

**COLLEGE OF GRADUATE STUDIES
MEDICAL UNIVERSITY OF SOUTH CAROLINA**

**GUIDE TO THE FIRST YEAR CURRICULUM
IN BIOMEDICAL SCIENCES**

The Guide for Students and Faculty is a single-source reference to all aspects of the Biomedical Sciences First Year Curriculum in the College of Graduate Studies at MUSC. The Guide is updated annually with valuable contributions from numerous faculty participating in the curriculum, and is edited by the curriculum course director. I especially acknowledge the boundless support I receive from Dr. Perry Halushka, Dean of the College of Graduate Studies, and the unstinting administrative assistance provided by Keisha Brown, Dodie Weise, Karla Locklear and Debra Shoemaker in the College of Graduate Studies Office.

Adam J. Smolka, Ph.D.
Professor of Medicine
Curriculum Course Director
1 August, 2009

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FROM THE DEAN

Together with the participating faculty and current students, I welcome you to the College of Graduate Studies First Year Curriculum.

We have an interdisciplinary curriculum because the complexity and interdisciplinary nature of science demands that scientists be well rounded and have a broad exposure to all the disciplines of the biomedical sciences. Furthermore, students can make an informed programmatic career decision only after they have had adequate exposure to all the basic sciences. This opportunity does not occur during undergraduate studies; therefore, the curriculum has been designed to ensure that first year students will be able to make informed decisions through a combination of exposure to all the research training programs as well as advice and guidance from the faculty.

The curriculum designed by the faculty is comprehensive, current, exciting and provides many novel educational experiences. The faculty have spent countless hours working to make this an outstanding and challenging curriculum. Their efforts are clearly evident as one reads the course schedule, syllabi and novel features that have been incorporated into this curriculum. As a student you will interact formally and informally with the faculty who are teaching this course. Our more senior students will also be involved in teaching various parts of the curriculum. This important educational experience for our senior students will also allow first year students to meet their senior peers. Our curriculum also prepares you to be successful for competitive extramural fellowships and scholarships via our Essentials of Scientific Practices courses. You will also learn about translational research through the Unanswered Questions in the Biomedical Sciences Seminar series.

By virtue of the fact that science is dynamic and constantly changing, the First Year Curriculum is responsive through yearly upgrades to the latest important new discoveries. Changes are dictated by at least two major criteria; 1) are the topics being well presented? 2) what is the latest cutting-edge science? Thus, a critical aspect of the curriculum will be your evaluation of the course content and its presentation by the faculty. Your input in this process is invaluable. Thus, we ask you to always fill out the WebCt evaluations. The results of these evaluations are used to improve the course and also choose the finalists for the Outstanding Teacher of the Year Award. As a result of the constant reevaluation of the curriculum, this year the entire structure of the curriculum has been improved and streamlined.

As both faculty and mentors, we are excited about providing you with an outstanding research training experience. Before you know it, we will be calling you colleagues.

Finally, as your Dean, I want you to know that I have an open door policy and welcome your thoughts and suggestions on how to create for you the best possible educational experiences.

Perry V. Halushka, Ph.D., M.D.
Professor of Pharmacology and Medicine
Dean, College of Graduate Studies
BSB 102

OBJECTIVES OF THE FIRST YEAR CURRICULUM

1. Develop a broad-based understanding of the basic biomedical sciences and their interdisciplinary nature.
2. Develop critical thinking skills.
3. Promote self-learning.
4. Maximize student exposure to the individual scientific disciplines and technologies.
5. Promote written and oral communication skills.
6. Expose students to faculty and research laboratories so that informed career decisions can be made.

CURRICULUM STRUCTURE

The goal of the Biomedical Sciences First Year Curriculum is to provide students with the critical knowledge, skills, and scientific insight necessary to be successful in any of the professional specialties in the College of Graduate Studies at MUSC. The First Year Curriculum lays the groundwork for the student's later advanced coursework and research training in a specific Ph.D. program, or program track, with a specific mentor, advisory committee and Ph.D. dissertation project.

The curriculum as a whole has five complementary elements: Foundations of Biomedical Sciences (CGS 701/702), Essential Scientific Practices (CGS 710/711/712), Laboratory Rotations (CGS 720/721), Important Unanswered Questions in the Biomedical Sciences (CGS 760), and Spring Selectives (various). To familiarize students with doctoral training programs offered by the College of Graduate Studies, a series of Program Exposures that highlight individual departments and/or programs are held at the beginning of the fall semester. Students are required to attend all classes in each of the five complementary elements, and each of the nine Program Exposures. As a prerequisite for the PhD degree, the College requires that students demonstrate a predetermined level of statistical competence. This may be achieved by either enrolling in and completing MCR 700 in the second or subsequent years of graduate study, or by providing transcript evidence of satisfactory completion of previously-taken statistical course(s) that fulfill the College requirement.

FOUNDATIONS OF BIOMEDICAL SCIENCES (CGS 701 AND 702)

Adam J. Smolka, Ph.D., Course Director

(smolkaaj@musc.edu)

27 August, 2009 to 5 March, 2010

Monday, Tuesday, Thursday, Friday 8:30 am–11:30 am

Room 435, Basic Science Building

A guiding principle of Foundations of Biomedical Sciences is that students must develop depth of knowledge, and an understanding of how to extend that knowledge by asking relevant questions and designing experiments that give solid answers. Just as importantly, students must acquire skill in articulate, clear discussion of scientific principles and data. Thus, students and faculty are encouraged to develop scientific interchange through interactive discussion-based forums that are integrated into all eight Units. Full student participation is essential; all students are required to attend all classes, and absences must be cleared through the appropriate Unit Leader.

Foundations of Biomedical Sciences comprises five Units in the fall semester, and three Units in the first half of the spring semester. The fall Units (CGS 701) address the basic molecular mechanisms of biology, encompassing protein and nucleic acid structure and function, membrane bioenergetics and functional metabolic compartments, receptor signal transduction and coupling to intracellular pathways and consequent regulation of gene expression at transcriptional, translational and post-translational levels. The Spring semester Units (CGS 702) extend molecular understanding to cellular, tissue and organismal biology levels, from a consideration of cell structure and functions, through mechanisms of disease and defense, and finally to appreciation of integrated physiological systems.

Merit grades are assigned for Foundations of Biomedical Sciences CGS 701 and 702. The final grade for each Foundations of Biomedical Sciences course is the average of the Unit scores, and is predicated on completion of all elements of that course. Each Unit grade is derived from performance on graded In-Unit assignments, quizzes and interactive discussion-based forums, and from closed-book, in-class exams. All exams, tests, quizzes, written work, laboratory work and research activities at MUSC are conducted under the Honor Code, detailed at www.musc.edu/honorcode/honorcode.html.

