August 2015

ADVANCED COURSES
Chemical and Physical Biology and Molecular and Cellular Biology Concentrations

To fulfill the advanced course requirement, MCB concentrators ordinarily take at least (1) 100 or 200 level MCB course, and may fulfill the remainder of the requirement with any course listed in this document. MCB concentrators who intend to fulfill the advanced course requirement without taking any MCB course should discuss their plan with Marty Samuels.

CPB concentrators must choose three upper-level courses in the natural sciences, engineering, and/or mathematics. **Any 100-level Chemistry, Molecular and Cellular Biology, Applied Math, Physics or SCRB course will meet this requirement, as will any course listed in this document.**

****NOTE: This document does not represent an exhaustive list of courses, and changes may be made at any time.****

Please scroll to the end of this document for important information regarding enrolling in courses offered through the Division of Medical Sciences. If you wish to count a course that is not on this list towards the advanced course requirement, please contact Marty and include the course description and syllabus of the course you wish to count.

MCB courses for undergraduates and graduates

Fall 2015

MCB 101	Human Genetics *(New Course)*	Craig Hunter
MCB 115	Cellular basis of neuronal function	Venkatesh Murthy
[MCB 121	The Microbes	Expected to be given in Fall 2016]
MCB 129	The Brain: Development, Plasticity, and Decline	Samuel Kunes
MCB 142	Major Advances in Understanding Evolution and Heredity	Meselson
[MCB 157	Developmental Genetics and Genomics	Expected to be given in Fall 2016]
MCB 169	Molecular and Cellular Immunology	Shiv Pillai (HMS)
MCB 176	Biochemistry of Membranes	Guido Guidotti
MCB 186	Circadian Biology: From Cellular Oscillators to Sleep Regulation	Charles Czeisler (HMS)

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Spring 2016

MCB 105	Systems Neuroscience	Florian Engert
MCB 111	Mathematics in biology	TBA
MCB 120	Global Health Threats (formerly LS 120)	Richard Losick and Barry Bloom
MCB 125	Molecular Basis of Behavior *(New Course)*	Dulac
[MCB 131	Computational Neuroscience	Expected to be given in Spring 2017]
[MCB 135	Introductory Systems Biology	Expected to be given in Spring 2017]
[MCB 141	Molecular and Cellular Biology of the Senses and their Disorders	Expected to be given in Spring 2017]

[MCB 144	The Power and Pitfalls of Genetical Thinking	Expected to be given in Spring 2017]
MCB 145	Neurobiology of Perception and Decision Making	Uchida
[MCB 146	Experience-Based Brain Development: Causes and Consequences	Expected to be given in Spring 2017]
MCB 148	The Neurobiology of Pain	TBA
[MCB 154	Advanced Cell and Developmental Biology	Expected to be given in Spring 2017]
MCB 165	Interplay between Viruses and their Hosts (*New Course)*	Victoria D'Souza
MCB 170	Brian Invaders: Building and Breaking Barriers in the Nervous System	Laura Magnotti
MCB 178	Biochemistry of Protein Complexes	Guido Guidotti
MCB 187	Genome Editing - Progress and Frontiers	J. Keith Joung (HMS)
MCB 188	Chromosomes *(New Course)*	Kleckner
MCB 195	Foundations of Systems Biology and Biological Engineering *(New Course)*	
[MCB 198	Advanced Mathematical Techniques for Modern Biology	Expected to be given in Spring 2017]
[MCB 199	Statistical Thermodynamics and Quantitative Biology	Expected to be given in Spring 2017]

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OTHER COURSES:

FALL 2015

[APMTH 104	Series Expansions and Complex Analysis	Expected to be given in Fall 2016]
Biophys 170	Quantitative Genomics (note: Meets at MIT)	Shamil Sunyaef (HMS) and others
BE 110	Physiological Systems Analysis (formerly ES 145; BME 110)	Kevin Parker
BE 121	Cellular Engineering (formerly ES 122; BME 121)	Neel Joshi
BE 160	Chemical Kinetics and Reactor Design	Daniel Needleman
CHEM 101	Organic Synthesis Towards a Genomic Medicine	Stuart Schreiber
CHEM 106	Advanced Organic Chemistry	Eugene Kwan
CHEM 115	Advanced Organic Chemistry: Synthesis of Complex Molecules	Andrew Myers
CHEM 145	Experimental Organic Chemistry	Theodore Betley

