UPSTATE
MEDICAL UNIVERSITY

2020-2021 COURSES

College of Graduate Studies

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SUNY UPSTATE MEDICAL UNIVERSITY ACADEMIC CALENDAR 2020-2021

FALL 2020 - COGS

FALL 2020 - CHP, CON, COM Public Health

FALL 2020 - COM MD program only

College					
COM	Mon	May	11	Deadline to Sit for USMLE Step 1 (Class of 2022)
COM	May 18-22			Clinical Orientation MS III (Required)
All	Sun	May	24	Eid al-Fitr - contact faculty if unable to attend due to religious beliefs
COM	Mon	May	25	Memorial Day - No Classes
COM	Tues	May	26	**MS III & MS IV Fall Semester Begins**
COM	Mon	June	1	30% Tuition Liability for MSIII and MSIV
COM	Mon	June	8	50% Tuition Liability for MSIII and MSIV
COM	Mon	June	15	70% Tuition Liability for MSIII and MSIV
COM	Mon	June	22	100% Tuition Liability for MSIII and MSIV
All	Fri	July	3	Independence Day Observed - No Classes
All	Fri	July	31	Eid al-Adha - contact faculty if unable to attend due to religious beliefs
COM	Aug 6-7			New Student Orientation (as assigned)
COM, CHP	Mon	Aug	10	**MSI and MSII Fall Semester Begins**
COGS/CHP/CON	Aug 10 - 28			Fall Semester Nonmatriculated Student Registration
COM/CHP	Mon	Aug	17	30% Tuition Liability for MSI & MSII
All	Aug 20-21			New Student Orientation (as assigned)
All	Mon	Aug	24	**FALL SEMESTER Begins (unless otherwise noted)**
COM/CHP	Mon	Aug	24	50% Tuition Liability for MSI & MSII
All	Mon	Aug	31	30% Tuition Liability (unless otherwise noted); 70% MSI & MSII
All	Fri	Sept	4	Last Day to Add or Drop courses without a late fee (except MD)
CHP/CON/MPH	Fri	Sept	4	Last Day to Drop a full semester course without a grade
All	Mon	Sept	7	Labor Day - No Classes
All	Tues	Sept	8	50% Tuition Liability (unless otherwise noted); 100% MSI & MSII
All	Mon	Sept	14	70% Tuition Liability (unless otherwise noted)
All	Sept 19 - Sept 20			Rosh Hashanah - contact faculty if unable to attend due to religious beliefs
All	Mon	Sept	21	100% Tuition Liability (unless otherwise noted)
All	Mon	Sept	28	Yom Kippur - contact faculty if unable to attend due to religious beliefs
COM/COGS	Mon	Oct	12	Fall Break - No Classes
CHP/CON	Oct 12-13			Fall Break - No Classes (Except PA students)
CHP/CON	Fri	Oct	16	Mid-Semester Grades Due
CHP/CON	Oct 19 - Nov 6			Spring Semester Open Enrollment-Matriculated Students
MPH	Oct 26 - Nov 23			Spring Semester Open Enrollment-Matriculated Students
CHP/CON	Fri	Nov	6	75% of the Semester Completed (WP/WF grades assigned)
COGS	Oct 19 - Dec 4			Spring Semester Open Enrollment-Matriculated Students
All	Thurs	Nov	26	THANKSGIVING Vacation Begins
All	Mon	Nov	30	Classes Resume
COM	Tues	Dec	1	Deadline to Sit for USMLE Step II CS & CK (Class of 2021)
CHP/CON/MPH	Mon	Dec	7	Last Day of Classes
CHP/CON/MPH	Tues	Dec	8	Study Day
CHP/CON/MPH	Dec 9-14			Final Exams (No exams on Sunday)
All	Dec 14 - Jan 8			Spring Semester Nonmatriculated Student Registration (except MD)
All	Fri	Dec	18	**Fall Semester Ends**
All	**Wed**	**Dec**	**30**	**Degree Conferral for Fall Graduates**

SPRING 2021	SPRING 2021 CHP, CON, COM Public Health	SPRING 2021	All	Mon	Jan 4 **SPRING SEMESTER Begins**
			All	Mon	Jan 11 30% Tuition Liability
			All	Fri	Jan 15 Last Day to Add or Drop courses without a late fee (except MD)
			CHP/CON/MPH	Fri	Jan 15 Last Day to Drop a full semester course without a grade
			All	Mon	Jan 18 Martin Luther King Day - No Classes
			All	Tues	Jan 19 50% Tuition Liability
			All	Mon	Jan 25 70% Tuition Liability
			All	Mon	Feb 1 100% Tuition Liability
			CHP	Sat	Feb 20 Spring Vacation Begins Year 2 Perfusion and Rad Ther Sr Students
			CHP/CON	Fri	Feb 26 Mid-Semester Grades Due
			CHP/CON	Sat	Feb 27 Spring Vacation Begins (except PT Year 3, PA Year 1, Perfusion Year 2 & Rad Ther Sr)
			CHP	Mon	Mar 1 Classes Resume Year 2 Perfusion and Rad Ther Sr Students
			MPH	Sat	Mar 6 Spring Vacation Begins
			CHP/CON	Mon	Mar 8 Classes Resume (except PT Year 3, PA Year 1, Perfusion Year 2 and Rad Ther Sr)
			CHP/CON	Mar 8-19	Summer Semester Open Enrollment - Matriculated Students
			COGS/CHPCOM	Sat	Mar 13 Spring Vacation Begins MSI, PA Year 1 and all Graduate Studies Students
			MPH	Mon	Mar 15 Classes Resume
			MPH	Mar 17 - Apr 13	Summer Semester Open Enrollment - Matriculated Students
			CHP/CON	Mar 22 - April 9	Fall Semester Open Enrollment - Matriculated Students
			COGS/CHP	Mon	Mar 22 Classes Resume MSI, PA Year 1 and all Graduate Studies Students
			CHP/CON	Wed	Mar 24 75% of the Semester Completed (WP/WF grades assigned)
			COM	Fri	Mar 26 Last Day of Classes MSII
			All	Mar 28 - April 4	Passover - contact faculty if unable to attend due to religious beliefs
			All	Fri	April 2 Good Friday - contact faculty if unable to attend due to religious beliefs
			CHP/CON/MPH	Mon	April 19 Last Day of Classes (except PT Year 3)
			COGS	Apr 19 - July 30	Fall Semester Open Enrollment - Matriculated Students
			CHP/CON	Apr 19 - May 7	Summer Semester Nonmatriculated Student Registration
			CHP/CON	Tues	April 20 Study Day
			CHP/CON	Apr 21-26	Final Exams (No exams on Sunday)
			MPH	Apr 26 - July 10	Fall Semester Open Enrollment - Matriculated Students
			CON/CHP/COM	Fri	April 30 **Spring Semester Ends - MSIV, CHP (except PT Year 3), CON & Public Health**
			All	**Sun**	**May 2 COMMENCEMENT Ceremony**
			All	**Sun**	**May 2 Degree Conferral for Spring Graduates**
	SUMMER 2021 CHP, CON, COM Public Health		CHP/CON/MPH	Mon	May 3 **SUMMER SEMESTER Begins (except as otherwise noted)**
			CHP/CON/MPH	Fri	May 7 Last Day to Add or Drop courses without a late fee
			CHP/CON/MPH	Fri	May 7 Last Day to Drop a full semester course without a grade
			CHP/CON/MPH	Mon	May 10 30% Tuition Liability
			COM	Mon	May 10 Deadline to Sit for USMLE Step 1 (Class of 2022)
			COM	Fri	May 14 **Spring Semeseter Ends MSII**
			CHP/CON/MPH	Mon	May 17 50% Tuition Liability for full semester courses
			COM	Sun	May 23 **Spring Semester Ends MSI and MSIII**
			CHP/CON/MPH	Mon	May 24 70% Tuition Liability for full semester courses
			All	Mon	May 31 Memorial Day - No Classes
			CHP/CON	Tues	June 1 100% Tuition Liability for full semester courses
			CHP	June 3 - 4	New Student Orientation (as assigned)
			COGS/CHP	Fri	June 4 **Semester Ends Graduate Studies, PT Year 3**
			CHP	Mon	June 7 **PA & PT Incoming Students SUMMER SEMESTER Begins**
			All	Thurs	June 10 Alternate Degree Conferral for Spring Graduates
			CHP	Sat	June 12 Med Tech vacation begins
			CHP	Sat	June 19 Perfusion vacation begins
			CHP	Mon	June 21 Med Tech Classes Resume
			CHP	Wed	June 23 Last Day of Arts and Sciences Classes
			CHP	Fri	June 25 Last Day of Classes for Medical Imaging BPS
			CHP	Mon	June 28 Perfusion Classes Resume
			CON	Tues	June 29 Last Day of Classes for Nursing
			CHP/CON	Mon	July 5 Independence Day Observed - No Classes
			CHP	Fri	July 23 Last Day of Classes for Med Tech Jr and Rad Ther Jr
			CHP	Fri	July 30 Last Day of Classes for PA and Medical Imaging BS
			CHP	Fri	Aug 6 Last Day of Classes for Respiratory Care, Behavioral Analysis, and PT
			CHP	Fri	Aug 13 Last Day of Classes for Perfusion
			CHP/CON/MPH	Tues	Aug 17 **Summer Semester Ends**

All Mon Aug 30 Degree Conferral for Summer Graduates

College Codes COGS College of Graduate Studies
CHP College of Health Professions COM College of Medicine
CON College of Nursing

Note: COM MSIII and MSIV students should refer to holiday policy for time off

8.28.2019

New York State Law - Section 224A

Students Unable to Attend Classes on Certain Days

1. No person shall be expelled or be refused admission as a student to an institution of higher education for the reason that he/she is unable, because of his/her religious beliefs, to attend classes or to participate in any examination, study or work requirements on a particular day or days.

2. Any student in an institution of higher education who is unable, because of his/her religious beliefs, to attend classes on a particular day or days shall, because of such absence on the particular day or days, be excused from any examination or any study or work requirements.

3. It shall be the responsibility of the faculty and of the administrative officials of each institution of higher education to make available to each student who is absent from school, because of religious beliefs, an equivalent opportunity to make up any examination, study, or work requirements which he may have missed because of such absence on any particular day or days. No fees of any kind shall be charged by the institution for making available to the said students such equivalent opportunity.

4. If classes, examinations, study or work requirements are held on Friday after four o'clock post meridian or on Saturday, similar or makeup classes, examinations, study, or work requirements shall be made available on other days, where it is possible and practicable to do so. No special fees shall be charged to the student or these classes, examinations, study, or work requirements held on other days.

