Course Catalog

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Please note that Certificate students are NOT allowed to take any RowanSOM courses.

Please note that Quick Admit (non-matriculated) students are NOT allowed to take any RowanSOM courses or any Rutgers University courses.

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Rowan University may at any time eliminate, modify or change the location of any School, Institute, Center, Program, Department, course or academic activity."
Cell and Molecular Biology (CMB) Program: PhD; DO-PhD; MS (thesis only)

Course Descriptions

**CMB 00701**  
**GRADUATE BIOCHEMISTRY**  
**FALL**  
4 Credits  
CORE COURSE

**COURSE DIRECTORS:** DR. SERGEI BORUKHOV

**PREREQ:** NO. BIOMEDICAL SCIENCE STUDENTS BY PERMISSION ONLY

**T,TH** 2:30-4:30 PM  SC-145

**REQUIRED TEXT:** Lehninger Principles of Biochemistry, 6th Edition


D.L. Nelson and M.M. Cox


This is a problems-oriented biochemistry course that requires substantial student participation in class. The course covers the major areas of biochemistry including - DNA, RNA, protein, carbohydrate and lipid structure and biosynthesis; enzyme kinetics; carbohydrate, lipid and nucleotide metabolism; DNA replication, repair and recombination.

Class-time consists of an engaging dialog on learning objectives and problems in various aspects of biochemistry. Previous exposure to biochemistry is helpful but not required. Students are required to come to class prepared to address the learning objectives and discuss the problems relevant to each section of the course.

**CMB 00702**  
**MOLECULAR BIOLOGY OF THE CELL**  
**SPRING**  
4 Credits  
CORE COURSE

**COURSE DIRECTOR:** DR. MICHAEL HENRY

**PREREQ:** NO. BIOMEDICAL SCIENCE STUDENTS BY PERMISSION ONLY

**T,TH** 3:00-5:00 PM  SC-145

**REQUIRED TEXT:** Molecular Biology of the Cell, 6th Edition

ISBN: 9780815344322


Garland Publishing, 2014

This course is the cornerstone of the graduate curriculum and is taken in the Spring semester of the student’s first year of graduate study. There are four sections to this course: I. Introduction to the cell. This section includes evolutionary aspects of the cell, a study of small molecules, energy metabolism and biosynthesis, macromolecular structure and function. II. Molecular genetics, including protein function, genetic mechanisms, recombinant DNA technology, the cell nucleus, and the control of gene expression. III. Internal organization of the cell, including membrane structure, transport mechanisms, cell signaling, cell division and the mechanisms controlling the phases of the cell-cycle. IV. Cells in their social context, including cell junctions, cell adhesion, germ cells and fertilization, cellular mechanisms of development, differentiation and tissue formation, the immune system and cancer.

**CMB 00801**  
**BIOETHICS IN SCIENCE AND MEDICINE**  
**SPRING**  
2 Credits  
SKILL COURSE

**COURSE DIRECTOR:** DR. KATRINA COOPER

**F** 10:00 AM - 12:00 PM  SC-290

**REQUIRED TEXT:** Scientific Integrity – Text and Cases in Responsible Conduct of Research, 3rd Edition


F. L. Macrina


This course will explore the major ethical issues confronting the practices of medicine and biomedical science. Students are expected to gain an understanding of the bioethical issues that we are faced with today in both science and medicine. The course covers a diverse range of topics and is taught by many “outside” lecturers who are experts their respective fields. Issues to be addressed include, research on humans and animals, organ transplants, stem cell research and cloning, vaccination policies and research.
misconduct. Students will examine the controversies around these and other cutting edge bioethical issues by participating in open discussions during class and presenting oral and written graded assignments. The course is a requirement for all Ph.D. students and Master of Science students who are doing a research thesis. It is also open to a Masters student who is not doing a research thesis, if space is available. It is a letter-graded course.

CMB 00802  EXPERIMENTAL DESIGN  SPRING  2 Credits  SKILL COURSE
COURSE DIRECTOR: DR. ERIC MOSS
PREREQ: NO but THESIS STUDENTS ONLY
M  2:00-4:00 PM  SC-330
REQUIRED TEXT: Experimental Design for Biologists
David J. Glass
CSHL Press, 2007
ISBN: 978-087969735-8
This course covers generally how experiments are designed in biomedical sciences. The focus is on how research questions are posed, including the reasoning behind hypotheses, controls, repetition, and models. Discussions will revolve around simple thought-experiments and real-life biomedical research. The goal of the course is to help students to read biomedical research literature critically, participate constructively in peer review, and to better approach research problems. A small amount of elementary statistics will be discussed. The course will consist of short advance reading assignments followed by in-class discussion of each topic. Short presentations (“vignettes”) at the end of each class will illuminate particular relevant ideas. Doctoral and Thesis Masters students only.

CMB 00803  SCIENTIFIC WRITING  SPRING  2 Credits  SKILL COURSE
COURSE DIRECTORS: DRS. MULLER-WEEKS AND FISCHER
PREREQ: CELL AND MOLECULAR BIOLOGY PROGRAM STUDENTS ONLY
W  1:00-3:00 PM  SC-145
REQUIRED TEXT: How to Write and Publish a Scientific Paper, 7th Edition
Robert A. Day and Barbara Gastel
Greenwood Press, 2011
ISBN (hardcover): 978-0-313-39195-8
This course presents fundamentals of clear scientific writing in the context of a selected research theme (i.e., the immune system, cancer mechanisms, etc). Students will develop and apply writing skills and thought processes necessary for a successful career in biomedical sciences. Topics include components of a manuscript, hypothesis formulation, utilization of scientific databases and elements of a research proposal. Students will complete several short written assignments during the semester as well as a research proposal, oral presentation and proposal critique. Upon completion of this course students will have acquired practical experience in all forms of scientific communication.

CMB 00804  CRITICAL READINGS IN CELL & MOLECULAR BIOLOGY  FALL  2 Credits  SKILL COURSE
COURSE DIRECTOR: DR. DMITRY TEMIAKOV
PREREQ: CELL AND MOLECULAR BIOLOGY PROGRAM STUDENTS ONLY
M  2:00-4:00 PM  SC-145
The course is designed to enable students to read and interpret scientific literature concerning Molecular and Cell Biology. This includes understanding basic experimental approaches and techniques, an ability to comment on the experimental design and validity, and the interpretation of data and implications. Each class will focus upon a
different area of research depending on the professor who is teaching the class. Students must read the manuscript before the class and be able to explain and discuss it during the class.

CMB 00805  CELL CULTURE AND STEM CELLS  FALL  2 Credits  FOCUS COURSE
COURSE DIRECTORS: DRS. HRISTO HOUBAVIY AND DIMITRI PESTOV
PREREQ: NO. BIOMEDICAL SCIENCE STUDENTS BY PERMISSION ONLY
W 10:00 AM-12:00 PM  SC-145
RECOMMENDED TEXT: Essentials of Stem Cell Biology, 3rd Edition
Lanza, R. and Atala, A.
Academic Press, 2013
R. Ian Freshney
Wiley-Blackwell, 2010
This course focuses on both the fundamentals and practical aspects of mammalian cell culture and transgenic technologies. Particular emphasis is given to the biology of stem cells and their emerging therapeutic applications. The major goal of the course is to give the students a deep understanding of the principles of cell culture and help them to creatively approach complex problems at the forefront of the modern cell biological research.

CMB 00806  GRADUATE GENETICS  FALL  2 Credits  FOCUS COURSE
COURSE DIRECTOR: DR. RONALD ELLIS
PREREQ: NO. BIOMEDICAL SCIENCE STUDENTS BY PERMISSION ONLY
TH 9:30 AM-11:30 AM  SC-145
RECOMMENDED TEXT: Introduction to Genetic Analysis, 10th Edition or earlier
AJF Griffiths, SR Wessler, SB Carroll, and J Doebley
This course covers advanced topics in genetic analysis and genetic methods. Our focus will be on the techniques and logic common to all research subjects, from viruses to humans. Previous exposure to Genetics is helpful but not required. Students must attend lectures, read the textbook, solve problems and read papers before each class.

CMB 00807  PRACTICAL BIOINFORMATICS  SPRING  2 Credits  FOCUS COURSE
COURSE DIRECTOR: DR. ERIC MOSS
PREREQ-GRADUATE BIOCHEMISTRY OR GRADUATE GENETICS; MASTERS STUDENTS BY PERMISSION ONLY
F 2:00-4:00 PM  SC-145
REQUIRED TEXT: Bioinformatics for Dummies
J.-M. Claverie and C. Notredame
Wiley, New York, 2003
Students learn basic computer- and web-based molecular biology methods, including DNA sequence analysis, protein sequence analysis, BLAST searches, use of genome databases, protein structure viewing, and electronic literature searches.
The goal of this course is to provide a comprehensive molecular description of the causes of both cellular transformation and tumor progression. The course is divided into 3 sections. The first examines the role of cell cycle regulators (transcription factors, oncogenes, tumor suppressors) on tumor initiation. The second part investigates how signal transduction pathways, epigenetics, and genomic stability impact tumor development. The third aspect of the course describes host-tumor interactions including the immune system, angiogenesis, metastasis and cancer stem cells.

