<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1002 BIOCHEMISTRY OF METABOLIC REGULATION</td>
<td>2</td>
</tr>
<tr>
<td>1004 MOLECULAR CELL BIOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>1006 GENE EXPRESSION</td>
<td>4</td>
</tr>
<tr>
<td>1014 INTRODUCTION TO BIOSTATISTICS</td>
<td>5</td>
</tr>
<tr>
<td>1106 HORMONE ACTION AND SIGNAL TRANSDUCTION</td>
<td>6</td>
</tr>
<tr>
<td>1114 CANCER: A BASIC SCIENCE APPROACH</td>
<td>7</td>
</tr>
<tr>
<td>1140 BIOINFORMATICS AND COMPUTATIONAL BIOLOGY OF PROTEINS</td>
<td>8 - 9</td>
</tr>
<tr>
<td>1210 SYSTEMS NEUROSCIENCE</td>
<td>10</td>
</tr>
<tr>
<td>1215 NEUROANATOMY: BASIC AND APPLIED</td>
<td>11</td>
</tr>
<tr>
<td>1216 PROTEIN FOLDING: DISEASE TO DESIGN</td>
<td>12</td>
</tr>
<tr>
<td>1219 MINI-WORKSHOP ON MODERN TECHNIQUES APPLIED TO BIOMEDICAL RESEARCH</td>
<td>13 - 15</td>
</tr>
<tr>
<td>1334 FUNDAMENTALS OF COURSE DESIGN AND TEACHING</td>
<td>16</td>
</tr>
<tr>
<td>1340 BIOSTATISTICS III WITH DATA ANALYSIS LAB</td>
<td>17</td>
</tr>
<tr>
<td>1341 ADVANCED TOPICS IN EPIDEMIOLOGY &amp; BIOSTATISTICS</td>
<td>18</td>
</tr>
<tr>
<td>1344 SYSTEMS BIOLOGY SEMINAR</td>
<td>19</td>
</tr>
<tr>
<td>1345 GENETIC BASIS OF BEHAVIORAL DISORDERS</td>
<td>20</td>
</tr>
<tr>
<td>1359 CLINICAL RESEARCH 201: DESIGN AND CONDUCT OF CLINICAL RESEARCH</td>
<td>21 - 22</td>
</tr>
</tbody>
</table>
1002 BIOCHEMISTRY OF METABOLIC REGULATION

COURSE LEADER: Dr. Steven Roderick

CREDITS/CLASS MEETINGS: 3 semester hours with approximately 24 lectures.

COURSE DESCRIPTION: This course will cover key topics in metabolism and will highlight relationships to clinically relevant inherited diseases. Integration and regulation of carbohydrate, lipid, amino acid and nucleic acid metabolism will be emphasized. A passing grade in Graduate Biochemistry or the permission of the Course Leader is a prerequisite.


CREDIT HOURS: 3.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1004 MOLECULAR CELL BIOLOGY

COURSE LEADERS: Drs. Dianne Cox, Tom Meier and Duncan Wilson

CREDITS/CLASS MEETINGS: 4 semester hours; approximately 34 lectures. Grading based on three in-class exams and 4 team-based learning sessions.

SUITABILITY FOR 1ST YEAR STUDENTS: This is a demanding course involving a substantial amount of reading and should only be taken by those first year students with a background in biochemistry and cell biology.

SUGGESTED BACKGROUND READING: “Lewin’s CELLS” 2011, second edition; eds. L. Cassimeris, V.R. Lingappa, and G. Plopper; Jones and Bartlett Publishers; Sudbury, MA. In addition the course will rely heavily on primary literature and current reviews.

COURSE DESCRIPTION: This course will cover basic areas in cell biology with emphasis on selected topics of current interest. The three main areas will be intracellular protein transport, the nucleus, and the cytoskeleton. Topics will include: membrane structure and biogenesis, functions of intracellular membranes and the signal hypothesis, protein trafficking and intracellular sorting, glycosylation, exocytosis, endocytosis and membrane fusion, nuclear structure and organization, nuclear transport, mRNA localization, self assembly of cytoskeletal structures, actin, microtubules, intermediate filaments, molecular motors, mitosis, cell junctions and extracellular matrix, cytoskeleton and signal transduction, calcium as second messenger, and cilia.

