data effectively, and how to give and respond to peer reviews.
S. Bhatia, C. Stultz, S. Jhaveri

HST.505 Laboratory in Molecular and Cellular Sciences
Prereq: Biochemistry or cell biology
G (IAP)
Not offered regularly; consult department
3-4-5 H-LEVEL Grad Credit
Provides laboratory training in state-of-the-art experimental approaches and techniques in molecular and cellular sciences. Lab training is reinforced with didactic lectures which stress the theory behind these methodologies. Topics include mammalian cell culture; tissue engineering; DNA cloning; gene transfer and gene therapy; transgenic animals; protein purification and analysis; and microscopy. Emphasis on the quantitative aspects of these methodologies. Students learn how to incorporate these approaches into an interdisciplinary research strategy aimed at addressing important questions in biomedical research.
J. Shah, J. Chen, U. Demirci, J. Karp

HST.506J Computational Systems Biology
(Same subject as 6.874J)
Prereq: Biology (GIR); 18.440 or 6.041
G (Spring)
3-0-9 H-LEVEL Grad Credit
See description under subject 6.874J.
D. Gifford, T. S. Jaakkola

HST.507J Advanced Computational Biology: Genomes, Networks, Evolution
(Same subject as 6.878J)
Prereq: 6.006, 6.041, Biology (GIR); or permission of instructor
G (Fall)
3-0-8 H-LEVEL Grad Credit
See description under subject 6.878J.
M. Kellis

HST.508 Quantitative Genomics
Prereq: Permission of instructor
G (Fall)
3-0-9 H-LEVEL Grad Credit
Provides in-depth quantitative understanding of evolutionary and population genetics, comparative and clinical genomics. Each module consists of a series of lectures, a journal club discussion of high impact publications, and lectures that provide clinical correlates. Homework assignments and final projects aim to develop understanding of genomic data from evolutionary principles.
L. Mirny, G. Kryukov, S. Sunyaev

HST.509 Computational and Functional Genomics
Prereq: Permission of instructor
G (Spring)
3-0-9 H-LEVEL Grad Credit
Experimental functional genomics and proteomics; DNA and protein sequence analysis; cellular regulatory networks; phenotypic analysis; human genetic variation. Primarily critical reading and discussion. Molecular biology, solid understanding of basic probability and statistics recommended. Follows Harvard FAS calendar.
M. L. Bulyk, S. R. Sunyaev, S. Gaudet

HST.510 Genomics and Computational Biology
Prereq: Permission of instructor
Acad Year 2014–2015: G (Fall)
Acad Year 2015–2016: Not offered
3-0-9 H-LEVEL Grad Credit
Integrates knowledge, research tools in new aspects of bioengineering, personalized medicine
and genetically modified organisms. Interplays of biophysical, ecological, economic, and social/ethical modeling are explored through multidisciplinary teams of students and individual brief reports. Follows Harvard FAS calendar.

HST.514j Sensory-Neural Systems: Spatial Orientation from End Organs to Behavior and Adaptation
(Same subject as 16.430)
Prereq: Neuroscience or systems engineering or permission of instructor
G (Spring)
3-0-9 H-LEVEL Grad Credit
See description under subject 16.430).
L. Young, C. Oman

HST.515j Aerospace Biomedical and Life Support Engineering
(Same subject as 16.423), ESD.65j)
Prereq: 16.400, 16.06, 16.060, or permission of instructor
Acad Year 2014–2015: G (Spring)
Acad Year 2015–2016: Not offered
3-1-8 H-LEVEL Grad Credit
See description under subject 16.423).
D. J. Newman

HST.516 Circadian Biology: From Cellular Oscillations to Sleep Regulation
Prereq: Biological sciences
G (Fall)
4-0-8 H-LEVEL Grad Credit
Properties, mechanisms, and functional roles of circadian rhythms in organisms ranging from unicells to mammals. Cellular and molecular components, regulation of gene expression and physiological functions, genetic and biochemical analyses of circadian rhythms, and neurobiology of the mammalian circadian pacemaker. Mathematics and modeling of oscillatory systems and applications to circadian rhythms. Experimental studies of human rhythms, including the sleep-wake cycle and hormone rhythms, with applications to sleep disorders. Follows Harvard FAS calendar.
C. A. Creisler

HST.521 Biomaterials, Tissue Engineering, and Regenerative Therapeutics
Prereq: HST.031 or permission of instructor
G (Spring)
4-0-5 H-LEVEL Grad Credit
Covers the structure, properties and therapeutic applications of biomaterials, as well as the opportunities and scientific and technological challenges of tissue engineering. Provides an interdisciplinary biological-engineering approach in an academic/corporate context, and probes mechanisms and methods of evaluation of tissue/biomaterials and patient/device interactions. Assesses current outcomes and challenges, and cutting-edge technological solutions to medical problems. Additional topics include key biological concepts; biofunctional/bioactive materials, drug delivery, and pertinent advances in nanotechnology; technical issues in design, development, fabrication and clinical evaluation; novel research directions and applications of materials to medicine; and ethical, economic and regulatory considerations.
F. J. Schoen, A. Khademhosseini