CHEM 154	Advanced Inorganic Chemistry	Daniel Nocera
CHEM 160	Quantum Chemistry	Kang-Kuen Ni
[CHEM 163	Frontiers in Biophysics	Expected to be given Fall '16]
CHEM 171	Biological Synthesis	Emily Balskus
[CHEM 190	Statistical Mechanics in Chemistry and Biology	Expected to be given Fall '16]
COMPSCI 50	Introduction to Computer Science I	David Malan
COMPSCI 108	Intelligent Systems: Design and Ethical Challenges	Barbara Grosz
COMPSCI 109	Data Science	Hanspeter Pfister, Joseph Blitzstein, Verena Kaynig Fittkau
COMPSCI 165	Data Systems	Stratos Idreos
ENG SCI 115	Mathematical Modeling	Zhiming Kuang, Sarah Iams
ENG SCI 125	Mechanical Systems	Katia Bertoldi
ENG SCI 158	Feedback Control Systems: Analysis and Design	Na Li
HEB 1321	Food, Drink, and Energy	Noreen Tuross, Linda M. Reynard
HEB 1390	Game Theory and Social Behavior	Moshe Hoffman, Erez Yoeli
HEB 1418	Endocrinology and Behavior: Research Seminar	Susan Lipton
HEB 1463	Molecular Evolution of the Primates	Mary Ellen Ruvolo
HEB 1480	Human Evolution through Developmental Change	Terence Capellini, Neil Roach
MATH 114	Analysis II: Measure, Integration and Banach Spaces	Daniel Gardiner
MATH 116	Real Analysis, Convexity, and Optimization	Paul Bamberg
[MATH 117	Topics in Analysis	Expected to be given Fall '16]
MATH 121	Linear Algebra and Application	Michael Hopkins
MATH 122	Algebra I: Theory of Groups and Vector Spaces	Benedict Gross
MATH 124	Number Theory	Barry Mazur
MATH 131	Topology I: Topological Spaces and the Fundamental Group	Cliff Taubes
MATH 136	Differential Geometry	Tristan Collins
[MATH 141	Introduction to Mathematical Logic	Expected to be given Fall '16]
MATH 142	Descriptive Set Theory	Paul Koellner
[MATH 145A	Set Theory I	Expected to be given Fall '16]
MATH 152	Discrete Mathematics	
MATH 153	Mathematical Biology – Evolutionary Dynamics	Martin Nowak

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[MATH 156	Mathematical Foundations of Statistical Software	Expected to be given Fall '16]
OEB 101	Biology of Mammals	
OEB 105	Neurobiology of Motor Control	Bence Olveczky
OEB 106	Plant Development and Differentiation	Elena Kramer
OEB 119	Deep Sea Biology	Peter Girguis
[OEB 145	Genes and Behaviors	Expected to be given Fall '16]
OEB 155r	Biology of Insects	Naomi Pierce, Michael Canfield
OEB 212R	Advanced Topics in Plant Physiology	Noel Holbrook
PHYSICS 123	Laboratory Electronics	Thomas Hayes
PHYSICS 125	Widely Applied Physics	John Doyle
[PHYSICS 136	Physics of Medical Imaging	Expected to be given Fall '16]
PHYSICS 141	The Physics of Sensory Systems in Biology	Aravi Samuel
PHYSICS 143A	Quantum Mechanics I	Matthew Reece
PHYSICS 143B	Quantum Mechanics II	Subir Sachdev
[SCRB 60	Ethics, Biotechnology, and the Future of Human Nature	Expected to be given Fall '16]
SCRB 130	Biomedical Entrepreneuring: Turning Ideas into Medicine	Derrick Rossi
[SCRB 150	Human Genetics: Mining Our Genomes for an Understanding of Human Variation and Disease	Expected to be given Fall '17]
SCRB 152	Asking Cells Who They Are: Computational Transcriptomics Using RNA-Seq	Doug Melton
[SCRB 160	Experimental Embryology: From Stem Cells to Tissues and Back Again	Expected to be given Fall '16]
SCRB 175	Glucose: From Molecule to Society	Richard T. Lee
SCRB 180	Regeneration and Repair in the Mammalian Brain	Jeff Macklis
SCRB 182	Got (New) Brain? The Evolution of Brain Regeneration	Paola Arlotta
SCRB 190	Understanding Aging: Degeneration, Regeneration, and the Scientific Search for the Fountain of Youth	Amy Wagers and Lee Rubin
SCRB 192	Principles of Drug Discovery and Development	Gregory Verdine
STAT 110	Introduction to Probability	Joseph Blitzen
STAT 121	Data Science	Joseph Blitzen, Verena Fittkau, Hanspeter Pfister
STAT 131	Time Series and Prediction	Neil Shephard
STAT 135	Statistical Computing Software	Steven Finch