CREDIT HOURS: 4.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1006 GENE EXPRESSION

COURSE LEADERS: Drs. B. Hilda Ye and Charles Query

CREDITS/CLASS MEETINGS: 4 semester hours; 28 lectures and 5 discussion sessions.

PREREQUISITE BACKGROUND: An undergraduate course in molecular biology at the level of Alberts et al. "Molecular Biology of the Cell" and Graduate Biochemistry #1001 or Molecular Genetics #1005 (Fall Semester), or equivalent.


SUITABILITY FOR 1ST YEAR STUDENTS: Yes, with the appropriate background described above.

COURSE DESCRIPTION: This course deals with molecular mechanisms of gene expression regulation, and their impact on cellular functions during development, differentiation, and pathology. Topics include: regulation of transcription and of chromatin structure, its modification and role in epigenetic phenomena; metabolism of the major cellular classes of RNA, emphasizing transcription, processing, stability/degradation, and translation of messenger RNA and control at each of these steps; the biology of non-coding RNA and the use of RNAi as an experimental and therapeutic tool; mechanisms of genome maintenance and DNA repair. The role of gene expression, as described in the previous sections, is then discussed with respect to control of the cell cycle and apoptosis in the context of cancer, hematopoiesis, and stem cell self-renewal.

Students are expected to participate actively in faculty-guided discussion sessions during which experimental problem sets representing each segment of the course are discussed in depth.

EXAMINATIONS: There will be three take-home examinations.

CREDIT HOURS: 4.0

LEVELS: Sue Golding Graduate Division

SCHEDULE TYPE: Lecture
1014 INTRODUCTION TO BIOSTATISTICS

COURSE LEADERS: Drs. Kenny Ye and Moonseong Heo

CREDITS/CLASS MEETINGS:
- 2 semester hours; Fourteen Twelve 2 hour lectures
- Class hour and location: Friday 10:00am-12:00pm in Belfer 1001
- Start Date: January 11, 2013
- Midterm: TBA
- Final Exam: TBA

PREREQUISITE BACKGROUND: Basic algebra and familiarity with Windows and access to SPSS for Windows Version 8 or higher. With the course leader's permission, a good working knowledge and access to another full-featured statistical package can substitute for the access to Windows/SPSS requirement.

REQUIRED TEXTS: Fundamentals of Biostatistics with (CD-Rom) by Bernard Rosner
Hardcover seventh edition, copyright 2010 (hardcover ISBN 9780538733496; retail price: $268.95)

REFERENCES: Andy Field, Discovering Statistics Using SPSS

COURSE DESCRIPTION: This is an elementary course on statistical methods primarily for clinical and other biomedical research applications. Topics include study variables and descriptive statistics; statistical inference, type-I and type-II errors; basic principles of probability; the Normal distribution and Z-scores; sampling distributions; tests of significance with student's t; p values and confidence intervals; non-parametric tests; analysis of variance; categorical variables, the chi-square distribution and odds ratios; correlation and simple linear regression; concepts in multivariate analysis with linear and logistic regression. Also introduce SPSS for data management and statistical analysis.

CREDIT HOURS: 2.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPES: Lecture
1106 HORMONE ACTION AND SIGNAL TRANSDUCTION

COURSE LEADERS: Drs. Jonathan M. Backer and Charles Rubin

CREDITS/COURSE MEETINGS: 3 semester hours; ~ 40 lectures (60 minutes).

PREREQUISITE BACKGROUND: Intermediate Biochemistry is desirable, but not absolutely necessary; graduate level understanding of protein structure and function, DNA structure & function also desirable.

REQUIRED TEXTS: Signal Transduction, Second Edition [Hardcover]
Bastien D. Gomperts (Author), Ijsbrand M. Kramer (Author), Peter E.R. Tatham (Author)

SUITABILITY FOR 1ST YEAR STUDENTS: Yes, with appropriate background. If uncertain, see Dr. Rubin or Dr. Backer for interview.