HST.522j Biomaterials: Tissue Interactions
(Same subject as 2.79j, 3.96j, 20.441j)
Prereq: Chemistry (GIR), Biology (GIR), Physics I (GIR); or permission of instructor
G (Fall)
3-0-9 H-LEVEL Grad Credit
See description under subject 20.441).
I. V. Yannas, M. Spector

HST.523j Cell-Matrix Mechanics
(Same subject as 2.78s), 3.97j, 20.411j)
Prereq: 2.001, or 2.01 and 2.02A; Chemistry (GIR), Biology (GIR); or permission of instructor
G (Fall)
3-0-9 H-LEVEL Grad Credit
See description under subject 2.78s).
I. V. Yannas, M. Spector

HST.524j Design of Medical Devices and Implants
(Same subject as 2.782), 3.96j, 20.451j)
Prereq: Chemistry (GIR), Biology (GIR), Physics I (GIR); or permission of instructor
G (Spring)
3-0-9 H-LEVEL Grad Credit
See description under subject 2.782).
I. V. Yannas, M. Spector

HST.525j Tumor Pathophysiology and Transport Phenomena: A Systems Biology Approach
(Same subject as 10.548j)
Prereq: 18.03; 10.301
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
2-0-4 H-LEVEL Grad Credit
Tumor pathophysiology plays a central role in the growth, invasion, metastasis and treatment of solid tumors. Principles of transport phenomena are applied to develop a systems level, quantitative understanding of angiogenesis, blood flow and microcirculation, metabolism and microenvironment, transport and binding of small and large molecules, movement of cancer and immune cells, metastatic process, and treatment response.
R. K. Jain

HST.527 Blood Vessels and Endothelial Phenotypes in Health and Disease
Prereq: Permission of instructor
G (Spring)
2-0-4 [P/D/F] H-LEVEL Grad Credit
Overview of the endothelium as a model system for understanding biological complexity in health and disease. Emphasis placed on: mechanisms of endothelial cell heterogeneity, including genetic and microenvironmental determinants; the role of endothelial cell trafficking, hemostasis, barrier function, antigen presentation and vasomotor tone; and the role of endothelial cell dysfunction in disease, including tumors, sickle cell disease, pulmonary hypertension, veno-occlusive disease of the liver, thrombotic microangiopathies and xenotransplantation. Additional topics covered include novel proteomic and genomic strategies for mapping endothelial cell phenotypes, evolutionary (Darwinian) principles, and complexity theory. Knowledge of introductory biology or physiology, and biochemistry or molecular biology required.
W. Aird, G. Garcia-Cardenas

HST.531 Medical Physics of Proton Radiation Therapy
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Spring)
2-0-4
Acceleration of protons for radiation therapy; introduction into advanced techniques such as laser acceleration and dielectric wall acceleration. Topics include the interactions of protons with the patient, Monte Carlo simulation, and dose calculation methods; biological aspects of proton therapy, relative biological effectiveness (RBE), and the role of contaminating neutrons; treatment planning and treatment optimization methods, and intensity-modulated proton therapy (IMPT); the effect of organ motion and its compensation by use of image-guided treatment techniques; general dosimetry and advanced in-vivo dosimetry methods, including PET/CT and prompt gamma measurements. Outlook into therapy with heavier ions. Includes practical demonstrations at the Proton Therapy Center of the Massachusetts General Hospital.
J. Unkelback, J. Schuemann
HST.535 Principles and Practice of Tissue Engineering
Prereq: None
G (Spring)
2-0-6
Leaders in the field present the principles and practice of tissue engineering (and regenerative medicine). Topics include the principles underlying strategies for employing select exogenous cells, biomaterial scaffolds, soluble regulators or their genes, and mechanical loading for the regeneration of tissues and organs in vitro and in vivo. Differentiated cell types and stem cells are compared and contrasted for this application, as are natural and synthetic scaffolds. Covers the rationale for employing selected growth factors and examines the methods for incorporating their genes into the scaffolds. Discusses the influence of environmental factors, including mechanical loading and culture conditions. Presents methods for fabricating tissue-engineered products and devices for implantation. Addresses the federal regulatory status of tissue-engineered products, as well as strategies for introducing such products into the clinic. Examples of procedures currently employed clinically are analyzed as case studies. All sessions are webcast to the world and archived for open access review at any time.
M. Spector

HST.540J Human Physiology
(Same subject as 7.20J)
Prereq: 7.05
U (Fall)
5-0-7
See description under subject 7.20J.
M. Krieger, D. Sabatini