5. If effectuating the provisions of this section, it shall be the duty of the faculty and of the administrative officials of each institution of higher education to exercise the fullest measure of good faith. No adverse or prejudicial effects shall result to any student because of his availing himself/herself of the provisions of this section.

6. A copy of this section shall be published by each institution of higher education in the catalog of such institution containing the listing of available courses. It shall be the responsibility of the administrative officials of each institution of higher education to give written notice to students of their rights under this section, informing them that each student who is absent from school, because of his/her religious beliefs, must be given an equivalent opportunity to register for classes or make-up any examination, study or work requirements which he/she may have missed because of such absence on any particular day or days. No fees of any kind shall be charged by the institution for making available to such student such equivalent opportunity.

7. As used in this section, the term "institution of higher education" shall mean schools under the control of the board of trustees of the State University of New York or the board of higher education of the city of New York or any community college.

Registration Information

FALL SEMESTER, 2020

RETURNING STUDENTS – June 15 – August 28

Registration for returning students can be done online from June 15 - August 28. Registration packets will be provided to the programs.

Late Payment Fee

A $50 late payment fee will be charged to all students if payment of tuition is not made by due date on mailed bill.

In addition, a $40 fee will also be assessed if registration is not completed by August 29.

Student Health Forms

All required health forms of students enrolled in graduate programs must be completed and on file with the Student Health Service prior to registration.

Tuition Rates and Fees:

Tuition and fees are based on semester charges. Please refer to the Bursar website for tuition and fee rates by visiting *http://www.upstate.edu/currentstudents/financial_resources/accounts/rates.php*

SPRING SEMESTER, 2021

October 19 - January 8

Registration can be done online from October 19 - January 8. Registration packets will be provided to the programs.

Late Payment Fee

A $50 late payment fee will be charged to all students if payment of tuition is not made by due date on mailed bill.

In addition, a $40 fee will also be assessed if registration is not properly completed by January 9.

Student Health Forms

All required health forms of students enrolled in graduate programs must be completed and on file with the Student Health Service prior to registration.

Tuition Rates and Fees:

Tuition and fees are based on semester charges. Please refer to the Bursar website for tuition and fee rates by visiting *http://www.upstate.edu/currentstudents/financial_resources/accounts/rates.php*

Registration Instructions

SUNY Graduate Students

The course registration form should be completed by you and signed by your advisor. Indicate number(s) and title(s) of course(s), where taken (SUNY, SU, SUNYESF). Graduate students who intend to register for classes at SU and/or the SUNY ESF are also required to register there. Special registration packets for these schools are available in the Graduate Studies Office, Weiskotten Hall, Room 3114.

Add/Drop actions for SUNY Upstate Medical University must be channeled through the SUNY Upstate Medical University College of Graduate Studies. [Please note add/drop dates on academic calendar in front of book]

ID Cards

ID cards are issued or validated in the PAYROLL OFFICE located in Jacobsen Hall, Room 100, on the day of registration. Proof of tuition payment is required.

Car Registration and Parking

Car registration and the issuance of parking permits is completed at the Parking Office which is located in the University Hospital, Room 1801. Car registration and ID cards will be required for verification. The Parking Office is open Monday through Friday, from 7AM to 4PM.

Student Health

The college has a student health service which is located on the fourth floor of Jacobson Hall. A description of the services available through Student Health is in the ***Student Handbook*** which is available online: *www.upstate.edu/currentstudents/support*.

Health Insurance

Health Insurance coverage is mandatory for all students.

Veteran's Educational Benefits

Students eligible for VA benefits should contact Ms. Jennifer Martin-Tse, Registrar, SUNY Upstate Medical University at Syracuse, 155 Elizabeth Blackwell Street, Room 203, Syracuse, NY 13210 (315-464-4604).

Special Students (Non-matriculated)

To be eligible for registration in a graduate course as a "special" or "non-matriculated" student, the student should be employed at the Upstate Medical University or be a student in one of the Center's academic programs (approval of program director or supervisor is required) or obtain permission by the Course Director.

Agreement between United University Professions and the State of New York 1982-85: Article 36.1 Program for Tuition Assistance

The State agrees to continue the existing Tuition Assistance Program using a “space available” concept. When space is available, employees may enroll in a course on a tuition free basis, subject to the following requirements:

1. The University determines when space is available, recognizing that such determination must be made in sufficient time to permit enrollment by employees.
2. Employees must meet course prerequisites.
3. All fees other than tuition shall be paid by employees.
4. Employees may enroll in a MAXIMUM of one course per semester in special session, for example, summer session and intersession.
5. Minimum enrollment requirements established by the university as a necessary condition for offering a course shall not be affected by students interested in enrolling in a course on a space available basis.
6. The program shall continue for the term of the agreement.

Syracuse University (SU) and SUNY ESF Students

Permission is required of your home college advisor(s) and the course instructor(s) of the College of Graduate Studies, SUNY Upstate Medical University.

Prior to registering at your home college, appropriate SUNY registration forms need to be completed. They are available at the Office of Graduate Studies, 766 Irving Avenue, Room 3116, Syracuse, NY 13210.

Instructions concerning payment of tuition for SUNY Upstate Medical University courses are listed in the Syracuse University Registration Booklet.

ADD/DROP actions for Syracuse University must be channeled through the SUNY Office of Graduate Studies.

Family Educational Rights and Privacy Act

The Family Educational Rights and Privacy Act of 1974 requires us to make provisions for complying with Section 99.5, “Directory Information.” Directory information is defined as information which may be released to the public. If a student wishes to restrict the release of directory information, s/he should indicate any restrictions at the time of registration. Directory information includes all of the following:

Name

Address

Telephone Number

Date/Place of Birth

Program of Study

Dates of Attendance

Degrees/Awards Received from the most recent previous educational agency or institution attended

The enclosed registration form (computer data sheet) complies with the above Family Educational Rights and Privacy Act. Please present your registration form along with the (multi-part) course registration form and biographical data sheet (incoming or special, non-matriculated students only) when you come to the Registration Desk.

The College of Graduate Studies educates students to be biomedical research scientists, preparing them for careers in academic medical centers, colleges and universities, biomedical research institutes, the biotechnology industry, and government agencies. The College educates graduate students through its six biomedical science programs, awarding PhD degrees and MS degrees as noted:

- Anatomy: MS
- Anatomy and Cell Biology: PhD
- Biochemistry: MS
- Biochemistry and Molecular Biology: PhD
- Microbiology: MS
- Microbiology and Immunology: PhD
- Neuroscience: PhD
- Pharmacology: MS and PhD
- Physiology: MS* and PhD*

**Not accepting students at this time.*

The MD/PhD program at SUNY Upstate Medical University is designed for college graduates who seek the medical training and advanced research skills required for careers in academic medicine and medical research. This eight-year, dual - degree program combines our medical school (College of Medicine) with our graduate school in biomedical sciences (College of Graduate Studies).

Degree and Program Overview

Doctoral Degree

www.upstate.edu/grad/curriculum/phd_degrees.php

The PhD degree – including research, didactic course work and successful defense of a dissertation – is intended to be completed in four to six years.

First Year: All first-year students participate in three lab rotations of their choosing. Lab rotations give students exposure to diverse research environments and help them select a mentor with whom to do their dissertation research. To help students select their rotation labs, the college offers the Graduate Student Research Opportunities course during the first three weeks. In this course, representatives from each of the six biomedical sciences programs describe the research interests of their faculty members. A faculty advisor also helps students select their rotation labs. All first-year students also participate in a core curriculum designed to provide a broad- based education in the biomedical sciences. The first-year core curriculum courses are: Foundations of Molecular and Cellular Biology, covering fundamental and advanced topics in biochemistry, molecular biology and cell biology; Principles of Biostatistics, introducing the basic principles of biostats for research; and Journal Club where students practice analyzing papers and giving oral presentations. Beginning in January, students take electives. By the end of the spring semester, students begin focusing on research. Students select a mentor and become affiliated with their mentor's degree granting program at the end of the first year.

Second Year: By the start of the second year, most PhD students have begun work on the research project that will lead to their dissertation. During this year, students take the Responsible Conduct of Scientific Research course, which examines research ethics and the moral and philosophical issues confronting scientists, and continue to take electives based on their research interests as well as courses required by their program. All students take a program specific grant writing course. Students pass a qualifying exam to become candidates for the doctoral degree. This exam is scheduled by the end of the second year.

Later Years: In their second year, students put together a dissertation advisory committee, comprised of three to six faculty members from different departments. The committee meets every six months to review the student's progress, make suggestions and provide direction. To assist in the guidance of a student's career planning, the student and advisor develop a career development plan which is updated and shared annually with the advisory committee to help a student meet their planned goal. After completing their research projects, students write a dissertation and defend it before a dissertation defense committee.

Master's Degree

www.upstate.edu/grad/curriculum/masters.php

The master's degree program typically takes two to three years to complete. Master's students participate in selected parts of the core curriculum along with PhD students. However, unlike PhD students who usually affiliate with a degree -granting program at the end of their first year, master's students join a degree-granting program from the start. Master's students write and defend a thesis, but they do not take a qualifying exam.

Additional required courses are determined by degree granting program and the advisor.

MD/PhD Program

www.upstate.edu/mdphd/curriculum/index.php

Upstate Medical University's MD/PhD Program is designed for individuals interested in pursuing a career as physician - scientists in academic medicine. During the students first two years of training students complete required courses in the College of Medicine curriculum (see College of Medicine section of the Academic Catalogue). They then advance into the laboratory where they spend three to four years completing additional coursework and dissertation research under the guidance of one of the faculty members in College of Graduate Studies. The time in the laboratory culminates with the defense of the doctoral dissertation, after which students re -enter the College of Medicine to complete their training in the required clinical clerkships and electives. The total time spent in the program should be no more than eight years. Throughout the training students will also participate in MD/PhD specific coursework and activities.

Annual stipends and tuition scholarships are provided for students during enrollment in the MD/PhD program.

MD/PhD students may receive up to but no more than 12 elective credits in the College of Medicine (COM) for research which will count toward fulfilling the COM graduation requirement of 25 elective credits. MD/PhD students must apply for this research credit; please see the Student Handbook for details. Alternatively, MD/PhD students are eligible to apply up to 9 credits from the Grand Rounds Course towards College of Medicine elective credits (see above).

