SYLLABI FOR FIRST YEAR COURSES AT UMDNJ-RWJMS
AND RUTGERS JOINT PROGRAMS

BIOCHEMISTRY 501/5501 Fall 2010

Wed. Sept. 1  Introduction to Biochemistry  Winkelmann
Mon. Sept. 6  Labor day, no class
Wed. Sept. 8  Protein Structure  Stock
Mon. Sept. 13 Protein Structure  Stock
Wed. Sept. 15 Protein Structure  Stock
Mon. Sept. 20 Protein Structure  Stock
Wed. Sept. 22 Enzymology  Patel
Mon. Sept. 27 Enzymology  Patel
Wed. Sept. 29 Enzymology  Patel
Mon. Oct. 3 Enzymology  Patel
Wed. Oct 6  Immunochemistry  Winkelmann

Mon. Oct. 11 Exam 1  RWJMS East or West Lecture Hall 4-7 PM

Wed. Oct. 13 Protein Folding  Winkelmann
Mon. Oct. 18 Protein Folding  Winkelmann
Wed. Oct. 20 Protein Turnover  Madura
Mon. Oct. 25 Protein Turnover  Madura
Wed. Oct. 27 Lipids and membranes  Kramer
Mon. Nov. 1 Lipids and membranes  Kramer
Wed. Nov. 3 Lipids and membranes  Kramer

Mon. Nov. 8 Exam 2  RWJMS East or West Lecture Hall 4-7 PM

Wed. Nov. 10 Complex carbohydrates  Yurchenco
Mon. Nov. 15 Complex carbohydrates  Yurchenco
Wed. Nov. 17 Bioenergetics  Niederman
Mon. Nov. 22 Bioenergetics  Niederman
Wed. Nov. 24 Thanksgiving break, no class
Mon. Nov. 29 Bioenergetics  Niederman
Wed. Dec. 1 Metabolic regulation  Hampsey
Mon. Dec. 6 Metabolic regulation  Hampsey
Wed. Dec. 8 Metabolic regulation  Hampsey
Mon. Dec. 13 Metabolic regulation  Hampsey

Fri. Dec. 17 Exam 3  RWJMS East or West Lecture Hall 2-5 PM
### COURSE INFORMATION

**Place:** Waksman Auditorium  
**Time:** 10 to 11:30 a.m. Tuesday and Thursday  
**Course Coordinator:** Dr. Gabriel/Dr. Brill  

### TOPIC SCHEDULE

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>INSTRUCTOR</th>
<th>CONTACT INFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 2(Th)</td>
<td>Introduction and DNA structure</td>
<td>Steven Brill</td>
<td>CABM 304; 732-235-4197</td>
</tr>
<tr>
<td>Sep 9(Th)</td>
<td>Prokaryotic DNA replication</td>
<td>Steven Brill</td>
<td><a href="mailto:brill@cabm.rutgers.edu">brill@cabm.rutgers.edu</a></td>
</tr>
<tr>
<td>Sep 14(Tu)</td>
<td>Prokaryotic DNA replication</td>
<td>Steven Brill</td>
<td></td>
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<tr>
<td>Sep 16(Th)</td>
<td>Eukaryotic DNA replication</td>
<td>Steven Brill</td>
<td></td>
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<tr>
<td>Sep 21(Tu)</td>
<td>Eukaryotic DNA replication</td>
<td>Steven Brill</td>
<td></td>
</tr>
<tr>
<td>Sep 23(Th)</td>
<td>DNA recombination</td>
<td>Kim McKim</td>
<td>Waksman 206; 732-445-1164</td>
</tr>
<tr>
<td>Sep 28(Tu)</td>
<td>DNA recombination</td>
<td>Kim McKim</td>
<td><a href="mailto:mckim@rci.rutgers.edu">mckim@rci.rutgers.edu</a></td>
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<tr>
<td>Sep 30(Th)</td>
<td>DNA recombination</td>
<td>Kim McKim</td>
<td></td>
</tr>
<tr>
<td>Oct 5(Tu)</td>
<td>DNA transposition</td>
<td>Abram Gabriel</td>
<td>CABM 306; 732-235-5097</td>
</tr>
<tr>
<td>Oct 7(Th)</td>
<td>DNA transposition</td>
<td>Abram Gabriel</td>
<td><a href="mailto:gabriel@cabm.rutgers.edu">gabriel@cabm.rutgers.edu</a></td>
</tr>
<tr>
<td>Oct 12(Tu)</td>
<td>Transcription: prokaryotic</td>
<td>Richard Ebright</td>
<td>Waksman 201A; 732-445-5179</td>
</tr>
<tr>
<td>Oct 14(Th)</td>
<td>Transcription: prokaryotic</td>
<td>Richard Ebright</td>
<td></td>
</tr>
<tr>
<td>Oct 15(Fr)</td>
<td>Exam 1 RWJMS West Lecture Hall 3:00 - 6:00 PM (Brill, McKim, Gabriel)</td>
<td>*Oct 19(Tu)</td>
<td>Transcription: eukaryotic (Waksman 1001) Joseph Fondell</td>
</tr>
<tr>
<td>Oct 21(Th)</td>
<td>Transcription: eukaryotic</td>
<td>Joseph Fondell</td>
<td><a href="mailto:fondeljd@umdnj.edu">fondeljd@umdnj.edu</a></td>
</tr>
<tr>
<td>Oct 26(Tu)</td>
<td>Transcription: eukaryotic</td>
<td>Joseph Fondell</td>
<td></td>
</tr>
<tr>
<td>Oct 28(Th)</td>
<td>Transcription: prokaryotic</td>
<td>Richard Ebright</td>
<td></td>
</tr>
<tr>
<td>Nov 2(Tu)</td>
<td>Transcription: prokaryotic</td>
<td>Richard Ebright</td>
<td></td>
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<tr>
<td>Nov 4(Th)</td>
<td>Chromatin (10:00 - 12:00)</td>
<td>Thomas Kusch</td>
<td>Nelson A123; 732-445-6895</td>
</tr>
<tr>
<td>Nov 9(Tu)</td>
<td>RNA processing</td>
<td>Sam Gunderson</td>
<td><a href="mailto:kusch@biology.rutgers.edu">kusch@biology.rutgers.edu</a></td>
</tr>
<tr>
<td>Nov 11(Th)</td>
<td>no lecture-so you can study for exam, replaced by longer lectures below)</td>
<td>Nov 12(Fr)</td>
<td>Exam 2 RWJMS West Lecture Hall 3:00 - 6:00 PM (Ebright, Fondell, Kusch)</td>
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<tr>
<td>Nov 16(Tu)</td>
<td>RNA processing (10:00 - 12:00)</td>
<td>Sam Gunderson</td>
<td>Nelson A322; 732-325-1234</td>
</tr>
</tbody>
</table>
445-1016
Nov 18(Th) RNA processing (10:00 - 12:00) Sam Gunderson
gunderson@biology.rutgers.edu
Nov 23(Tu) RNA processing (10:00 - 12:00) Sam Gunderson