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STAT 139	Statistical Sleuthing Through Linear Models	Kevin Rader
[STAT 140	Design of Experiments	Expected to be given Fall '16]
STAT 151	Multilevel and Longitudinal Models	Luke Miratrix
SYSBIO 200	Dynamic and Stochastic Processes in Cells	Johan Paulsson (HMS) and Jeremy Gunawardena (HMS)
SYSBIO 204	Biomolecular Engineering and Synthetic Biology	Peng Yin (HMS), George Church (HMS), William Shih (HMS), and Pamela Silver (HMS)

SPRING 2016

APMTH 105	Ordinary and Partial Differential Equations	Margo Levine
APMTH 107	Graph Theory and Combinatorics	Leslie Valiant
BIOPHYS 205	Computational and Functional Genomics	Matha Mulyk, Suzzane Gaudet, Shamil Sunyaev
BE 125	Tissue Engineering (formerly ES 130; BME 125)	David Mooney
[BE 130	Neural Control of Movement (formerly ES 149; BME 130)	Expected to be given Spring '17]
[BE 153	Bioelectromagnetics	Expected to be given Spring '17]
BE 191	Introduction to Biomaterials (formerly BME 191)	Neel Joshi
CHEM 110	Small Molecules and Biological Processes	Matthew Shair
[CHEM 117	Diversity-Oriented Synthesis	Expected to be given Spring '17]
CHEM 135	Experimental Synthetic Chemistry	Austin Scharff
CHEM 156	Experimental Physical Chemistry	TBA
[CHEM 158	Nanoscience and Nanotechnology	Expected to be given Spring '17]
CHEM 161	Statistical Thermodynamics	Xiaowei Zhuang
[CHEM 163	Frontiers in Biophysics	Expected to be given Spring '17]
CHEM 165	Experimental Physical Chemistry	TBA
[CHEM 190	Statistical Mechanics in Chemistry and Biology	Expected to be given Spring '17]
COMPSCI 51	Introduction to Computer Science II	Stuart Shieber
COMPSCI 171	Visualization	Hanspeter Pfister
COMPSCI 181	Machine Learning	Finale Doshi-Velez
ENG SCI 112	Thermodynamics by Case Study	Scot Martin
ENG SCI 115	Mathematical Modeling	Ariem Amir, Saram Iams

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ENG SCI 123	Introduction to Fluid Mechanics and Transport Processes	Shmuel Rubinstein
ENG SCI 151	Applied Electromagnetism	TBA
ENG SCI 154	Electronic Devices and Circuits	Gu-Yeon Wei
ENG SCI 155	Biological Signal Processing	Demba Ba
HEB 1210	Research in Comparative Biomechanics: Seminar	Daniel Lieberman
HEB 1420	Human Evolutionary Anatomy	Katherine D. Zink, Neil Roach
HEB 1451	Primate Functional Genetics and Genomics	Terence Capellini
MATH 110	Vector Space Methods for Differential Equations	Paul Bamberg
MATH 112	Introductory Real Analysis	Tristan Collins
MATH 113	Analysis I: Complex Function Theory	Horng`Tzer Yau
MATH 115	Methods of Analysis	Babak Haghighat
[MATH 117	Probability and Random Processes with Economic Applications	Expected to be given Spring ‘17]
MATH 118R	Dyanamical Systems	
MATH 123	Algebra II: Theory of Rings and Fields	Arul Shankar
MATH 12	Number Fields	Barry Mazur
MATH 130	Classical Geometry	Eric Peterson
MATH 132	Topology II: Smooth Manifolds	Michael Hopkins
MATH 137	Algebraic Geometry	Joseph D. Harris
MATH 144	Model Theory	William Boney
[MATH 145B	Set Theory II	Expected to be given Spring ‘17]
MATH 154	Probability Theory	Jacob Lurie
MATH 155R	Combinatorics	Noam D. Elkies
MATH 157	Mathematics in the World	Joseph D. Harris
OEB 103	Plant Systematics and Evolution	
OEB 123	Biology of Symbiosis	TBA
OEB 125	Molecular Ecology and Evolution	TBA
OEB 130	Biology of Fishes	George Lauder
OEB 131	Neuroethology	TBA
OEB 167	Herpetology	Jonathan Losos
OEB 173	Comparative Biomechanics	Andrew Biewener
OEB 185	Genetic Conflict	TBA
OEB 190	Biology and Diversity of Birds	Scott Edwards