There can be 24 credits transferred from the COM to the College of Graduate Studies (CGS). These credits are based on criteria set forth by the Graduate Programs, the Dean of College of Graduate Studies, and the MD/PhD Program Co - directors. The courses transferred are those that fulfill the CGS core curriculum and correlate with the degree-granting program in which the student is enrolled.

The MD/PhD Grand Rounds course is a required course for all students in all years of the program. MD/PhD students in the first year of their PhD are required to take the MD/PhD grant writing course.

For MD/PhD course descrptions, see page 36.

Prior to graduation from the program each student must have at least one accepted first-author publication of experimental data from their dissertation work in a peer-reviewed journal.

GRADUATE STUDIES CORE CURRICULUM COURSE DESCRIPTIONS

GS604 Graduate Student Research Opportunities

0 Credit Hours

Course Coordinator(s):

Dean, College of Graduate Studies

Semester Offered: Fall

Course Description: With one full afternoon per program, each of the six PhD training programs will describe its currently active research projects. This description will be presented in a format which the program's faculty feels best displays all its research activities. Two major goals of these presentations are to: 1) acquaint the incoming graduate students with the breadth of research being pursued within each graduate program, and 2) to thereby give the incoming graduate students further information upon which to base their own choice of research area and advisor for their dissertations.

Prerequisites: None.

Textbook(s): None.

GS612 Biomedical Sciences Laboratory Rotations

2 Credit Hours/Rotation

Course Coordinator(s):

Dean, College of Graduate Studies

Semester Offered: Year-round

Course Description: The purpose of the rotation is to learn new research skills and more about the research of a potential dissertation advisor, and to potentially lay the groundwork for a future dissertation. Biomedical Sciences PhD students are required to do three laboratory rotations, taken consecutively, in the first year. Rotations begin approximately September, January and March. An optional fourth rotation in the summer may be taken. MD/PhD students are required to do two laboratory rotations, one each summer prior to their medical school years one and two (an optional third rotation may be taken). Written report due to Advisor at the end of each rotation.

Prerequisites: None.

Textbook(s): None.

GS616 Foundations of Molecular and Cellular Biology

4 Credit Hours

Course Coordinator(s):

Dr. Stephan Wilkens

Dr. Scott Blystone

Semester Offered: Fall

Course Description: This course provides a comprehensive background for students in the Biomedical Sciences Program. It covers fundamental and advanced topics in biochemistry, molecular biology, and cell biology. Lectures and discussions are based on primary research articles, reference books, and lecture notes. Major divisions of the course are 1) properties of biomolecules, 2) cell organization and regulation, and 3) cell function.

Prerequisites: None.

Textbook(s): None.

MPHP602 Principles of Biostatistics

3 Credit Hours

Course Coordinator(s):

Dr. Donald Cibula

Semester Offered: Fall

Course Description: This course introduces the basic principles of biostatistics and requires students to apply these principles to describe and analyze health data. Topics include descriptive statistics, probability distributions, point and interval estimation of population parameters, and hypothesis testing. A variety of one and two-sample tests for continuous and categorical data are covered, as is analysis of variance and linear regression modeling. Equal attention is given to manual calculation and use of statistical software; students will learn to analyze data using SPSS software and interpret output and results.

Prerequisites: None.

Textbook(s): Neil A Weiss, *Principles of Biostatistics: Introductory Statistics, 10th edition*

GS637 Responsible Conduct of Scientific Research (Research Ethics)

2 Credit Hours

Course Coordinator(s):

Dr. Robert Quinn
Dr. Rachel Fabi

Semester Offered: Fall

Course Description: The faculty instructors participate in lecture and discussion with the students. The lecture topics include Authorship, Peer Review and Plagiarism, Conflicts of Interest, Policies on Research Misconduct, Human Subjects, Animal Subjects, and Intellectual Property.

Prerequisites: None.

Textbook(s): Francis L. Macrina, *Scientific Integrity, 4th edition*

GS892 Introduction to the Presentation and Analysis of Scientific Literature: Journal Club

1 Credit Hour

Course Coordinator(s):

Dr. Peter Calvert

Semester Offered: Fall

Course Description: This course gives students the opportunity to read, critically evaluate, and present research articles in a variety of fields. During this course students are expected to develop a high standard of scientific analysis and good public presentation skills. Students will be required to present one to two paper(s) each semester depending on time availability and to actively participate in class discussions when not presenting. This course is required for all first year graduate students in the fall semester, but, if space is available, it is also offered as an elective for advanced students.

Prerequisites: None.

Textbook(s): None.

**For additional Graduate Studies general electives, see course descriptions listed on page 35-36.*

BIOCHEMISTRY AND MOLECULAR BIOLOGY PROGRAM AND DEGREE REQUIREMENTS

CIP Code: 26.0202

This program awards:

- PhD in Biochemistry and Molecular Biology
- MS in Biochemistry

Faculty researchers in Biochemistry and Molecular Biology seek to understand the molecular and cellular bases of human health and disease. They apply a broad range of tools ranging from those of structural biology and biophysics to cell biology and genetics. Faculty with expertise in X-ray crystallography, single-molecule electron microscopy, and spectroscopy investigate protein structure, folding, and interactions at the atomic level. Other faculty members employ modern genetics and genomic technologies to integrate the above information with in vivo studies to generate a broader understanding of cellular pathways and systems biology. This comprehensive strategy is reflected by the diverse approaches that our researchers take, from high-resolution structural and single-molecule studies to the use of animals and single-celled organisms to model disease processes and development. Areas of focus in the Department of Biochemistry and Molecular Biology include membrane and transport protein structure and function, DNA replication and transcription, cellular responses to stress, epigenetics and energy metabolism. These studies impact disorders from cancer to neurodegenerative diseases to pathogenic infections. Our program boasts a robust and long-standing record of extramural funding, particularly from the National Institutes of Health.

PhD Degree Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS637	Responsible Conduct of Scientific Research
GS612	Biomedical Sciences Laboratory Rotations (x3)
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
B620	Biochemistry Seminar
B648	Research Design in Biochemistry and Molecular Biology
B650	Scientific Writing in Biochemistry

Electives: At least 6 credits of Advanced Biochemistry and Molecular Biology elective courses are required. (Note: GS628 Systems Biology of Genetics, Genomics, and Proteomics and PHA615 Apoptosis and Cancer Pharmacology are considered advanced Biochemistry and Molecular Biology courses for this purpose).

- Total 90 credit hours (a minimum of 30 Didactic Graduate Course credit hours and a minimum of 30 Research Graduate Course credit hours).
- Qualifying Examination (to be scheduled before or during the summer following the student's second year)
- Dissertation Advisory Committee Meetings and Department Research Talk (minimum of one meeting every six months)
- Successful Dissertation Defense

MS Degree Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS637	Responsible Conduct of Scientific Research
B609	Biochemistry & Molecular Biology Rotations
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
B620	Biochemistry Seminar

Electives: At least 3 credits of Advanced Biochemistry and Molecular Biology elective courses are required.

- Total 30 credit hours (a minimum of 20 Didactic Graduate Course credit hours and a minimum of 10 Research Graduate Course credit hours).
- MS Thesis Committee Meetings (minimum of two meetings per year)
- Successful Thesis Defense

BIOCHEMISTRY AND MOLECULAR BIOLOGY COURSE DESCRIPTIONS

B609 Biochemistry and Molecular Biology Rotations

2 Credit Hours

Course Coordinator(s):

Dr. Patricia Kane

Semester Offered: Year-round

Course Description: This laboratory course is primarily intended for Biochemistry graduate students. The course will provide instruction in laboratory techniques commonly used in biochemical and molecular biological laboratories and will aid students in the selection of a research advisor. This course is offered year-round. Research areas covered span the interests of Biochemistry and Molecular Biology program faculty. The grading for laboratory rotations is satisfactory/unsatisfactory.

Prerequisites: None.

Textbook(s): None.

B617 Methods of Biochemistry and Molecular Biology Research

Variable Credit Hours

Course Coordinator(s):

Dr. Patricia Kane

Semester Offered: By arrangement only

Course Description: Course provides an individualized laboratory experience for students who have not yet completed their qualifying exam. Topics are determined by student and faculty sponsor. Generally taken between rotations and qualifying exam to fulfill credit requirements.

Prerequisites: GS612.

Textbook(s): None.

B620 Biochemistry Seminar

0 Credit Hours

Course Coordinator(s):

Dr. Xin Jie Chen

Semester Offered: Year-round

Course Description: Presentations of recent research activities by invited speakers and department members.

Prerequisites: None.

Textbook(s): None.

B638 Independent Study in Biochemistry and Molecular Biology

1 – 2 Variable Credit Hours

Course Coordinator(s):

Dr. Patricia Kane

Semester Offered: Year-round

Course Description: A tutorial course designed for graduate students in biochemistry, or related disciplines that will involve in-depth review of recent developments in biochemical research. May include 1) literature searches, 2) seminar and/or lectures, 3) hands on experience with new techniques available in the department, and 4) a written report. The purpose of the course is to develop a broad knowledge of the biochemical literature as the student advances in his/ her more defined research goals.

Prerequisites: General biochemistry or equivalent.

Textbook(s): None.

B647 Gene Expression and Epigenetic Regulation

2 Credit Hours

Course Coordinator(s):

Dr. Michael Cosgrove

Dr. Steven Hanes

Semester Offered: Spring, even years

Course Description: Gene expression is a fundamental process in all living organisms. Regulation of gene expression determines cell type during development and is required for cells to carry out their functions in response to nutritional, hormonal and environmental signals. At the heart of gene expression is the process of transcribing DNA into RNA. In this course, we will discuss the detailed mechanisms of transcription with a particular emphasis on the role of epigenetic modifications of chromatin in the regulation of transcription. We will use knowledge obtained from the study of a variety of model organisms to illustrate the basic concepts that are conserved throughout evolution, including (but not limited to) the role of histone modifications, chromatin remodeling, the CTD code, non-coding regulatory RNAs, and mechanisms of cell memory. In addition, we will discuss the role of epigenetic mechanisms in imprinting, iPS cell reprogramming, and human disease. The course is organized into both lecture and discussion groups, with opportunities for student participation and presentations. Readings will include contemporary studies from the published literature.

Prerequisites: None.

Textbook(s): None.

B648 Research Design in Biochemistry and Molecular Biology

3 Credit Hours

Course Coordinator(s):

Dr. Steven Hanes

Semester Offered: Spring

Course Description: This course promotes the development of critical thinking, experimental designing and scientific writing important to the students' future career as scientists. The students will gain experience in developing an original dissertation research project and preparing the plan in a formal hypothesis-based research proposal. Students will learn the essential features of grant writing, with the emphasis on developing skills necessary for effectively communicating their research design.