COURSE DESCRIPTION: This course considers two fundamental aspects of biological regulation in experimental and theoretical detail: 1) The biochemical and molecular basis for the interaction between hormones and receptors; and 2) the mechanisms by which hormone-receptor complexes control cell metabolism, motility, proliferation, and the expression of specific genes. A series of hormone/receptor systems is discussed to provide current concepts of the diverse mechanisms by which different classes of hormones exert their actions. A partial list of topics includes: growth factors and their receptors and relationships to oncogene products; catecholamine-regulated adenylate cyclase with a focus on the role of a family of GTP-binding proteins as mediators of hormone action; regulation of intracellular calcium and calcium-induced signaling the enzymatic, structural and functional properties of cAMP-dependent, calmodulin-activated and calcium-phospholipid activated protein kinases; phosphoinositide kinases and their downstream effectors; small GTPases and their role in mitogenic signaling and cytoskeletal regulation; signaling by non-receptor tyrosine kinases; the progesterone and glucocorticoid receptors and the central roles of steroid receptor-ligand complexes in controlling gene transcription; TGFβ signaling in development.

CREDIT HOURS: 3.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1114 CANCER: A BASIC SCIENCE APPROACH

COURSE LEADERS: Drs. Charles E. Rogler and Jeffrey E. Segall

CREDITS/CLASS MEETINGS: A one semester course; 3 semester hours; approximately 15 lectures and 15 discussion sessions.

PREREQUISITE BACKGROUND: First semester courses in biochemistry and molecular genetics.

REQUIRED TEXTS: The Biology of Cancer by Robert A. Weinberg, (paperback ISBN: 9780815340768 retail price $145.00)

SUITABILITY FOR 1ST YEAR STUDENTS: Yes.

COURSE DESCRIPTION: The course is designed to bring together current approaches in cancer research including epidemiology, histopathology, physiology, cell biology, and molecular genetics. The course will involve both lectures and case studies/paper discussions on various cancers. Topics will include the pathology of cancer, pathways in the development of cancers, oncogenes, tumor suppressor genes, micro RNAs and stem cells in cancer, the metastatic cascade, immune responses to cancer, and a few treatment modalities. Selected tumor types will be covered in more detail, such as breast, colon, liver, lung, etc. Emphasis will be on classic and emerging genomics approaches in basic cancer research. The overall goal is to establish a firm foundation in the "Ten Hallmarks of Cancer" and enable students to gauge difficulties and opportunities for advances in cancer research.

Class size limited to 24.

CREDIT HOURS: 3.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPES: Lecture
1140 BIOINFORMATICS AND COMPUTATIONAL BIOLOGY OF PROTEINS

COURSE LEADER: Dr. Andras Fiser

TEACHING ASSISTANCE: Dr Eduardo Fajardo, Dr. Dmitrij Rykunov, Dr. Narcis Fernandez-Fuentes, Carlos Madrid.

CREDITS/CLASS MEETINGS: 4 semester hours: ~25 lectures. Classes twice a week, each for 2 lecture hours (1.5 hours). Plus weekly, two hour long tutorials. Grading will be based on assignments and 2 exams: midterm, final.

PREREQUISITE/BACKGROUND: Open to all. Graduate Biochemistry is required, Biophysical Chemistry of Macromolecules is suggested.

SUGGESTED BACKGROUND READING:

- Protein Structure Prediction: A Practical Approach by MJE Sternberg

SUITABILITY FOR FIRST YEAR STUDENT: Yes, if perquisite courses are taken already. Exemptions are possible, but require explicit permission by the course leader before registering.

COURSE DESCRIPTION: It is an introductory course to Protein Bioinformatics. We provide a systematic introduction to the major techniques, algorithms and tools used in Bioinformatics (for sequence alignments, classifications, secondary and tertiary structure predictions, prediction of various functional structural features of proteins etc.). The students are expected to learn programming in PERL at the beginning of the course and utilize this technique in various bioinformatics assignments. Guest lecturers will provide in depth introductions to popular techniques and examples for state of the art applications.