Nov 30(Th) Translation Terri Kinzy RWJMS
R709; 732-235-5450
Dec 2(Th) Translation Terri Kinzy
kinzytg@umdnj.edu
Dec 7(Tu) Translation Paul Copeland RWJMS 819W; 732-
235-4670
Dec 9(Th) RNA turnover Gary Brewer RWJMS 735; 732-
235-3473
Dec 14(Tue) Exam 3 RWJMS West Lecture Hall 3:00 - 6:00 PM (Gunderson, Kinzy, Copeland
and Brewer)

*Class will be in Waksman 1001 on Oct. 19 because of CABM symposium.
All lecture notes, readings and announcements will be posted on the course SAKAI site.
Exams from prior years will be posted on the SAKAI site for instructional purposes. Studying
from old exams can be helpful, but you should be aware that instructors and course content change from year to year.

**QUANTITATIVE PROBLEMS IN BIOLOGICAL SCIENCES**

**Course Calendar 2010**

<table>
<thead>
<tr>
<th>Date</th>
<th>Module Introduced &amp; Homework Assigned</th>
<th>Homework Problem Set Due</th>
<th>In-Class Quiz or Exam</th>
</tr>
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<tbody>
<tr>
<td>Sep. 1</td>
<td>Intro &amp; Module 1 (Martin – Units/dimensions dilutions)</td>
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<tr>
<td>Sep. 8</td>
<td>Module 2 (Martin-Aqueous solutions I)</td>
<td>Module 1</td>
<td></td>
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<tr>
<td>Sep. 15</td>
<td>Module 3 (Martin-Aqueous solutions II)</td>
<td>Module 2</td>
<td>Module 1</td>
</tr>
<tr>
<td>Sep. 22</td>
<td>Module 4 (M. Orange - Photometrics)</td>
<td>Module 3</td>
<td>Module 2</td>
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### MOLECULAR GENETICS

**16:681:502**

The main goal of this course is to expose students to the basic principals of genetics and genetic analysis of biological processes. An underlying theme in the course is exposure to the advantages and genetic tools that are used in different model systems. The course design currently has a problem-based instead of a recitation-based approach. Students are encouraged to understand how to do a genetic analysis and interpret results using practice problems and take home questions instead of memorize facts and pathways.

The course meets from 10-11:30 on Tues/Thurs in the Waksman Auditorium during the spring semester. There are 3 closed book exams that currently held during class periods. All course materials are posted on the Sakai site.

<table>
<thead>
<tr>
<th>#</th>
<th>Topic</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic Genetic Principals Overview</td>
<td>Vershon</td>
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</tbody>
</table>
Genetic analysis of biological processes,
Genotype vs phenotype,
Mendel- dominant vs recessive, segregation of traits,
Punnett Square & frequency of phenotypes,
Types of mutants that affect a process- function, expression etc
Types of mutations- point mutants, deletions
Forward and Reverse mutations
Intragenic and extragenic suppressors
Null vs leaky mutations, conditional mutants- TS, CS,
Making mutations, mutagens, mutator strains

2 **Bacterial Genetics – Conjugation, Transformation**, Vershon

- Bacterial genomics and databases
- Life cycle, growth, lag, log and stationary phases,
- Replica plating
- Screen (blue/white) vs selection (auxotrophic growth, ampR)
- Conjugation, U-tube exp., transfer of markers, (Lederberg)
- Blender Expt (Wollman & Jacob)
- F', Hfr, F+, Direction of transfer (Hayes)
- Mapping distances by recombination of markers
- Reciprocal crosses
- Transduction – generalized, specific (Lederberg & Zinder)
- Transformation- Genomic fragments (Griffith)

3 **Bacterial Genetics – Bacteriophages, deletion mapping**, Vershon

- Bacteriophage – lytic life cycle, resistance to infection
- Clonal Theory Luria/Delbruck - Poisson
- Fine point mapping with rII locus, deletion mapping- Benzer
- Suppressor mutants, Genetic code is non-overlapping Crick -