The course will introduce students to advanced technologies related to the study of molecular interactions in biological systems. Participants will learn basic principles of biomolecular recognition and interactions, and how these interactions can be studied in vitro and within the living cell. The course instructors are research scientists, who have hands-on knowledge and expertise in various methods and techniques to study biomolecular interactions. During the course, the students will be introduced to a wide range of experimental approaches, from traditional biochemical and immunological techniques, to cutting edge biophysical, imaging and high-throughput genetic methods that are currently used to detect, visualize and characterize protein-protein and protein-nucleic acid interactions in biomedical translational research and molecular diagnostics applications. This course is aimed to be highly interactive with a purpose of developing student's analytical skills.

Laboratory rotations are essential components of a student's education in the Cell and Molecular Biology program. These experiences introduce students to specific areas of cell and molecular biology, expose students to specialized techniques, and familiarize students with specific projects in the program in anticipation of choosing a research advisor. Students will be evaluated on their attendance, motivation and interest within the lab as well as their attendance and participation at lab meetings. Students are responsible for learning new techniques, asking questions and working semi-independently by the end of each lab rotation. Students are encouraged to select their laboratory rotations so as to acquire diverse research experiences. Three laboratory rotations must be completed in the Cell and Molecular Biology program prior to the selection of a thesis advisor. During the first two weeks of the fall semester, the student will provide the director with the names of two faculty members, who have agreed to sponsor the student for lab rotation in the fall semester. Each lab rotation will consist of 7 weeks with two in the fall and one in the spring semester; if a fourth is necessary, it can be completed within the spring semester. Hence, by the middle or end of the spring semester, the student will know which lab they will do their research in for their thesis.
CMB 00920  RESEARCH IN CELL AND MOLECULAR BIOLOGY  FALL/SPRING  5 Credits  REQUIRED COURSE

COURSE DIRECTOR:  DOCTORAL STUDENT'S MENTOR

Each course will be directed by a doctoral student’s Mentor who is a member of the Cell or Molecular Biology Department and its content will reflect his/her research interests. The goal is to have the student gain experience in a research laboratory and gain insight into the creative research process. Satisfactory/Unsatisfactory graded course.

CMB 00690  THESIS RESEARCH - MSCMB  FALL/SPRING/SUMMER  5 Credits  REQUIRED COURSE

The Mentor or Mentor-of-Record is responsible for grading this Satisfactory/Unsatisfactory graded course. The student must publically defend his/her thesis. A student can enroll in this course only once.

CMB 00699  MS THESIS CONTINUATION  FALL/SPRING  1-9 Credits

After completing the number of thesis credits as defined by the MS program requirements and completing required coursework, students may register for Master of Science Thesis Continuation during each subsequent semester of thesis phase. Master of Science Thesis Continuation will carry a variable credit weight of 1-9 credits (5 credits are part-time status; 9 credits are full-time status). The student's mentor will be responsible for certifying that a student is working on his/her thesis on a part-time or full-time basis commensurate with the number of credits they are registered for in a semester. Students will be charged the Master of Science Thesis Continuation fee of $200 per semester for thesis continuation regardless of the number of thesis credits for which they are registered. The maximum number of semesters that a student can register for thesis research and thesis continuation is four (2 years). The grading for this course is Satisfactory/Unsatisfactory, which does not affect the grade point average.

CMB 00980  THESIS RESEARCH/DO-PhD  FALL/SPRING  5 Credits  REQUIRED COURSE

COURSE DIRECTOR:  DR. SALVATORE CARADONNA

This course is based on the laboratory research that each doctoral student performs as they work toward their thesis defense. The chair of each student's thesis research committee has the responsibility of ensuring that the course goals are met for that student. The course requires that the student formally present their research progress and plan for future work and receive critical feedback from committee members. The presentation will be either a written report or an oral presentation, alternating these formats each semester. The students will receive detailed feedback in the form of a written review and discussion with committee members. The student is expected to take advantage of the feedback and present again the next semester what steps were taken in response. As this course recurs every semester for qualified doctoral candidates, the course is considered completed when the student successfully defends her/his thesis. It is a Satisfactory/Unsatisfactory graded course.
Biomedical Sciences Program: MS (thesis); MBS (non-thesis); DO/MS (thesis); Certificate
Course Descriptions

MBS 00501  FUNDAMENTALS OF BIOCHEMISTRY AND MOLECULAR BIOLOGY (I)  FALL  3 Credits  CORE COURSE
COURSE DIRECTOR: DR. SUBHASIS BISWAS
TH 5:00-8:00 PM  AC-279
REQUIRED TEXT: Biochemistry, 6th OR 7th Edition
ISBN-10: 0716787245
W.H. Freeman and Company Publishing
REQUIRED TEXT: Genes by B. Lewin
ISBN-10: 0763766321
B. Lewin Genes X or Essential genes
Jones & Bartlett Publisher
This course will focus on basic and advanced topics in Biochemistry and Molecular Biology. The course is designed to give the students a solid foundation in these subject areas. It is a course for both the basic scientist who seeks general principles about cellular function, and students preparing for health-related careers who wish to apply knowledge of the mechanisms of normal cellular function to the understanding of molecular dysfunction in human diseases.

MBS 00502  FUNDAMENTALS OF CELL BIOLOGY (II)  FALL  3 Credits  CORE COURSE
COURSE DIRECTOR: DR. DMITRIY MARKOV
W 5:00-8:00 PM  AC-279
RECOMMENDED TEXTS:
1) Essential Cell Biology, 4th Edition
ISBN: 978-0-8153-4455-1 (paperback)
2) Molecular Biology of the Cell, 6th Edition
ISBN: 978-0-8153-4464-3 (paperback)
This course will focus on the biology and physiology of the cell and is organized around the central theme of homeostasis – how the cell meets changing demands while maintaining the internal constancy necessary for all cells and organs to function. It is a course for both the basic scientist who seeks general principles about cellular function, and students preparing for health-related careers who wish to apply knowledge of the mechanisms of normal cellular function to the understanding of cellular dysfunction in human disease.
MBS 00503 FUNDAMENTALS OF SYSTEMS BIOLOGY (III)* SPRING 3 Credits CORE COURSE
COURSE DIRECTOR: DR. KINGSLEY YIN
T 5:00-8:00 PM AC-279
PREREQ- FUNDAMENTALS I AND FUNDAMENTALS II
RECOMMENDED TEXT: Berne & Levy Physiology, 6th Edition
ISBN: 0-323-04582-0
B.M. Koeppen, and B.A. Stanton
This course will focus on physiological systems of the human body, namely, the cardio-renal system and endocrinology. The course will be in the form of didactic lectures. Students will be evaluated on their performance on three examinations. At first the student will be introduced to basic physiological aspects of the cardiovascular system and how it interacts with the kidney. Integrated within the lectures, there will be discussion on diseases that may affect the heart and kidneys and pharmacological treatments for these disorders. In the endocrinology section, the student will be introduced to the actions of various hormones, which affect macro- and micronutrient metabolism. These series of lectures will provide the student with a clear understanding of three complex physiological systems. In order to consolidate understanding of these systems, lectures will be supplemented with appropriate literature outside of texts.
* MEDICAL PHYSIOLOGY CAN SUBSTITUTE FOR FUNDAMENTALS III.

MBS 00602 ANTIMICROBIAL DRUGS: MECHANISMS OF ACTION & RESISTANCE SPRING 2 Credits
COURSE DIRECTOR: DR. SERGEI BORUKHOV
M 5:00-7:00 PM AC-279
PREREQ: MICROBIOLOGY RECOMMENDED; COMPLEMENTS PRINCIPLES OF PHARMACOLOGY
Lippincott, Williams and Wilkins, 2011
ISBN/ISSN: 9781608312702
SUPPLEMENTAL TEXT: Microbiology (an Introduction), 10th Edition
G. Tortora, B. Funke, C. Case
Pearson Benjamin Cummings, 2010.
This course covers the mechanisms of action, selectivity, and resistance to agents that are used to treat microbial infections, including: bacterial, fungal, protozoal, helminthic, and viral infections.

MBS 00603 BASIC IMMUNOLOGY FALL 2 Credits
COURSE DIRECTORS: DRS. GRANT Gallagher
TH 1:00-3:00 PM MDL/HUMIDGEN FACILITY: Galaxy Building, North One Conference Room
This course provides students with a grounding in the cells, mechanisms and genetics of the adaptive immune system, principally the human immune system. In addition, elements and problems that promote immunologic diseases, or define the role of the immune system in malignant disease will be introduced. Immunology-themed journal clubs, laboratory research elements and private mentor-guided study are available to supplement the class-work, but do not contribute directly to the grade for this class.