First Year Curriculum Calendar 2009-2010

AUGUST	MONDAY 24	TUESDAY 25	WEDNESDAY 26	THURSDAY 27	FRIDAY 28	SATURDAY
8:30 - 11:30	Orientation	Course Overview		Proteins	Proteins	
12:00 - 1:00						
1:00 - 6:00	Outstanding Graduate Lecture (5:00 pm)	Biochemistry Program Exposure	Pharm Sci Program Exposure	Pharmacology Program Exposure	Pathology Program Exposure	
AUG/SEPT	31	1	2	3	4	
8:30 - 11:30	Proteins	Proteins		Proteins	Proteins	
12:00 - 1:00						
1:00 - 6:00	Bioengineering Program Exposure	Microbiology/Immunol Program Exposure	Neuroscience Program Exposure		MCBP Program Exposure	
SEPTEMBER	7	8	9	10	11	12
8:30 - 11:30	Labor Day	Proteins		Proteins	Proteins	CGS 710 Research Conduct
1:00-3:00					CGS 710 Ess Sci Prac	
1:00 - 6:00		Biostatistics Program Exposure		1st Lab Rotation Selection Deadline 5:00 pm		
SEPTEMBER	14	15	16		18	19
8:30 - 11:30	Proteins	Proteins	This color is lab research	Proteins	Proteins	CGS 710 Research Conduct
1:00-3:00	CGS 710 Ess Sci Prac				CGS 710 Ess Sci Prac	
1:00 - 6:00	1st Lab Rotation Begins					
SEPTEMBER	21	22	23	24	25	26
8:30 - 11:30	Nucleic Acids	Nucleic Acids		Nucleic Acids	Nucleic Acids	CGS 710 Research Conduct
12:00 - 1:00	CGS 710 Ess Sci Prac				CGS 710 Ess Sci Prac	
5:00 - 6:00				CGS 711 Diversity		
SEPT/OCT	28	29	30	1	2	
8:30 - 11:30	Nucleic Acids	Nucleic Acids		Nucleic Acids	Nucleic Acids	
12:00 - 1:00						
1:00 - 6:00						
OCTOBER	5	6	7	8	9	
8:30 - 11:30	Nucleic Acids	Nucleic Acids		Nucleic Acids	Nucleic Acids	
12:00 - 1:00						
5:00 - 6:00				CGS 711 Diversity		
OCTOBER	12	13	14	15	16	
8:30 - 11:30	Metabolism and Bioenergetics	Metabolism and Bioenergetics		Metabolism and Bioenergetics	Metabolism and Bioenergetics	
12:00 - 1:00		Unanswered Questions				
1:00 - 6:00						
OCTOBER	19	20	21	22	23	
8:30 - 11:30	Metabolism and Bioenergetics	Metabolism and Bioenergetics		Metabolism and Bioenergetics	Metabolism and Bioenergetics	
12:00 - 1:00		Unanswered Questions				
5:00 - 6:00				CGS 711 Diversity		
OCTOBER	26	27	28	29	30	
8:30 - 11:30	Metabolism and Bioenergetics	Metabolism and Bioenergetics		Metabolism and Bioenergetics	Metabolism and Bioenergetics	
12:00 - 1:00		Unanswered Questions				
1:00 - 6:00			Selection Deadline: 2nd Lab Rotation		1st Lab Rotation Ends	
NOVEMBER	2	3	4	5	6	
8:30 - 11:30	Receptors & Signaling	Receptors & Signaling		Receptors & Signaling	Research Day	
12:00 - 1:00		Unanswered Questions				
5:00 - 6:00	2nd Lab Rotation Begins					
NOVEMBER	9	10	11	12	13	
8:30 - 11:30	Receptors & Signaling	Receptors & Signaling		Receptors & Signaling	Receptors & Signaling	
12:00 - 1:00		Unanswered Questions				
1:00 - 6:00				CGS 711 Diversity		

NOVEMBER		16	17	18	19	20
8:30 - 11:30	Receptors & Signaling	Receptors & Signaling			Receptors & Signaling	Receptors & Signaling
12:00 - 1:00		Unanswered Questions				
5:00 - 6:00					CGS 711 Diversity	

NOVEMBER		23	24	25	26	27
8:30 - 11:30	Receptors & Signaling	Receptors & Signaling			Thanksgiving	Break
12:00 - 1:00						
1:00 - 6:00						

NOV/DEC		30	1	2	3	4
8:30 - 11:30	Gene Expression	Gene Expression			Gene Expression	Gene Expression
12:00 - 1:00		Unanswered Questions				
1:00 - 6:00						

DECEMBER		7	8	9	10	11
8:30 - 11:30	Gene Expression	Gene Expression			Gene Expression	Gene Expression
12:00 - 1:00		Unanswered Questions				
1:00 - 6:00						

DECEMBER		14	15	16	17	18
8:30 - 11:30	Gene Expression	Gene Expression			Gene Expression	Gene Expression
12:00 - 1:00		Unanswered Questions		Selection Deadline: 3rd Lab Rotation		2nd Lab Rotation Ends
1:00 - 6:00						End of Term

JANUARY		4	5	6	7	8
8:30 - 11:30		Cell Functions			Cell Functions	Cell Functions
12:00 - 1:00	WINTER BREAK	Unanswered Questions		3rd Lab Rotation Begins		
1:00 - 6:00						

JANUARY		11	12	13	14	15
8:30 - 11:30	Cell Functions	Cell Functions			Cell Functions	Cell Functions
12:00 - 1:00		Unanswered Questions				
1:00 - 6:00						

JANUARY		18	19	20	21	22
8:30 - 11:30		Cell Functions			Cell Functions	Cell Functions
12:00 - 1:00	Martin Luther King Day	Unanswered Questions				
1:00-6:00						

JANUARY		25	26	27	28	29
8:30 - 11:30	Cell Functions	Cell Functions			Cell Injury/Response	Cell Injury/Response
12:00 - 1:00		Unanswered Questions				
1:00 - 6:00						

FEBRUARY		1	2	3	4	5
8:30 - 11:30	Cell Injury/Response	Cell Injury/Response			Cell Injury/Response	Cell Injury/Response
12:00 - 1:00		Unanswered Questions				
1:00-6:00						

FEBRUARY	8	9	10	11	12
8:30 - 11:30	Cell Injury/Response	Cell Injury/Response		Cell Injury/Response	Cell Injury/Response
12:00 - 1:00		Unanswered Questions			
1:00 - 6:00					

FEBRUARY	15	16	17	18	19
8:30 - 11:30	Cell Injury/Response	Cell Injury/Response		Systems Biology	Systems Biology
12:00 - 1:00		Unanswered Questions			
1:00-6:00					

FEBRUARY	22	23	24	25	26
8:30 - 11:30	Systems Biology	Systems Biology		Systems Biology	Systems Biology
12:00 - 1:00		Unanswered Questions			
1:00 - 6:00					

MARCH	1	2	3	4	5
8:30 - 11:30	Systems Biology	Systems Biology		Systems Biology	Systems Biology
12:00 - 1:00					
1:00-6:00			Selection Deadline: 4th Lab Rotation		3rd Lab Rotation Ends

MARCH	8	9	10	11	12
	Spring Break				

MARCH	15	16	17	18	19
	Selectives Begin				
	4th Lab Rotation Start				

MARCH	22	23	24	25	26

MAR/APR	29	30	31	1	2
				Outstanding Teacher Award	

APRIL	5	6	7	8	9

APRIL	12	13	14	15	16

APRIL	19	20	21	22	23

APRIL	26	27	28	29	30

MAY	3	4	5	6	7
					Selectives Exams
					4th Lab Rotation Ends
					End of Term

MAY	10	11	12	13	14
					Program/Mentor Selection Due

MAY	17	18	19	20	21

MAY	24	25	26	27	28
	Enter Mentor Laboratory				

MAY/JUNE	31	1	2	3	4

SUMMER SEMESTER 2010

JUNE	7	8	9	10	11
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

JUNE	14	15	16	17	18
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

JUNE	21	22	23	24	25
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

JUNE/JULY	28	29	30	July 1	July 2
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

JULY	5	6	7	8	9
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

JULY	12	13	14	15	16
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

JULY	19	20	21	22	23
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

JULY	26	27	28	29	30
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

AUGUST	2	3	4	5	6
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

AUGUST	9	10	11	12	13
9:00-11:00		ESP 712 Scientific Writing			
11:00-6:00					

AUGUST	16	17	18	19	20
9:00-11:00		ESP 712 Scientific Writing			End of Term
11:00-6:00					

CGS 701/702 UNIT SYLLABI

MACROMOLECULES: PROTEINS

Scott Eblen, Ph.D.
BSB 313E; 792-1444
eblen@musc.edu

Date	Lectures	Flex	Instructor
Thursday Aug 27	Molecular Structure	Assignment 1 Distribution	Beeson (beesonc)
Friday Aug 28	Chemical Reactivity		Beeson
Monday Aug 31	Solvation and Electrostatics		Dix (dixta)
Tuesday Sept 1	Protein Folding and Stability		Beeson/Isaacs (isaacsj)
Thursday Sept 3	Principles of X-ray Crystallography		Davies (davies)
Friday Sept 4	Protein-Protein Interactions		Hsu (hsuy)
Tuesday Sept 8	Protein Modifications		Eblen
Thursday Sept 10	Protein Characterization/Proteomics		Ball (balle)
Friday Sept 11	Enzymes and Catalysis		Krupenko (krupenko)
Monday Sept 14	Enzyme Kinetics	Kinetics Questions	Beeson
Tuesday Sept 15	Protein Purification		Hennig (hennig)
Thursday Sept 17	Proteomics/Informatics		Schwacke (schwacke)
Friday Sept 18	Unit Exam		

General reading Prerequisite reading for this Unit are Chapters 2, 3, 6, 10.3, 10.4, 23.2 and 23.3 of Stryer's Biochemistry (6th ed).