4 **Bacterial Genetics – Regulation Lac, Trp**, Vershon

- *Lac* system, inducers: IPTG, reporters: Xgal, ONPG
- Identification of regulators, Hfr transfer of lac – PaJaMo exp.,
- Cis (O°) vs trans (lacI) acting mutations
- Development of the model from genetics (Jacob & Monod)
- What the screens missed and why – parameters of assays
- Ordering of genes in biosynthesis pathway (Yanofsky)
- Transcription attenuation – analysis of mutants

5 **Bacterial Genetics – Phage**, Vershon

- Genetic analysis of Lytic vs lysogenic life cycles
- Mechanisms of gene regulation
  - Lytic vs lysogeny – cl, cII, cIII (trans), O_L, O_R (cis)
  - Early vs late – different promoters, N and Q anti-termination
  - Int vs Xis- different promoters, RNA degradation
- Phage and cosmid libraries

6 **Yeast Genetics - Introduction**, Vershon

- Background – History, genome size & complexity, growth,
- Advantages and disadvantages as an experimental system
- Life and cell cycle, haploid/diploid, mating, sporulation
Nomenclature
Analysis of a mutant, 2:2 and 3:1 segregation of markers
Linkage of genes, spore dissection, PD, TT, NPD,
Complementation analysis of mutants
Plasmid types and cloning gapped repair
Constructing and testing null mutants, gene replacements
Plasmid shuffle assays to test mutations in essential genes

7 Yeast Genetics – Screens/selections
Vershon
Classic Forward genetic screen
Level of mutagenesis, killing curves
Rescreen and backcross to determine dominant/recessive
Analysis of spores to determine if one gene
Complementation analysis among mutants
Cloning and gene by complementation
Constructing null and verifying phenotype
High throughput reverse genetic screen (test null arrays)
Advantages and disadvantages of each method

8 Genomics – DNA, protein databases
Vershon
Using the genetic & protein databases in a screen
BLASTn analysis to identify the genetic region of the mutant
Use SGD to identify likely candidates
SGD features – maps, activity, phenotypes, literature
Microarrays, Expression databases
Localization (GFP)
Interactions – co-IP, two-hybrid, synthetic lethal
Genomic comparisons, synteny, CLUSTALs

9/10 Yeast Genetics – Using genetics to investigate a process
Vershon
Mating type switching
Silent information (Sirs),
Mother/daughter (Ash1 mRNA transport)
Cell cycle Sin –repressors, Swi – activators (SAGA)
Regulation of cell type – analysis of MAT mutants
Regulation of mating – STE MAP Kinase cascade
Epistasis analysis to determine order in pathway
Suppressor screen – SPT component of transcription
Genetic analysis of cis regulatory elements in a promoter
Cell cycle – isolation of CDC mutants, check point suppressors

Exam I
Vershon

Note: The Plant sections are no longer offered because Kerstetter moved and no other professors wanted to teach these lectures

11 Genetics of Arabidopsis
Kerstetter
Genetic analysis of plants – crops, GMO, security
Differences in plants vs animals
Life cycle and growth
Arabidopsis as a model system
12 Genetics of Arabidopsis
Kerstetter
Transformation with Agrobacterium
Genome – size, complexity, structure (duplications)
Nomenclature
Mutagenesis
Forward genetic screen
Cytoplasmic inheritance
Genetic mapping (classical and SNP)
Mapped based cloning

13 Genetics of Arabidopsis
Kerstetter
An example of mapped based cloning
Forward and reverse genetics
Targeted induced local lesions (TILLING)
Systematic RNAi screens
Enhancer traps, activation tagging
Expression arrays

14 Genetics of C. elegans
Rongo
Introduction to C. elegans biology
Mendel’s Laws as they apply to Hermaphrodite Genetics
Discussing phenotype: Expressivity versus Penetrance
Forward Genetic Screens: clonal versus nonclonal
Defining genes by linkage and by complementation testing
Intragenic complementation and non-allelic non-complementation

15 Genetics of C. elegans
Rongo
Screen saturation modeled by Poisson Distribution
Types of alleles, gain of function, loss of function, dominant negative, haploinsufficiency
Two types of genetic pathways: sequential and regulatory
Deducing gene order in a pathway using epistasis analysis
Vulval induction as an example pathway
Genetic redundancy

Spring Break
Spring Break

16 Genetics of C. elegans
Rongo
Two factor mapping: computing linkage distance in worms
Three factor mapping
SNPs, Three factor mapping with SNPs

17 Genetics of C. elegans
Rongo
New methods for mapping and cloning genes: SNP array analysis and deep sequencing
Transgenesis in C. elegans
Generation of deletion mutants for C. elegans
RNAi screening in C. elegans

Exam II
Rongo/Kerstetter
Note: Dr. Nowakowski has moved. Mouse/human lecture will be don by T. Matise, Sahota, and Konsolaki. I have not received syllabi from them yet.

18  **Mammalian Genetics/Genomics**  Nowakowski
    Background – genome organization, size and complexity
    Mice as a model system
    Inbreeding and Inbred Strains
    Congenics and Speed Congenics (Snell)
    Flanking regions of markers

19  **Mammalian – Mapping of Mendelian Loci**  Nowakowski
    (Splotch/Waardenburg Syndrome)
    Types of mutations, polymorphisms, SNPs, RFLPs
    Hartwell mutagenesis, linkage testing
    Congenics vs Consomics
    Recombinant Inbred Strains, advantages, disadvantages
    •  CXB
    •  BXD
    The Complex Cross

20  **Mammalian – Mapping mutations using F2’s**  Nowakowski
    The Paigen approach
    QTL
    Genomics
    Cis vs trans regulatory mutants
    Genetical Genomics