MBS 00604 CANCER CHEMOTHERAPY SPRING 2 Credits
COURSE DIRECTOR: DR. GARY GOLDBERG
Th 5:00-7:00 PM UDP-3000
PREREQ: FUNDAMENTALS I AND II OR PERMISSION OF COURSE DIRECTOR
REQUIRED TEXT: Cancer Chemotherapy: Basic Science to the Clinic
Rachel Airley
Wiley, 2009

REQUIRED TEXT: Molecular Biology of Cancer, 3rd Edition
Lauren Pecorino
Oxford University Press, 2012

ADDITIONAL TEXT: Cell Biology
Thomas D. Pollard
William C. Earnshaw
Saunders, 2008

Over 30% of people in the USA are diagnosed with cancer in their lifetimes. A recent (December 2014) PubMed search for “cancer” finds over 3 million publications. This represents several times more papers on cancer than other widespread ailments including “diabetes” or “arthritis”. This sheer volume of cancer information attests to the complexities of cancer. This course is designed clarify chemotherapeutic approaches, their underlying mechanisms, and how research can lead to new and effective cancer treatments.
Developmental Biology has been an integral part of the Biological and Medical Sciences since their inception. Developmental Biology addresses many important concepts including differentiation, morphogenesis, growth, reproduction, regeneration, evolution, and environmental interactions. This course will introduce fundamental concepts in Developmental Biology and mechanisms that control these events.

**MBS 00606 ESSENTIAL NEUROSCIENCE**

**SPRING**

3 Credits

**COURSE DIRECTOR:** DR. PAOLA LEONE (even years) or DR. DMITRIY MARKOV (odd years)

**F 5:00-8:00 PM AC-279**

**PREREQ:** FUNDAMENTALS I AND II OR PERMISSION OF COURSE DIRECTOR

**RECOMMENDED TEXT:** Essential Neuroscience, 3rd Edition

Allan Siegel and Hreday N. Sapru

ISBN-10: 1451189680


Lippincott Williams & Wilkins, 2014

This course focuses on the basic molecular and biochemical aspects of neuronal physiology, emphasizing mechanisms that underlie the major classes of neurological disorders. Students will be provided with a fundamental understanding of the gross anatomy and general functions of the central nervous system at the cellular and molecular levels. The course will introduce essential concepts and facts on how neuronal cells communicate with each other, with examples of how neurotransmitter dysregulation and metabolic malfunction lead to the development of mental disorders. The course instructors are research scientists who have expertise in clinical neuroscience and translational research. There will be invited speakers who specialize in various neurological and psychiatric diseases with complex or heterogeneous etiology, including Alzheimer's disease, Parkinson's disease, autism, and Canavan disease. The major goals of the course will be to introduce Master and Ph.D. students to translational neuroscience and to the pivotal role that neuroscience plays in understanding and treatment of human brain diseases. Lectures will be supplemented with handouts, references and PowerPoint presentations.

**MBS 00607 EXERCISE PHYSIOLOGY**

**SPRING**

3 Credits

**COURSE DIRECTOR:** DR. RENEE DEMAREST

**TH 5:00-8:00 PM AC-279**

**CO-REQUISITE:** FUNDAMENTALS III OR MEDICAL PHYSIOLOGY

**HIGHLY SUGGESTED TEXT:** Exercise Physiology, 6th Edition

William McArdle, Frank Katch, Victor Katch

Lippincott, Williams & Wilkins, 2007

A major emphasis will be placed on examining the mechanisms underlying the body's response to acute and chronic exercise stress. The first portion of the course will include the fundamentals of bioenergetics and metabolism, measurement of work, power and energy expenditure, respiratory system, cardiovascular system, endocrine system, neuromuscular system, and the physiological adaptations of training. The latter part of the course will delve into selected topics in the field of exercise physiology such as obesity and weight loss, slowing age-related changes with exercise, ergogenic aids, overtraining and fatigue and gender differences in physiology and performance.

**MBS 00608 LABORATORY ANIMAL SCIENCE**

**FALL**

2 Credits

**COURSE DIRECTOR:**

**M 2:00-4:00 PM SC-145**

**REQUIRED TEXT:** Laboratory Animal Medicine: Principles and Procedures

ISBN: 0-323-01944-7
This course will fulfill the training requirements as defined by the Animal Welfare Act. The first five weeks will cover topics such as laws and regulations, the ethics of animal research, basic husbandry and animal welfare, occupational health and safety, and animal diseases with an emphasis on how they affect research. The course will also include discussions of animal model selection, including the use of transgenic and immunocompromised animals and a review of standard animal related techniques used in research such as aseptic surgery, injections, blood collection, antibody production, euthanasia and tissue harvesting. Other topics will include studying techniques for handling, anesthesia, injection sites, and blood, urine and tissues harvesting from a variety of species.

MBS 00609  MECHANISMS OF DISEASE  FALL  2 Credits
COURSE DIRECTOR: DR. CATHERINE NEARY & JOHN PASTORINO
TH  5:00-7:00 PM  UDP-3000
PREREQ: FUNDAMENTALS I AND II OR BY PERMISSION OF INSTRUCTOR
RECOMMENDED TEXT: Pathophysiology of Disease: An Introduction to Clinical Medicine, 7th Edition
Hammer, Gary F.; McPhee, Stephen J.
McGraw-Hill Medical, 2014
This course is an introduction to the mechanisms by which disease processes develop on a cellular, tissue and organ level, focusing on their impact on physiological functions and subsequent clinical manifestations. Advances in biochemical and genetic techniques have produced substantial information about altered cellular function in pathological conditions. Each week, pathological conditions will be discussed in the context of the normal histophysiology of the relevant organ system as well as known cellular signaling pathways involved in the disease process. Topics include cytology, genetic, and infectious diseases.

MBS 00610  MICROBIOLOGY  FALL  3 Credits
COURSE DIRECTOR: DR. MICHAEL HENRY
M  5:00-8:00 PM  AC-279
PREREQ: NO
REQUIRED TEXT: Microbiology (an Introduction), 11th Edition
G. Tortora, B. Funke, C. Case
Pearson Benjamin Cummings, 2013.
This is an introductory Microbiology course taken in the Fall Semester of the student’s first or second year of graduate study. It strikes an appropriate balance between microbiological fundamentals and medical/research applications. It also provides a foundation in microbiology for those students planning to pursue advanced degrees. There are three sections to this course: I. Fundamentals of Microbiology. This section includes a brief history, methods used to observe microorganisms, and a study of microbial cell anatomy, metabolism, growth and genetics. II. A survey of the Microbial World, including classifications of Eukaryotes, Prokaryotes, Viruses, Virioids, and Prions. III. Interaction between the Microbe and host, including principle of disease and epidemiology, mechanisms of pathogenicity, innate and adaptive immunity, immunology and antimicrobial drugs. Although this course assumes no previous study of biology chemistry, a basic understanding of DNA, RNA, and proteins is recommended.

MBS 00611  PATHOPHYSIOLOGY OF THE CARDIOVASCULAR SYSTEM  FALL  3 Credits
COURSE DIRECTOR: DR. CARL HOCK
T  6:00-9:00 PM  UDP-3000
PREREQ: MUST PASS FUNDAMENTALS III (“C” grade or higher); CANNOT ENROLL IF registered in or completed MEDICAL PHYSIOLOGY
REQUIRED TEXT: Pathophysiology of Heart Disease, 5th Edition
ISBN 978-1-60547-723-7
L.S. Lilly
Cardiovascular disease remains the number one killer in the United States. Despite the current successes in the treatment of acute myocardial infarction, the incidence of heart failure continues to increase as the population ages. This course will explore the underlying causes of heart disease and other cardiovascular diseases with an emphasis on normal physiology, pathophysiologic changes and current controversies. The course will cover selected topics of cardiovascular disease including: common cardiac arrhythmias, ischemic heart disease, acute coronary syndromes, atherosclerosis, hypertension, diseases of the peripheral vasculature and heart failure. The purpose of this course is to examine the underlying causes and the most current thinking as it relates to cardiovascular disease. The course will involve both lecture presentation and discussion of current literature.

**MBS 00612 PRINCIPLES OF PHARMACOLOGY**

**COURSE DIRECTOR: DR. BERND SPUR**

**W 5:30-8:30 PM AC-AUDITORIUM**

**REQUIRED TEXT: Basic and Clinical Pharmacology, 9th Edition**
B.G. Katsung

The modern discipline of pharmacology involves understanding how medications are used in the prevention, diagnosis and treatment of human diseases. The emphasis of this course is on mechanisms of drug action, therapeutic applications, adverse effects, contraindications and drug interactions. The overall mission of the course will be to introduce students to the basic principles of pharmacology and to familiarize them with classes of drugs and examples of specific drugs used frequently in the clinical setting.

**MBS 00613 INDEPENDENT STUDY**

**COURSE DIRECTORS: GSBS FACULTY**

**PREREQ: PERMISSION BY FACULTY/INVESTIGATOR**

The student and faculty member will select a topic to study. The faculty member will present the student with a selected set of papers. The student and faculty member will meet weekly to discuss the papers and monitor the progress of writing the required 20 page paper. The student will also be responsible for presenting the findings in an oral seminar. The “Letter of Agreement” and an “Add” form must be filled out by the student and the mentor prior to starting in the course. The 20 page paper must be turned in to the GSBS office in order for the student to receive their grade for the semester. A student may only take this course once within the MBS or CBS program. It is a NORMAL, LETTER GRADED COURSE.