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OEB 191	Physiological and Biochemical Adaptation	Peter Girguis
OEB 223	Topics in Neurogenetics	TBA
PHYSCIS 123	Laboratory Electronics	Thomas Hayes
PHYSICS 140	Introduction to the Physics of Living Systems	Aravinthan Samuel
PHYSICS 143A	Quantum Mechanics I	Gerald Gabrielse
PHYSICS 153	Electrodynamics	Mikhail Lukin
PHYSCIS 175	Laser Physics and Modern Optical Physics	Markus Greiner
PHYSICS 181	Statistical Mechanics and Thermodynamics	Phillip Kim
[SCRB 25]	Biochemistry and Human Metabolism	Expected to be given Spring '17]
[SCRB 110	Classic Experiments in Developmental Biology	Expected to be given Spring '17]
[SCRB 125	Nuclear Reprogramming and Developmental Plasticity	Expected to be given Spring '17]
SCRB 140	Developmental and Molecular Basis of Growth and Regeneration	Fernando Camargo
[SCRB 155	Epigenetic Regulation in Development	Expected to be given Spring '17]
[SCRB 157	The Noncoding Genome	Expected to be given Spring '17]
SCRB 162	Experimental Regenerative Biology	Qiao Zhou
SCRB 165	Directed Differentiation of Stem Cells	Chad Cowan
SCRB 167	Stem Cells and Regeneration in the Pathobiology and Treatment of Human Disease	George Daley (HMS)
SCRB 178	Molecular Immunology: Seminar	Jonathan Hoggatt
[SCRB 185	Human Disease	Expected to be given Spring '17]
SCRB 187	Brains, Identity, and Moral Agency	Steven Hyman
SCRB 192	Principles of Drug Discovery and Development	Greg Verdine
STAT 111	Introduction to Theoretical Statistics	Kevin Rader
STAT 115	Introduction to Computational Biology and Bioinformatics	Xiaole Shirley Liu (HSPH)
STAT 139	Statistical Sleuthing Through Linear Models	
STAT 149	Statistical Sleuthing through Generalized Linear Models	
STAT 171	Introduction to Stochastic Processes	
STAT 186	Statistical Methods for Evaluating Causal Effects	

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SYSBIO 201	Principles of Animal Development from a Systems Perspective	Sean Megason (HMS), Angela DePace (HMS), and Marc Kirschner (HMS)

COURSES IN THE DIVISION OF MEDICAL SCIENCES AT HMS

Ordinarily, courses above the 200 level listed by the Division of Medical Sciences in the departments of Biological Chemistry and Molecular Pharmacology, Cell Biology, Genetics, Immunology, Microbiology and Molecular Genetics, Neurobiology, Pathology and Virology count as advanced courses for CPB and MCB concentrators. *Please note, however, that those courses are primarily intended for graduate students and it is therefore essential that you obtain permission to take the course from the instructor.* You should also contact Marty Samuels to ensure that the course you wish to take will count for your concentration.