21  **Mammalian Genetics/Genomics**  Nowakowski

22  **Genetics of Drosophila**  McKim
    History of Drosophila Genetics – why was Morgan successful.
    Basic Drosophila genetics and nomenclature
    two point mapping cross
    sex linkage
    Non-disjunction and chromosome theory
    Drosophila chromosomes and polytenes
    Balancers
    P-elements, transposition and transformation

23  **Genetics of Drosophila**  McKim
    targeted integration with C31 integrase
    mutagenesis and mutation detection
    Muller’s experiment with a Balancer and X-rays
    screens for maternal effect lethal mutations and zygotic lethals
    Drosophila oogenesis and embryogenesis
    developmental genetics, segmentation and homeotic genes

24  **Genetics of Drosophila**  McKim
    genetic screen using a sensitized background (dominant modifier screen)
    chemical mutagenesis vs insertional mutagenesis and reverse genetics
25. **Genetics of Drosophila**  
McKim

- Gene targeting
- GAL4-UAS system of controlling gene expression
- Mitotic recombination and genetic mosaics
- Using FLP-FRT to generate mitotic recombination and genetic mosaics

**Exam III**  
McKim/Nowakowski

**ADVANCED CELL BIOLOGY SPRING 2011**

**Course Directors:** John Pintar  Nancy Walworth

The class will meet on Mondays and Wednesdays, 10-11:30 AM, Room V10, RWJMS

**W** Jan. 19  
Introduction & Overview  
Walworth/Pintar

**M** Jan. 24  
Membranes  
Runnels  
(Note: V14, RWJMS)

**W** Jan. 26  
Membranes  
Runnels

**M** Jan. 31  
Targeting to the ER  
Pintar

**W** Feb. 2  
Vesicular transport  
Pintar

**M** Feb. 7  
Vesicular transport  
Pintar

**W** Feb. 9  
Vesicular transport  
Pintar

**M** Feb. 14  
Nucleus  
Pintar

**W** Feb. 16  
Cell signaling  
Zhou

**M** Feb. 21  
Cell signaling  
Zhou

**W** Feb. 23  
Cell signaling  
Zhou

**M** Feb. 28  
Cytoskeleton  
Hitchcock-DeGregori

**W** Mar. 2  
Cytoskeleton  
Hitchcock-DeGregori

**M** Mar. 7  
**Flex Day**

**MID-TERM EXAMINATION:** Wednesday, March 9, 9:30 a.m.–11:30 a.m.  V-10

**March 14-18**  
**Spring Break**

**M** Mar. 21  
Cytoskeleton  
Hitchcock-DeGregori

**W** Mar. 23  
Extracellular Matrix  
Pintar  
**First paper due**

**M** Mar. 28  
Cell adhesion  
Wadsworth  
(Note: V14, RWJMS)

**W** Mar. 30  
Cell adhesion  
Wadsworth

**M** Apr. 4  
Cell Cycle  
Walworth

**W** Apr. 6  
Cell Cycle  
Walworth

**M** Apr. 11  
Cell Cycle  
Walworth

**W** Apr. 13  
Apoptosis  
Walworth

**M** Apr. 18  
Cancer  
Walworth

**W** Apr. 20  
Cell Bio of Neural Disease  
D’Arcangelo

**M** Apr. 25  
Cell Bio of Neural Disease  
D’Arcangelo

**W** Apr. 27  
Signaling in Development  
Matise  
**Second paper due**
**BIOMEDICAL ENGINEERING (TWO OPTIONS FOR MOLECULAR BIOLOGY)**

**ADVANCED CELL BIOLOGY//MOLECULAR BIOLOGY OF CELLS**

**Fall 2010 Lecture Schedule: 01-146:470 + 16-148:514**

Course coordinators: Prof. Charles Martin (Nelson B323); Prof. Guy Werlen (Nelson B333)
Faculty: Prof. Ron Hart (rhart@rci.rutgers.edu); Prof. Charles Martin (martin@biology.rutgers.edu); Prof. Martin Grumet (mgrumet@rci.rutgers.edu); Prof. Beatrice Haimovich (Haimovic@umdnj.edu);
Prof. Gary Brewer (brewerga@umdnj.edu); Prof. Guy Werlen (werlen@biology.rutgers.edu); Prof. Barth Grant (grant@biology.rutgers.edu);

First period (8:40-10:00 AM) Monday and Thursday, Fall semester - SEC 118.
The text is MOLECULAR CELL BIOLOGY by Lodish, Berk, Matsudaira, Kaiser, et al. 6ed, WH Freeman.

Access to Lecture Powerpoints and handouts will be done through Sakai.