MACROMOLECULES: NUCLEIC ACIDS

Dr. Christopher Davies
BSB 518D; 792-1468
davies@musc.edu

Date	Lectures	Flex	Instructor
Monday Sept 21	Introduction to Unit 1. History 2. DNA structure	X-ray diffraction of DNA	Davies
Tuesday Sept 22	1. RNA structure		Hennig (hennig)
Thursday Sept 24	1. DNA replication 2. DNA replication (continued)	Prep for presentations	Brown (broweri)
Friday Sept 25	1. Recombination 2. DNA repair	"	Brown
Monday Sept 28	Student presentations		Brown
Tuesday Sept 29	1. Transcription in prokaryotic genes 2. Mechanisms of transcriptional regulation in prokaryotes		Cowart (cowartl)
Thursday Oct 1	1. Genetic code 2. tRNA synthetases, translation		Davies
Friday Oct 2	1. Structure of the prokaryotic ribosome 2. Regulation of prokaryotic translation		Davies
Mon Oct 5	1. Catalytic RNA 2. RNA world hypothesis		Davies
Tues Oct 6	Techniques in nucleic acid research		Kurtz (kurtzdt)
Thurs Oct 8	Pharmacogenetics		Kurtz
Fri Oct 9	Unit Exam		

General reading

Prerequisite: Chapters 4-7 of Molecular Biology of the Cell, 5th ed., Alberts *et al.*
Also useful are Chapters 4, 5, 28, 29 & 30 in Stryer, 6th ed.

METABOLISM AND BIOENERGETICS

Dr. Craig Beeson
 QF309C, 876-5091
beesonc@musc.edu

Date	Lectures	Flex	Instructor
Mon Oct 12	1. Biological thermodynamics & kinetics 2. Overview of bioenergetics & redox	Redox Questions	Beeson
Tues Oct 13	1. Lipids, bilayers & membranes 2. Membrane biophysics		Beeson
Thurs Oct 15	1. Transporters & channels: classes, function 2. Transporters & channels: techniques	Transport Paper	Covington (covingt)
Fri Oct 16	1. Regulation of catabolism versus anabolism 2. Signaling in regulation of metabolism		Beeson
Mon Oct 19	1. Mechanisms in Glycolysis 2. Gluconeogenesis	Assignment 1 Due	Davies (davies)
Tue Oct 20	Structural Aspects of Regulation		Davies
Thu Oct 22	1. Citric Acid Cycle 2. Beta oxidation	Seahorse Lab	Lemasters (lemaste)
Fri Oct 23	1. Electron transport chain 2. Biophysics of mitochondrial membranes		Lemasters
Mon Oct 26	1. Chemiosmotic energy transduction 2. Oxidative Phosphorylation	Assignment 2 Due	Lemasters
Tue Oct 27	1. Mitochondrial DNA 2. Mitochondrial Diseases	Mito-DNA Paper	Chan (lamcf)
Thu Oct 29	Integrative metabolism and metabolomics	Questions Overview	Beeson
Fri Oct 30	Unit Exam		

General Reading for the Metabolism and Bioenergetics Unit

	Lehninger (5th ed.) Chapter	Stryer (6th ed.) Chapter
Intro to Metabolism	14	14
Bioenergetics	13	
Lipids, membranes	10	12
Ion channels	11	13
Glycolysis	14, 15	16
TCA	16	17
Oxidative-Phosph	19	18
Fatty Acid Oxidation	17	22
Pentose Phosphate Pathway (HMP-shunt)	15	20
Gluconeogenesis	14-15	16
Glycogen Synthesis	15	21
Glycogen Catabolism	15	21
Fatty Acid Synthesis	17	22

Useful Websites:

<http://www.bmb.leeds.ac.uk/illingworth/oxphos/>

<http://www.esf.edu/efb/course/EFB325/default.htm>

<http://www.aw-bc.com/mathews/>

<http://www.rpi.edu/dept/bcbp/molbiochem/MBWeb/mb1/MB1index.html>

RECEPTORS & SIGNALING

Dr. Steven A. Rosenzweig

BSB 313G; 792-5841

rosenzsa@musc.edu

Date	Lectures	Flex	Instructor
Mon Nov 2	Overview of receptors & signaling I	Methods of Studying Ligand:Receptor Interactions	Rosenzweig (rosenzsa)
Tues Nov 3	G protein coupled receptors	Paper discussion (1)	Blumer (blumerjb)
Thurs Nov 5	G proteins and their regulatory proteins	Paper discussion (2)	Blumer
Mon Nov 9	Photoreceptors	Paper discussion (3)	Koutalos (koutalo)
Tues Nov 10	Receptor tyrosine kinases	Paper discussion (4)	Rosenzweig
Thurs Nov 12	Protein:protein interactions in signal transduction	Methods for identifying and studying protein interactions	Ball (balle)
Fri Nov 13	Receptor tyrosine kinase signaling to cell migration	Paper discussion (6)	Isaacs (isaacsj)
Mon Nov 16	Protein kinases: MAP kinases	Paper discussion (7)	Eblen (eblen)
Tues Nov 17	TGF- β Receptors and the Smads	Paper discussion (8)	Eblen
Thurs Nov 19	Signaling to apoptosis	Methods exercise	Voelkel-Johnson (johnsov)
Fri Nov 20	Cell signaling in disease: cancer	Paper discussion (9)	Rosenzweig
Mon Nov 23	Cell signaling in disease: Animal models of cancer	Paper discussion (10)	Neumann (neumannc)
Tues Nov 24	Unit Exam		

General reading Prerequisite: Chapters 15, 17 & 23 of Molecular Biology of the Cell, 5th ed, Alberts *et al.*

Specific Reading Papers will be posted on WebCT as required

REGULATION OF GENE EXPRESSION

Dr. Donald Menick
Gazes/Strom Thurmond 203; 876-5045
menickd@musc.edu

Date	Lectures	Flex	Instructor
Mon Nov 30	1. Eukaryotic Transcription/Regulation of Gene Expression I 2. Eukaryotic Transcription/Regulation of Gene Expression II	Discussion of student presentations	Kyu-Ho Lee (leeh)
Tues Dec 1	3. Integrating Transcriptional Regulation Signaling Events 4. Epigenetic Regulation of Gene Expression		Kyu-Ho Lee
Thurs Dec 3	5. HDAC's and HAT's Role in Gene Expression I 6. HDAC's and HAT's Role in Gene Expression II		Menick (menickd)
Fri Dec 4	7. RNA Interference I 8. RNA Interference II		Menick
Mon Dec 7	9. Regulation of mRNA Processing and Localization I 10. Regulation of mRNA Processing and Localization II		McDermott (mcdermp)
Tues Dec 8	11. Regulation of mRNA Stability and Translation 12. Regulation of Translation and Degradation	Practice talks	McDermott
Thurs Dec 10	13. Viral Models for Molecular Biology I 14. Viral Models for Molecular Biology II	Practice talks	Wright (wrightcf) Eisenman
Fri Dec 11	Student presentations of research papers		
Mon Dec 14	Student presentations of research papers		
Tues Dec 15	Student presentations of research papers		
Thurs Dec 17	Overview of Exam		
Fri Dec 18	Unit Exam		

General Reading Prerequisite: Chapters 7, 8 and section 6.6 of Lodish *et al*, 6th ed. Additional reading from recent reviews will be assigned by each lecturer.

Flex-Time: Primary research papers will be presented and discussed. Each student will select a current paper on gene expression (instructors will provide examples). Selected papers will be

submitted for Unit leader approval by Friday, December 4, 2009. The Unit Leaders will give sample presentations, and students' initial flex-time presentations on December 8 and 10, 2009 will be in small groups (4-5 students) to maximize questions and input. Within each group, an instructor, postdoc TA or senior student will critique each presentation. Students will present to the entire class on December 11, 14 and 15, 2009. A secondary focus of Flex-times will be discussion of topics or techniques relevant to gene expression arising from lectures that day.

Grading: 35% of the Unit grade will derive from in-Unit research paper presentation, and 65% will derive from the Unit exam (closed-book, in-class).