Prerequisites: General biochemistry or equivalent and with course coordinator approval.

Textbook(s): None.

B650 Scientific Writing in Biochemistry

1 Credit Hour

Course Coordinator(s):

Dr. Stewart Loh

Semester Offered: Fall

Course Description: This course is required in the second year for all students performing their thesis research in the Department of Biochemistry and Molecular Biology. The purpose of this course is to provide practice and one-on-one instruction in scientific writing. Each week the student will be assigned a paper to read from the primary literature by one of the program members, usually in the faculty member's area of expertise. The student will have one week to read the paper and write a concise one page summary and critique of the paper. In the second week, the student will revise the paper, with the direct guidance and final approval of that faculty member.

Prerequisites: First year core curriculum.

Textbook(s): None.

B664 Protein Sorting and Vesicular Trafficking

1 Credit Hour

Course Coordinator(s):

Dr. Patricia Kane

Semester Offered: Spring, even years

Course Description: The current literature is used to analyze recent discoveries and controversies in protein sorting and trafficking. After an initial review of core material related to the topic, students are assigned papers to read in advance of each class along with questions to think about in relation to the reading assignment. Each class consists of a student presentation(s) of the assigned paper(s) and class discussion of the readings. Grading is based on presentation and class participation.

Prerequisites: None.

Textbook(s): None.

B665 Bioenergetics and Metabolism

2 Credit Hours

Course Coordinator(s):

Dr. Xin Jie Chen

Semester Offered: Spring, odd years

Course Description: This course is taught by Biochemistry faculty specialized in bioenergetics and metabolism. Using both lecture and student-driven discussions, basic principles of bioenergetics and metabolism will be discussed and applied in a variety of disease states. The topics covers mitochondrial signaling, regulation of energy metabolism, nutrient and energy sensing, pH homeostasis and cancer, immunometabolism, hypoxia signaling, and oncometabolites in epigenetic regulation.

Prerequisites: None.

Textbook(s): None.

B666 Protein Structure Determination

2 Credit Hours

Course Coordinator(s):

Dr. Stephan Wilkens

Semester Offered: Spring, even years

Course Description: The primary literature will be used to cover advanced topics in determination of protein structure and dynamics. Topics include characterization of protein structure and dynamics by X-ray crystallography, nuclear magnetic resonance, spectroscopy, cryo-electron optical super resolution microscopy, and fluorescence spectroscopy, mass spectrometry, and computational methods. Emphasis is placed on how structure and dynamics of proteins relates to their function and mechanism.

Prerequisites: None.

Textbook(s): None.

B700 Research in Biochemistry

Variable Credit Hours

Course Coordinator(s):

Dr. Patricia Kane

Semester Offered: Year-round

Course Description: Original thesis research in the field of
Biochemistry under the supervision of a member of the staff.

Prerequisites: None.

Textbook(s): None.

CELL AND DEVELOPMENTAL BIOLOGY PROGRAM AND DEGREE REQUIREMENTS

CIP Code: 26.0601

This program awards:

- PhD in Anatomy and Cell Biology
- MS in Anatomy

Research in the Department of Cell and Developmental Biology explores the molecular and biochemical mechanisms of cellular function and development. Faculty researchers in the department have funding for fundamental studies of: proteins and structures responsible for the assembly and dynamics of myofibrils; the genetics and cell biology of heart formation; the role of class I myosins in kidney functions; the mechanisms of actin assembly during endocytosis; the role of cell adhesion in regulating the cytoskeleton and cell motility in normal and cancerous cells; integrin regulation of the actin cytoskeleton; research on neural plasticity and spinal cord injury; the role of formins in the assembly of the actin cytoskeleton; the identification of genes important for the assembly
and motility of cilia; the interface between cytoskeletal dynamics, mitotic signaling, and membrane transport during cell division. Models used in the research include: zebrafish, avian embryos, the alga *C. reinhardtii*, cell culture lines, *C. elegans*, the yeast *S. pombe*, rats and mice. Students and faculty use a variety of research methods including sophisticated light microscopy (laser scanning confocal microscopy, spinning disc confocal microscopy, wide field deconvolution imaging, real-time fluorescence microscopy, TIRF microscopy), high-sensitivity digital cameras and image processing, electron microscopy, tissue culture, stereotactic surgery, and a complete range of molecular and biochemical techniques.

PhD Degree Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
A623	Grant Writing in Cell and Developmental Biology
A624	Seminar in Cell and Developmental Biology
GS612	Biomedical Sciences Lab Rotations (x3)
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS637	Responsible Conduct of Scientific Research
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club

Electives:

GS628	Systems Biology of Genetics, Genomics, Proteomics
A507	Introduction to Neuroscience
A613	Graduate Cellular Anatomy
A614	Contemporary Cellular, Molecular, and Developmental Biology
A615.5	Teaching in Graduate Cellular Anatomy
A617	Methods of Cell and Developmental Research
A621	Neuroanatomy Lab
A622	Developmental Biology
B647	Gene Expression and Epigenetic Regulation
B664	Protein Sorting and Vesicular Trafficking
B666	Protein Structure Determination
N620	Advanced Topics in Receptors and Cell Signaling
N623	Systems Neuroscience
PHA615	Apoptosis and Cancer Pharmacology

- Total 90 credit hours (a minimum of 30 Didactic Graduate Course credit hours and a minimum of 30 Research Graduate Course credit hours).
- Qualifying Examination (to be completed by the end of the second year)
- 30 min Departmental Seminar (to be presented within 6 mos. of qualifying exam)
- Department Seminar Series (attendance required at all seminars)
- Dissertation Advisory Committee Meetings (minimum of one meeting every six months)
- Successful Dissertation Defense

MS Degree Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
A624	Seminar in Cell and Developmental Biology
GS637	Responsible Conduct of Scientific Research
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club

Electives:

GS628	Systems Biology of Genetics, Genomics Proteomics
A507	Introduction to Neuroscience
A613	Graduate Cellular Anatomy
A614	Contemporary Cellular, Molecular, and Developmental Biology
A617	Methods of Cell and Developmental Research
A621	Neuroanatomy Lab
A622	Developmental Biology
B664	Protein Sorting and Vesicular Trafficking
B666	Protein Structure Determination
N620	Advanced Topics in Receptors and Cell Signaling
N623	Systems Neuroscience
PHA615	Apoptosis and Cancer Pharmacology

- Total 30 credit hours (a minimum of 20 Didactic Graduate Course credit hours and a minimum of 10 Research Graduate Course credit hours).
- Department Seminar Series
- Successful Thesis Defense

CELL AND DEVELOPMENTAL BIOLOGY COURSE DESCRIPTIONS

A507 Introduction to Neuroscience

3 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Dr. Mary Lou Vallano

Dr. Dana Mihaila

Semester Offered: Fall

Course Description: The Systems Neuroscience course will consist of the Neuroscience course given to first year medical students, without the neuroanatomy components. This course will include the study of systems of neuroscience, including sensory, motor, limbic systems, sleep and awakening, and basic cognitive processing. There are a total of 29 lectures with 2 essay examinations. The summer session will be a combination of video presentations and live tutorials. There will be 2 essay/ multiple choice exams.

Prerequisites: Course coordinator approval.

Textbook(s): Neuroscience, 6th edition, Purves et. al, Sinauer Associates, Sunderland, MA, 2018. & Neuroanatomy in clinical context, 10th edition, Haines, Duane E., Lippincott Williams & Wilkins, Philadelphia, 2019.

A613 Graduate Cellular Anatomy

2 Credit Hours

Course Coordinator(s):

Dr. Vladimir Sirotkin

Semester Offered: Spring, odd years

Course Description: Graduate Cellular Anatomy provides an opportunity for graduate students to independently visualize cells, tissues, and organs of the human body by direct light-microscopic observation of prepared histologic specimens and develop their teaching and presentation skills. Introductory lectures on the histology of the basic tissue types will be followed by a guided laboratory session where each student will use their own university microscope to explore these tissue types. Course participants will select organ systems of interest and prepare presentations on the histology of those organ systems and present it to the class. Student presentations will also be followed by a laboratory session for students to explore that organ system.

Prerequisites: First year core curriculum.

Textbook(s): A combined text and color atlas of histology (examples Junquiera, Ross, Wheater, or Kerr).

A614 Contemporary Cellular, Molecular and Developmental Biology

2 Credit Hours

Course Coordinator(s):

Dr. Jeffrey Amack

Semester Offered: Fall, odd years

Course Description: Lectures, student presentations, and discussions dealing with cellular and molecular mechanisms during embryonic development. Classical as well as contemporary concepts will be emphasized.

Prerequisites: A622 or with course coordinator approval.

Textbook(s): None.

A615.5 Teaching in Graduate Cellular Anatomy

2 Credit Hours

Course Coordinator(s):

Dr. Vladimir Sirotkin

Semester Offered: By arrangement only

Course Description: This course will provide an opportunity for graduate students to teach a graduate level course through assisting the faculty instructors of Graduate Cellular Anatomy.

Prerequisites: A517 or A613.

Textbook(s): None.

A617 Methods of Cell and Developmental Research

Variable Credit Hours

Course Coordinator(s):

Dr. Joseph Sanger

Semester Offered: By arrangement only

Course Description: Methods of research used by the faculty are demonstrated. Problem design and research methods emphasized.

Prerequisites: Course coordinator approval.

Textbook(s): None.

A621 Neuroanatomy Lab

2 Credit Hours

Course Coordinator(s):

Dr. Dana Mihaila

Semester Offered: Fall

Course Description: Using a case-based format, this course will provide students an appreciation for the structure and three-dimensional organization of the central nervous system including external and internal anatomy of the central nervous system, functional organization and interconnections of the major brain pathways.

Prerequisites: None.

Textbook(s): *Neuroscience, 6th edition*, Purves et. al, Sinauer Associates, Sunderland, MA, 2018. & *Neuroanatomy in clinical context, 10th edition*, Haines, Duane E., Lippincott Williams & Wilkins, Philadelphia, 2019.

A622 Developmental Biology

2 Credit Hours

Course Coordinator(s):

Dr. Jeffrey Amack

Semester Offered: Spring, odd years

Course Description: This is an introductory graduate course in developmental biology. The course will have two 90 minute sessions per week for 10 weeks. The format will be a mix of lectures and discussions that cover fundamental concepts in developmental biology. Faculty will give lectures and students will participate in group projects and give a journal club style presentation of an assigned research paper. Grades will be based on effectiveness of the presentation, performance on short quizzes and participation in class discussions.