- **September 2** - Course overview; review of cell structure and function CM (Chapters 1, 2)
- **September 6** – NO CLASS – LABOR DAY
- **Wednesday September 8** - Protein structure and function / Cell Division CM (3.1-3.5)
- **September 9** - The Cell Cycle, CM (Chapter 20.1 – 20.7)
- **September 13** - Nucleic acid structure and function, RH (4.1 – 4.4)
- **September 16** - DNA replication and repair, RH (4.5 – 4.6)
- **September 20** – Methods to study and manipulate DNA and proteins RH (5.1 - 5.3)
- **September 23**– Chromatin structure and mobile genetic elements RH (6.1 – 6.3, 6.6)
- **September 27** - Methods to study and manipulate DNA and proteins RH (5.4 - 5.5)
- **September 30** - Genomics RH (6.5)
- **October 4** – Exam #1
- **October 7** Biomembranes, structure function, CM (Chapter 10)
- **October 11** - Protein Targeting, CM (13.1-13.4, 13.6)
- **October 14** – Membrane Transport (Chapter 11)
- **October 18** Secretion BG (Chapter 9.1, 14.1-14.4)
- **October 21** - Endocytosis BG (Chapter 9.2-9.3, 14.5-14.6
- **October 25**) Transcription, GB (Sections 7.1 – 7.8, 21.3, pp. 969-977
- **October 28**) RNA processing I, GB (Sections 8.1 through 8.3 and pp 357-367)
- **November 1** - RNA processing II, GB (pp.352-353 "Degradation of mRNA and P Bodies"); section 13.6)
- **November 4** - Translation, GB (4.3,4,4; pp347-356; Sect 13.1; pp908-910;)
- **November 8** – Exam #2
- **November 11** – The cytoskeleton, BH (Chapter 17.1 – 17.4; Chapter 18.7-18.8)
- **November 15** – Motor Proteins, BH (Chapter 17.5-17.7; Chapter 18.1)
- **November 18** - Movement and Cell Motility, BH (Chapter 18.2-18.6).
- **November 22** – NO CLASS – Wednesday classes only
- **November 25** - THANKSGIVING
MOLECULAR BIOLOGY AND BIOCHEMISTRY 694:407
& 115:511
LECTURE SCHEDULE - FALL 2010
Course Number: 01:694:407:01 Index 00969
16:115:511:01 Index 01237
Course Coordinator: Dr. Frank Deis (Nelson A 311, 732-445-2814)
Grades posted at: http://www.rci.rutgers.edu/~molbio/Courses/MBB_408_512/512.html
Textbook site: http://www.whfreeman.com/lehninger
Date Lecturer Topics Chapter*
1 9/3 Deis Foundations of Biochemistry Leh.1
2 9/7 " Water (pH and buffers) 2
3 9/10 Severinov Amino Acids, Peptides, and Proteins 3
4 9/14 " Proteins, Lab Methods, Bioinformatics 3
5 9/17 " 3D Structure of Proteins 4
6 9/21 " Protein Function – Hemoglobin 5
7 9/24 " Enzymes 6
8 9/28 " Nucleotides & Nucleic Acids 8
9 10/5 Deis Carbohydrates 7
10 10/8 " Lipids 10
11 10/12 " Bioenergetics, Coenzymes 13
12 10/15 " Glycolysis & Gluconeogenesis 14
13 10/19 " Pentose Phosphate 14
14 10/22 " Glucose and Glycogen 15
15 10/26 " Citric Acid Cycle 16
10/29 TEST #2 [over lectures 8-13]
16 11/2 Niederman Membrane Transport 11
17 11/5 " Light Reactions of Photosynthesis 19
18 11/9 " Lipid Metabolism 17,21
19 11/12 " Protein Turnover 27
20 11/16 " Signal Transduction 12
21 11/23 Deis Electron Transport, Oxidative Phosphorylation I 19
22 11/30 " Electron Transport, Oxidative Phosphorylation II 19
23 12/3 " Amino Acid Catabolism & The Urea Cycle 18
24 12/7 " Amino Acid Biosynthesis 22
25 12/10 " Nucleotide Metabolism 22
FIN 12/16 TEST #4 [over lectures 20-25] Thursday, 12-2 PM
Advanced Topics Fall and Spring

**Advanced Neurobiology I 146:445/Neurobiology 710:555 Fall 2010**
MW7 & 8 (6:40–8:00 PM & 8:10–9:05 PM), SEC 117

**Instructors (in order of appearance):**
Dr. Mark Plummer Dr. Shu-Chan Hsu Dr. Ronald Hart
mplummer@rci.rutgers.edu hsu@biology.rutgers.edu rhart@rci.rutgers.edu
Office hours by appointment Office hours by appointment Office hours by appointment
Dr. Bonnie Firestein Dr. Gabriella D’Arcangelo
firestein@biology.rutgers.edu darcange@rci.rutgers.edu
Office hours by appointment Office hours by appointment

**Modules 1 – 3: Fundamental features of neuronal function**
**Date Subject K&S Suppl.**

**Module 1 – Basic electrophysiology (Plummer)**
Sept. 1 (1st lec) Introduction and overview 1, 2
Sept. 1 (2nd lec) Basic electronics Ap. A F: A
Sept. 6 **NO CLASS** – Labor Day
Sept. 8 Movement of ions in solution F: 5
Sept. 13 (1) Membrane potential 7
Sept. 13 (2) Voltage-gated ion channels 6 F: 2
Sept. 15 The action potential 9 F: 6
Sept. 20 **Module 1 exam**

**Module 2 – Cell biology of neurons (Hsu)**
Sept. 22 (1) Protein and lipid targeting in neurons 5 N: 2
Sept. 22 (2) Vesicle trafficking in neuronal function & development 14 N: 7
Sept. 27 Neuronal cytoskeletons and their function 4 N: 2
Sept. 29 (1) Survival and growth in response to intrinsic & extrinsic factors 53 N: 14
Sept. 29 (2) Axon pathfinding during development 54 N: 15
Oct. 4 Neuronal death 53

**Module 3 – Synaptic transmission and plasticity (Plummer)**
Oct. 6 (1) Overview of synaptic transmission and plasticity 10
Oct. 6 (2) Transmitter release 14
Oct. 11 **Module 2 exam**
Oct. 13 (1) Transmitter release 14
Oct. 13 (2) Synaptic integration 12
Oct. 18 (1) Long-term synaptic plasticity S: 9
Oct. 18 (2) Neural correlates of learning & memory 63 S: 11