CELLULAR FUNCTIONS

Dr. Edward Krug
CRI 607; 792-1543
krugel@musc.edu

Date	Lectures	Flex	Instructor
Tues Jan 5	Cell:Extracellular Matrix Interactions	Literature databases	Bradshaw (bradshad)
Thurs Jan 7	Cell Motility		Bradshaw
Fri Jan 8	Cytoskeletal Dynamics	Paper discussion	Krug (krugel)
Mon Jan 11	Molecular Motors		Krug
Tues Jan 12	Regulation of the Eukaryotic Cell Cycle Tumor Suppressor Genes	Paper discussion	Wright (wrightcf)
Thurs Jan 14	Oncogenes Proto-oncogenes		Wright Spyropoulos (spyropdd)
Fri Jan 15	Sorting and Secretion	Paper discussion	Hunter (huntera)
Mon Jan 18 MLK	MLK Day – no class		
Tues Jan 19	Integrating Cells Into Tissues		Gourdie (gourdier)
Thurs Jan 21	Cell Differentiation		Wooten-Blanks (wootenl)
Fri Jan 22	Panel Discussions of Current Literature		Faculty and Class
Mon Jan 25	Panel Discussions of Current Literature		Faculty and Class
Tues Jan 26	Unit Exam		

General Reading Chap 13, 14, 17-20, 22 and 25, Molecular Cell Biology, 6th ed., Lodish
Specific Reading: Papers will be posted on WebCT before the relevant lecture.

CELL INJURY AND RESPONSE

Dr. Debra Hazen-Martin
Walton Research Building 8th floor complex, 792-2906
hazenmad@musc.edu

Date	Lectures	Flex	Instructor
Thursday Jan 28	1. Introduction 2. Causes, mechanisms, morphology of cell and tissue injury	Multihead scopes with pathologists. In-Unit assignment 1	Hazen-Martin (l)* (hazenmad)
Friday Jan 29	1. Cellular adaptations, cell death, and necrosis 2. Introduction to inflammation and repair	Tissue injury: a discussion of time-line of events. Assignment 1 due.	Hazen-Martin (l/f)*
Monday Feb 1	1. Components of immune system I 2. Components of immune system II	Chose techniques rotation. In-Unit assignment 2	London (l/f) (londonl)
Tuesday Feb 2	Immune system III	POPS**	London (l/f)
Thursday Feb 4	1. Inflammation in acute cellular injury 2. Immunopathology: 2 examples of inflammation in disease	No flex: all lecture	Hazen-Martin (l) Self (l) (selfs)
Friday Feb 5	No lecture: all flex	Paper discussion 1	Schnellman (f) (schnell)
Monday Feb 8	No lecture: all flex	Techniques rotation. In-Unit assignment 3	
Tuesday Feb 9	1. Cellular senescence 2. Aging	Techniques follow-up: discuss choice of papers with group	Zhou (l) (zhoud) Hazen-Martin (f)
Thursday Feb 11	1. Apoptosis: historical overview 2. Apoptosis: causes, mechanisms, and detection	Promote?/Prevent? Paper discussion 2	Cunningham (l) (cunninll) Brown (f) (broweri) Wei (f) (weil)
Friday Feb 12	1. Benign and malignant neoplasms 2. Biology of tumor growth	Work on group presentations.	Metcalf (l) (metcalfj)
Monday Feb 15	Student Techniques Presentations		
Tuesday Feb 16	Unit Exam		

*(l)=lecture, (f)=flex

**a group problem-solving workshop

General reading Robbins Basic Pathology, 7th ed. (on reserve); the following chapters will supplement lecture notes:

- Chapter 1: Cellular Injury and response
Aging
Apoptosis
- Chapter 2: Inflammation
- Chapter 5: Diseases of Immunity

Chapter 6: Neoplasia

If you prefer a more comprehensive version of this text try Robbins Pathologic Basis of Disease which is available on line through MD Consult. Additional articles and/or reviews may be provided in class.

Kuby's Immunology, 6th ed. (Kuby *et al*, 2006,) Chapters 1-10 contain basic information that supplements lecture notes.

Specific Reading will be posted on WebCT before the relevant lecture and/or assignment.

SYSTEMS BIOLOGY

Dr. Perry Halushka
BSB 102; 792-3012
halushpv@musc.edu

Date	Lectures	Flex	Instructor
Thursday Feb 18	1. Introduction to the Unit 2. Mechanisms of Neurotransmission		Halushka Ramamoorthy (rama)
Friday Feb 19	The Heart and Arterial Pressure Control Mechanisms		Halushka
Monday Feb 22	Autonomic Nervous System Control of the CV System	In Unit Assignment	Webb (webbj)
Tuesday Feb 23	Molecular Basis of Atherosclerosis		Hammad (hammadsm)
Thursday Feb 25	Molecular Mechanism for Aspirin-mediated Cardiovascular Prophylaxis		Halushka
Friday Feb 26	Molecular Basis of Electrical Mechanical Coupling	In Unit Assignment	Menick (menickd)
Monday Mar 1	Renal Physiology		Bell (bellpd)
Tuesday Mar 2	Proteomic Tools for Analysis of Renal Disease	In Unit Assignment	Janech (janechmg)
Wednesday Mar 3	Molecular Mechanisms of Innate Immunity		Cook (cookja)
Thursday Mar 4	No class		
Friday Mar 5	Unit Exam		

FIRST YEAR CURRICULUM RECOMMENDED TEXTBOOKS

There is no assigned textbook for the First Year Curriculum. A number of standard texts (shown below) are recommended for background reading in the topics students will encounter during the curriculum. Copies of all these textbooks are available on reserve in the Library for the exclusive use of first year graduate students. Not all texts are available in the latest editions as shown below. Please check with the Circulation Desk for borrowing privileges.

Title	Edition	Authors
Biochemistry *	6 th (2006)	Lubert Stryer
Biochemistry	3 rd (1999)	Mathews and Van Holde
Biomembranes: Molecular Structure and Function	1 st (1989)	Robert B. Gennis
DNA Replication	2 nd (2005)	Arthur Kornberg
Lehninger Principles of Biochemistry	5 th (2008)	David L. Nelson and Michael M. Cox
Advanced Organic Chemistry-Reactions, Mechanisms, and Structure	6 th (2007)	M.S. Smith and J. March
Molecular Biology of the Cell	5 th (2008)	Bruce Alberts <i>et al.</i>
Molecular Biology of the Gene *	6 th (2008)	James D. Watson <i>et al.</i>
Molecular Cell Biology *	6 th (2008)	Harvey Lodish <i>et al.</i>
Review of Organic Functional Groups: Introduction to Medicinal Organic Chemistry *	4 th (2003)	T.L. Lemke
Basic Pathology	8 th (2007)	Stanley L. Robbins <i>et al.</i>
Introduction to Genetic Analysis	8 th (2008)	Griffiths <i>et al.</i>

Program-Related Textbooks

Cellular & Molecular Immunology	6 th (2007)	Abul K. Abbas <i>et al.</i>
Fundamental Neuroscience	2 nd (2002)	Michael Zigmond <i>et al.</i>
Immunology	6 th (2007)	Richard Goldsby <i>et al.</i>
The Immune System	3 rd (2009)	Peter Parham

(* Highly Recommended)

PH.D. PROGRAM EXPOSURES

August 25-September 8, 2009

During the first two weeks of the Curriculum, departmental faculty, along with their students and postdoctoral fellows, present their Ph.D. programs to matriculating graduate students, familiarizing them with the overall themes of the individual programs, advanced coursework, the nature of qualifying exams, and dissertation research opportunities. Ph.D. Program Exposures provide students with important information that will be useful in selecting faculty mentors for their laboratory rotations. The schedule of Program Exposures for Fall 2009 is as follows:

<i>Date</i>	<i>Program</i>	<i>Contact</i>	<i>Time</i>	<i>Place</i>
Tuesday 25 August	Biochemistry and Molecular Biology	Dr. Maurizio Del Poeta delpoeta@musc.edu 792-8381	noon-2:00 pm (lunch provided)	BSB 502
Wednesday 26 August	Pharmaceutical Sciences	Dr. Craig Beeson beesonc@musc.edu 876 5091	Noon-5:00 pm (lunch; reception & cocktails at 3:00pm)	QF 106
Thursday 27 August	Cell and Molecular Pharmacology	Drs. Lauren Ball, Jennifer Isaacs balle@musc.edu , isaacsj@musc.edu 792 4153, 792 8393	1:00-3:00 pm (lunch provided)	BSB 350
Friday 28 August	Pathology and Laboratory Medicine	Dr. Lisa Cunningham cunninll@musc.edu 792-8324	1:00-6:00 pm (buffet & cocktails at 4:30 pm)	Institute of Psychiatry Aud. & Gazes 125
Monday 31 August	Clemson-MUSC Bioengineering	Dr. Richard Swaja swajar@musc.edu 792 0430	2:00-3:30 pm	BSB 202
Tuesday 1 September	Microbiology and Immunology	Dr. Laura Kasman kasmanl@musc.edu 792-8117	noon-2:00 pm (lunch provided))	BSB 204
Wednesday 2 September	Neurosciences	Dr. Judson Chandler chandj@musc.edu 792-4993	3:00-5:00 pm (posters and reception at 3:30 pm)	BSB 435
Friday 4 September	Molecular and Cellular Biology and Pathobiology Program	Dr. Don Menick menickd@musc.edu 876 5045	3:00-5:00 pm (Happy Hour at 5:00 pm)	Gazes 125 (with optional trip to Fort Johnson)
Tuesday 8 September	Biostatistics and Epidemiology	Dr. Elizabeth Slate slate@musc.edu 876 1133	11 am-1:00 pm (lunch provided)	Cannon Place 135 Cannon St, Room 305

ESSENTIAL SCIENTIFIC PRACTICES I, II AND III

Essential Scientific Practices I, II and III (CGS 710, CGS 711 and CGS 712) address the imperatives of performing biomedical research in an ethically responsible manner, the requirements facing scientists as they navigate the increasingly complex spectrum of regulations governing scientific practice, and the importance of effective scientific and social communication with a professionally and ethnically diverse audience.

CGS 710 Responsible Conduct of Research

Edward L. Krug, Ph.D. Course Director
CRI 607, 792-1543, krugel@musc.edu

CGS 710 emphasizes ethical principles and regulations concerning animal models and human subjects in research, and accurate record keeping and data management. The course also presents essential skills for searching the scientific literature, and for reading and critical analysis of manuscripts. Finally, the course explores the moral reasoning behind the responsible conduct of research. Students will increase their knowledge of ethical theory and develop core competencies that include institutional policies on research misconduct as well as relevant governmental regulations on the conduct of research. This is a Pass/Fail course, and attendance is mandatory - please contact Dr. Krug should any problems or conflicts arise. Lectures and quizzes will be posted on WebCT (100% required for each quiz).

Date	Time	Topic	Instructor
Friday Sept 11 BSB 502	1:00 to 1:50 pm 2:00 to 2:50 pm	Mentoring Intellectual Property	Krug Gourdie, Ghatnekar
Saturday Sept 12 BSB 435	8:30 am to noon	RCR Workshop I <ul style="list-style-type: none"> • Brief History of RCR • Questionable Research Practices • Ethical Decision Making 	Krug
Monday Sept 14 EL 438	(A) 1:00 to 2:50 pm (B) 3:00 to 4:50 pm	Literature Databases (Group A) Literature Databases (Group B)	Herbert and Poyer
Friday Sep 18 BSB 502	1:00 to 2:50 pm	Human Subjects Research Animals Use in Research	Sonne Smith
Saturday Sept 19 BSB 435	8:30 am to noon	RCR Workshop II <ul style="list-style-type: none"> • Data Selection and Management • Authorship, Accountability and Plagiarism • Peer Review 	Krug and faculty
Monday Sept 21 BSB 502	1:00 to 1:50 pm 2:00 to 2:50 pm	Conflict of Interest/Commitment Assessing Scientific Literature	Higerd Borg
Friday Sept 25 BSB 502	1:00 to 1:50 pm 2:00 to 2:50 pm	Collaborative Science Career Planning & Time Management	Hill and Krug Krug
Saturday Sept 26 BSB 435	8:30 am to noon	RCR Workshop III <ul style="list-style-type: none"> • Emerging Issues • Reporting Misconduct and Whistleblowers Protection 	Krug and faculty

CGS 711 Diversity in Science

Cynthia F. Wright, Ph.D., Course Director
(wrightcf@musc.edu)

BSB 402, Thursdays: 5:00 pm-6:00 pm
(Sept 24, Oct 8, Oct 22, Nov 12, Nov 19)

In CGS 711, students address topics that pertain to concerns facing both under-represented minority and majority groups in the biomedical sciences. Topics discussed include how to succeed in the scientific community, hurdles and how to overcome them, and working in and developing a diverse workforce. Invited speakers discuss how they have succeeded in science and the obstacles they overcame. This is a Pass/Fail course. Attendance is mandatory-please contact Dr. Wright should any problems or conflicts arise.

CGS 712 Scientific Writing

Edward L. Krug, Ph.D., Course Director
CRI 607, 792-1543, krugel@musc.edu
(CGS 712 Syllabus, next page)

This course guides students through the creation and development of an individual short grant proposal. This exercise develops effective scientific writing skills, promotes early student-mentor interaction, encourages appreciation of the benefits of giving and receiving constructive criticism, and introduces the mechanics of extramural funding. Over the summer, faculty facilitators and student mentors provide critical feedback on drafts of proposal sections. Students will also partner with one another to critique each others' proposals. Class discussion is devoted to selected samples of submitted writing. The top four proposals selected by an outside grant consultant are placed on reserve in the College of Graduate Studies office and their authors receive a year's subscription to *Science*.

CGS 712 Scientific Writing
Edward L. Krug, Ph.D., Course Director
(krugel@musc.edu)
Tuesdays 9:00-11:00 am, BSB 435

Date	Time	Topic	Instructor
June 8	9-10:50 am	<i>"Pre-Writing Techniques"</i>	Smith
June 15	9-10:50 am	<i>"Extramural Grant Agencies and Fellowship Opportunities"</i>	Sullivan
June 22	9-10:50 am	<i>"The Basics of Proposal Writing"</i> (Personal Statements and Outlines due)	Krug
June 29	9-9:50 am	<u>Critique Session</u> : Proposal Outlines and Personal Statements	Class
	10-10:50 am	<i>"Writing an Effective Background & Significance"</i>	Krug
July 6	9-9:50 am	<i>"The Peer Review Process"</i>	Krug
	10-10:50 am	<i>"Writing Constructive Critiques"</i> (Background & Significance draft due)	Krug
July 13	9-9:50 am	<u>Critique Session</u> : Background & Significance Drafts	Study Groups
	10-10:50 am	<i>"Getting to the Point in the Specific Aims Section"</i>	Krug
July 20	9-10:50 am (BSB 611)	<i>"Troubleshooting Word Formatting Problems"</i> (Specific Aims draft due)	Trusk
July 27	9-9:50 am	<u>Critique Session</u> : Specific Aims Drafts	Study Groups
	10-10:50 am	<i>"The Experimental Approach Section: Design vs. Method"</i>	Krug
Aug 3	9-10:50 am	<i>"Statistical Considerations in Experimental Design"</i> (Experimental Approach draft due)	Yeatts
Aug 10	9-9:50 am	<u>Critique Session</u> : Experimental Approach Drafts	Study Groups
	10-10:50 am	<i>"Summarizing Key Points in the Abstract"</i>	Krug
Aug 17	9-10:50 am	<i>"Manuscript Writing"</i> (Final proposals due)	Krug
August 21 - Peer critiques due by 4:00 pm - Keisha Brown, BSB 102			

Laboratory Rotations (CGS 720/721)

Jacqueline F. McGinty, Ph.D., Course Director (mcginty@musc.edu)

First Year Curriculum students are required to enroll in two 6-8 week long laboratory rotations in each of the fall and spring semesters. Students receiving a Dean's Scholarship rotate through at least three different laboratories (different mentors) to maximize their exposure to a diversity of scientific experiences and technologies. Self-funded or mentor-supported students are required to rotate through two separate laboratories in the Fall semester of the first year and may petition the Associate Dean for approval to repeat one of those rotations twice in the Spring semester. Rotation objectives may include one or all of the following:

1. To acquaint students with potential dissertation mentors. Students will:
 - a. Receive a briefing on the research focus of the laboratory
 - b. Receive 1-3 review and/or research papers to read and discuss with the mentor during the rotation
2. To introduce students to conduct of laboratory science. Students will:
 - a. Work on limited projects with the goal of understanding the basis for the hypothesis being tested and the general approach to test the hypothesis
 - b. Participate in weekly group or laboratory meetings
 - c. Attend department or program seminars
3. To acquire skill in diverse laboratory techniques. Students will:
 - a. Learn techniques (theory, limitations, etc) associated with the rotation project by collaborating with a mentor, graduate student, postdoctoral trainee and/or technician)
 - b. Conduct laboratory research throughout the week and weekends when indicated
4. To acquaint students with other graduate students and faculty, students will attend seminars, journal clubs and other research activities of the department or program.