HST.541J Cellular Biophysics
(Same subject as 2.794J, 6.521J, 20.470J)
Subject meets with 2.791J, 6.021J, 20.370J
Prereq: Physics II (GIR); 18.03; 2.005, 6.002, 6.003, 6.071, 10.301, 20.110, or permission of instructor
G (Fall)
5-2-5 H-LEVEL Grad Credit
Meets with undergraduate subject 6.021J. Requires the completion of more advanced home problems and/or an additional project.
D. M. Freeman, J. Han, T. Heldt, J. Voldman, M. F. Yanik

HST.542J Quantitative Systems Physiology
(Same subject as 2.792J, 6.022J, 20.371J)
Subject meets with 2.796J, 6.522J, 20.471J
Prereq: Physics II (GIR), 18.03, or permission of instructor
U (Spring)
4-2-6
See description under subject 6.022J.
T. Heldt, R. G. Mark, C. M. Stultz

HST.543 Cardiac Biophysics
Prereq: 6.021
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
3-0-9 H-LEVEL Grad Credit
In depth review of contemporary theories in the physics of the heart. Overview of cardiac physiology, including an in depth examination of cardiac excitation and excitation-contraction coupling. Cardiac membrane channels, the action potential (Hodgkin-Huxley and Luo-Rudy models), and action potential propagation (cable and bidomain models). Arrhythmias, drugs, and defibrillation. Relies heavily on the current literature in the field. Follows Harvard FAS schedule.
K. K. Parker

HST.544J Fields, Forces, and Flows in Biological Systems
(Same subject as 2.795J, 6.561J, 10.539J, 20.430J)
Prereq: 6.013, 2.005, 10.302, or permission of instructor
G (Fall)
3-0-9 H-LEVEL Grad Credit
See description under subject 20.430J.
M. Bathe, A. J. Grodzinsky, R. D. Kamm

HST.545 Physiological Systems Analysis
Prereq: 18.03, 8.03; or permission of instructor
Acad Year 2015–2016: Not offered
Acad Year 2014–2015: G (Spring)
3-1-8
D. M. Merfeld

HST.560J Radiation Biophysics
(Same subject as 22.55J)
Subject meets with 22.055
Prereq: Permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Spring)
3-0-9 H-LEVEL Grad Credit
See description under subject 22.55J.
Staff

HST.561J Noninvasive Imaging in Biology and Medicine
(Same subject as 9.173J, 20.483J, 22.56J)
Prereq: 18.03, 8.03, or permission of instructor
Acad Year 2014–2015: G (Spring)
Acad Year 2015–2016: Not offered
3-0-9 H-LEVEL Grad Credit
See description under subject 22.56J.
A. Jasanoff

HST.562 Imaging and Sample Processing in Biology and Medicine (New)
Prereq: Biology (GIR), 5.12; or permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: Not offered
3-1-8
Discusses basic principles and concepts of bioimaging and sample processing. Topics include optical imaging modalities; optical/physical/chemical properties of a broad range of biological samples, including clinical tissues and sample handling/processing technologies; underlying engineering principles; and basic image analysis. Provides experience with optical microscopy and tissue processing technique (CLARITY). Limited to 15.
K. Chung

HST.563 Imaging Biophysics and Clinical Applications
Prereq: 18.03, 8.03; or permission of instructor
Acad Year 2014–2015: G (Spring)
Acad Year 2015–2016: Not offered
2-1-9 H-LEVEL Grad Credit
Introduction to the connections and distinctions among various imaging modalities (x-ray, optical, ultrasound, MRI, PET, SPECT, EEG), common goals of biomedical imaging, broadly defined target of biomedical imaging, and the current practical and economic landscape of biomedical imaging research. Emphasis on applications of imaging research. Final project consists of student groups writing mock grant applications for biomedical imaging research project, modeled after an exploratory National Institutes of Health (NIH) grant application.
C. Catana, A. Kumar, A. Guimaraes
HST.565 Medical Imaging Sciences and Applications
Prereq: None
G (Fall)
3-0-9
Covers the biophysical, mathematical and instrumentation basics of positron emission tomography (PET), x-ray and computed tomography (CT), magnetic resonance imaging (MRI), and single photon emission tomography (SPECT). Topics include particles and photon interactions, nuclear counting statistics, gamma cameras, and computed tomography as it pertains to SPECT and PET (including PET-CT, PET-MR, and time-of-flight PET). Discusses the clinical applications of PET in molecular imaging of the brain, the heart, and cancer. Includes a practical demonstration of SPECT and PET-CT imaging at the Massachusetts General Hospital. Considers the ways in which these imaging techniques are rooted in physics, engineering, and mathematics as well as their respective role in anatomic and physiologic/molecular imaging.
E. El Fakhri, M. Normandin