**Advanced Neurobiology I 146:445/Neurobiology 710:555 Fall 2010**
MW7 & 8 (6:40–8:00 PM & 8:10–9:05 PM), SEC 117

**Modules 4 – 6: Advanced features of neuronal function**
**Date Subject K&S Suppl.**

**Module 4 – Neurogenomics (Hart)**
Oct. 20 Introduction/Neurogenomics: Genomic tools to study the CNS
Oct. 25 **Module 3 exam**
Oct. 27 (1) Microarrays to Discover Human Brain Development Programs
Oct. 27 (2) Cloning to Knockouts to Clinical Trials: the Fragile X Story
Nov. 1 (1) Mapping Brains with Genomics I
Nov. 1 (2) Mapping Brains with Genomics II

**Module 5 – Organization of the synapse (Firestein)**
Nov. 3 Introduction S: 2
Nov. 8 (1) Neurotransmitters
Nov. 8 (2) Postsynaptic density
Nov. 10 **Module 4 exam**
Nov. 15 **NO CLASS** – Annual Neurosciences Society Meeting
Nov. 17 **NO CLASS** – Annual Neurosciences Society Meeting
Nov. 22 (1) Protein-protein interaction domains S: 7
Nov. 22 (2) Second Messengers I
Nov. 24 **NO CLASS** – Thanksgiving Recess
Nov. 29 Second Messengers II

**Module 6 – Brain Disorders and Disease (D’Arcangelo)**
Dec. 1 (1) Neurogenesis and Neuronal Migration
Dec. 1 (2) Lissencephaly
Dec. 6 Reelin signaling and brain development
Dec. 8 (1) Cortical Dysplasias
Dec. 8 (2) Syndromes with genetic etiology
Dec. 13 Syndromes with complex etiology
Dec. 20 **Final Exam (Modules 5 and 6)** – Time by arrangement

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**TOXICOLOGY**

**Draft 10: Biochemical Toxicology Spring 2011 (16:963:505)**
**Course Directors: Drs. Paul E. Thomas, Gisela Witz, Helmut Zarbl.**
**Tuesdays and Thursdays, 3:30-5:30 PM**
**EOHSI Bldg. /Conference Room C [could change on short notice]**

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Topics</th>
<th>Lecturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 18</td>
<td>Tues</td>
<td>Course Overview by course directors et al.</td>
<td>Course Directors</td>
</tr>
<tr>
<td>Jan 20</td>
<td>Thurs</td>
<td>1. Chemistry in Biochemical Toxicology</td>
<td>G. Witz &amp; P. Thomas</td>
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<tr>
<td>Jan 25</td>
<td>Tues</td>
<td>2. Cytochrome P450-Catalyzed Reactions/P450 Structure and Function</td>
<td>A.Y.H. Lu</td>
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<td>Jan 27</td>
<td>Thurs</td>
<td>3. Active Site Topology and Drug Oxidation/Clinical</td>
<td>A.Y.H. Lu</td>
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<tr>
<td></td>
<td></td>
<td>Significance of Genetic Polymorphism</td>
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<td>Feb 1</td>
<td>Tues</td>
<td>4. Key Enzymes of Oxygen Metabolism I</td>
<td>R. White</td>
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<tr>
<td>Feb 3</td>
<td>Thurs</td>
<td>5. Key Enzymes of Oxygen Metabolism Ii</td>
<td>R. White</td>
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<tr>
<td>Feb 8</td>
<td>Tues</td>
<td>6. Drug-Drug Interactions: P450 Induction/Inhibition</td>
<td>H. Einolf</td>
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<tr>
<td>Feb 10</td>
<td>Thurs</td>
<td>7. P450 Enzymes, Gene Structure &amp; Mechanisms of Regulation</td>
<td>M. Iba</td>
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<tr>
<td>Feb 15</td>
<td>Tues</td>
<td>8. Phase II metabolism &amp; implications for toxicity</td>
<td>F. Kauffman</td>
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<tr>
<td>Feb 17</td>
<td>Thurs</td>
<td>9. Reactive Oxygen species—In Mechanisms of Toxicity &amp; Disease</td>
<td>J. Richardson</td>
</tr>
<tr>
<td>Feb 22</td>
<td>Tues</td>
<td><strong>1st Examination covering Lect. 1-8</strong></td>
<td>P. Thomas et al.</td>
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<tr>
<td>Date</td>
<td>Day</td>
<td>Topic</td>
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<td>Feb 24</td>
<td>Thurs</td>
<td>10. Pharmacokinetics and Disposition of Xenobiotics</td>
<td>A-N T. Kong</td>
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<tr>
<td>Mar 1</td>
<td>Tues</td>
<td>11. Covalent Binding of Drugs to Proteins</td>
<td>R. White</td>
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<tr>
<td>Mar 3</td>
<td>Thurs</td>
<td>12. Drug Transporters Biology and Function</td>
<td>L. Aleksunes</td>
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<tr>
<td>Mar 8-10</td>
<td>Tues &amp; Thurs</td>
<td>Society of Toxicology Meeting Mar. 6-10 Washington, DC</td>
<td>-No Classes This Week- There will be classes during Spring Break-</td>
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<tr>
<td>Mar 15</td>
<td>Tues</td>
<td>13. Signal Transduction and its role in xenobiotic toxicity</td>
<td>A. Black</td>
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<tr>
<td>Mar 17</td>
<td>Thurs</td>
<td>14. Nuclear Receptor-Mediated Toxicity</td>
<td>M. Iba</td>
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<td>Mar 22</td>
<td>Tues</td>
<td>15. Ah Receptor-Controlled Gene Expression and TCDD Toxicity</td>
<td>M. Gallo</td>
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<tr>
<td>Mar 24</td>
<td>Thurs</td>
<td>16. Mechanisms of Nitric Oxide Signaling</td>
<td>A. Gow</td>
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<tr>
<td>Mar 29</td>
<td>Tues</td>
<td>17. Toxicogenomics</td>
<td>H. Zarbl</td>
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<tr>
<td>Mar 31</td>
<td>Thurs</td>
<td>2nd Examination Covering Lect. 9-16</td>
<td>P. Thomas et al.</td>
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<tr>
<td>Apr 5</td>
<td>Tues</td>
<td>18. Oncogenes and Tumor Suppressor Genes</td>
<td>S. Chen</td>
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<tr>
<td>Apr 7</td>
<td>Thurs</td>
<td>19. Concepts of Carcinogenesis</td>
<td>A. Conney</td>
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<tr>
<td>Apr 12</td>
<td>Tues</td>
<td>20. Apoptosis – its Role in Toxicity ??</td>
<td>G. Zeevank</td>
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<tr>
<td>Apr 14</td>
<td>Thurs</td>
<td>21. Epigenetics</td>
<td>H. Zarbl</td>
</tr>
<tr>
<td>Apr 19</td>
<td>Tues</td>
<td>22. Biomarkers and Biomonitoring</td>
<td>M. Bird</td>
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<tr>
<td>Apr 21</td>
<td>Thurs</td>
<td>23. Antibody Specificity Proteins &amp; Proteomics ??</td>
<td>P. Thomas</td>
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<tr>
<td>Apr 26</td>
<td>Tues</td>
<td>24.</td>
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<tr>
<td>Apr 28</td>
<td>Thurs</td>
<td>25. Application of the principles described in this course to the study of the toxicity and leukemogenicity of benzene ??</td>
<td>R. Snyder</td>
</tr>
<tr>
<td>May 3</td>
<td>Tues</td>
<td>Study for Final Exam</td>
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<tr>
<td>May 5</td>
<td>Thurs</td>
<td>Kuna Lecture required attendance</td>
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**General Toxicology I**  
**Spring 2009**  
Monday and Wednesday 12:00 – 1.20 PM  
ARC 103  
Course Director: J. Richardson  
Co-Course Director: M. Gallo  