Lab Biosafety. Before starting Lab Rotations, all students are required to attend Dr. Dan Eisenman's biosafety seminar addressing issues pertaining to compliance, occupational safety, and biological and chemical hazards. The website <http://www.musc.edu/biosafety> is an invaluable resource in this context.

Mentor Selection. Having reviewed each research program in Program Exposures, students submit their first and second mentor choices for each laboratory rotation to Keisha Brown in the Graduate Office. Every effort is made to accommodate students' first choices; however, if several students select the same mentor, students who delay submission may be assigned their second choice of mentor or they may need to select another mentor. Laboratory resources should be weighed carefully in selecting rotations; students should ensure that space and financial support would be available if they decide to pursue their dissertation in that mentor's lab. Schedules for the laboratory rotations and form submission deadlines are shown here and in the FYC Calendar (pages 9 to 12).

Rotation	Submit Choices	Begin	End	Evaluations Due
First	Sep 9, 2009	Sept 14, 2009	Oct 30, 2009	Oct 30, 2009
Second	Oct 28, 2009	Nov 2, 2009	Dec 18, 2009	Dec 18, 2009
Third	Dec 16, 2009	Jan 6, 2010	Mar 5, 2010	Mar 5, 2010
Fourth	Mar 3, 2010	Mar 15, 2010	May 7, 2010	May 7, 2010

Evaluation of Lab Rotations. At the end of the laboratory rotation, mentors are responsible for submitting a signed evaluation form (APPENDIX II) to Keisha Brown in the Graduate Office. Prompt submission of the evaluation form provides the necessary information for the Course Director to assign an Honors/Pass/Fail grade. In addition, students will complete a mandatory WebCT-based evaluation of the laboratory rotation. Failure to submit timely evaluations will result in an incomplete grade for the rotation.

Selection of Dissertation Mentor. Laboratory Rotations, Program Exposures, Spring Selectives, attendance and participation in journal clubs and seminars, and focused discussion throughout the year with faculty advisors, mentors, and senior students regarding all aspects of available Ph.D. programs should facilitate selection of a dissertation mentor by the end of the spring semester. In addition, students should discuss with each Principal Investigator in whose lab they rotate the prospects (including potential stipend funding) for performing their dissertation research in that lab. Students should submit their Ph.D. program selection form (Appendix III) in the two week period following the last laboratory rotation.

**IMPORTANT UNANSWERED QUESTIONS IN THE BIOMEDICAL SCIENCES
(CGS 760)**

Perry V. Halushka, M.D., Ph.D., Course Director (halushpv@musc.edu)
Tuesdays, 12:00 noon, BSB 402 (lunch is provided)
Oct.13-Dec 15, 2009 and Jan 5-Feb 23, 2010

The Seminar Series. As an academic medical center, our mission is to improve human health and find better treatment for diseases. We want our students' and faculty research to parallel the mission of the institution. This seminar series is in concert with our mission and designed to meet two objectives; 1) excite our students about and broaden their perspectives on translational research and 2) develop critical thinking skills that encompass the evaluation of data and the design of hypothesis-driven research. Seminar speakers are chosen for their area of research, which should be hypothesis-driven clinical or basic research, the latter with a potential clinical application. The seminar topics are picked to coincide with the particular topic being covered in the didactic portion of the First Year Curriculum. Approximately one week prior to the seminar, students will receive one or two papers relevant to the research topic.

The Unanswered Questions. Almost invariably, the results of a research project or seminar lead to additional important unanswered questions. At the end of the seminar, students should be thinking about how they would take the research to the next level. There is often no single correct direction in which to move the research. Thus, the challenge for the students is to determine what they would do. **To meet this challenge, students are required to pose a question or hypothesis that they feel is directly related to the results presented.** They have to support their idea(s) with a rationale based on the results presented and/or evidence from the literature. The final piece of the assignment is to design at least one and preferably two experiments that one would perform and provide a description of the anticipated results. The following format **must** be used. **Each one of these headings should precede the section and in this order.**

BACKGROUND AND RATIONALE
HYPOTHESIS
SPECIFIC AIM 1
SPECIFIC AIM 2
ANTICIPATED RESULTS AND/OR LIMITATIONS OF THE RESULTS
BIBLIOGRAPHY

Evaluation of Student Comprehension. Students are required to submit their answers (minimum of one single-spaced page, maximum of two pages, not including the bibliography) through WebCT within a week of the seminar; failure to submit an answer on time earns a zero for that seminar. **Failure to use the format above will result in no credit for the assignment.** Students missing a seminar for a legitimate reason are not assigned a grade for that seminar. An excused absence must be obtained from the course director prior to the seminar. Answers are graded on the honors, pass or fail system. Students are assigned a semester grade based on their cumulative grades for each seminar.

SPRING SELECTIVES

In the second half of the spring semester, doctoral training programs in the College of Graduate Studies offer First Year Curriculum students a choice of discipline- or program-specific courses. These seven-week "Selectives" provide students with more focused studies in their specific fields of interest. Upon registering for the 2009 Spring semester, students are required to enroll in one of the nine Selectives courses listed below. Specific times and locations for each of the Selectives will be announced in advance of the registration deadline.

Department of Biochemistry and Molecular Biology

One of the following five Selectives will be offered each year. Merit-based grades are based on class participation (25%) and outside assignments (75%); the latter include written reviews of scientific manuscripts (40%) and presentation of a scientific paper in class (35%). Please contact Dr. Del Poeta for the 2010 Spring Selective topic.

Course Directors: Yusuf Hannun, M.D., Ph.D. (hannun@musc.edu) and Maurizio Del Poeta, Ph.D. (delpoeta@musc.edu)

Mechanism of Aging and Life Span (BMB-605A)

Many pathological processes have become amenable to study using the various tools and approaches of biochemistry, molecular biology, genetics, chemistry, and bioinformatics. This is perhaps best illustrated in the study of aging. After decades of little progress, it is now apparent that fundamental processes regulate lifespan of organisms ranging from yeast to *Caenorhabditis elegans*, to *Drosophila*, to mice, and, by extension, to humans. These common mechanisms involve transcription factors, insulin-like signaling, lipid signaling pathways, and telomerase. Disorders in these pathways result in disturbances in lifespan, and in some cases in human diseases. This course will provide the students with the necessary foundation in understanding the various models employed for the study of aging and lifespan. The course will rely primarily on original literature and in-depth discussion of key foundation papers. The discussion will be led by expert faculty who will introduce each topic and provide the students with the necessary foundations.

Mechanisms of Cancer Pathogenesis (BMB-605B)

The abnormal behavior of neoplastic cells can often be traced to alterations in cell death and apoptosis. This course will provide the study of molecular mechanisms involved in the transformation process, the study of altered levels of specific growth factors, intracellular processes for conveying lipid membrane signals to the nucleus, portions of the transcription apparatus, and genes involved in the cell cycle, the regulation of DNA replication, and programmed cell death.

Mechanisms of Inflammation (BMB-605C)

Understanding the mechanisms underlying the inflammation process is an emerging area of research. In particular, bioactive molecules produced by immune system cells are involved in inflammatory diseases such as rheumatoid arthritis, sepsis, asthma, inflammatory bowel disease, and atherosclerosis. This course will provide a study of mechanisms leading to and maintaining the inflammation process, such as dyslipidemia, the leading cause of the inflammation process that leads to the atherothrombotic disease, and the oxidative stress, the pathological factor responsible for this damage. In addition, the course will focus on a variety of stimuli, such as mechanical, anoxic, chemical (e.g. oxidized LDL), immunological or infectious ones, that are responsible for activation of the endothelium. Finally, the course will also examine how many infectious agents regulate the inflammation process, leading either to the control of

the infection or the development of infectious disease, depending on the cross talk between the host and the pathogen.