HST.569 Biomedical Optics
Prereq: Calculus
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
4-0-8 H-LEVEL Grad Credit
Introduction to physics and engineering of optical technologies and their applications in medicine and biology. Propagation of light in tissue, bright field, dark field, phase contrast, DIC, fluorescence, Raman, confocal, two-photon, low-coherence, spectral microscopy, and speckle. Current trends in microscopy and optical imaging. Appropriate for upper-level undergraduates and graduate students in life sciences as well as engineering. Includes lectures, seminars, and occasional guest lectures. Grading based on midterm and final report. Report analyzes a specific technological need in medicine or biology and proposes a solution. Opportunity to pursue implementation of the solution as a project in the following term is available.
B. Vakoc, B. E. Bouma, G. J. Tearney, S. H. Yun

HST.576J Topics in Neural Signal Processing
(Same subject as 9.272J)
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Spring)
3-0-9
See description under subject 9.272J.
E. N. Brown

HST.580J Data Acquisition and Image Reconstruction in MRI
(Same subject as 6.556J)
Prereq: 6.011
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
3-0-9 H-LEVEL Grad Credit
See description under subject 6.556J.
E. Adalsteinsson

HST.582J Biomedical Signal and Image Processing
(Same subject as 6.555J, 16.456J)
Prereq: 6.003, 2.004, 16.004, or 18.085
G (Spring)
3-4-5 H-LEVEL Grad Credit
Fundamentals of digital signal processing with particular emphasis on problems in biomedical research and clinical medicine. Basic principles and algorithms for data acquisition, imaging, filtering, and feature extraction. Laboratory projects provide practical experience in processing physiological data, with examples from cardiology, speech processing, and medical imaging.
J. Greenberg, E. Adalsteinsson, W. Wells

HST.583 Functional Magnetic Resonance Imaging: Data Acquisition and Analysis
Prereq: Permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
Units arranged H-LEVEL Grad Credit
Provides information relevant to the conduct and interpretation of human brain mapping studies. In-depth coverage of the physics of image formation, mechanisms of image contrast, and the physiological basis for image signals. Parenchymal and cerebrovascular neuroanatomy and application of sophisticated structural analysis algorithms for segmentation and registration of functional data discussed. Additional topics include fMRI experimental design including block design, event related and exploratory data analysis methods, and building and applying statistical models for fMRI data. Human subject issues including informed consent, institutional review board requirements and safety in the high field environment are presented. Twice weekly lectures and weekly laboratory and discussion sessions. Laboratory will include fMRI data acquisition sessions and data analysis workshops. Assignments include reading of both textbook chapters and primary literature as well as fMRI data analysis in the laboratory. Probability, linear algebra, differential equations, and introductory or college-level subjects in neurobiology, physiology, and physics required.

HST.584J Magnetic Resonance Analytic, Biochemical, and Imaging Techniques
(Same subject as 22.561J)
Prereq: Permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Spring)
3-0-12 H-LEVEL Grad Credit
Introduction to basic NMR theory. Examples of biochemical data obtained using NMR summarized along with other related experiments. Detailed study of NMR imaging techniques includes discussions of basic cross-sectional image reconstruction, image contrast, flow and real-time imaging, and hardware design considerations. Exposure to laboratory NMR spectroscopic and imaging equipment included.
L. Wald, K. Setsompop

HST.590 Biomedical Engineering Seminar Series
Prereq: None
G (Fall, IAP, Spring)
1-0-0 [P/D/F]
Can be repeated for credit
Seminars focused on the development of professional skills. Each term focuses on a different topic, resulting in a repeating cycle that covers medical ethics, responsible conduct of research, written and oral technical communication, and translational issues. Includes guest lectures, case studies, interactive small group discussions, and role-playing simulations.
HST Faculty

HST.598 Research in Health Sciences and Technology
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged
Can be repeated for credit
For undergraduates desiring to carry on substantial projects of their own choosing in biomedical sciences or engineering. Work may be of experimental, theoretical, or design nature. A project proposal is required at time of registration.
Consult HST Faculty
HST.599 Research in Health Sciences and Technology
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit
For students conducting research in HST, in cases where the assigned research is approved for academic credit by the department. Hours arranged with research supervisor. Consult HST Faculty

HST.710J Speech Communication
(Same subject as 6.541J, 24.968J)
Prereq: Permission of instructor
G (Spring)
3-1-8 H-LEVEL Grad Credit
See description under subject 6.541J.
L. D. Braida, S. S. Ghosh, R. E. Hillman, S. Shattuck-Hufnagel

HST.712J Laboratory on the Physiology, Acoustics, and Perception of Speech
(Same subject as 6.542J, 24.966J)
Prereq: Permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
2-2-8 H-LEVEL Grad Credit
See description under subject 6.542J.
L. D. Braida, S. Shattuck-Hufnagel

HST.714J Acoustics of Speech and Hearing
(Same subject as 6.551J)
Prereq: 8.03, 6.003; or permission of instructor
G (Fall)
4-1-7 H-LEVEL Grad Credit
See description under subject 6.551J.