**Goals and Objectives:**  
The purpose of this course is to provide the learner with a basic understanding of pharmacology: the effects of drugs on living systems. The course will emphasize mechanisms of actions of drugs (pharmacodynamics), and mechanisms associated with the absorption,
distribution, metabolism and excretion (ADME, pharmacokinetics) of drugs. Students will be introduced to contemporary approaches in drug discovery, drug development and molecular therapeutics. Upon completion of this course, the learner is expected to:

1) understand the basis for dose-response relationships;
2) be able to define potency, efficacy, agonist and antagonists;
3) have a working knowledge of receptors and mechanisms associated with modulation of intracellular events following drug-receptor interactions;
4) be familiar with fundamental aspects of the physiology and function of organs influencing ADME and drug action in the body;
5) develop an appreciation for ADME processes and their impact on drug efficacy and safety.

The class will be taken along with Introduction to Pharmacology. Toxicology Graduate students will be responsible for all of the in class material and take the tests administered in the class. In addition to the in class work, Toxicology Graduate students will be responsible for problem sets that will be of a take home variety and due in to Drs. Richardson and Gallo one week from their assignment. Furthermore, there will be a required paper to be written by each student and a take home comprehensive final in addition to the final exam given in Introduction to Pharmacology. There will be an initial organizational meeting and periodic recitation periods that will be arranged.

Basic Principles of Pharmacology
01/19 Introduction to Pharmacology and Concept of Dose-Response R. Snyder
01/24 Dose Response I: Dose R. Snyder
01/26 Dose Response II: Fundamental Models and Dose-Response Relationships R. Snyder
01/31 Signal Transduction I: Basic Mechanisms of Receptors L. Aleksunes
02/02 Signal Transduction II: Ion Channels L. Aleksunes
02/07 Signal Transduction III: G-Proteins L. Aleksunes
02/09 Signal Transduction IV: Intracellular Signaling L. Aleksunes

Absorption, Distribution, Metabolism and Excretion (ADME)
02/14 Introduction to Absorption, Distribution, Metabolism and Excretion R. Snyder
02/16 Absorption and Distribution I: Physiological Basis and Circulation F. Kauffman
02/21 Absorption and Distribution II: GI Tract and Brain F. Kauffman
02/23 Phase I Metabolism: Introduction to Drug Oxidation R. Snyder
02/28 EXAM I (covers material from 01/19/11–02/14/11)
03/02 Phase I Metabolism M. Iba
03/07 Phase II Metabolism M. Iba
03/09 Phase III Transport M. Iba
03/21 Drug Interactions: Induction and Inhibition of Metabolism and Transport M. Iba
03/23 Review/Regulation of Phase I, II, III Metabolism and Transport M. Iba/L. Aleksunes
03/28 Excretion: Hepatic and Renal L. Aleksunes