LECTURE TOPICS:

1. Biological databases, on line resources
2. Pairwise sequence alignment, dynamic programming, similarity matrices
3. Phylogenetic trees, multiple sequence alignments
4. Heuristic and iterative alignment methods, position specific scoring matrices
5. Hidden Markov Models in sequence alignments
6. Clustering and classification schemes of sequences
7. Sequence motifs, conservation, analyses
8. Structure superposition, classification, structural motifs and conservation
9. Predicting structural, functional features (secondary structures, transmembrane regions, functions, solvent accessibility, 3D contacts etc.)
10. Protein folding problem, tertiary structure prediction approaches
11. Ab initio structure predictions, forcefields, gradient optimization methods, solvent representations, electrostatics
12. Fold recognition techniques, threading, statistical potentials
13. Comparative modeling and structural genomics
14. Modeling variable regions, mini protein folding problem
15. Side chain rotamer state predictions, Protein design
16. Docking ligands to proteins
17. Protein complexes, interactions, interfaces
18. Applications of protein sequence analyses (guest lecture)
19. Applications of structure prediction (guest lecture)
20. Modeling cellular networks (guest lecture)

CREDIT HOURS: 4.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPES: Lecture
1210 SYSTEMS NEUROSCIENCE

COURSE LEADERS: Drs. Adam Kohn, Jose Luis Pena, and Odelia Schwartz

CREDITS/CCLASS MEETINGS: 5 semester hours; three 1.5 hour meetings per week for a total of approximately 30 class sessions.

PREREQUISITE BACKGROUND: You must have completed and passed the Cellular and Molecular Neuroscience course. (Exceptions must be approved by the course leaders in advance).


SUITABILITY FOR 1ST YEAR STUDENTS: Suitable for 1st year students.

COURSE DESCRIPTION:

- **Scope:** The course will explore how complex neural systems integrate afferent information and direct efferent outflow. The overall goal will be to explore higher order functions, such as the structure and function of neural systems underlying sensation and movement, learning and memory at the sensory and motor levels, as well as higher-level cognitive processes including object perception and attention. At every stage we will build on a firm understanding of the underlying physiology and anatomical structure. Principal areas of interest will be on hierarchical neural systems, the plasticity of neural networks, serial and parallel neural processing, cognition and computational modeling.

- **Format:** The course will be divided into four modules: 1) Principles of neural systems, 2) Neural bases of sensation 3) Neural bases of behavior and 4) Higher order functions and cognition. Each module will contain an initial series of didactic lectures introducing key facts and concepts, as well as class participation sessions focused on pre-assigned questions and relevant research papers. Techniques will be illustrated by demonstration.

- **Grading:** The grade will be based on class participation and a term paper in the form of a grant proposal. The midterm exam will involve critiquing classmates’ grant proposals.

CREDIT HOURS: 5.0  
LEVELS: Sue Golding Graduate Division  
SCHEDULE TYPE: Lecture
1215 NEUROANATOMY: BASIC AND APPLIED

COURSE LEADER: Dr. Reed Carroll

CREDITS/CLASS MEETINGS: A short course offered every Spring semester, 2 semester hours, 18 sessions including 5 laboratory sessions and an exam.

PREREQUISITE BACKGROUND: An undergraduate course in Neuroscience is recommended but not required.

SUGGESTED BACKGROUND READING: Martin, J.H., Neuroanatomy Text and Atlas, Appleton and Lange, 1996

SUITABILITY FOR 1ST YEAR STUDENTS: Recommended for 1st Year Students

COURSE DESCRIPTION: Basic and applied neuroanatomy is a hands-on interactive course designed to acquaint the student with central nervous system neuroanatomy and current methods in research. "Applied" in this course means research applications rather than clinical, although clinical questions are used for learning purposes. Brain function will be divided into systems such as motor control, sensory processing, and learning and memory. The course meets 3 times per week. Each class meeting will include a didactic lecture covering one of the brain systems followed by demonstrations and discussion of neuroanatomical methods and techniques being used widely in neuroscience research today. Each Friday, laboratory meetings will involve brain dissections. The course grade will be based on student presentations, an exam and lab notebooks. Class size limited to 16.