Pathogenesis of Diabetes (BMB-605D)

Diabetes is the most common disease in developed countries. Understanding its pathogenesis will potentially improve new therapeutic interventions. The role of a particular life style as well as inflammation and autoimmunity have been implicated as crucial factors for the development of diabetes. This course will discuss the molecular mechanisms by which obesity, dyslipidemia, hyperglycemia, inflammation and autoimmunity can lead to the development of diabetes.

Autophagy and Human Disease (BMB 605E)

Autophagy is a cellular process in which the cell self-digests its own components to recycle nutrients and to eliminate unnecessary or damaged proteins and organelles. Recent studies have demonstrated the fundamental importance of autophagy in health and disease. Participants will be introduced to the historical overview of the field, the current knowledge on the molecular and cellular mechanisms of autophagy, and how autophagy plays a role in various aspects of human pathophysiology. The discussion topics include autophagy in stress response, infectious diseases, cancer, and neurodegenerative diseases.

Department of Biochemistry and Molecular Biology

Introduction to Bioinformatics (BMTRY 744)

Course Director: Jim Zheng, Ph.D. (zhengw@musc.edu)

The course gives a comprehensive entry-level introduction to bioinformatics. It covers a wide variety of topics in bioinformatics, including sequence analysis, protein structure, genome analysis, proteomics data analysis, database, transcription profiling, etc. Two major goals are 1) to help students to understand the scope, the basic concepts and the theory of bioinformatics and 2) to get familiar with tools for bioinformatics related data analysis. Programming skills are not necessary. Prerequisites: Basic molecular biology concepts

Department of Microbiology and Immunology

Emerging Infectious Diseases (MBIM 785)

Course Director: Laura Kasman, Ph.D. (kasmanl@musc.edu)

This course will teach basic immunological and microbiological concepts through in-depth study of six microorganisms responsible for emerging or epidemic infectious diseases. Each week will focus on the biology, natural history, pathology and immunology associated with one pathogen. Pathogens covered will include avian influenza, tuberculosis, Ebola/Marburg virus, methicillin resistant *Staphylococcus aureus*, SARS, and anthrax. Classes will include lectures, primary literature reading and analysis, and some in-class small group work. Student performance will be assessed by weekly quizzes, presentation of an assigned paper, and a final project.

Departments of Cell and Molecular Pharmacology and Experimental Therapeutics/ Pharmaceutical and Biomedical Sciences

Drug Discovery & Molecular Pharmacology (PCOL 724/PHMSC 712)

Course Directors: Steven Rosenzweig, Ph.D. (rosenzsa@musc.edu; PCOL) and Kennerly Patrick, Ph.D. (patrickk@musc.edu; PHMSC).

In this course, students will be introduced to the scientific fundamentals used in drug design, focusing on the targeting of cell signaling pathways and ranging from bench discovery, drug approval for human testing and ultimately, therapeutic application. Agents for the treatment of

cancer, cardiovascular disease and psychiatric disorders will be exemplified. This course underscores the interdisciplinary nature of pharmacology and medicinal chemistry, within which biochemistry, cell biology, physiology and medicine have been integrated to facilitate drug discovery. Understanding biological problems/pathologies at a mechanistic level are shown to be essential to the rational design of tomorrow's best-in-class drugs. The interdependence of pharmacodynamic and pharmacokinetic relationships will be discussed as a prominent feature of drug discovery. Merit grades will be based on class participation (25%) and outside assignments (75%).

Molecular and Cellular Biology and Pathobiology Program

Advanced Cell Biology (MCBP 723)

Course Directors: Edward L. Krug, Ph.D. (krugel@musc.edu), Bryan Toole, Ph.D. (toolebp@musc.edu)

The course builds on student knowledge from the Regulation of Gene Expression, Cellular Functions and Receptors and Signaling Units of the First Year Curriculum. New approaches and technology that are being utilized to identify the molecular mechanism and factors at play in cellular function and disease will be discussed. The course will combine lectures, discussion of papers from the literature, student presentations and a formal paper.

Molecular and Cellular Biology and Pathobiology Program (Marine Biomedicine and Environmental Sciences)

Environment, Oceans, and Humans: The Inextricable Relationship between Climate Change, Marine Environment, and Human Health (MCBP 746)

Course Director: Eric Lacy, Ph.D., (lacyer@musc.edu)

This course introduces students to some of the topical issues in marine and environmental sciences as they relate to Human Health. The course shows the application of cell and molecular biology and epidemiology approaches to environmentally relevant questions that ultimately impact human health. These topics are put into context of the reports of the International Panel on Climate Change, the Kyoto Protocol, and the latest Bali summit. In addition students will participate in learning how results from research in environmental cell and molecular science are synthesized with economics and law to form public policy. The role of federal and SC state government agencies in these processes will be presented through the appropriate representatives of these agencies on the Ft. Johnson campus. This is a course that includes students reading scientific papers, lay communications, and books in conjunction with active class participation through discussions on topical issues.

Department of Pathology and Laboratory Medicine

Graduate Histology and Introduction to Histopathology (PATH 789)

Course Director: Debra Hazen-Martin, Ph.D. (hazenmad@musc.edu)

Students will learn to visualize the microscopic architecture of the human/animal body. A main goal is to teach basic and organ histology as a prerequisite for graduate student participation in a general pathology course. For graduate students in fields other than pathology the course will provide a practical understanding of histology. The primary resource for this course is WebMic, a Virtual Microscope and a Companion Manual of Histology Exercises. Webmic mimics the use of the microscope in learning histology. Emphasis will be placed on guided self-directed learning with ample opportunity for interaction with faculty through direct viewing of specimens with microscopes, the use of dual viewing microscopes, and TV microscopy. This course, including oral and written examinations, will be managed and administered online via WebCT.

STUDENT EVALUATION OF COURSE EFFECTIVENESS

A guiding principle behind development and evolution of the First Year Curriculum is that detailed analysis and responsiveness to student opinion promotes excellence in both faculty and curriculum content. Thus, an essential feature of the curriculum is student evaluation of faculty and course effectiveness. Students evaluate the First Year Curriculum using the MUSC E*Value course evaluation software administered by the Office of Enrollment Management and by the College of Graduate Studies E*Value representative, and by selecting the recipient of the Dean's Outstanding Teacher of the Year Award.

I. Unit and Course Evaluation

Units in CGS 701/702 and other constituent elements of the First Year Curriculum are evaluated anonymously by students using E*Value. Online quantitative evaluation forms are open to registered students for one week starting on the last day of each Unit. Students are asked to rate seven Unit statements and four Instructor statements (APPENDIX IV). In addition, after each set of Unit exams, students are asked to offer constructive written criticism of each Unit (content, instructors, etc) in an editable text box. Unit evaluations are reviewed by the Course Director, and distributed to individual Unit Leaders, the Associate Dean, and the Dean.

II. Student Selection of the Outstanding Teacher

Instructor scores accumulated from course Unit evaluations serve to identify a final list of ten candidates for the Dean's Outstanding Teacher of the Year Award. Students elect the recipient of the Award at the year-end First Year Curriculum Student Luncheon.

ENROLLMENT IN THE CURRICULUM

First Year Curriculum courses are shown below for purposes of registration. Most students matriculating into the Ph.D. degree program in August enroll in the full curriculum. Medical Scientist Training Program (M.D.,Ph.D.) students enroll in Essential Scientific Practices I and II (CGS 710 and CGS 711) and selected Units in CGS 701 and 702. Dental Medicine Scientist Training Program (D.M.D., Ph.D.) students enroll in Essential Scientific Practices I (CGS 710). Biometry Ph.D. program students enroll in Essential Scientific Practices I and, depending on their program requirements, may enroll in all or part of the remainder of the curriculum. Students in M.S. degree programs enroll in all or part of the curriculum to satisfy the requirements of their individual M.S. programs. Non-degree students may enroll in all or part of the curriculum on a space-available basis. Students and postdoctoral fellows wishing to audit may do so with the permission of the Unit Leader(s), obtained at least one week prior to start of the Unit.