HST.716J Signal Processing by the Auditory System: Perception
(Same subject as 6.552J)
Prereq: 6.003; 6.041 or 6.431; or permission of instructor
Acad Year 2014–2015: G (Fall)
Acad Year 2015–2016: Not offered
3-0-9 H-LEVEL Grad Credit
See description under subject 6.552J.
L. D. Braida

HST.718 Anatomy of Speech and Hearing
Prereq: Biology (GIR), permission of instructor
G (IAP)
2-2-2 H-LEVEL Grad Credit
Studies the anatomy of the human head and neck, focusing on structures involved in speech and hearing. Covers general organization of the nervous system and control of the peripheral structures. Involves dissection of a human cadaver, examination of brain specimens, and analysis of cross-sectional radiographic images. Limited to 12; undergraduates admitted based on seniority.
B. C. Fullerton

HST.720 Physiology of the Ear
Prereq: Permission of instructor
Acad Year 2014–2015: G (Fall)
Acad Year 2015–2016: Not offered
4-0-8 H-LEVEL Grad Credit
Physical and physiological mechanisms underlying the transduction and analysis of acoustic signals in the auditory periphery. Topics include the acoustics, mechanics, and hydrodynamics of sound transmission; the biophysical basis for cochlear amplification; the production of oto-acoustic emissions; the physiology of hair-cell transduction and synaptic transmission; efferent feedback control; the analysis and coding of simple and complex sounds by the inner ear; and the physiological bases for hearing disorders. Based primarily on reading and discussions of original research literature.
J. J. Guinan, J. J. Rosowski, C. A. Shera

HST.721 The Biology of the Inner Ear
Prereq: Permission of instructor
G (Fall)
3-1-8 H-LEVEL Grad Credit
Reviews the normal biology, biophysics, physiology and morphology of the inner ear and auditory nerve, as well as the mechanisms underlying sensorineural hearing loss.
M. C. Liberman, S. F. Maison

HST.723J Neural Coding and Perception of Sound
(Same subject as 9.285J)
Prereq: Permission of instructor
G (Spring)
3-1-8 H-LEVEL Grad Credit
Neural structures and mechanisms mediating the detection, localization, and recognition of sounds. Discussion of how acoustic signals are coded by auditory neurons, the impact of these codes on behavioral performance, and the circuitry and cellular mechanisms underlying signal transformations. Topics include temporal coding, neural maps and feature detectors, learning and plasticity, and feedback control. General principles are conveyed by theme discussions of auditory masking, sound localization, musical pitch, cochlear implants, and auditory scene analysis. Follows Harvard FAS calendar.

HST.724 Clinical Aspects of Speech and Hearing
Prereq: HST.718 or permission of instructor
G (Spring)
5-5-2 H-LEVEL Grad Credit
Clinical approach to speech and hearing disorders as practiced by physicians, audiologists, speech clinicians, rehabilitation specialists, pathologists, and bioengineers. Includes observation of patient care in the clinic and operating room, laboratory experience in audiology, voice and speech evaluation, evaluation of balance disorders; lectures and discussion groups. Prior completion of HST.714 and HST.721 is recommended.
K. Stankovic, J. Nadol

HST.725 Music Perception and Cognition
Prereq: HST.723 or permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Spring)
4-0-8 H-LEVEL Grad Credit
Survey of perceptual and cognitive aspects of the psychology of music, with special emphasis on underlying neurocomputational representations and mechanisms. Systematically explores basic dimensions of hearing (pitch, timbre, consonance, loudness) and the time sense (duration, temporal pattern) that form our perception of tonal quality, melody, harmony, meter, and rhythm in music. Examines mechanisms responsible for separation of multiple voices/instruments (polyphony), and for melodic and rhythmic grouping of events (musical phrase structure). Special topics include comparative, evolutionary, and developmental psychology of music; biological vs. cultural influences; Gestaltist, associationist, and schema-based theories; music vs. speech perception; music vs. language cognition; music and cortical function, music therapy, and neural basis of music performance.
P. Cariani

HST.728J Automatic Speech Recognition
(Same subject as 6.345J)
Prereq: 6.003, 6.041, or permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Spring)
3-0-9 H-LEVEL Grad Credit
See description under subject 6.345J.
V. W. Zue, J. R. Glass
HST.730 Molecular Biology of the Auditory System
Prereq: Biology (GIR)
G (Fall)
3-0-9 H-LEVEL Grad Credit
Focuses on molecular approaches to cochlear development and function, based on readings and discussion of research literature. Lectures by course director and local experts in the field. Includes discussion of gene expression, cell fate determination, deafness mutations, stem cells and regeneration of the cochlea.
A. Edge

HST.750 Modeling Issues in Hearing and Speech
Prereq: HST.714, HST.721
G (Spring)
3-0-9 H-LEVEL Grad Credit
Explores the theory and practice of scientific modeling in the context of auditory and speech biophysics. Based on seminar-style discussions of the research literature, subject draws on examples from hearing and speech (cochlear and vocal-fold mechanics) and explores general, meta-theoretical issues that transcend the particular subject matter. Examples include: What is a model? What is the process of model building? What are the different approaches to modeling? What is the relationship between theory and experiment? How are models tested? What constitutes a good model?
C. A. Shera, J. R. Melcher