CREDIT HOURS: 2.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1216 PROTEIN FOLDING: DISEASE TO DESIGN

COURSE LEADERS: Drs. Robert Callender, Jonathan Lai, Marion Schmidt

CREDITS/CLASS MEETINGS: 2 semester hours. Wednesdays, 2 hour lectures for 11 weeks

PREREQUISITE BACKGROUND: Graduate Biochemistry is required

COURSE DESCRIPTION: This course will focus on current research in understanding the relationship between the biophysical nature of proteins, the cellular mechanisms to maintain protein homeostasis and protein misfolding diseases, and will provide up-to-date insights in current approaches of protein engineering. The course is most appropriate for Sue Golding Students who have already completed Graduate Biochemistry. The course takes a very broad and comprehensive view. It will first cover protein folding from a reductionist view with emphasis on current quantitative approaches. Subsequently the individual pathways, which constitute the cellular proteostasis network, their crosstalk and their regulation will be introduced. With all this in hand, the origin, pathogenesis and treatment approaches of protein misfolding diseases will be presented. Finally, the theory and application of protein design will be discussed. Students will be expected to read original research articles and to be prepared to periodically present these articles to the class. Several guest lectures from researchers currently working in both protein folding and the role of protein folding in human disease are planned.

TENTATIVE COURSE OUTLINE:
- Introduction to the energetics of protein structure
- Protein Folding: Descriptions of the folding pathway.
  - Folding of small model systems: helix and sheet.
  - The Folding pathway of specific proteins.
- Protein structure modeling
- Protein quality control in the cell.
  - The proteostasis network and regulation
- Human disease based on misfolding
  - Non-amyloidogenic diseases
  - Amyloidogenic and neurodegenerative diseases.
- Protein Engineering
  - Hierarchical Design
  - Design of novel proteins
  - Protein-protein interactions

CREDIT HOURS: 2.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1219 MINI-WORKSHOP ON MODERN TECHNIQUES APPLIED TO BIOMEDICAL RESEARCH

COURSE LEADER: Dr. Eliana Scemes


CREDITS/CLASS MEETINGS: 2 semester hours: one 6 hour session per week for a total of nine sessions.

SUITABILITY: First year student may register after consulting coordinator.

COURSE DESCRIPTION: The field of Biomedical research has been enormously influenced by advances in techniques, with vast array of different technical approaches and analytical methods now being used to address biological questions. The aim of this course is to provide students with a rigorous "hands-on" experience in a number of the most recent methods that have revolutionized biomedical research in this last decade such as confocal imaging, total internal reflectance fluorescence, microPet, patch clamping, genetically engineered optical probes, gene micro-array, proteomics, bio-informatics, brain imaging and activity. Because the course involves mainly laboratory work, it will be offered to a limited number of students (maximum of six and minimum of three), and will be given one day a week for 10 weeks. Classes will be 3 - 6 hrs each. Students will be graded (Pass - Fail) according to their participation during the course and elaboration of a brief project that will be presented at the end of the classes (April 9, 2013).

COURSE OUTLINE:

INTRODUCTION TO THE COURSE (January 22, 2013 at 9:00 AM, Kennedy Center, room 919).

A) Structure and Function of Neural Cells

1) Confocal microscopy (Dobrenis, K) (January 29, 2013, from10:00 AM-1:00 PM and from 2:00 to 5:00 PM)

   a. Respecting and breaking the light barrier; physical principles of confocal fluorescence microscopy and properties of fluorophores.
   b. Slicing, dicing and counting; acquisition and analysis of optical data including area/volume, intensity and co-localization measurements.
   c. The big picture; z-series and time-series acquisition of fixed and living brain cells, followed by 3D and 4D reconstruction.
   d. Spectral Fluorescence Imaging: enhanced multi-fluorophore detection and intrinsic profiling of cell populations.
2) Ca^{2+} imaging and Total Internal Reflected Fluorescence (TIRF) (Scemes, E) (February 5, 2013, from 9:00 AM to 12:00 and from 1:00-4:00 PM).

   a. Properties of fluorescent Ca^{2+} indicators
   b. Intercellular Ca^{2+} wave propagation in cultured astrocytes using confocal microscopy
   d. Generating an evanescent field
   e. Exocytosis measured by TIRF microscopy

B) Electrophysiology and imaging in studies of gap junction channels and hemichannels (Baukauskas, F) (February 12, 2013, from 9:00AM-12:00 and from 1:00-4:00 PM)

   a. Following the formation of gap junction channels and function of hemichannels using time-lapse imaging in cells expressing connexins fused with color variant of GFP.
   b. Measuring junctional conductance and voltage gating of gap junction channels using a dual voltage clamp system.