**MBS 00660 BIOETHICS IN SCIENCE AND MEDICINE**

**COURSE DIRECTOR: DR. KATRINA COOPER**

**F 10:00 AM - 12:00 PM SC-290**

**REQUIRED TEXT: Scientific Integrity – Text and Cases in Responsible Conduct of Research, 3rd Edition**
F. L. Macrina

This course will explore the major ethical issues confronting the practices of medicine and biomedical science. Students are expected to gain an understanding of the bioethical issues that we are faced with today in both science and medicine. The course covers a diverse range of topics and is taught by many “outside” lecturers who are experts in their respective fields. Issues to be addressed include, research on humans and animals, organ transplants, stem cell research and cloning, vaccination policies and research misconduct. Students will examine the controversies around these and other cutting edge bioethical issues by participating in open discussions during class and presenting oral and written graded assignments. The course is a requirement for all Ph.D. students and master’s students who are research track and is also open to all non-research track masters students. It is a letter-graded course.
Cross-listed in the CMB PhD program as CMB 00801 and in the MPI program as MPI 00660 for masters research thesis students. Non-thesis masters students may be enrolled if the course limit has not been met.

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<th>Course Title</th>
<th>Semester</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>MBS 00680</td>
<td>LABORATORY ROTATION (A) – MBS (15 WEEKS)</td>
<td>FALL/SPRING/SUMMER</td>
<td>2 Cr</td>
<td>Required For Thesis Students</td>
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<td>MBS 00681</td>
<td>LABORATORY ROTATION (B) – MBS (15 WEEKS)</td>
<td>FALL/SPRING/SUMMER</td>
<td>2 Cr</td>
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**COURSE DIRECTORS: GSBS FACULTY**  
**PREREQ: PERMISSION BY FACULTY/INVESTIGATOR**

Laboratory rotation experience introduces students to specific areas of cell and molecular biology, exposes students to specialized techniques, and familiarizes students with specific projects in the program in anticipation of choosing a research advisor. A Masters of Biomedical Sciences Program student needs only to complete one laboratory rotation prior to the selection of a thesis advisor. The length of the one laboratory rotation is an entire semester (15 weeks) either in the fall, spring or summer. A “Letter of Agreement” must be filled out by the student and the mentor prior to starting in the laboratory. This Letter of Agreement form can be found on the “current students” tab of the RowanGSBS website. Masters of Biomedical Sciences Program students are required to submit a 2-5 page report on their experiences within the lab and are limited to 2 lab rotations. MBS students are expected to spend at least 10-15 hours per week in the laboratory for these 2 credits courses.

LABORATORY ROTATION (A) – MBS: Normal, Letter Graded Course.  
LABORATORY ROTATION (B) – MBS: Satisfactory or Unsatisfactory Graded Course.

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>MBS 00690</td>
<td>THESIS RESEARCH - MSBS</td>
<td>FALL/SPRING</td>
<td>5 Cr</td>
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</table>

The Mentor or Mentor-of-Record is responsible for grading this Satisfactory/Unsatisfactory graded course, which must be laboratory (not library) based and must be hypothesis driven. A student can enroll in this course just once. However, please note that the research thesis is done over two or more semesters, which is the equivalent of at least 1 year. The conclusion of the research is based on testing the hypothesis but not necessarily on proving the hypothesis (unlike a doctoral or masters thesis in the Cell and Molecular Biology program). The student must publically defend his/her thesis. The grading for this course is Satisfactory/Unsatisfactory, which does not affect the grade point average.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>MBS 00699</td>
<td>MS THESIS CONTINUATION</td>
<td>FALL/SPRING</td>
<td>1-9 Cr</td>
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</tr>
</tbody>
</table>

After completing the number of thesis credits as defined by the MS program requirements and completing required coursework, students may register for Master of Science Thesis Continuation during each subsequent semester of thesis phase. Master of Science Thesis Continuation will carry a variable credit weight of 1-9 credits (5 credits are part-time status; 9 credits are full-time status). The student’s mentor will be responsible for certifying that a student is working on his/her thesis on a part-time or full-time basis commensurate with the number of credits they are registered for in a semester. Students will be charged the Master of Science Thesis Continuation fee of $200 per semester for thesis continuation regardless of the number of thesis credits for which they are registered. The maximum number of semesters that a student can register for thesis continuation is four (2 years). The grading for this course is Satisfactory/Unsatisfactory, which does not affect the grade point average.

<table>
<thead>
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<tr>
<td>MBS 00659</td>
<td>GSBS MAINTAINING MATRICULATION</td>
<td>FALL/SPRING</td>
<td>0-9 Cr</td>
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</tr>
</tbody>
</table>

**COURSE DIRECTOR: DR. DIANE WORRAD**

A Master of Biomedical Science program student who requires an additional semester to complete a course, especially a RowanSOM course that begins in the fall and ends in the spring, may register for GSBS Maintaining Matriculation during the subsequent semester. This course will carry a variable credit weight of 0-9 credits (5 credits are part-time status; 9 credits is full-time status). The GSBS office will be responsible for certifying that a student is completing a course in progress on a part-time or full-time basis commensurate with the number of credits they are registered for in the previous semester. The student will not be charged tuition or a fee for continuation regardless of the number of credits for which they are registered. A student can only register for GSBS Maintaining Matriculation for one (1) semester. This course is not graded.
Histopathology Program: MS (non-thesis)
Course Descriptions

MBS 00501  FUNDAMENTALS OF BIOCHEMISTRY AND MOLECULAR BIOLOGY (I)
FALL  3 Credits  CORE COURSE
COURSE DIRECTOR: DR. SUBHASIS BISWAS
TH  5:00-8:00 PM  AC-279
REQUIRED TEXT: Biochemistry, 5th Edition
ISBN-10: 0716746840
REQUIRED TEXT: Genes IX
ISBN: 9780763740634
B. Lewin
This course will focus on basic and advanced topics in Biochemistry and Molecular Biology. The course is designed to give the students a solid foundation in these subject areas. It is a course for both the basic scientist who seeks general principles about cellular function, and students preparing for health-related careers who wish to apply knowledge of the mechanisms of normal cellular function to the understanding of molecular dysfunction in human disease.

MBS 00502  FUNDAMENTALS OF CELL BIOLOGY (II)
FALL  3 Credits  CORE COURSE
COURSE DIRECTOR: DR. DMITRIY MARKOV
W  5:00-8:00 PM  AC-279
RECOMMENDED TEXTS:
1) Essential Cell Biology, 4th Edition
ISBN: 978-0-8153-4455-1 (paperback)
2) Molecular Biology of the Cell, 6th Edition
ISBN: 978-0-8153-4464-3 (paperback)
This course will focus on the biology and physiology of the cell and is organized around the central theme of homeostasis – how the cell meets changing demands while maintaining the internal constancy necessary for all cells and organs to function. It is a course for both the basic scientist who seeks general principles about cellular function, and students preparing for health-related careers who wish to apply knowledge of the mechanisms of normal cellular function to the understanding of cellular dysfunction in human disease.

MBS 00503  FUNDAMENTALS OF SYSTEMS BIOLOGY (III)
SPRING  3 Credits  CORE COURSE
COURSE DIRECTOR: DR. KINGSLEY YIN
This course will focus on physiological systems of the human body, namely, the cardio-renal system and endocrinology. The course will be in the form of didactic lectures. Students will be evaluated on their performance on three examinations. At first, the student will be introduced to basic physiological aspects of the cardiovascular system and how it interacts with the kidney. Integrated within the lectures, there will be discussion on diseases that may affect the heart and kidneys and pharmacological treatments for these disorders. In the endocrinology section, the student will be introduced to the actions of various hormones, which affect macro- and micronutrient metabolism. These series of lectures will provide the student with a clear understanding of three complex physiological systems. In order to consolidate understanding of these systems, lectures will be supplemented with appropriate literature outside of texts.

MHP 00504 BASIC LABORATORY TECHNIQUES – BIOLOGY SPRING 3 Credits CORE COURSE
COURSE DIRECTORS: DR. RENEE M. DEMAREST & DR. CATHERINE L. NEARY
PREREQ: Fundamentals of Biochemistry and Molecular Biology I (MBS 00501) and Fundamentals of Cell Biology II (MBS 00502); or equivalent, with course director's permission
M 2:00-5:00 PM SC-124 (check course website for updates)
This course will teach students the most basic techniques used in a modern biomedical laboratory, to prepare them to integrate these techniques into more advanced processes they will use later. *This course is only open to students in the Masters in Histopathology program.*

MBS 00613 INDEPENDENT STUDY FALL 3 Credits
COURSE DIRECTORS: DR. RENEE M. DEMAREST or DR. CATHERINE L. NEARY
The student and faculty member will select a topic to study. The faculty member will present the student with a selected set of papers. The student and faculty member will meet weekly to discuss the papers and monitor the progress of writing the required 20 page paper. The student will also be responsible for presenting the findings in an oral seminar. The “Letter of Agreement” and an “Add” form must be filled out by the student and the mentor prior to starting in the course. The 20 page paper must be turned in to the GSBS office in order for the student to receive their grade for the semester. Transfer students may be exempt from this requirement. It is a NORMAL, LETTER GRADED COURSE.