HST.771–HST.779 Research in the Speech and Hearing Sciences
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit
Research on topics in theoretical, experimental, or clinical aspects of Speech and Hearing Sciences arranged on an individual basis with a research supervisor. At the time of registration, a project proposal endorsed by the supervisor is required. At the end of the term, a concise written progress report along with a brief written evaluation by the supervisor must be submitted.
L. D. Braida

HST.780 Independent Study in Speech and Hearing Sciences
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged H-LEVEL Grad Credit
Can be repeated for credit
Opportunity for independent study of speech and hearing sciences under regular supervision by an SHBT faculty member. Projects require prior approval, as well as a substantive paper.
Consult L. D. Braida

HST.905 Introduction to Health Care Management
Prereq: None
G (Spring)
2-0-4
Introduction to the academic disciplines of business management with illustration from examples in various medical care settings. Topics include economics of health care; evolving role of physicians and other medical professionals; ethics of business decisions in a clinical context; underlying concepts in financial, marketing, and operations management in health institutions; and the management of risk in health-related enterprise. Presentations by carefully selected multidisciplinary faculty group from the Harvard and MIT communities. Student projects address current issues occasioned by the rapidly changing health care environment. Meets at Harvard Medical School. Limited to graduate and medical students.
S. Finkelstein, P. L. Slavin

HST.914J Frontiers in Therapeutics and Drug Delivery
(Same subject as 10.644J)
(Subject meets with 10.444)
Prereq: 7.05 or permission of instructor
G (Fall)
3-0-6
See description under subject 10.644J.
D. G. Anderson

HST.916J Case Studies and Strategies in Drug Discovery and Development
(Same subject as 7.549J, 15.137J, 20.486J)
Prereq: Permission of instructor
G (Spring)
2-0-4 H-LEVEL Grad Credit
See description under subject 20.486J.
S. R. Tannenbaum, A. J. Sinskey, A. Wood

HST.918J Economics of the Health Care Industries
(Same subject as 15.141J)
Prereq: Permission of instructor
G (Spring)
3-0-6 H-LEVEL Grad Credit
See description under subject 15.141J.
E. R. Berndt

HST.920P Principles and Practice of Drug Development
(Same subject as 7.547J, 10.547J, 15.136J, ESD.691J)
Prereq: Permission of instructor
G (Fall)
3-0-6 H-LEVEL Grad Credit
See description under subject 15.136J.
T. J. Allen, C. L. Cooney, S. N. Finkelstein, A. J. Sinskey, G. K. Raju

HST.922 Enabling Technology Innovation in Healthcare and the Life Sciences
(Subject meets with HST.921)
Prereq: None
G (Spring)
2-0-7
Innovative, trans-faculty subject teaches how information technologies are reshaping and redefining the health care marketplace through improved economies of scale, greater technical efficiencies in the delivery of care to patients, advanced tools for patient education and self-care, network integrated decision support tools for clinicians, and the emergence of e-commerce in health care. Students ordinarily also register for HST.923 or HST.924, the lab component of this subject. Undergraduates require permission of instructor. Only HST students may register under HST.921, graded P/D/F.
S. E. Locke, B. P. Bergeron, J. Blander, D. Z. Sands, J. A. Cartreine

HST.924 Enabling Technology Innovation in Healthcare and the Life Sciences
(Subject meets with HST.923)
Prereq: None
G (Spring)
0-3-0
Student tutorial provides an opportunity for interactive discussion covering emerging information technologies (IT) used in healthcare. Practicum: HMS and MIT graduate students in medicine, business, law, education, engineering, computer science, public health, and government collaborate in interdisciplinary teams to design an innovative IT application. Student projects presented during the final class.
Students ordinarily also register for HST.921 or HST.922, the lecture component of the subject. Undergraduates require permission of instructor. Only HST students may register under HST.923, graded P/D/F.
S. E. Locke, B. P. Bergeron, J. Blander, D. Z. Sands, J. A. Cartreine
HST.936J Seminar on Health Care Systems Innovation
(Same subject as ESD.69J)
Prereq: Permission of instructor
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
2-0-7
See description under subject ESD.69J.
S. Finkelstein, J. Moses, J. Coughlin

HST.934J Introduction to Global Medicine: Bioscience, Technologies, Disparities, Strategies
(Same subject as STS.449J)
Prereq: None
G (Spring)
2-0-1 [P/D/F]
Exploration of basic themes in social medicine via a specific examination of issues in global medicine. The course takes as its challenge to understand new paradigms for global health that focus on providing complex medical services to treat complicated health conditions (e.g. multi-drug-resistant TB, HIV/AIDS, and mental health problems) in low resource settings. Special attention given to the development of new technologies or adapting existing technologies in ways that enable new solutions to global health problems, as well as overcoming barriers to translation of medical technologies for use in settings of great need. Addresses classic themes of social inequalities and health disparities, and issues such as patenting and the development and delivery of pharmaceuticals or other biotechnologies in international context. Presentations by Harvard faculty involved in global health, basic or clinical research with a global reach, or medical humanitarian activities, in addition to class discussion.
M. J. Good, B. J. Good