Prerequisites: GS616.

Textbook(s): Scott Gilbert, *Developmental Biology, 10th edition.*

A623 Grant Writing in Cell and Developmental Biology

2 Credit Hours

Course Coordinator(s):

Dr. Joseph Sanger

Semester Offered: Spring

Course Description: Faculty will provide an overview of grant writing style and mechanics and provide examples of grants written in common formats for private and government agencies. Students will write their own grants, limited to ten pages, excluding Abstract and Bibliography, and otherwise following the style of the current NIH R01 grant. Each mentor-student pair may follow their own timetable towards completion by semesters end. Students and mentors are encouraged to review writing progress and provide feedback frequently.

Prerequisites: GS616 and with course coordinator approval.

Textbook(s): None.

A624 Seminar in Cell and Developmental Biology

0-1 Credit Hours

Course Coordinator(s):

Dr. Christopher Turner

Semester Offered: Fall

Course Description: Graduate students will meet throughout the year to participate in formal public seminars. Seminars will be given by invited speakers, faculty candidates, department faculty and students. Students required to present a minimum of one, 30 minute seminar within approximately six months of passing their qualifying exam to obtain 1 credit in the semester in which they present their seminar, Student are also expected to meet with the invited speakers over lunch to discuss their research as well as career development/opportunities.

Prerequisites: None.

Textbook(s): None.

A700 Research in Cell and Developmental Biology

Variable Credit Hours

Course Coordinator(s):

Dr. Joseph Sanger

Semester Offered: Year-round

Course Description: Original dissertation research in anatomical sciences under-supervision of a staff member.

Prerequisites: None.

Textbook(s): None.

MICROBIOLOGY AND IMMUNOLOGY PROGRAM AND DEGREE REQUIREMENTS

CIP Code: 26.0501

This program awards:

- PhD in Microbiology and Immunology
- MS in Microbiology

Major research areas in the Department of Microbiology and Immunology are in diseases caused by viruses, the host response to infection, and the development and function of the immune system. A range of viruses are studied, including dengue virus, cytomegalovirus, varicella zoster virus, and Zika virus. The focus of virology research is on pathogenesis, gene regulation, molecular interactions between the virus and host cell, and antiviral agents. Immunology research focuses on autoimmune diseases and the role of innate and adaptive immune responses in development, infectious disease and cancer. A major focus of our immunology research is immunoreceptor signaling. Research is conducted at the molecular, biochemical, genetic and population levels with goals of developing vaccines and therapeutics of infectious diseases and cancer.

PhD Requirements:

Required Graduate Courses:

First and Second Years:

GS604	Graduate Student Research Opportunities
GS612	Biomedical Sciences Laboratory Rotations (x3)
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
GS637	Responsible Conduct of Scientific Research
M627	Introduction to Virology
M628	Introduction to Immunology
M616	Current Concepts in Virology*
M610	Problems in Cellular and Molecular Immunology*
M630	Seminar in Microbiology and Immunology
M623	Directed Individual Study in Microbiological and Immunological Research Methods
M609	Grant Writing in Microbiology and Immunology

Third Year & Following Years:

M700	Research in Microbiology and Immunology
M630	Seminar in Microbiology and Immunology

**Students must take either 6 credits of both M616 and M610 or 3 credits of one of these advanced courses plus 3 credits of another advanced course offered by College of Graduate Studies degree-granting programs.*

- Total 90 credit hours (a minimum of 30 Didactic Graduate Course credit hours and a minimum of 30 Research Graduate Course credit hours).
- Qualifying Examination (to be scheduled by the end of the second year)
- Dissertation Advisory Committee - The committee must meet at least twice per year during the dissertation research period, and committee must sign-off on student's readiness to write & defend dissertation.
- Submission of First-Author (or Co-First-Author) Research Paper - Students in Microbiology and Immunology are required to submit at least one first-author or co-first-author research paper for publication prior to the Dissertation Defense.
- Successful Dissertation Defense

MS Requirements:

Required Graduate Courses:

First and Second Years:

GS604	Graduate Student Research Opportunities
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
GS637	Responsible Conduct of Scientific Research
M627	Introduction to Virology
M628	Introduction to Immunology
M616	Current Concepts in Virology*
M610	Problems in Cellular and Molecular Immunology*
M630	Seminar in Microbiology and Immunology
M623	Directed Individual Study in Microbiological and Immunological Research Methods

Electives:

M609	Grant Writing in Microbiology and Immunology

**Either M616 for M610 is required.*

- Total 30 credit hours (a minimum of 20 Didactic Graduate Course credit hours and a minimum of 10 Research Graduate Course credit hours).
- Successful Thesis Defense

MICROBIOLOGY AND IMMUNOLOGY COURSE DESCRIPTIONS

M609 Grant Writing in Microbiology and Immunology

3 Credit Hours

Course Coordinator(s):

Dr. Gary Chan

Semester Offered: Spring

Course Description: Students will learn the essential features of writing research proposals, with an emphasis on the requirements of the NIH. In the first half of the course the principles of clear, unambiguous writing will be presented in lectures, accompanied by analysis of good and bad examples. In the second half of the course the students will meet regularly with the course instructor to review their assignments, which will then be revised as necessary in the final sessions of the course the students will meet as a group to review and discuss each other's proposals.

Prerequisites: Thesis advisor must be chosen.

Textbook(s): None.

M610 Problems in Cellular and Molecular Immunology

3 Credit Hours

Course Coordinator(s):

Dr. Iwona Koenig

Semester Offered: Fall

Course Description: This is an advanced immunology course that will consist of a number of modules on special topics in immunology chosen by the faculty. Typically, the first session of each module will provide an overview of the topic, and the second session will be in the form a discussion of the current literature. Students will be asked to participate during the discussion sections. At the end of the semester, each student will give an oral presentation on a special topic of their choosing. Topics will vary with faculty interests, but have included innate immune, macrophage immunity, immunometabolism, T and B lymphocytes, tumor immunity, and autoimmunity.

Prerequisites: M628.

Textbook(s): Janeway's, *Immunobiology, 9th edition.*

M616 Current Concepts in Virology

3 Credit Hours

Course Coordinator(s):

TBD

Semester Offered: Spring

Course Description: The structure, function and replication of important virus groups will be studied. Current research topics and techniques will be reviewed, with an emphasis on molecular biology, viral pathogenesis, and anti-viral therapy.

Prerequisites: M627 or equivalent course of basic virology and GS616.

Textbook(s): None.

M623 Directed Individual Study In Microbiological and Immunological Research Method

Variable Credit Hours

Course Coordinator(s):

Dr. Steven Taffet

Semester Offered: By arrangement only

Course Description: This is a special research training program designed to acquaint students with specific areas of research and/or use of methods, techniques, or instrumentation, as well as to introduce students intensively to the laboratory, and research approaches.

Prerequisites: Declaration in the Microbiology and Immunology program or with program director approval.

Textbook(s): None.

M626 Methods of Microbiology and Immunology Research

Variable Credit Hours

Course Coordinator(s):

Dr. Steven Taffet

Semester Offered: By arrangement only

Course Description: Methods of Research used by the faculty are demonstrated. Problem design and research methods are emphasized. Course deals with individualized laboratory experience. Topics agreed upon by student and faculty sponsor.

Prerequisites: GS612 or with course coordinator approval.

Textbook(s): None.

M627 Introduction to Virology

2 Credit Hours

Course Coordinator(s):

Dr. Jennifer Moffat

Semester Offered: Spring

Course Description: This is an introductory course in virology for graduate students. The objectives are to understand the structure and characteristics of viruses, their replication, interactions with the host, and applications in biomedical science. The material will be presented as online lectures viewed outside class time. Students will generate discussion questions that are addressed in class, which meets once for 2 hours weekly. Course grade is based on weekly quizzes and an oral presentation.

Prerequisites: At least one course in Biochemistry and Molecular Biology.

Textbook(s): S.J. Fint, et al., *Principles in Virology: Molecular Biology, Pathogenesis, and Control, 3rd edition (2008)*.

M628 Introduction to Immunology

2 Credit Hours

Course Coordinator(s):

Dr. Steven Taffet

Semester Offered: Spring

Course Description: This course is intended to be an introductory course in immunology for graduate students. The course goal is to develop a general understanding of immunology including both adaptive and innate immunity.

Prerequisites: At least one course in Biochemistry and Molecular Biology.

Textbook(s): K. Murphy and C. Weaver, Janeway's, *Immunobiology, 9th edition.*

M629 Microbial Pathogenesis

2 Credit Hours

Course Coordinator(s):

Dr. Christine King

Semester Offered: Spring, even years

Course Description: The objective of the course is to provide students with an understanding of the mechanisms of bacterial pathogenesis and an appreciation of the continuing and serious impact of bacterial disease on modern life. Students will learn basic principles of bacteriology and parasitology and the scope of bacterial colonization of both humans and the environment. Mechanisms of microbial pathogenesis and intervention strategies will be discussed. Finally, students will gain an understanding of the research priorities in this field.

Prerequisites: None.

Textbook(s): None.

M630 Seminar in Microbiology and Immunology

1 Credit Hour

Course Coordinator(s):

Dr. Eain Murphy

Semester Offered: Year-round

Course Description: Faculty and students will present their research work, in a selected subject area. Meetings will be once a week lasting 60 minutes per session.

Prerequisites: At least one microbiology and immunology course or with course coordinator approval.

Textbook(s): None.

M700 Research in Microbiology

Variable Credit Hours

Course Coordinator(s):

Dr. Steven Taffet

Semester Offered: Year-round

Course Description: Original research in microbiology for doctoral dissertation.

Prerequisites: None.

Textbook(s): None.

NEUROSCIENCE PROGRAM AND DEGREE REQUIREMENTS

CIP Code: 26.0608

This program awards:

- PhD in Neuroscience

The Neuroscience Graduate Program is a multidisciplinary program divided into three areas: Cell and Molecular Neuroscience, Development and Regeneration, and Systems Neuroscience. Program research relates to many human diseases and disorders, including fetal alcohol syndrome, retinitis pigmentosa, spinal cord injury, Alzheimer's, multiple sclerosis, cerebral palsy and amyotrophic lateral sclerosis (ALS). Research in Cell and Molecular Neuroscience group the regulation of gene expression in the nervous system, mechanisms of cell signaling and excitability within cells, and the molecular bases of neurological disease and disorders. Research topics in Development and Regeneration include the development of the mammalian cortex, regulation of gene expression during development, neuronal stem cells in the CNS and the eye, and mechanisms of regeneration in the retina, and the spinal cord. Research in Systems Neuroscience focuses on the neural mechanisms that underlie the functions of the olfactory system, the visual system, and motor systems in health and disease. Students can take advantage of a collaborative neuroscience program with neighboring Syracuse University.