MHP 00611 HISTOLOGY I: BASIC TISSUE TYPES SPRING 3 Credits
COURSE DIRECTOR: DR. CATHERINE L. NEARY
PREREQ: Fundamentals of Biochemistry and Molecular Biology I (MBS 00501) and Fundamentals of Cell Biology II (MBS 00502); or equivalent, with course director's permission
T/Th 2:00-4:00 PM SC-124
This course introduces students to the basic tissue types, as well as some of the common stains used to differentiate elements of tissue. In addition, students will learn to use a microscope and analyze photomicrographs critically. *This course is only open to students in the Masters in Histopathology program.*
MHP 00612 HISTOLOGY II: TECHNIQUES SUMMER (8 week course) 4 Credits
COURSE DIRECTOR: DR. RENEE M. DEMAREST PREREQ: Histology I: Basic Tissue Types (MHP 00511) and Basic Laboratory Techniques – Biology (MHP 00514) T/W 10:00 AM-4:00 PM SC-124
This lab-intensive course builds upon the theory learned in Histology I: Basic Tissue Types. Students will be trained in histological techniques in a hands-on setting, in order to develop the critical skills required to become a histotechnologist. *This course is only open to students in the Masters in Histopathology program.*

MHP 00613 HISTOLOGY III: ORGAN SYSTEMS SPRING 3 Credits
COURSE DIRECTOR: DR. CATHERINE L. NEARY PREREQ: Histology I: Basic Tissue Types (HSPO00511) and Fundamentals of Systems Biology III (HSPO00503; or equivalent, with course director’s permission) W 2:00-5:00 PM SC-145
In this course, students will apply their knowledge of tissue types to develop an understanding of organ structure and function. This will include information specific to commonly used animal models (e.g. rats, mice, rabbits). *This course is only open to students in the Masters in Histopathology program.*

MHP 00614 BASIC LABORATORY ANIMAL TECHNIQUES FALL 4 Credits
COURSE DIRECTOR: DR. RENEE M. DEMAREST PREREQ: Basic Laboratory Techniques – Biology (MHP 00514), Histology I: Basic Tissue Types (MHP 00511), and Histology II: Histotechniques (MHP 00512) M, T, & Th 2:00-4:00 PM SC-124
This basic animal techniques course will teach students basic mouse colony management and preclinical research techniques. This course is lab intensive. Students will receive one-on-one instruction for each of the indicated skills listed in the syllabus. This format will allow students to develop basic skills in managing a mouse colony and processing of tissues, which is valuable for job placement upon graduation. *This course is only open to students in the Masters in Histopathology program.*

MHP 00615 ADVANCED LABORATORY ANIMAL TECHNIQUES SPRING 4 Credits
COURSE DIRECTOR: DR. RENEE M. DEMAREST PREREQ: Basic Laboratory Techniques – Biology (MHP 00514), Histology I: Basic Tissue Types (MHP 00511), Histology II: Histotechniques (MHP 00512), and Basic Animal Laboratory Techniques (MHP 00611) M/T/Th 2:00-5:00 PM SC-124
This advanced animal techniques course will reinforce what students learned about basic mouse colony management and teach students advanced preclinical research techniques. This course is lab intensive. Students will receive one-on-one instruction for each of the indicated skills listed in the syllabus. This format will allow students to develop advanced animal research skills, which is valuable for job placement upon graduation. *This course is only open to students in the Masters in Histopathology program.*
MHP 00616 TOPICS IN PATHOLOGY SPRING 2 Credits
COURSE DIRECTOR: DR. RENEE M. DEMAREST
PREREQ: Mechanisms of Disease (MBS00609)
CO-REQUISITE: Histology III (MHP 00513)
F 2:00-4:00 PM SC-145
REQUIRED/RECOMMENDED TEXT: NONE
This course will provide students in the Masters in Histopathology program exposure to the pathology of major organ systems. *This course is only open to students in the Masters in Histopathology program.*
# Molecular Pathology and Immunology Program: MS (thesis)

## Course Descriptions

### MBS 00501  
**FUNDAMENTALS OF BIOCHEMISTRY AND MOLECULAR BIOLOGY (I)**

**COURSE DIRECTOR:** DR. SUBHASIS BISWAS  
**TH:** 5:00-8:00 PM  AC-279  
**REQUIRED TEXT:** Biochemistry, 5th Edition  
**ISBN-10:** 0716746840  
**REQUIRED TEXT:** Genes IX  
**ISBN:** 9780763740634  
B. Lewin  

This course will focus on basic and advanced topics in Biochemistry and Molecular Biology. The course is designed to give the students a solid foundation in these subject areas. It is a course for both the basic scientist who seeks general principles about cellular function, and students preparing for health-related careers who wish to apply knowledge of the mechanisms of normal cellular function to the understanding of molecular dysfunction in human disease.

### MBS 00502  
**FUNDAMENTALS OF CELL BIOLOGY (II)**

**COURSE DIRECTOR:** DR. DMITRIY MARKOV  
**W:** 5:00-8:00 PM  AC-279  
**RECOMMENDED TEXTS:**  
1) Essential Cell Biology, 4th Edition  
**ISBN:** 978-0-8153-4454-4 (hardcover)  
ISBN: 978-0-8153-4455-1 (paperback)  
2) Molecular Biology of the Cell, 6th Edition  
**ISBN:** 978-0-8153-4432-2 (hardcover)  
ISBN: 978-0-8153-4464-3 (paperback)  

This course will focus on the biology and physiology of the cell and is organized around the central theme of homeostasis – how the cell meets changing demands while maintaining the internal constancy necessary for all cells and organs to function. It is a course for both the basic scientist who seeks general principles about cellular function, and students preparing for health-related careers who wish to apply knowledge of the mechanisms of normal cellular function to the understanding of cellular dysfunction in human disease.

### MPI 00503  
**MOL PATH & IMMUNO SEMINAR**

**COURSE DIRECTORS:** DR. GRANT GALLAGHER
All students are required to attend the Medical Diagnostic Laboratories (MDL) and HUMIGEN Basic Research Seminar and Distinguished Lecturer Seminar Series during their first semester. The Basic Research Seminar series is a weekly meeting that includes the presentation and discussion of scientific data from individual members of MDL’s basic research groups. These seminars will serve two functions: the critical analysis and proper planning of experiments and the opportunity to become familiarized with the various research projects and multiple scientific disciplines offered within MDL. This exposure will aid the students in their selection of laboratory rotations during the current semester. Held on a monthly basis, the Distinguished Seminar Series provides students the unique opportunity to learn about various scientific disciplines from invited speakers who are experts in their fields. Both seminar series are held on MDL’s campus. Within this course students are expected to participate in the scientific discussion and are invited to ask questions of the presenters and are required to submit written summaries, supplemented with information and references from relevant published articles, of each presentation.

**MPI 00504**

**TOPICS IN MOL PATH AND IMMUNO**  
**SPRING**  
**4 Credits**  
**CORE COURSE**

**COURSE DIRECTORS: DR. JASON TRAMA & GRANT GALLAGHER**

**T & TH 10:00 AM-12:00 PM**  
**MDL/HUMIGEN FACILITY: Galaxy Building, North One Conference Room**

**REQUIRED TEXT:** None. Will be taught from current literature

This course provides the student with a factual understanding of key host/pathogen elements related to the development of human disease, in an introductory manner. The course will cover major human bacterial, viral and fungal pathogens and their disease-causing mechanisms. In addition, the human immune system is presented in the context of host-defense against infectious and malignant disease. Mechanisms of tumorogenesis and metastasis are explored, as are the strategies and approaches used to develop new therapeutic compounds. Finally, two shorter elements describe the creation, validation and standardization of new molecular diagnostic tools, and the critical evaluation of experimental data. Upon completion of the course, students will have gained a broad overview of the theoretic and practical aspects of the subjects that underlie the laboratory courses they will take in the future.

**MPI 00660**

**BIOETHICS IN SCIENCE AND MEDICINE**  
**SPRING**  
**2 Credits**  
**REQUIRED COURSE**

**COURSE DIRECTOR: DR. KATRINA COOPER**

**F 10:00 AM - 12:00 PM SC-290**

**REQUIRED TEXT:** Scientific Integrity – Text and Cases in Responsible Conduct of Research, 3rd Edition  
F. L. Macrina  

This course will explore the major ethical issues confronting the practices of medicine and biomedical science. Students are expected to gain an understanding of the bioethical issues that we are faced with today in both science and medicine. The course covers a diverse range of topics and is taught by many “outside” lecturers who are experts in their respective fields. Issues to be addressed include, research on humans and animals, organ transplants, stem cell research and cloning, vaccination policies and research misconduct. Students will examine the controversies around these and other cutting edge bioethical issues by participating in open discussions during class and presenting oral and written graded assignments. The course is a requirement for all Ph.D. students and master’s students who are research track and is also open to all non-research track masters students. It is a letter-graded course.