HST.936 Global Health Informatics to Improve Quality of Care
(Subject meets with HST.937, HST.938)
Prereq: None
G (Spring)
2-2-2
Addresses issues related to how health information systems can improve the quality of care in resource poor settings. Discusses key challenges and real problems; design paradigms and approaches; and system evaluation and the challenges of measuring impact. Weekly lectures led by internationally recognized experts in the field. Students taking HST.936, HST.937 and HST.938 attend common lectures; assignments and laboratory time differ. HST.936 has no laboratory.
L. G. Celi, H. S. Fraser, V. Nikore, K. Paik, M. Somai

HST.937 Global Health Informatics to Improve Quality of Care
(Subject meets with HST.936, HST.938)
Prereq: None
G (Spring)
2-2-2
Addresses issues related to how health information systems can improve the quality of care in resource poor settings. Discusses key challenges and real problems; design paradigms and approaches; and system evaluation and the challenges of measuring impact. Weekly lectures led by internationally recognized experts in the field. Students taking HST.936, HST.937 and HST.938 attend common lectures; assignments and laboratory time differ. HST.936 has no laboratory.
L. G. Celi, H. S. Fraser, V. Nikore, K. Paik, M. Somai

HST.938 Global Health Informatics to Improve Quality of Care
(Subject meets with HST.936, HST.937)
Prereq: None
G (Spring)
2-2-8
Addresses issues related to how health information systems can improve the quality of care in resource poor settings. Discusses key challenges and real problems; design paradigms and approaches; and system evaluation and the challenges of measuring impact. Weekly lectures led by internationally recognized experts in the field. Students taking HST.936, HST.937 and HST.938 attend common lectures; assignments and laboratory time differ. HST.936 has no laboratory.
L. G. Celi, H. S. Fraser, V. Nikore, K. Paik, M. Somai

HST.939J Designing and Sustaining Technology Innovation for Global Health Practice
(Same subject as 15.127J)
Prereq: None
G (Spring)
Not offered regularly; consult department
Units arranged
Course trains students to think and act like global health leaders and entrepreneurs. Looks at the business of running a social venture and how to plan and provide access to life-saving medicines and essential services in international and domestic settings. Considers specific case studies for influential and leading edge technologies for health services delivery, as well as human resources, and pharmaceutical and diagnostic design in resource-poor settings. Features lectures and skills-based tutorial sessions led by industry, foundation, and academic leaders. Lectures provide the foundation for a design project that may involve creation of a market or business plan, product design specification, or research study. Limited to 24.
U. Demirci, J. Blander

HST.940J Bioinformatics: Principles, Methods and Applications
(Same subject as 10.555J)
Prereq: Permission of instructor
G (Spring)
3-0-9 H-LEVEL Grad Credit
See description under subject 10.555J.
Gr. Stephanopoulos, I. Rigoutsos

HST.950J Biomedical Computing
(Same subject as 6.872J)
Prereq: 6.034
G (Fall)
3-0-9 H-LEVEL Grad Credit
See description under subject 6.872J.
G. Alterovitz, P. Szolovits

HST.960 At the Limits of Medicine: Philosophy, Religion, Literature
Prereq: None
G (IAP)
1-0-3 [P/D/F]
Critical examination of modern culture’s view of human beings (and God) and what it reveals about its attitude toward death. Students explore two descriptions of modern deaths, two essays contemplating the egocentric nature of man, the radical secularization of the concept of man in the 19th century, and two alternative views that restitute human goodness without religion or sentimentality.
S. Klingenstein

HST.971J Strategic Decision Making in the Life Sciences
(Same subject as 15.363J)
Prereq: None
G (Spring)
3-0-6
See description under subject 15.363J.
J. Fleming, A. Zarur
HST.973J Evaluating a Biomedical Business Concept
(Same subject as 15.124J)
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
3-0-6
Involves critical analysis of new biomedical business ideas. Inventors or principals of early stage companies present their ideas to the class and provide background material including scientific papers and patents. A team of students is assigned to evaluate each business idea. Students interact with the companies, potential customers, other stakeholders and experts to develop a series of analyses concerning the critical issues that each business idea would face. Company and student presentations supplemented by topic-specific lectures and presentations by biomedical entrepreneurs. Enrollment limited. Enrollment limited.
C. Berke, R. Anders, R. J. Cohen