C) Imaging Function in vivo (Spray, DC) (February 19, 2013, from 9:00AM-12:00 and from 1:00-4:00PM)

   a. Optogenetic strategies: genetically encoded calcium indicators and photoactivated channel proteins.
   b. Use of fluorescent tags in whole animal imaging to detect stem cell and parasite load with invasive cells, and miroPET to determine functional changes in organs.

D) Functional Analysis of the CNS.

1) Electrophysiological techniques in the study of human cognition (Sussman, E) (February 26, 2013, from 9:00 AM-12:00 and from 1:00-4:00 PM).

2) Electrophysiological analysis of CNS activity (Arezzo, J) (March 5, 2013, from 9:00AM-12:00 and from 1:00-4:00 PM)

   a. Timing and Spatial Distribution of Intra-cortical Activity in the Monkey
   b. Recording of Whole Nerve Conduction Velocities in a Rat Model of Neuropathy

D) Transcriptomics (Iacobas, DA) (March 12, 2013, from 9:00 AM-12:00 and from 1:00-4:00 PM)

1) Analyzing and quantifying gene expression patterns

   a. How to hybridize micro-arrays

2) Construction and characterization of functional gemonic fabrics

   a) Analysis of expression control and coordination
   b) Prominence gene analysis
c) Analysis of genomic fabrics’ remodeling during disease progression and recovery following a treatment.

E) Proteomics: Mass spectroscopy. (Jordan, B.) (March 19, 2013; from 9:00 AM - 12:00 and from 1:00-4:00PM)

1) Principles and techniques for analyzing and quantifying macromolecular complexes by proteomics

2) Generating samples for analysis by mass spectrometry
   a. Purification of sub-cellular fractions and protein complexes for analysis
   b. Pre-fractionation of samples by 1D and 2D electrophoresis

3) Mass Spectrometry analysis.

G) Paper presentation by students: April 9, 2013 (Room#919 from 9:00 to 12:00)

CREDIT HOURS: 2.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPES: Lecture/Laboratory
1334 FUNDAMENTALS OF COURSE DESIGN AND TEACHING

COURSE LEADER: Dr. Michael S. Risley

CREDITS/CLASS MEETINGS: 2 semester hours; 1 two-hr session of lecture/discussion/group projects per week; total of 17 meetings.

PREREQUISITE BACKGROUND: Open to advanced graduate students who have completed their required coursework and qualifying exam. This course cannot be used to fulfill a graduate course or graduate program requirement. Also open to postdocs and faculty. The course enrollment will be limited to 40.

COURSE DESCRIPTION: Research and teaching are two major spheres of scholarship and responsibility for most faculty in academic science. Training in the science and art of teaching is uncommon, however, particularly in the research intensive environment of a medical school. Although we are often expected to teach and show evidence of good teaching, our training in pedagogy is frequently weak, and research training does not substitute for training to teach.

The proposed course will present fundamental concepts and principles widely used in the design and execution of courses for adult learners (college and postgrad). Topics will include cognitive hierarchies and multiple intelligences in adult learning, course, lesson and syllabus design, lecture hall strategies, active learning strategies, formative and summative assessment techniques.

Readings will be drawn from multiple texts, online resources and primary education research literature. The main texts will be:


STUDENT ASSESSMENT: Participants who successfully complete (pass/fail) the course will receive an official institutional certificate of completion to add to their CV. Successful completion will be assessed by attendance, weekly participation in discussions/assignments and satisfactory completion of exercises in course design. More than three absences/failed assignments will be grounds for course failure.

CREDIT HOURS: 2.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1340 BIOSTATISTICS III WITH DATA ANALYSIS LAB

COURSE LEADERS: Drs. Nan Xue, Baiyu Zhou, Aileen McGinn

CREDITS/CLASS MEETINGS: 3 semester hours; 14 week course meets 1x week for 3.5 hours

PREREQUISITE BACKGROUND: Must have completed Clinical Research Summer Intensive (Course #1307), Biostatistics II, Epidemiology II, and co-enrolled or have completed Advanced Topics of Epidemiology & Biostatistics, and permission from director.