**Cross-listed in the CMB PhD program as CMB 00801 and in the MBS program as MBS 00660 for masters research thesis students. Non-thesis masters students may be enrolled if the course limit has not been met.**

**MPI 00601**

**TECHNIQUES IN MOLECULAR DIAGNOSTICS**  
**SPRING**  
**2 Credits**  
**REQUIRED COURSE**

**COURSE DIRECTOR: DR. JOSEPH NICKELS**

**M – F, as required**  
**MDL/HUMIGEN FACILITY: Galaxy Building, North One Laboratory**

**REQUIRED TEXT:** None.
This course is designed to allow students to master techniques routinely used in molecular diagnostics. Students will develop and apply these techniques in a laboratory-based setting. Methods include DNA and RNA isolation and quantification, protein expression, purification, and analysis, molecular cloning methods, diagnostic methods used for genetic testing, culture methods for growth of bacteria, yeast, and viruses, microscopic methods for diagnostic testing, etc. Students will select two techniques during the course to perform and master. The student will be required to write a short 4-5 page NIH type introduction on each method. In addition, the student will give an oral presentation on one of the techniques mastered. Upon completion of this course students will have acquired a basic mastery of a subset of methods routinely used in the molecular diagnoses of disease.

**MPI 00602**  MOL PATH & IMMUNO READINGS I  SUMMER  2 Credits  REQUIRED COURSE

**MPI 00603**  MOL PATH & IMMUNO READINGS II  FALL  2 Credits  REQUIRED COURSE

**COURSE DIRECTORS: DR. GRANT GALLAGHER**

**W 3:00-5:00 PM**  MDL/HUMIGEN FACILITY: Galaxy Building, North One Conference Room

This course prepares the student for reading, analyzing, criticizing and summarizing the scientific literature, and prepares them to write their own. Students will participate in group discussion reviews of scientific publications, and prepare a written critique of three advanced research papers. Students will prepare and present one additional paper for group discussion. Students will review carefully the scientific literature on a topic of their choosing related to one of their laboratory rotations and prepare a small series of relevant research questions, describe their biomedical significance and provide an appropriate description of the background to these research questions. Upon completion of the course, students will have gained experience in reviewing the scientific literature, analyzing research communications, to formulate hypotheses and justify research questions. Optimally, work on this course will be conducted in parallel with laboratory research.

**MPI 00604**  SPECIAL TOPICS IN MOL PATH & IMMUNO  SUMMER  2 Credits  REQUIRED COURSE

**COURSE DIRECTOR: DR. SAL CARADONNA**

**PREREQ: PERMISSION BY FACULTY/INVESTIGATOR**

This is a two-credit, independent study course designed to help the student develop literature research skills as well as writing skills. The student is to conduct a literature search on a topic that is agreed upon by the student and course director. The student will then write a review of the resulting literature search.

**MPI 00680**  MOL PATH & IMMUNO LAB ROTATION I (7 weeks each)  FALL  1 Credit  REQUIRED COURSE

**MPI 00681**  MOL PATH & IMMUNO LAB ROTATION II (7 weeks each)  FALL  1 Credit  REQUIRED COURSE

**COURSE DIRECTORS: MDL/HUMIGEN GSBS FACULTY MENTOR**

**PREREQ: PERMISSION BY FACULTY/INVESTIGATOR**

Laboratory rotations are essential components of a student’s education in the Molecular Pathology and Immunology Program. These experiences introduce students to specific areas of molecular pathology and immunology; expose students to specialized techniques, and familiarize students with specific projects in the program in anticipation of choosing a research advisor. Students will be evaluated on their attendance, motivation and interest within the lab as well as their attendance and participation at lab meetings. Students are responsible for learning new techniques, asking questions and working semi-independently by the end of each lab rotation. Students are encouraged to select their laboratory rotations so as to acquire diverse research experiences. A Molecular Pathology and Immunology Program student needs to complete two laboratory rotations prior to the selection of a thesis advisor. The length of each laboratory rotation is 7 weeks and each must be completed within the fall semester of the student’s first year. Hence, by the end of the fall semester, the student will know which lab they will do their research in for their thesis.

**MPI 00685**  MOL PATH & IMMUNO RESEARCH I  SPRING  1 Credit  REQUIRED COURSE

**MPI 00686**  MOL PATH & IMMUNO RESEARCH II  SUMMER  2 Credits  REQUIRED COURSE

**COURSE DIRECTOR: MDL/HUMIGEN GSBS FACULTY MENTOR**

Each course will be directed by a masters student’s Mentor who is a member of the GSBS Faculty at MDL/Humigen and its content will reflect his/her research interests. The goal is to have the student gain experience in a research laboratory and gain insight into the creative research process.
MPI 00690  THESIS RESEARCH – MSMPI  FALL  5 Credits  REQUIRED COURSE
The Mentor or Mentor-of-Record is responsible for grading this Satisfactory/Unsatisfactory graded course, which must be laboratory (not library) based and must be hypothesis driven. A student can enroll in this course just once. However, please note that the research thesis is done over two or more semesters. The conclusion of the research is based on testing the hypothesis but not necessarily on proving the hypothesis (unlike a doctoral or masters thesis in the Cell and Molecular Biology program). The student must publically defend his/her thesis. The grading for this course is Satisfactory/Unsatisfactory, which does not affect the grade point average.

MPI 00699  MS THESIS CONTINUATION  FALL/SPRING  1-9 Credits
After completing the number of thesis credits as defined by the MS program requirements and completing required coursework, students may register for Master of Science Thesis Continuation during each subsequent semester of thesis phase. Master of Science Thesis Continuation will carry a variable credit weight of 1-9 credits (5 credits are part-time status; 9 credits are full-time status). The student’s mentor will be responsible for certifying that a student is working on his/her thesis on a part-time or full-time basis commensurate with the number of credits they are registered for in a semester. Students will be charged the Master of Science Thesis Continuation fee of $200 per semester for thesis continuation regardless of the number of thesis credits for which they are registered. The maximum number of semesters that a student can register for thesis research and thesis continuation is four (2 years). The grading for this course is Satisfactory/Unsatisfactory, which does not affect the grade point average.
Rowan University School of Osteopathic Medicine: First Year DO Courses

Course Descriptions

MBS 00671  MEDICAL PHYSIOLOGY*  FALL & SPRING  6 Credits
COURSE DIRECTOR: DR. DEBORAH PODOLIN
PREREQUISITE: PERMISSION OF INSTRUCTOR
See SOM schedule for day, time and location of course.
REQUIRED TEXT: Medical Physiology: Principles for Clinical Medicine, 4th Edition
Rodney A. Rhoades & David R. Bell
The ultimate objective of this course is to understand the mechanisms that operate in mammals at all levels, ranging from the subcellular to the whole animal. Specifically, two major principles will recur throughout our study of mammalian physiology. First, function is based on structure. Our understanding of how a muscle contracts, for example, rests largely on an understanding of the molecular basis of the contractile machinery. The second major principle emphasized in this course involves the ability of mammals to regulate their internal environment within narrow limits. “Constancy of the internal milieu” as the great pioneer of modern physiology Claude Bernard phrased it, enables animals to survive in potentially stressful environments. When body systems are no longer able to maintain an optimal internal environment, pathophysiological states result. Understanding physiology is imperative for medical practice. Only with a solid understanding of function and dysfunction of the body is it possible to develop effective and scientifically sound treatments for human maladies. The physician who understands physiology is better equipped to make intelligent and insightful diagnoses and decisions, and less likely to commence on a course of treatment that is disruptive to the body’s physiological balance. Without an understanding of physiological principles, a physician dispensing medicine will be relying entirely on the advertising brochures of pharmaceutical companies. With this in mind, our two major goals in this course are 1) to help you learn the fundamental mechanisms of human physiology needed to study and practice medicine, and 2) to stimulate a lifelong interest in physiology and pathophysiology. There is an additional course fee attached to this course.
* MEDICAL PHYSIOLOGY CAN SUBSTITUTE FOR FUNDAMENTALS III.