FALL 2015

[BCMP 228	Macromolecular NMR	Expected to be given Fall '16]
BCMP 200	Principles of Molecular Biology	Joseph John Loparo, Dipanjan Chowdhury, Stirling Churchman, Johannes Walter, Timur Yusufzai, Melissa Leger-Abraham
BCMP 218	Molecular Medicine	George Daley, David Cohen, Irving London
BCMP 230	Principles and Practice of Drug Development	Lee Rubin, Stan Finkelstein
CELLBIO 226	Concepts in Development, Self-Renewal, and Repair	Iain Drummond, Amar Sahay
GENETICS 201	Principles of Genetics	Fred Winston, Thomas Bernhardt, Maxwell Heiman, Mitzi Kuroda, Steven McCarroll, Matthew Harris
IMMUN 201	Principles of Immunology	Thorsten Mempel, Michael Carroll, Ulrich von Andrian
MICROBIO 205	Mechanisms of Microbial Pathogenesis	Clyde Crumpacker
MICROBIO 214	Mechanisms of Bacterial Pathogenesis and Host Immune Response	Marcia Goldberg, Jonathan Kagan, Michael Starnbach, Darren Higgins
NEUROBIO 200	Neurobiology	John Assad, Matthew Frosch, Jeffrey Holt, Rosalind Segal, Ziv Williams
NEUROBIO 220	Cellular Neurophysiology	Bruce Bean, Wade Regehr, Bernardo Sabatini, Gary Yellen
NEUROBIO 230	Visual Recognition: Computational and biophysical perspective	Gabriel Kreiman

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VIROLOGY 200	Introduction to Virology	Max Nibert, David Knipe, Priscilla Yang, Elliott Kieff, Karl Munger
VIROLOGY 202	Proposal Writing	Benjamin Gewurz, Galit Alter, James DeCaprio, Frederick Wang

Spring 2016

BCMP 201	Biological Macromolecules: Structure, Function and Pathways	Stephen Harrison, Stephen Blacklow, Peter Sorger
BCMP 213	Behavioral Pharmacology	Jack Bergman
BCMP 234	Cellular Metabolism and Human Disease	Thomas Michel
BCMP 236	Modern Drug Discovery: from principles to patients	Nathanael Gray, Timothy Mitchison
CELLBIO 201	Principles of Cell Biology	Danesh Moazed, Christopher Wood
CELLBIO 207	Developmental Biology: Molecular Mechanisms of Vertebrate Development	Andrew Lassar, John Flanagan, Wolfram Goessling, Jordan Kreidberg, Sean Megason, Trista North, Ramesh Shivdasani, Jessica Whited, Malcolm Whitman
CELLBIO 211	Molecular and Systems Level Cancer Biology	Peter Sicinski, Marc Vidal
[CELLBIO 212	Biology of the Cancer Cell	Expected to be given Spring '17]
GENETIC 202	Human Genetics	Matthew Warman
GENETIC 216	Advanced Topics in Gene Expression	Robert Kingston, Fred Winston
GENETIC 219	Inheritance and Weird Stuff	Chao-ting Wu, Kami Ahmad
GENETIC 228	Genetics in Medicine - From Bench to Bedside (meets at MGH)	Christopher Newton-Cheh, David Sweetser
IMMUN 202	Advanced Principles of Immunology	D. Moody, Martin Hemler
IMMUN 204	Critical Readings for Immunology	Duane Wesemann
MICROBI 201	Molecular Biology of the Bacterial Cell	David Rudner, Thomas Bernhardt, Simon Dove, Ann Hochschild
MICROBI 210	Microbial Sciences: Chemistry, Ecology, and Evolution	Michael Gilmore
MICROBI 213	Social Issues in Biology	Jonathan Beckwith, Louis Guenin
NEUROBIO 204	Neurophysiology of Central Circuits	Richard Born, Mark Andermann, Michael Do, Christopher Harvey, Margaret Livingstone, Rachel Wilson
NEUROBIO 209	Neurobiology of Disease	Edward Kravitz

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NEUROBIO 211	Molecular and Developmental Neurobiology	Lisa Goodrich, Sandeep Datta, Michela Fagiolini, Chenghua Gu, Pascal Kaeser, Joshua Kaplan, Maria Lehtinen, Beth Stevens
VIROLOGY 201	Virology	Sean P.J. Whelan, James Cunningham, Michaela Gack

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