SUITABILITY FOR 1ST YEAR STUDENTS: Advanced course

COURSE DESCRIPTION: To learn how the logistic regression can be used to assessed associations between exposure variables and dichotomous outcome variables. Methods for variable selection, examining confounders and interaction effects between variables, and assessing the goodness of fit of logistic regression models will be discussed. To learn fundamental methods in analyzing survival data including the Kaplan-Meier survival curves, the log-rank test, the Cox proportional hazards model, the stratified Cox proportional hazards model and the Cox proportional hazards model with time-dependent covariates. The Data Analysis Lab portion of this course will use STATA software to apply the concepts discussed in Biostatistics III including performing and interpreting statistical output related to logistic regression and Cox proportional hazards modeling. This will include assessing for interaction and confounding, model building strategies, testing of appropriate assumptions and evaluating regression diagnostics.

EXAMINATIONS: One take-home midterm; and One take-home final
Class Participation 10%; Homework 30%; Midterm 30% and Final 30%

CREDIT HOURS: 3.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture/Lab
1341 ADVANCED TOPICS IN EPIDEMIOLOGY & BIOSTATISTICS

COURSE LEADERS: Drs. Ilir Agalliu and Shankar Viswanathan

CREDITS/COURSE MEETINGS: 2 semester hours; 14 week course meets 1x week for 2.0 hours

PREREQUISITE BACKGROUND: Must have completed Clinical Research Summer Intensive (Course #1307), Epidemiology II, and Biostatistics II, and co-enrolled or have taken Biostatistics III, and by permission of director

SUITEABILITY FOR 1ST YEAR STUDENTS: Advanced course.

COURSE DESCRIPTION: This course aims at introducing advanced concepts and topics in epidemiology and biostatistics with the goal of expanding the knowledge and understanding of evolving methods in these fields. Topics in the epidemiologic component will include discussion about causation and causal inference; efficient study designs (e.g. nested case-controls, case-cohort); biomarkers of exposure and disease in epidemiological studies, different types of confounding and biases and methods to address them, and screening. The biostatistical component of this course will focus on methods for the analysis of repeated measures and other types of clustered data: fixed effects regression, mixed models, and marginal GEE-based models. Data analysis, variable construction, and model fitting will be performed on several training/example data sets using STATA. At the end of the course students will have a better understanding of epidemiologic and biostatistics methods and their application in different field studies.

EXAMINATIONS: midterm; and final
Class Participation 10%; Homework 30%; Midterm 30% and Final 30%

CREDIT HOURS: 3.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1344 SYSTEMS BIOLOGY SEMINAR
(adopted in part from Princeton University)

COURSE LEADER: Dr. Aviv Bergman

CREDITS/CLASS MEETINGS: 3 semester hours; 2 times a week for 1 1/2 hours

PREREQUISITE BACKGROUND: Molecular Genetics is recommended but not required.

TEXTBOOK FOR BACKGROUND READING AND REFERENCE: None - collections of journal articles will be used.

SUITABILITY FOR 1ST YEAR STUDENTS: The course will be open to students in at least their second year, post-doctorates and faculty members.

COURSE DESCRIPTION: It has long been recognized that scientific breakthroughs and groundbreaking research in the coming century requires multidisciplinary approaches to many areas of research. By means of critical reading of classical and contemporary articles the course will cover a broad range of relevant techniques from mathematical, statistical and computational sciences, and their relations to the specific scientific questions in each of the articles discussed. The course will cover 26 articles on biological questions that have been addressed both theoretically and experimentally. These articles will cover a broad range of biological topics from molecular biology, evolutionary biology, genomics and neuroscience.

CREDIT HOURS: 3.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1345 GENETIC BASIS OF BEHAVIORAL DISORDERS

COURSE LEADER: Dr. Noboru Hiroi

CREDITS/CLASS MEETINGS: 2 semester hours; 1 lecture per week/1.5 hrs per week, 18 lectures & sessions 2pm-3:30pm. Extended 1hr sessions held on every third Thursday (2pm-4:30pm)

PREREQUISITE BACKGROUND: Some background in neurobiology is desirable.

SUITABILITY FOR 1ST YEAR STUDENTS: Yes, but some background in neurobiology is desirable.