MBS 00672  CLINICALLY INTEGRATED HUMAN ANATOMY  FALL & SPRING  7 Credits
MBS 00673  CIHA I (INTRODUCTION AND THORAX)  FALL  1 Credit
MBS 00674  CIHA II (ABDOMINOPELVIS AND PERINEUM)  SPRING  2 Credits
MBS 00675  CIHA III (INTEGRATED BACK AND LIMBS)  SPRING  2 Credits
MBS 00676  CIHA IV (HEAD AND NECK)  SPRING  2 Credits
COURSE DIRECTOR: DR. ROCCO CARSIA
PREREQ: NO
Frank H. Netter, M.D.
This course focuses on the study of the macroscopic structure and the 3-dimensional relationship of structures of the human body through dissection, diagnostic imaging and other methods. In addition, the anatomical basis for certain body functions and diseases are taught. This course can be thought to be an “anatomical medicine” course. Indeed, students must develop competencies in normal and abnormal diagnostic imaging, recognition of structures in dissection, and recognition of the anatomical basis of relevant adult and pediatric clinical problems. There are additional course fees attached to these courses.
Rutgers-Camden: Master of Science in Biology Program

Course Descriptions

56:120:508  CELL PHYSIOLOGY
COURSE DIRECTOR: DR. PATRICK MCILOHY
LECTURE 3 HOURS; LABORATORY 3 HOURS
PREREQUISITES: GENERAL PHYSIOLOGY OR BIOCHEMISTRY
Analysis of functional activities of cells, with special emphasis on problems of cell permeability, cell-environment interaction, cell excitability and conduction, and secretion.

56:120:509  CYTOGENETICS
COURSE DIRECTOR: DR. DENNIS JOSLYN
LECTURE 3 HOURS; LABORATORY 3 HOURS
PREREQUISITE: GENETICS
Topics include chromosome structure and cell division, chromosomes in sex determination, chromosomal aberrations, induction of mutations, and chromosomes as research tools. Laboratory studies include the preparation of metaphase and anaphase chromosomes, banding and labeling procedures, and the analysis of chromosomal abnormalities.

56:120:510  CELL ULTRASTRUCTURE AND FUNCTION
COURSE DIRECTOR: DR. ROBERT NAGELE
LECTURE 2 HOURS; LABORATORY 3 HOURS
PREREQ: MICROBIOLOGY, CELL BIOLOGY OR HISTOLOGY
Introduction to the methodologies employed in the study of cell organelles and their function, using selected cell types to emphasize basic methods of preparation of materials for electron-microscopical, X-ray diffraction, histochemical, and radioautographic studies.

56:120:512  MAMMALIAN PHYSIOLOGY
COURSE DIRECTOR: DR. PATRICK MCILOHY
LECTURE 3 HOURS
PREREQUISITES: GENERAL PHYSIOLOGY OR HUMAN PHYSIOLOGY
Detailed study of several areas in mammalian physiology through lecture and student presentation of selected research reports.

56:120:513  POPULATION GENETICS
COURSE DIRECTOR: DR. DENNIS JOSLYN
PREREQUISITE: GENETICS
Experimental approaches to measuring gene frequencies in animal and plant populations; changing genetic profiles in evolving populations.

56:120:515  HUMAN GENETICS
COURSE DIRECTOR: DR. CHARLA LAMBERT (Postdoc at UPenn)
LECTURE 3 HOURS
PREREQUISITES: GENETICS OR MOLECULAR BIOLOGY OR PERMISSION OF INSTRUCTOR
Principles of human heredity. Topics include genetics aspects of health and disease, birth defects, metabolic disorders, modes of inheritance, molecular and biochemical analyses, genomics and proteomics. Case studies will be discussed.
IMMUNOLOGY

COURSE DIRECTOR: DR. PRADIP SARKAR

PREREQUISITES: MICROBIOLOGY OR CELL BIOLOGY OR CELL PHYSIOLOGY

Immunoglobulin gene rearrangements and antibody diversity; antibody structure; antibody-antigen interactions; monoclonal antibodies and immunoconjugates; immunochemistry techniques; cellular immunology; viruses of the immune system.

TOPICS IN QUANTITATIVE BIOLOGY

COURSE DIRECTOR: DR. MARK MORGAN

PREREQUISITES: PERMISSION OF INSTRUCTOR

Designed primarily for those students without much prior experience in the use of quantitative methods for the analysis and interpretation of biological data; topics include sampling, experimental design, hypothesis testing, and analysis of variance.

MOLECULAR GENETICS OF MICRO-ORGANISMS

COURSE DIRECTOR: DR. DENNIS JOSLYN

LECTURE 3 HOURS; LABORATORY 3 HOURS

PREREQUISITE: PERMISSION OF INSTRUCTOR

Surveys the genetics of bacteria, bacteriophages, and lower eucaryotes. Topics include general features of the genetic code, phage genetics, structure and replication of phage nucleic acids, extra-chromosomal genetic elements, gene transfer in bacteria, and genetic analysis in lower eucaryotes.

MOLECULAR CARCINOGENESIS

COURSE DIRECTOR: DR. ERIC KLEIN

LECTURE 3 HOURS

PREREQUISITE: NO

Detailed examination and discussion of the molecular mechanisms underlying the initiation, promotion, and progression of cancer. Topics include cancer genetics, signal transduction, mutagenesis, and molecular therapies. Previous work in genetics or molecular biology would be helpful in taking this course.

BIOLOGY OF PARASITIC PROTOZOA

PREREQUISITE: INVERTEBRATE ZOOLOGY OR PARASITOLOGY

Examination of the morphology, cell biology, and life history of various parasitic protozoans of humans and other animals. Topics include immune mechanisms, control measures, pathology, and the social and economic impacts of infection.

BIOLOGY OF PARASITIC WORMS

PREREQUISITE: INVERTEBRATE ZOOLOGY OR PARASITOLOGY

Survey of the parasitic worms infecting humans and other animals. Emphasis placed on the transmission and reproductive strategies of the parasites, immune mechanisms, pathologic consequences, behavioral and other changes in the host, and the social and economic impacts of parasites.

ADVANCED CELL AND DEVELOPMENTAL BIOLOGY

COURSE DIRECTOR: DR. HSIN-YI LEE

PREREQUISITE: CELL BIOLOGY AND EMBRYOLOGY
In-depth discussion of selected topics in cell and developmental biology. Topics include gene regulation in development, cell reproductions, cell differentiation, neoplastic transformation, cell interaction, morphogenesis, pattern formation, and cell aging and senescence.

56:120:536 BIOLOGICAL BASIS OF BEHAVIOR SPRING 3 Credits
COURSE DIRECTOR: DR. WILLIAM SAIDEL
LECTURE 3 HOURS
PREREQUISITES: NEUROBIOLOGY AND ENDOCRINOLOGY
BBB will investigate and detail the neural and/or endocrinological mechanisms of numerous specific behaviors. The focus will primarily be on vertebrate behaviors with possible forays into specific invertebrate behaviors to investigate certain motor concepts.

56:120:555 NEUROBIOLOGY I SPRING 3 Credits
COURSE DIRECTOR: DR. WILLIAM SAIDEL
PREREQUISITE: GENERAL PHYSIOLOGY OR CELL BIOLOGY
Study of the neuroanatomical organization of the mammalian brain with a corresponding examination of its functional properties as described electrophysiologically and by brain imaging techniques; also included is a focus on the differences between mammalian and non-mammalian brains.

56:120:556 NEUROBIOLOGY II FALL 3 Credits
COURSE DIRECTOR: DR. WILLIAM SAIDEL
PREREQUISITE: GENERAL PHYSIOLOGY, CELL BIOLOGY, NEUROBIOLOGY I OR PERMISSION OF INSTRUCTOR
Study of the neuroanatomical organization of the mammalian brain with a corresponding examination of its functional properties as described electrophysiologically and by brain imaging techniques; also included is a focus on the differences between mammalian and non-mammalian brains.

56:120:560 ENDOCRINOLOGY FALL 3 Credits
COURSE DIRECTOR: DR. PATRICK MCILROY
PREREQUISITE: CELL OR SYSTEMS PHYSIOLOGY
Endocrinology and neuroendocrinology. The structure and function of the endocrine glands, including the hypothalamus, and the biosynthesis and mechanisms of action of hormones.

56:120:580 FUNGI IN ECOSYSTEMS FALL 3 Credits
LECTURE 3 HOURS
PREREQUISITE: GENERAL ECOLOGY OR PERMISSION OF INSTRUCTOR
Introduction to the complexities of ecosystem function and the role fungi play in these processes. The impact of fungi on primary production, secondary production, population and community regulation and their interaction with environmental pollutants will be discussed.

56:120:582 SPECIAL TOPICS: BIOLOGY SPRING 3 Credits
(COMPUTATIONAL SYSTEMS BIOLOGY)
COURSE DIRECTOR: DR. DAWEI HONG
LECTURE 3 HOURS
PREREQUISITE: No
REQUIRED TEXT: An Introduction to Systems Biology - Design Principles of Biological Circuits
Uri Alon
ISBN: 9781584886426  
ISBN 10: 1584886420

This course will provide an in-depth introduction to systems biology. See reviews on the book below:

"Uri Alon’s An Introduction to Systems Biology is a superb, beautifully written and organized work that takes an engineering approach to systems biology. Alon provides nicely written appendices to explain the basic mathematical and biological concepts clearly and succinctly without interfering with the main text. He starts with a mathematical description of transcriptional activation and then describes some basic transcription-network motifs (patterns) that can be combined to form larger networks. …Alon investigates networks at a higher level, including genomic regulatory networks. He does an excellent job of explaining and motivating a useful toolbox of engineering models and methods using network-based controls."