PhD Requirements:

Required Didactic Courses (minimum of 30 credits): The didactic credits requirement is satisfied through 15 credits of required GS coursework and 15 or more credits of Neuroscience courses (up to 2 credits of non-NS courses are accepted without petition).

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS612	Biomedical Sciences Laboratory Rotations (x3)
	OR
N675	Research Rotations in Neuroscience (x3)
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
GS637	Responsible Conduct of Scientific Research
N507	Introduction to Neuroscience OR
N601	Neuroscience
N629	Scientific Writing in Neuroscience and Physiology
N627	Grant Writing in Neuroscience and Physiology

Electives:

N610	Topics in Developmental Neurobiology
N616	Topics in Vision I
N617	Methods of Neuroscience Research
N618	Topics in Vision II
N619	Neurobiology of Disease
N620	Advanced Topics in Receptors and Cell Signaling
N621	Neuroanatomy Lab (same as A621)
N623	Systems Neuroscience
N628	Neurobiology of Addiction
N630	Independent Study in Neuroscience
N631	Topics in Neuroscience (only open to 1st Year students)
N635	Neurophysiology Methods
N653	Topics in Cellular and Molecular Neurobiology

- Total 90 credit hours (a minimum of 30 Didactic Graduate Course credit hours and a minimum of 30 Research Graduate Course credit hours).
- Qualifying Examination – to be completed by the end of the second year.
- Each student in the Neuroscience Graduate Program is required to attend the complete seminar series and to present a seminar to the members of the Program each year.
- Dissertation Advisory Committee Meetings (minimum of one meeting every six months).
- Successful Dissertation Defense

NEUROSCIENCE COURSE DESCRIPTIONS

N507 Introduction to Neuroscience

3 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Dr. Mary Lou Vallano

Dr. Dana Mihaila

Semester Offered: Fall

Course Description: Same as A507 above.

N601 Neuroscience

3 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: Spring

Course Description: In-depth exploration of the various components of the nervous system and how it produces behavior. Topics include: human and comparative neuroanatomy, neurons and their electrochemical properties, visual, sensory, and motor systems, homeostasis, and learning and memory.

Prerequisites: None.

Textbook(s): TBD.

N610 Topics in Developmental Neurobiology

2 Credit Hours

Course Coordinator(s):

Dr. Rick Matthews

Dr. Sijun Zhu

Semester Offered: Fall, even years

Course Description: This course will provide extensive, yet selective, exposure to major issues and events in the development of the nervous system. Topics include: Axis determination and early patterning, Developmental signals and gene regulation, Cell generation/proliferation, Cell migration and guidance, Cell death, Synaptogenesis, and Plasticity.

Prerequisites: N601.

Textbook(s): None.

N616 Topics in Vision I

3 Credit Hours

Course Coordinator(s):

Dr. Eduardo Solessio

Dr. William Brunken

Semester Offered: Fall, odd years

Course Description: The course is a comprehensive study of the eye and visual system. We will examine neuroanatomical, electrophysiological, developmental and evolutionary aspects of vision. The course is a combination of didactic lecture and problem-based learning. Course source material is largely from the original scientific literature. It is particularly appropriate for graduate students intending to conduct original research in the visual system.

Prerequisites: N623 strongly encouraged.

Textbook(s): None.

N617 Methods of Neuroscience Research

2 Credit Hours

Course Coordinator(s):

Dr. Peter Calvert

Semester Offered: Spring

Course Description: Survey of research methods in neuroscience. Course will include modules on the study of gene expression, morphology of neurons and glia cells, neuronal and glial function, behavior, networks, inheritance, etc. Emphasis is on experimental design, research protocols and data interpretations. Most modules will include both study of theory and actual hands-on practice through in-lab demonstrations of research methods.

Prerequisites: GS616.

Textbook(s): None.

N618 Topics in Vision II

2 Credit Hours

Course Coordinator(s):

Dr. Daniel Ts'o

Semester Offered: Spring, by arrangement only

Course Description: The course will examine neuroanatomical, electrophysiological, and psychophysical aspects of vision. This is primarily a readings course, with emphasis on original literature. It is particularly appropriate for graduate students intending to conduct original research in the visual system. This second half will focus on visual mechanisms beyond the level of the retina, focusing on the cortical contributions to visual processing and visually-guided behavior.

Prerequisites: N623 strongly encouraged.

Textbook(s): None.

N619 Neurobiology of Disease

2 Credit Hours

Course Coordinator(s):

Dr. Huaiyu Hu

Semester Offered: Fall, odd years

Course Description: This course is focused on the fundamental biological mechanisms of neurological and neuropsychiatric diseases such as Alzheimer's disease and schizophrenia.

Prerequisites: None.

Textbook(s): None.

N620 Advanced Topics in Receptors and Cell Signaling

1 Credit Hour

Course Coordinator(s):

Dr. Brian Howell

Semester Offered: Fall

Course Description: This advanced course will cover a topic in receptors and cell signaling; for example, G-protein-coupled receptors, integrins and cell adhesion, glutamate receptor signaling and LTP, CDKs with emphasis on the neural -specific CDK5, ras signaling and tyrosine kinase-linked receptors, scaffolding proteins. Topics will be covered by a combination of graduate student-specific lectures and tutorials, based on current research papers and associated reviews. Each topic will also include a take-home essay-type examination.

Prerequisites: First year core curriculum.

Textbook(s): None.

N621 Neuroanatomy Lab

2 Credit Hours

Course Coordinator(s):

Dr. Dana Mihaila

Semester Offered: Fall

Course Description: Using a case-based format, this course will provide students an appreciation for the structure and three-dimensional organization of the central nervous system including external and internal anatomy of the central nervous system, functional organization and interconnections of the major brain pathways.

Prerequisites: None.

Textbook(s): Neuroscience, 6th edition, Purves et. al, Sinauer Associates, Sunderland, MA, 2018. & Neuroanatomy in clinical context, 10th edition, Haines, Duane E., Lippincott Williams & Wilkins, Philadelphia, 2019. & Essential Neuroscience, 3rd edition, Siegel A., and Sapru H.N., Lippincott, Williams & Wilkins, Philadelphia, PA, 2015.

N623 Systems Neuroscience

3 Credit Hours

Course Coordinator(s):

Dr. Daniel Ts'o

Semester Offered: Fall

Course Description: An exploration of issues and themes in systems neuroscience, focusing on the cooperativity of neurons in circuits, ensembles, representations and pathways, leading to sensation, perception, information processing, cognition and behavior. Course format includes lectures and discussion. Readings include selected textbook chapters and reviews as well as in-depth analysis of original literature. This is an introductory graduate level course that does not assume prior exposure to systems neuroscience beyond the level of N507/N601.

Prerequisites: N507 or N601.

Textbook(s): Kandel, Schwartz et al. 5th Ed. "Principles of Neural Science".

N627 Grant Writing Course in Neuroscience and Physiology

3 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: Spring

Course Description: The primary goal of the course is to teach grant writing, critical thinking, and experimental design skills using the current NIH format for predoctoral fellowships. The course is divided into 3 sections. The First section includes a general introduction to the NIH peer-review process and application materials and procedures. In section 2, students will develop their specific aims page through a series of interactive meetings with the course coordinators as well as peer review. In section 3, students will work closely with the course coordinators as well as their mentors to develop and refine the main research plan of the proposal based on their specific area of study. Upon completion, students who are eligible will be expected to submit their proposal for funding to the NIH or other appropriate funding agency.

Prerequisites: Second year standing or equivalent, N601, N629

Textbook(s): None

N628 Neurobiology of Addiction

2 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: By arrangement only

Course Description: Overview of the neuroanatomy and molecular neurobiology underlying addiction. Students will interactively learn and discuss the neurobiological basis of many drugs of abuse and addictive behavior.

Prerequisites: None.

Textbook(s): None.

N629 Scientific Writing in Neuroscience

1 Credit Hour

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: Fall

Course Description: This course is required in the second year for all students performing their thesis research in the Neuroscience program. The goal of the course is to develop writing skills, by providing practice and one-on - one instruction in scientific writing. There will be formal class meetings with the instructor for 90 minutes each week for the first part of the course (4 meetings). The student will read from the primary literature and write concise summaries and critiques of the papers. Student will revise the paper, with the direct guidance and final approval of the faculty member.

Prerequisites: First year core curriculum.

Textbook(s): None.

N630 Independent Study in Neuroscience

1 – 3 Variable Credit Hours

Course Coordinator(s):

Dr. Francesca Pignoni

Semester Offered: By arrangement only

Course Description: A tutorial course designed for graduate students in neuroscience that provides an in-depth look at a field of neuroscience research. Course will include: 1.) Literature survey, 2.) Seminar and/or lectures, 3.) In-depth critique of literature and/or experimental techniques. Fulfillment of the course requires a written report. The purpose of the course is to develop in-depth knowledge of a field of neuroscience research as a student continues to make progress towards his/her research goals.

Prerequisites: MBBH101, N601, A507, or N507.

Textbook(s): None.

N631 Topics in Neuroscience

1 Credit Hour

Course Coordinator(s):

Dr. Rick Matthews

Semester Offered: Fall

Course Description: For first year students only, this is a survey course of current research in neuroscience. Members of the Neuroscience Faculty will present specific subfields of neuroscience research focusing on major questions and recent progress. Course will combine a basic introductory lecture (focused on major questions and techniques) with a discussion session to go over a recent research paper. Students will be required to submit written questions for, and actively participate in, the discussion session. The purpose of the course is to familiarize incoming students with major research questions and experimental approaches in neuroscience research.

Prerequisites: None.

Textbook(s): None.

N635 Neurophysiology Methods

2 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: Fall

Course Description: This course will provide a concise and easy-to-understand guide on the most important contemporary neurophysiological techniques, their implementation, applications, and ways in which they can be combined and integrated with neuroscientific techniques. It is intended for second year graduate students with a basic neuroscience background to study cellular, synaptic, and circuit mechanisms of the brain functions in physiological and pathological conditions. Each topic area will provide a concise description of equipment, materials, methods, data management, and analysis. At the end of this course, the students will: 1) understand neurophysiological techniques regularly used by neuroscientists; 2) understand the implementation and applications of electrophysiology on brain functions at cellular, synapse, and system levels; 3) identify the major benefits and pitfalls of the neurophysiological methods.