03/30 Developmental and Geriatric Pharmacology M. Iba

Pharmacogenomics and Personalized Medicine
04/04 Pharmacogenomics: Pharmacokinetics (ADME) M. Iba
04/06 Pharmacogenomics: Pharmacodynamics (Receptors and Other Drug Targets) M. Iba
04/11 EXAM II (covers material from 2/16/11-3/28/11)
04/13 Personalized Medicine C. Molloy
### General Toxicology II
Fall 2010. Classes run from 3:30-5:00 pm on Mondays and Wednesdays. The tentative schedule is as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Course</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>Sept 13</td>
<td>Hepatotox</td>
<td>L. Aleksunes</td>
</tr>
<tr>
<td>Sept 15</td>
<td>Hepatotox</td>
<td>L. Aleksunes</td>
</tr>
<tr>
<td>Sept 20</td>
<td>Nephrotox</td>
<td>M. Gochfeld</td>
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<td>Sept 22</td>
<td>Nephrotox</td>
<td>M. Gochfeld</td>
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<tr>
<td>Sept 27</td>
<td>Pulmonary Tox</td>
<td>A. Black</td>
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<td>Sept 29</td>
<td>Pulmonary Tox</td>
<td>A. Black</td>
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<tr>
<td>Oct  4</td>
<td>Hemato Tox</td>
<td>R. Snyder</td>
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<tr>
<td>Oct  6</td>
<td>Hemato Tox</td>
<td>R. Snyder</td>
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<tr>
<td>Oct 11</td>
<td>Immuno Tox</td>
<td>D. Laskin</td>
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<tr>
<td>Oct 13</td>
<td>Immuno Tox</td>
<td>D. Laskin</td>
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<tr>
<td>Oct 18</td>
<td>Cardio Tox</td>
<td>R. Laumbach</td>
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<td>Oct 20</td>
<td>Cardio Tox</td>
<td>R. Laumbach</td>
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<tr>
<td>Oct 25</td>
<td>Dermato Tox</td>
<td>J. Laskin</td>
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<tr>
<td>Oct 27</td>
<td>Ocular Tox</td>
<td>M. Gallo</td>
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<tr>
<td>Nov  1</td>
<td>Endocrine Tox</td>
<td>M. Gallo</td>
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<tr>
<td>Nov  3</td>
<td>Endocrine Tox</td>
<td>M. Gallo</td>
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<tr>
<td>Nov  8</td>
<td>Mutagenesis</td>
<td>H. Zarbl</td>
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<td>Nov 10</td>
<td>Carcinogenesis</td>
<td>H. Zarbl</td>
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<td>Nov 15</td>
<td>Repro Tox</td>
<td>TBA</td>
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<td>Nov 17</td>
<td>Teratology</td>
<td>TBA</td>
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<td>Nov 18</td>
<td>Clinical Toxicology</td>
<td>D. Colella</td>
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<td>Nov 29</td>
<td>Ecotox</td>
<td>K. Cooper</td>
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<tr>
<td>Dec  1</td>
<td>Exposure Science</td>
<td>P. Lioy</td>
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<tr>
<td>Dec  6</td>
<td>Metals</td>
<td>TBA</td>
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<td>Dec  8</td>
<td>Pesticides</td>
<td>J. Richardson</td>
</tr>
<tr>
<td>Dec 13</td>
<td>Solvents</td>
<td>M. Gallo</td>
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**EXPOSURE SCIENCE**

32:832:595 Environmental Exposure Measurements & Assessment (3). Did not get syllabus because unrelated to other topics.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic and Lecturer</th>
<th>Protected Course Material</th>
<th>Discussion Leaders</th>
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<tbody>
<tr>
<td>Jan. 21, 2011</td>
<td>Introduction/Professionalism in Research Dr. Michael J. Leibowitz and Dr. Troy Shinbrot</td>
<td>PowerPoint Presentation</td>
<td>No Small Groups</td>
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<td>*Jan. 28, 2011</td>
<td>Record Keeping, Data Selection and Falsification Dr. Terri Kinzy</td>
<td>Case A2, and Handouts</td>
<td>Kinzy-Ho-Marcello-Olabisi-Stapleton</td>
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<td>*Feb. 4, 2011</td>
<td>Authorship and Grantsmanship Dr. Victor Stollar</td>
<td>Cases B1, B3 and B4</td>
<td>Ho-Marcello-Olabisi-Stollar</td>
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<td>*Feb. 11, 2011</td>
<td>Professional Conduct &amp; Substance Abuse Dr. Joseph Schwenkler</td>
<td>Handouts</td>
<td>To be announced</td>
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<td>PowerPoint Presentation</td>
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<td>*Feb. 18, 2011</td>
<td>Ethical Use of Animals in Biomedical Research Dr. Stephen Moorman</td>
<td>Case I2</td>
<td>Ho-Marcello-Moorman-Stapleton</td>
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<td>*Feb. 25, 2011</td>
<td>Plagiarism/Academic Rules/Copyright Dr. Michael J. Leibowitz</td>
<td>Cases B5, B6, B7, B8</td>
<td>Ho-Leibowitz-Marcello-Stapleton</td>
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<td>PowerPoint Presentation</td>
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<td>*Mar. 4, 2011</td>
<td>Conflict of Interest Dr. Diane Ambrose</td>
<td>PowerPoint Presentation</td>
<td>Ambrose-Ho-Marcello-Stapleton</td>
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<td>Cases G1, G2, G3</td>
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<td>Mar. 11, 2011</td>
<td>Human Subject Research Protections and the IRB: Historical Basis, Laws, and Present and Future Challenges Donna Hoagland, LPN, BS, CIP, CCRC</td>
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<td>Mar. 18, 2011</td>
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<td>Instructor/Case Study</td>
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<td>April 1, 2011</td>
<td>Dual Use of Select Agents in Research</td>
<td>Dr. Nancy Connell</td>
<td>West Lecture Hall</td>
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<td>April 8, 2011</td>
<td>“Whistle Blowing” and Ombudsman Function</td>
<td>Dr. Celine Gelinas</td>
<td>C1, C2, C3, C4, C5</td>
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<td>April 15, 2011</td>
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<td>April 22, 2011</td>
<td>Good Friday NO CLASS</td>
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<td>NO CLASS</td>
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* Indicates small group discussions