COURSE DESCRIPTION: The role of molecules and neurons in behavior is studied by inhibiting or enhancing their functions in experimental preparations. Similarly, alterations in molecules and neurons occur in disease states, which provide a glimpse as to how the brain functions. Such neuronal alterations often occur as a result of gene alterations, whether inherited, spontaneous, or environmentally driven. These neuronal alterations powerfully shape our behavior. Brain functions can be ascertained when they deviate from a normal state-- without such deviations, observations remain simply correlative.

Students will see patients with schizophrenia or autism at the beginning of the course. Students will then explore the function of different brain regions from a disease perspective. Recent advances in our understanding of the genetic and epigenetic aspects of neurological and neuropsychiatric disorders will be discussed. A secondary focus of this course will be placed on translational research. Students will learn how to ascertain the genetic and molecular mechanisms of behavior in both humans and model systems.

Sessions will be informal, with active student participation and student presentations of articles. Critical evaluation of existing dogma or commonly held views is encouraged. Grading will be based on a final essay (50%), presentation (25%) and participation in discussion (25%). Specific instructions about the final essay and presentations will be given at the first class. This course will be given if there are 2 or more students registered; if not, it will be given in the following year.

CREDIT HOURS: 2.0
LEVELS: Sue Golding Graduate Division
SCHEDULE TYPE: Lecture
1359 CLINICAL RESEARCH 201: DESIGN AND CONDUCT OF CLINICAL RESEARCH

COURSE LEADER: Drs. Paul R. Marantz, Ellie Schoenbaum, Patricia Friedmann

CREDITS/CLASS MEETINGS: 2 semester hours; 1 lecture per week/1.5 hrs per week, 5pm-6:30pm.

PREREQUISITE BACKGROUND: Successful completion of the Clinical Research Lecture Series (CR101), or permission from Dr. Marantz.


COURSE DESCRIPTION: This seminar course aims to introduce students to clinical research with a focus on epidemiology and study design. The course uses an introductory clinical research text, along with a critical assessment of papers from the scientific (clinical and epidemiologic) literature, in order to learn about study designs: their strengths and weaknesses and how such studies are conducted. Topics to be covered include: Basic Epidemiology, Measures of Association, Basic Statistics, Cohort Studies, Case Control Studies, Clinical Trials, Causal Inference, and Research Ethics.

COURSE OVERVIEW: The course will be taught by a team of 3 faculty members. Some topics will be covered in 2-week blocks, each block led by a single faculty member: the first week will provide an overview of the topic (connected to a chapter/chapters from the Hulley textbook); the second week will involve a critical analysis of a journal article chosen that exemplifies the topic. Some classes will involve computer-based exercises, and will require students to bring their laptops to class. All classes will require advance preparation and active participation.

LEARNING OBJECTIVES:
At the end of the course, students will be able to:

- Describe what makes a good research question.
- List the major elements of a cohort (and retrospective cohort) study.
- Critique a case-control study, and describe alternative designs.
- Explain the advantages and disadvantages of specific study designs for specific research questions.
- Interpret a randomized trial.
- Explain the role of significance testing in clinical research.
- Interpret the major measures of association used in epidemiologic research.
- Describe the estimates and assumptions involved in sample size determination, and perform simple calculations.
- Identify ethical challenges in clinical investigation, and propose solutions to those challenges.
- Distinguish between associations and causal connections in etiologic research.

COURSE REQUIREMENTS & GRADING: The course will be graded "Honors/Pass/Fail". (As per graduate school regulations, a grade of "incomplete" may be allowed if absolutely necessary at the discretion of the Professors) We plan to use a criterion standard for grading: i.e., Honors > 90%, Pass 65-90%, Fail < 65%. However, we reserve the right to ‘curve’ these cut-points if necessary.
The grade will be determined using the following formula:

- Final examination (in-class; short-answer/short-essay): 70%
- Class participation as determined by faculty (preparation, contribution to discussion): 30%

**FINAL EXAM:** There will be an in-class final exam on May 9 at 5PM.

**ANGEL:** Angel will be used as the main platform for posting course materials and communicating with students.

**CREDIT HOURS:** 2.0  
**LEVELS:** Sue Golding Graduate Division  
**SCHEDULE TYPE:** Lecture