Prerequisites: None.

Textbook(s): Robert P. Vertes and Robert Stackman, *Electrophysiological Recording Techniques*, and Ellen Covey and Matt Carter, *Basic Electrophysical Methods*.

N653 Topics in Cellular and Molecular Neurobiology

2 Credit Hours

Course Coordinator(s):

Dr. Brian Howell

Semester Offered: By arrangement only

Course Description: This course will discuss major issues in Molecular and Cellular Neurobiology, emphasizing contemporary approaches.

Prerequisites: First year core curriculum and N601.

Textbook(s): None.

N675 Research Rotations in Neuroscience

1-5 Variable Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: By arrangement only

Course Description: Methods of research used by the faculty are demonstrated. Problem design and research methods emphasized. Course deals with individualized laboratory experience. Topics agreed upon by student and faculty sponsor.

Prerequisites: None.

Textbook(s): None.

N700 Research in Neuroscience

Variable Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: Year-round

Course Description: Original dissertation research in Neuroscience under supervision of a Neuroscience faculty member and monitored by an advisory committee.

Prerequisites: None.

Textbook(s): None.

PHARMACOLOGY PROGRAM AND DEGREE REQUIREMENTS

CIP Code: 26.0705

This program awards:

- PhD in Pharmacology
- MS in Pharmacology

Current research in the Department of Pharmacology focuses on cancer biology, structure-based drug design, cell signaling, cardiovascular disease, neurodegeneration, stem cells, and the discovery, development and testing of novel therapeutics. This work is supported by external funding, particularly from NIH.

To continue this excellent tradition in research and teaching and to keep pace with ongoing changes in pharmacology, our department is enhancing its research strengths and expanding into new research areas.

PhD Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS612	Biomedical Sciences Lab Rotations (x3) OR
PHA653	Pharmacology Laboratory Rotations (x3)
GS637	Responsible Conduct of Scientific Research
PHA623	Grant Writing in Pharmacology
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
PHA610	Principles of Pharmacology
PHA645	Pharmacology Seminar

Electives:

PHA612	Cardiovascular Physiology and Pharmacology*
PHA615	Apoptosis and Cancer Pharmacology*
PHA618	Current Topics of Pharmacology*
PHA622	Principles and Practices of Drug Discovery and Development*

**All Pharmacology PhD students must take a minimum of 4 advanced Pharmacology course credits (including credit hours for PHA610).*

- Total 90 credit hours (a minimum of 30 Didactic Graduate Course credit hours and a minimum of 30 Research Graduate Course credit hours).
- Qualifying Examination – to be taken late summer of student's second year
- Dissertation Advisory Committee Meetings (minimum of one meeting every six months)
- Successful Dissertation Defense

MS Degree Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS637	Responsible Conduct of Scientific Research
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
PHA610	Principles of Pharmacology
PHA645	Pharmacology Seminar

Electives:

PHA612	Cardiovascular Physiology and Pharmacology*
PHA615	Apoptosis and Cancer Pharmacology*
PHA617	Methods of Pharmacology Research*
PHA618	Current Topics of Pharmacology
PHA622	Principles and Practices of Drug Discovery and Development*
PHA623	Grant Writing in Pharmacology

**All MS students are required to take minimum of 4 advanced Pharmacology course credits (including credit hours for PHA610). Students can take other elective courses offered by the Department of Pharmacology or by other Departments to fulfill the didactic course requirement. Also, it is suggested that students take Methods of Pharmacology Research (PHA617) in the first year (no more than 4 credits).*

- Total 30 credit hours (a minimum of 20 Didactic Graduate Course credit hours and a minimum of 10 Research Graduate Course credit hours).
- Successful Thesis Defense

PHARMACOLOGY COURSE DESCRIPTIONS

PHA610 Principles of Pharmacology

1 Credit Hour

Course Coordinator(s):

Dr. Richard Veenstra

Semester Offered: Fall

Course Description: This advanced course will cover and analyze the fundamental principles of Pharmacology at the cellular and molecular levels. Topics covered will be kinetics of drug distribution and elimination, as well as agonism, antagonism, cooperativity and desensitization. It will consist of a combination of graduate student-specific lectures and tutorials together with selected lectures from the Medical School Pharmacology course (PHA540). The course may be taken in conjunction with other Pharmacology modules. A minimum of two students must register for this course to be offered.

Prerequisites: First year core curriculum.

Textbook(s): None.

PHA612 Cardiovascular Physiology and Pharmacology

1 Credit Hour

Course Coordinator(s):

Dr. Arkadii Perzov

Semester Offered: Year-round

Course Description: This advanced course will cover cardiac anatomy and physiology, basic mechanisms of cardiac arrhythmias, methods of diagnostics and treatment of cardiac diseases, and the mechanisms of action of antiarrhythmic drugs. The course will be run in a small discussion group format. The group will meet once a week to discuss a set of 4 -5 topics formulated by the moderator. The students are expected to study the materials independently and be prepared to give a short presentation on any of the topics to the class as well as discuss it with other members of the group.

Prerequisites: First year core curriculum.

Textbook(s): None.

PHA615 Apoptosis and Cancer Pharmacology

2 Credit Hours

Course Coordinator(s):

Dr. M.Saeed Sheikh

Dr. Ying Huang

Semester Offered: Spring

Course Description: This advanced course will cover current concepts in cell death and cancer pharmacology, and will specifically address the molecular actions of anti-cancer agents with emphasis on death ligands/receptors, apoptotic machinery, tumor suppressor genes, oncogenes, molecular mechanisms of chemoprevention and anti-cancer drug resistance, novel anticancer drug targets and emerging anti-cancer therapies. It will consist of a combination of graduate student-specific lectures and tutorials.

Prerequisites: First year core curriculum.

Textbook(s): None.

PHA617 Methods of Pharmacology Research

Variable Credit Hours

Course Coordinator(s):

Dr. Juntao Luo

Semester Offered: By arrangement only

Course Description: Methods of research used by faculty are demonstrated. Problem design and research methods are emphasized.

Prerequisites: GS612.

Textbook(s): None.

PHA618 Current Topics in Pharmacology

1 Credit Hour

Course Coordinator(s):

Dr. Juntao Luo

Semester Offered: By arrangement only

Course Description: The purpose of this tutorial course is to develop a student's knowledge of Pharmacologic research as well as to provide an opportunity for focused study in areas of cell and molecular pharmacology not otherwise covered in the graduate curriculum. The course format may include selected readings, discussions with faculty, seminars, and lectures. Course content should be discussed with the faculty mentor prior to enrollment in the class, and a course outline with possible start and end dates should be prepared and approved by the Pharmacology Program Director.

Prerequisites: PHA610.

Textbook(s): None.

PHA622 Principles and Practices of Drug Discovery and Development

1 Credit Hour

Course Coordinator(s):

Dr. Hong Lu

Dr. Juntao Luo

Semester Offered: Fall

Course Description: The course objective is to help students understand the overall process of drug discovery and development, structure-based drug design, combinatorial chemistry and high throughput screening in drug discovery, in vitro drug screening - identification and optimization of lead compound, mouse models for drug development, early safety and efficacy assessments, pharmacokinetics/ toxicology (PK/TOX) studies in drug development, and nanotechnology in drug delivery. Students will be expected to read literatures and think critically about the objectives and experimental designs of the various stages of drug development.

Prerequisites: Course coordinator approval.

Textbook(s): None.

PHA623 Grant Writing in Pharmacology

3 Credit Hours

Course Coordinator(s):

Dr. Richard Wojcikiewicz

Semester Offered: Spring

Course Description: The primary goal is to teach critical thinking, organizational skills and proposal writing using the current NIH R21format. The course will be divided into 4 sections: (I) introductory sessions concerning the peer review process, application materials, the overall organization of the proposal, hypothesis development, and the setting of deadlines, (II) the development of Specific Aims and then the entire proposal in conjunction with thesis advisors (this will involve regular meetings and discussions between the student and advisor), (III) review and critiquing of the proposals by participating faculty and the class, (IV) revision of the proposal on the basis of critiques and completion of final version.

Prerequisites: First year core curriculum and declaration into Pharmacology department.

Textbook(s): None.

PHA645 Pharmacology Seminar

0 Credit Hours

Course Coordinator(s):

Dr. Juntao Luo

Semester Offered: Year-round

Course Description: Graduate students and faculty will meet every week during the academic year to participate in seminars. Seminars will be given by outside speakers and Departmental members, including Graduate Students who, after their first year, will be required to give one presentation per year. Grades will be assigned based on attendance and performance.

Prerequisites: None.

Textbook(s): None.

PHA653 Pharmacology Laboratory Rotations

Variable Credit Hours

Course Coordinator(s):

Dr. Juntao Luo

Semester Offered: By arrangement only

Course Description: Students learn methods of research used by the Pharmacology Faculty. Problem design and research methods are emphasized. Written report required at end of rotation.

Prerequisites: None.

Textbook(s): None.

PHA700 Research in Pharmacology

Variable Credit Hours

Course Coordinator(s):

Dr. Juntao Luo

Semester Offered: Year-round

Course Description: Original dissertation research in Pharmacology under the supervision of a Pharmacology Faculty member and monitored by an advisory committee.

Prerequisites: None.

Textbook(s): None.

PHYSIOLOGY PROGRAM AND DEGREE REQUIREMENTS

CIP Code: 26.0706

This program awards:

- PhD in Physiology*
- MS in Physiology*

**Not accepting students at this time.*

The major research in this department includes endocrinology, exercise science, neurophysiology, and pulmonary and sensory physiology.

Since a number of the Physiology faculty hold primary appointments in clinical departments, the Physiology program is an ideal vehicle for students looking to apply basic science research techniques to clinically relevant biomedical problems such as bone tumors, diabetes, osteoporosis, kidney disease and lung disease.

Experimental approaches range from studies on whole animals and isolated tissues to studies of cellular and molecular events.

Scientific inquiry may include the complex interactions of systems in the whole individual, the orchestration of processes integrating organ and cell function, and/or integration of molecular events within individual cells.