HST.975J Clinical Trials in Biomedical Enterprise
(Same subject as 15.121J)
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
2-0-4
Clinical trials have become one of the leading barriers to success in the introduction of new products and services for the healthcare industry. Subject enables healthcare managers to ask the important questions surrounding a decision to pursue a clinical trial. Deciding to participate in a clinical trial can sometimes result in expensive, long-term corporate commitments, which can have a significant impact on the company’s success or failure, particularly in the case of smaller companies. Subject explores issues related to determining whether a clinical trial is needed to significantly further the important goals of the company. Topics include the design, implementation, analysis and presentation of clinical trials. Case scenarios are presented by professionals in the field, and students are asked to develop their own outline plan and clinical trial study plan from the sample cases provided. Enrollment limited.
H. Golub

HST.977J Critical Reading and Technical Assessment of Biomedical Information
(Same subject as 15.122J)
Prereq: SB degree in Biological Science or permission of instructor
G (Spring; first half of term)
1-0-2 H-LEVEL Grad Credit
Gain experience in critical reading of scientific literature, including patents, journal articles and FDA labels, with an emphasis on analyzing clinical controversies and emerging technologies in subject areas that have been or could become sources of entrepreneurial activity. Students required to analyze a variety of topics in the scientific literature, including screening for and cost-effectiveness of early detection of cancer, therapeutic opportunities in oncology, evaluation of immunotoxins and antibody therapies, and new prospects for the treatment of autoimmune disorders. To support the discussion of these topics, outside experts may be invited to participate as facilitators.
S. Lapidus, J. Karp

HST.THG Graduate Thesis
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged H-LEVEL Grad Credit
Can be repeated for credit
Program of research leading to the writing of a PhD or ScD thesis or an HST SM thesis; to be arranged by the student and an appropriate MIT faculty advisor.
HST Faculty

HST.UR Undergraduate Research in Health Sciences and Technology
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit
Opportunity for group study of advanced subjects related to health sciences and technology not otherwise included in the curriculum. Prerequisites may vary by topic; consult faculty at time of offering.
HST Faculty

HST.S46–HST.S49 Special Subject: Health Sciences and Technology
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit
Opportunity for group study of advanced subjects related to health sciences and technology not otherwise included in the curriculum. Prerequisites may vary by topic; consult faculty at time of offering.
HST Faculty

HST.S14–HST.S15 Special Subject: Health Sciences and Technology
Prereq: None
G (Fall, IAP, Spring, Summer)
Units arranged
Can be repeated for credit
Prerequisites may vary by topic; consult faculty at time of offering.
HST Faculty

HST.553 Special Subject: Medical Engineering and Medical Physics (New)
Prereq: None
G (Fall, IAP, Spring)
Units arranged
Can be repeated for credit
Opportunity for group study of advanced subjects related to the Medical Engineering and Medical Physics Program not otherwise included.
in the curriculum. Offerings are initiated by MEMP faculty on an ad hoc basis subject to program approval. Prerequisites may vary by topic; consult faculty at time of offering.

HST Faculty

HST.S54–HST.S55 Special Subject: Medical Engineering and Medical Physics (New)
Prereq: None
G (Fall, IAP, Spring)
Units arranged [P/D/F] Can be repeated for credit
Opportunity for group study of advanced subjects related to the Medical Engineering and Medical Physics Program not otherwise included in the curriculum. Offerings are initiated by MEMP faculty on an ad hoc basis subject to program approval. Prerequisites may vary by topic; consult faculty at time of offering.

HST Faculty

HST.S56–HST.S57 Special Subject: Medical Engineering and Medical Physics
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F] H-LEVEL Grad Credit Can be repeated for credit
Opportunity for group study of advanced subjects related to the Medical Engineering and Medical Physics Program not otherwise included in the curriculum. Offerings are initiated by MEMP faculty on an ad hoc basis subject to program approval. Prerequisites may vary by topic; consult faculty at time of offering.

HST Faculty

HST.S58–HST.S59 Special Subject: Medical Engineering and Medical Physics
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged H-LEVEL Grad Credit Can be repeated for credit
Opportunity for group study of advanced subjects related to the Medical Engineering and Medical Physics Program not otherwise included in the curriculum. Offerings are initiated by MEMP faculty on an ad hoc basis subject to program approval. Prerequisites may vary by topic; consult faculty at time of offering.

HST Faculty

HST.S76–HST.S77 Special Subject: Speech and Hearing Sciences
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F] H-LEVEL Grad Credit Can be repeated for credit
Opportunity for group study of advanced subjects related to the Speech and Hearing Sciences not otherwise included in the curriculum. Offerings initiated by members of the SHBT faculty on an ad hoc basis subject to program approval. Prerequisites may vary by topic; consult faculty at time of offering.

SHBT Faculty

HST.S96–HST.S97 Special Subject: Biomedical Enterprise
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F] Can be repeated for credit
Opportunity for group study of advanced subjects relating to biomedical enterprise not otherwise included in the curriculum. Offerings are initiated by HST faculty on an ad hoc basis subject to program approval. Prerequisites may vary by topic. Consult faculty at time of offering.

HST Faculty