"This is a remarkable book that introduces not only a field but a way of thinking. Uri Alon describes in an elegant, simple way how principles such as stability, robustness and optimal design can be used to analyze and understand the evolution and behavior of living organisms. Alon's clear intuitive language and helpful examples offer - even to a mathematically naive reader - deep mathematical insights into biology. The community has been waiting for this book; it was worth the wait."
/Galit Lahav, Harvard Medical School, Boston, Massachusetts, USA /

56:120:583 MOLECULAR MECHANISMS OF DEVELOPMENT SPRING 3 Credits  
COURSE DIRECTOR: DR. NIR YAKOBY  
LECTURE 3 HOURS  
PREREQUISITE: NO  
REQUIRED TEXT: NO

The development of an animal from a fertilized egg to a multi-cellular complex organism is governed by a handful of signaling pathways. The coordinated interactions among them facilitate a fast and accurate developmental plan. The class will focus on genetic studies in model organisms such as Drosophila and Xenopus, with an emphasis on cell to cell signaling, morphogen gradients, signal interpretation, and signaling pathways’ crosstalk. During class, students will become familiar with the different concepts and molecular methods used in Developmental Biology to determine genetic interactions between molecules in signaling networks. Students will learn how to critically read papers and then present and discuss them in class.

56:120:585 RECOMBINANT DNA TECHNOLOGY SPRING 3 Credits  
COURSE DIRECTOR: DR. DANIEL SHAIN  
LECTURE 3 HOURS  
PREREQUISITE: MOLECULAR BIOLOGY OR PERMISSION OF Instructor

Examination of recombinant DNA technology and its utility in specific medical and industrial applications as well as its use in basic research. Topics include discussion of in vitro mutagenesis, heterologous gene expression in a variety of hosts, disease diagnosis, and gene therapies using genetic engineering, as well as the ecological / societal impacts of DNA technology.

56:120:588 LIFE AT EXTREMES SPRING 3 Credits  
PREREQUISITE: PERMISSION OF INSTRUCTOR

Analysis of adaptations of organisms to extreme environments. Principles of evolution and biology illustrated by unusual adaptations.

56:120:590 POPULATION ECOLOGY FALL 3 Credits  
COURSE DIRECTOR: DR. JOHN DIGHTON  
PREREQUISITE: ECOLOGY
Emphasis placed on terrestrial vertebrates and arthropods; focus on patterns and determinants of population dynamics, ecological variation among populations, and the processes affecting community organization and species interactions. Three or four Saturday field trips may replace lectures in those respective weeks. Computer simulations of population dynamics (not requiring computer literacy) and a term paper developed from the recent ecological literature are required.

56:120:592  MEDICAL, INDUSTRIAL AND ENVIRONMENTAL MYCOLOGY  FALL  3 Credits
COURSE DIRECTOR: DR. JOHN DIGHTON
PREREQUISITE: NO
Fungi are integral in many ecological processes. Due to their basic modus operandi, they act as decomposers not only of dead plant and animal matter, but are active pathogens of plants and animals. Included in the animals they attack are humans. Medical mycological is an often overlooked, but important aspect of medicine. Since fungi are evolutionarily close to animals, it is often difficult to target fungi with antibiotics which do not also harm their human host. Antibiotic production is a natural defense mechanism of fungi, which has been exploited by humans, resulting in multi-million dollar investments by pharmaceutical industries to produce fungal derived antibiotics and food supplements. Many by-products of fungal activity are used in the food industry. Fungi are used as food themselves. They are of huge economic importance in food spoilage and crop reduction. Fungi can be important agents in controlling pollutants in industrial process and pollutant spills.

56:120:596  WRITING FOR SCIENTIFIC PUBLICATION  FALL  3 Credits
CO-COURSE DIRECTORS: DR. DANIEL SHAIN & SONIA KRUTZKE, M.A.
PREREQUISITE: NO
The object of the course is to prepare you for writing your thesis (research or non-research) and for publishing a scientific manuscript. Robert A. Day, former managing editor of 9 ASM journals, observes that "Scientists, starting as graduate students . . . are measured, and become known (or remain unknown) by their publications" and that “Bad writing can and often does prevent or delay the publication of good science”. Writing for Scientific Publication is geared toward increasing your ability to evaluate and improve your writing, and also to better manage the thesis and publishing process. The course will be co-instructed by Sonia Krutzke (who has taught Scientific and Technical Writing multiple times for the English Department) and myself. The course will close at 12 students.

56:120:597  SPECIAL TOPICS: ION CHANNELS  FALL  3 Credits
COURSE DIRECTOR: DR. THOMAS BELL

56:120:598  CELL AND TISSUE CULTURE  FALL  3 Credits
COURSE DIRECTOR: DR. HSIN-YI LEE
LECTURE 3 HOURS
PREREQUISITES: CELL BIOLOGY
Principles and techniques of cell and tissue culture; review of classical experiments on growth, differentiation, metabolism, and interactions of cells and other components of developing systems.

56:120:601,602  SEMINAR IN BIOLOGY  FALL/SPRING  1 Credit
Through discussion of papers developed and presented by students, a single topic from the area of cell biology, physiology, or ecology is investigated in depth.
### Rutgers-Camden: Master of Science in Chemistry Program

#### Course Descriptions

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<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
<th>Credits</th>
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<tbody>
<tr>
<td>56:160:514</td>
<td><strong>INTRODUCTION TO MOLECULAR MODELING</strong></td>
<td>SPRING</td>
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<td>COURSE DIRECTOR: DR. LUKE BURKE</td>
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<td>Introduction to the use of computer-assisted molecular modeling techniques for the study of chemical problems; lectures on theoretical principles; instruction in use of modern modeling programs; and computer projects involving solution of chemical problems.</td>
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<td>56:160:545</td>
<td><strong>RADIOCHEMISTRY AND RADIATION CHEMISTRY</strong></td>
<td>FALL</td>
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<td>COURSE DIRECTOR: DR. SIDNEY KATZ</td>
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<td>Interactions of ionizing radiation with matter and the resulting radiation-induced chemical reactions; excitation, ionization, free radical formation and recombination; chemical consequences of nuclear reactions; and ‘hot atom’ chemistry.</td>
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<td>56:160:576</td>
<td><strong>SPECIAL TOPICS: CHEMISTRY</strong></td>
<td>FALL</td>
<td>3 Credits</td>
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<td>(INTRODUCTION TO CHEMICAL TOXICOLOGY)</td>
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<td></td>
<td>COURSE DIRECTOR: DR. HARRY SALEM (Editor-in-Chief <em>Journal of Applied Toxicology</em>)</td>
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<td>LECTURE 3 HOURS</td>
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<td><strong>PREREQUISITES:</strong> NO</td>
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<td>Distribution, cellular penetration, metabolic conversion and elimination of toxic agents as well as the fundamental laws governing the interaction of foreign chemicals with biological systems. The course focuses on applying these concepts to the understanding and prevention of mortality and morbidity resulting from exposure to toxic agents.</td>
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Rutgers School of Public Health: Master of Public Health

Course Descriptions

Credits, not quality points, for these courses can be transferred into the Biomedical Sciences program, if a “B” (3.00) grade or better is earned. Therefore, these courses will not affect your grade point average in the Biomedical Sciences program.

PHCO-0504J INTRODUCTION TO BIOSTATISTICS FALL 3 Credits
COURSE DIRECTOR: DR. MARK FULCOMER
PREREQUISITE: Quantitative Skills Assessment
Applying statistical methods across the health, social, behavioral, natural, and physical sciences emphasizes similarities in analytic approaches taken by different disciplines. Examples with "real" data are related to some professions dealing directly with service provision (e.g., medicine, nursing, occupational therapy, physical therapy, clinical psychology, public health, social work, speech pathology and audiology) as well as to others frequently performing research or ancillary roles in health-care (e.g., biology, business, demography, geography). Reviews some research design, measurement, and other considerations in studying health-related issues.

This course is taught by the Rutgers School of Public Health (SPH).

PHCO-0503J INTRODUCTION TO ENVIRONMENTAL HEALTH SPRING 3 Credits
COURSE DIRECTOR: DR. ROY MEYERS
PREREQUISITES: NO
This course explores the way in which particular characteristics of our environment impinge on health. The course examines health problems associated with chemical, physical, and biological agents, how they impact food safety, infectious disease, air quality, water quality, and land resources in community and occupational settings. Policies intended to improve public health through mitigation of environmental impacts will be reviewed.

This course is taught by the Rutgers School of Public Health (SPH).

PHCO-0502J PRINCIPLES AND METHODS OF EPIDEMIOLOGY SPRING 3 Credits
COURSE DIRECTOR: DR. PATTY VITALE
PREREQUISITES: NO
Principles and Methods of Epidemiology: This course introduces students to the study of disease and ill health through their patterns of occurrence in human populations. The approaches of epidemiology in estimating the burden of disease, in making inferences about cause of disease, and in evaluating primary, secondary and tertiary prevention strategies are presented.

This course is taught by the Rutgers School of Public Health (SPH).