Fall Semester (16 Credit Hours)

#	Course	Credit Hours	Grading
CGS 701	Foundations of Biomedical Sciences I	10	Merit
CGS 710	Essential Scientific Practices I	1	Pass/No Pass/Honors
CGS 711	Diversity in Science	1	Pass/No Pass/Honors
CGS 720	Laboratory Rotation I and II	3	Pass/No Pass/Honors
CGS 760	Important Unanswered Questions	1	Pass/No Pass/Honors

Spring Semester (15 Credit Hours)

#	Course	Credit Hours	Grading
CGS 702	Foundations of Biomedical Sciences II	6	Merit
CGS 721	Laboratory Rotation III and IV	5	Pass/No Pass/Honors
CGS 760	Important Unanswered Questions	1	Pass/No Pass/Honors
various	Spring Selective	3	Merit

Summer Semester (15 Credit Hours)

#	Course	Credit Hours	Grading
CGS 712	Essential Scientific Practices III	2	Pass No Pass/Honors
CGS 970	Research	13	Pass/No Pass/Honors

FIRST YEAR CURRICULUM STEERING COMMITTEE

Adam J. Smolka, Ph.D., Chair (smolkaaj@musc.edu)

The Steering Committee is charged with continued evaluation, revision, and evolution of the First Year Curriculum for the College of Graduate Studies. The committee meets twice in each of the Fall and Spring semesters and once during the Summer semester. The committee may meet more often as deemed necessary by the chair, Associate Dean or Dean. Two weeks prior to a scheduled meeting, the chair solicits agenda items from committee members and the entire graduate faculty. The transactions of the Steering Committee are reported to the Graduate Council by the chair, who is an *ex officio* member of the Graduate Council. The chair also reports on Steering Committee activities at the Dean's quarterly meetings of the department chairmen.

Membership of the Steering Committee comprises the course directors of constituent elements of the First Year Curriculum, CGS 701/702 Unit leaders, a first year student representative and an alternate elected by their class, and the First Year Curriculum course director (chair). The Dean and the Associate Dean serve as *ex officio* members of the committee. Current members of the Steering Committee are:

Craig Beeson	Pharm. Science	Eric Lacy	Marine Biosciences
Jim Cook	Neuroscience	Jakie McGinty	Neuroscience
Christopher Davies	Biochemistry	Don Menick	Medicine
Maurizio Del Poeta	Biochemistry	Ken Patrick	Pharm. Science
Scott Eblen	Pharmacology	Steve Rosenzweig	Pharmacology
Debra Hazen-Martin	Pathology	Adam Smolka (Chair)	Medicine
Perry Halushka	Pharmacology	Cynthia Wright	Diversity Course
Laura Kasman	Microbiology	Jim Zheng	Biochemistry
Ed Krug	Regenerative Medicine	Graduate Student	To be Elected

FIRST YEAR CURRICULUM PROGRESS COMMITTEE

Craig Beeson, Ph.D., Chair (beesonc@musc.edu)

The Progress Committee is charged with monitoring the academic progress of all graduate students enrolled in the First Year Curriculum. Students are required to maintain the academic standards set forth in the MUSC Bulletin and the Biomedical Sciences First Year Curriculum Guide (see below). The Committee may recommend improvements in performance or remediation following thorough review of all relevant material and circumstances presented by the student, the course director, and faculty. In addition, the Progress Committee members consult with students regarding their choices of laboratory rotations and dissertation lab. Students are required to meet with their Committee member advisor before selection of their first lab rotation, at the end of the fall and spring semesters, and at any other time requested by the advisor or the student. All Unit grades in CGS 701/702, Selective grades, and rotation assignments are forwarded to the Progress Committee. Current members of the Progress Committee are:

Craig Beeson (Chair)	Pharm. Sciences	Andy Wessels	Regenerative Med.
Christina Voelkel-Johnson	Microbiology	Jerry Webb	Pharmacology
Robin Muise-Helmericks	Regenerative Medicine	Harold May	Microbiology
Besim Ogretmen	Biochemistry	Antonieta Lavin	Neuroscience
Joyce Nicholas	Biostatistics	Daohong Zhou	Pathology

Probation Policy. First Year Curriculum students are required to maintain a minimum overall grade point average (GPA) of 3.0 according to the following guidelines:

1. Students receiving less than a minimum cumulative GPA of 3.0 at the end of a semester will be placed on academic probation.
2. Students on academic probation must achieve a minimum cumulative GPA of 3.0 at the end of the following semester to be removed from academic probation.
3. Students who remain on academic probation for two consecutive semesters can be dismissed from the program. Students have the right to appeal this decision to the Progress Committee. Any decision by the Progress Committee can be appealed to the Dean.

Student Teaching. As graduate students progress in their studies, becoming integral members of the academic community, they are encouraged to teach in the First Year Curriculum. Graduate student and postdoctoral fellow participation may include formal lectures, composition of exam questions, assisting Unit leaders with grading of student assignments/tests, and participation in flex-time activities (small-group discussions or technical demonstrations). Unit leaders determine the extent to which graduate students and postdoctoral fellows teach in their Units. Unit leaders review all graduate student and postdoc teaching participation for appropriate content, accuracy and professional delivery. A prerequisite for student and postdoc teaching in the First Year Curriculum is completion of CGS 725 (Teaching Techniques, Dr. Ruth Patterson), or documented evidence of equivalent training or teaching experience.

WEBCT

WebCT is a server-based proprietary software package providing integrated e-learning systems for higher education. The package combines pedagogical tools with content management capabilities, options for personalization and customization of the learning experience, and seamless integration with an institution's existing campus infrastructure. Much of the First Year Curriculum lecture content, most of the PowerPoint presentations, and a wealth of curriculum administrative and scheduling information are accessible through WebCT. Students are automatically registered as WebCT users, and are given overviews of WebCT access and navigation procedures during orientation at the start of the fall semester.

APPENDIX I.

GRADING SCALE FOR CGS 701/702

Percent	GPA	Percent	GPA
>90	4.0	58	2.4
88	3.9	56	2.3
86	3.8	54	2.2
84	3.7	52	2.1
82	3.6	50	2.0
80	3.5	48	1.9
78	3.4	46	1.8
76	3.3	44	1.7
74	3.2	42	1.6
72	3.1	40	1.5
70	3.0	38	1.4
68	2.9	36	1.3
66	2.8	34	1.2
64	2.7	32	1.1
62	2.6	30	1.0
60	2.5	<30	0

APPENDIX II.

LABORATORY ROTATION GRADE REPORT

Rotation 1 2 3 4 (circle one)

Student _____

Mentor _____

Objectives of Rotation:

Evaluation of Student Performance

(1=Outstanding, 5=Poor)

Enthusiasm	1	2	3	4	5
Work ethic	1	2	3	4	5
Ability to work with others	1	2	3	4	5
Scientific curiosity	1	2	3	4	5
Ability to think independently	1	2	3	4	5
Laboratory skills	1	2	3	4	5
Communication skills	1	2	3	4	5
Journal discussion	1	2	3	4	5

Comment on the student's performance and progress.

Grade for Rotation: PASS NO PASS HONORS

Mentor Signature

Submit form to College of Graduate Studies (BSB 102) by 5:00 pm on last day of lab rotation

APPENDIX III.

PH.D. PROGRAM AND MENTOR SELECTION

Name of Student (print or type)

Signature of Student

Date

Name of Ph.D. Program (print or type)*

Signature of Director of Ph.D. Program*

Date

Name of Mentor (print or type)*

Campus Address and Lab Phone # of Mentor

Signature of Mentor*

Date

*If mentor or Ph.D. program has not been selected, leave blank

Submit form to College of Graduate Studies (BSB 102) by 5:00 pm on 14 May, 2010

This form is not the same as the Appointment of Major Advisor form.

APPENDIX IV.

CGS 701/702 WEBCT EVALUATION QUESTIONS

Unit Statements

1. The learning objectives of the Unit were adequately explained.
2. The Unit was well organized.
3. There was a sufficient depth and number of lectures.
4. There was adequate time for scientific discussion.
5. Assignments contributed meaningfully to Unit content.
6. Textbooks on reserve in the Library were useful.
7. I had the necessary knowledge and experience for this Unit.

Instructor Statements

Instructor (named):

1. was an effective teacher.
2. provided useful feedback on my assignments and/or presentations.
3. was well prepared for this class.
4. was available for student questions in and out of class.