PhD Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS612	Biomedical Sciences Laboratory Rotations (x3)
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club
GS637	Responsible Conduct of Scientific Research
PHY627	Grant Writing Course in Neuroscience and Physiology
PHY659	Physiology Seminar

- Total 90 credit hours (a minimum of 30 Didactic Graduate Course credit hours and a minimum of 30 Research Graduate Course credit hours).
- Qualifying Examination to be scheduled at the end of the spring of the second year.
- Each student in the Physiology Graduate Program is required to attend the complete seminar series and to present a seminar to the members of the Program each year.
- Dissertation Advisory Committee Meetings (minimum of one meeting every six months).
- Successful Dissertation Defense

MS Requirements:

Required Graduate Courses:

GS604	Graduate Student Research Opportunities
GS616	Foundations of Molecular and Cellular Biology
MPHP602-002	Principles of Biostatistics
GS637	Responsible Conduct of Scientific Research
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club

- Total 30 credit hours (a minimum of 20 Didactic Graduate Course credit hours and a minimum of 10 Research Graduate Course credit hours).
- Successful Thesis Defense

PHYSIOLOGY COURSE DESCRIPTIONS

PHY603 Biomaterials and Medical Devices

2 Credit Hours

Course Coordinator(s):

Dr. Rick Matthews

Semester Offered: By arrangement only

Course Description: This course is designed to be an introduction to the field of biomaterials and medical devices. The basic material science of metals, ceramics, polymers, and biological materials used in medical applications will be presented. Major concepts will focus on structure-property relationships and the physical and mechanical properties of these important classes of materials.

Prerequisites: None.

Textbook(s): None.

PHY617 Methods of Physiology Research

Variable Credit Hours

Course Coordinator(s):

Dr. Rick Matthews

Semester Offered: By arrangement only

Course Description: Methods of research used by the faculty are demonstrated. Problem design and research methods are emphasized. Course deals with individualized laboratory experience. Topics agreed upon by student and faculty sponsor.

Prerequisites: GS612.

Textbook(s): None.

PHY620 Advanced Topics in Receptors and Cell Signaling

1 Credit Hour

Course Coordinator(s):

Dr. Brian Howell

Semester Offered: Fall

Course Description: Same as N620 above.

PHY627 Grant Writing Course in Neuroscience and Physiology

3 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: Spring

Course Description: Same as N627 above.

PHY652 Journal Club in Physiology

1 Credit Hour

Course Coordinator(s):

Dr. Rick Matthews

Semester Offered: By arrangement only

Course Description: This course is designed to be taken concurrently with Systems Physiology (PHA657), although it could also be taken one year later. It consists of six sessions, each lasting approximately two hours. Students will present and discuss assigned journal articles dealing with topics currently being discussed in the lecture course in Systems Physiology. Sessions will cover cardiovascular physiology (2), respiratory physiology (1), renal physiology (1), gastrointestinal physiology (1) and endocrine physiology (1).

Prerequisites: PHY657.

Textbook(s): None.

PHY658 Directed Individual Study in Physiological Research Methods

Variable Credit Hours

Course Coordinator(s):

Dr. Rick Matthews

Semester Offered: By arrangement only

Course Description: This is a special research training program designed to acquaint students with specific areas of research and/or the use of methods, techniques and instrumentation.

Prerequisites: Declaration in Neuroscience or Physiology.

Textbook(s): None.

PHY659 Physiology Seminar

1 Credit Hour

Course Coordinator(s):

Dr. Rick Matthews

Semester Offered: Year-round

Course Description: Graduate students and faculty will meet once every other week during the academic year for the purpose of discussing current topics in neuroscience and physiology and departmental research programs. Outside speakers also participate. Each graduate student is required to present a critical review of a topic in biology during a scheduled meeting.

Prerequisites: Declaration in Physiology.

Textbook(s): None.

PHY700 Research in Physiology

Variable Credit Hours

Course Coordinator(s):

Dr. Rick Matthews

Semester Offered: Year-round

Course Description: Independent research in preparation for dissertation requirement.

Prerequisites: None.

Textbook(s): None.

ADDITIONAL GRADUATE COURSES

GS628 Systems Biology of Genetics, Genomics and Proteomics

4 Credit Hours

Course Coordinator(s):

Dr. Frank Middleton

Semester Offered: Spring, odd years

Course Description: The goal of this course is to train graduate students in modern experimental and theoretical methods of performing systems level investigations that address fundamental and clinically-relevant questions in genetics, genomics and proteomics. The course is divided into 4 sections. Section 1 is an examination of the origins of living organisms, basic genome organization, the basis of genetic diversity, mitochondrial and yeast genetics, and genomic instability. Section 2 is an examination of human genetics, including linkage, association of quantitative trait analysis, as well as transcription factor analysis, epigenetics, microRNA analysis, and immunorepertoire analysis. Section 3 provides in-depth exposure in the use of next-generation sequencing and gene network analysis for monitoring gene expression, the fundamentals of proteomics and metabolomics and sequencing by mass spectrometry, as well as mouse genetics, pharmacogenetics, personalized medicine, and microbiome analysis. Section 4 concludes the course with students developing and presenting their own systems biology research project.

Prerequisites: GS616.

Textbook(s): None.

GS632 Biomolecular X-Ray Diffraction: Theoretical Basis and Experimental Procedures

4 Credit Hours

Course Coordinator(s):

Dr. Debashis Ghosh

Semester Offered: Fall, odd years

Course Description: An introduction to the theory and practices of X-ray diffraction and crystallographic methods applicable to the elucidation of structure-function relationships of biological molecules and interactions thereof. The course is designed to provide a comprehensive understanding of the basic principles through in- depth theoretical discussion, extensive problem solving and hands-on experimental and computational steps through the biomolecular structure solution process. Prerequisite: undergraduate (senior level) biochemistry, chemistry, physics or physical chemistry or permission of the instructor.

Prerequisites: None.

Textbook(s): None.

GS638 Teaching for the Basic Scientist

2 Credit Hours

Course Coordinator(s):

Dr. Rebecca Greenblatt

Semester Offered: Spring, odd years

Course Description: This course prepares the graduate student who desires to pursue an academic tract to teach by exploring the process for the design, delivery and assessment of any academic course for adult learners. The student will learn to write objectives and plan content as well as deliver content with an emphasis on active learning. The student will also learn appropriate assessment methods that fit the delivery and objectives of the course.

Prerequisites: None.

Textbook(s): None.

GS643 Introduction to Quality and Compliance for Biotechnology

3 Credit Hours

Course Coordinator(s):

Mr. Terrence Howell

Semester Offered: Fall

Course Description: This course provides an overview of the skills and knowledge needed to perform and oversee quality and regulatory compliance functions within the biotechnology industry. This introduction in Quality and Compliance for Biotechnology reviews Good Pharmaceuticals Industry Practice (GXP) principles, procedural guidelines, FDA, and other regulations and ethical considerations.

Prerequisites: None.

Textbook(s): None.

GS647 Nanocourses in Biomedical Sciences

0.5 Credit Hours

Course Coordinator(s):

Dean, College of Graduate Studies

Semester Offered: By arrangement only

Course Description: Nanocourses are short courses that meet for a total of ~7-8 hours and typically address a new or evolving area that is not covered by the standard graduate curriculum. The course could be given in a week or two days or even over 7 weeks. Typical nanocourses could involve new methodologies (super-resolution microscopy, microfluidics, proteomics) or could focus on a specific biological entity (exocyst) or could be practical (presenting scientific data using Photoshop and Illustrator). Course could include lecture, discussion, paper presentations, problem solving or other modalities. A full list of courses can be found at *http://upstate.edu/grad/curriculum/nanocourses.php*.

Prerequisites: None.

Textbook(s): None.

MD/PHD COURSES

(The courses below are unique to the MD/PhD program)

MDPH601 Research Design for Physician-Scientists

3 Credit Hours

Course Coordinator(s):

Dr. Amit Dhamoon

Semester Offered: Fall

Course Description: This course promotes the development of critical scientific writing important to the students' future career as physician-scientists. The student will gain experience in grantsmanship by writing and presenting an original hypothesis-based research proposal. Students will learn the essential features of scientific writing, with the emphasis on developing skills necessary for crafting an effective grant proposal.

Prerequisites: None.

Textbook(s): None.

MDPH602 MD/PhD Grand Rounds

Variable Credit Hours

Course Coordinator(s):

Dr. Amit Dhamoon

Semester Offered: Year-round

Course Description: The MD/PhD Grand Rounds course is required for all MD/PhD students. MSI and MSII students attend Grand Rounds, read assigned papers, and participate in discussion. Students in the PhD years will spend eight clinical hours per month. From each month's clinical experience the student will write up, in detail, a clinical case, reviewing the clinical scenarios, pathophysiology, pharmacology, etc. and also summarize recent advances or gaps in our knowledge with respect to clinical and translation research related to the specific disease and case report. The clinical mentor will review each month's write -up. Once per year, each student will present one of their clinical cases and discuss the chosen case within the context of the basic, clinical and translational research issues discussed in the relevant case report. The student presenter is also responsible for assigning relevant background papers of the Grand Rounds seminar and facilitating discussion. Students will be required to arrange a clinical mentor for each semester of their PhD training. To ensure a breadth of exposure, students will be required to select a minimum of two different clinical areas of experience during the course of their PhD training. MSIII and MSIV student participation is the same as students in the PhD years. Cases will be chosen from clerkships.

Prerequisites: None.

Textbook(s): None.

UPSTATE
MEDICAL UNIVERSITY

Department of Biochemistry and Molecular Biology

MS Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS616	Foundations of Molecular and Cellular Biology	4		
GS637	Responsible Conduct of Scientific Research	2		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
MPHP602-002	Principles of Biostatistics	3		
GS604	Graduate Student Research Opportunities	0		

Advanced Courses:

At least 3 credits of Advanced Biochemistry and Molecular Biology are required.

B665	Bioenergetics and Metabolism	2		
B647	Gene Expression and Epigenetics	2		
B664	Protein Sorting	1		
B666	Protein Structure Determination	2		
GS628	Systems Biology of Genetics Genomics & Proteomics	4		
GS632	Biomolecular X-Ray Diffraction	4		
PHA615	Apoptosis and Cancer Pharmacology	2		

2. Total Didactic Graduate Course (minimum of 20 credit hours): _____

3. MS Thesis Committee Meetings (minimum of two meetings per year): **Meeting Dates**

First Year: _____

_____

Second Year: _____

_____

4. Thesis Defense:

Date: _____

Committee Approved: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Biochemistry and Molecular Biology
PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS612	Biomedical Sciences Laboratory Rotations	6		
GS616	Foundations of Molecular and Cellular Biology	4		
GS637	Responsible Conduct of Scientific Research	2		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
B620	Biochemistry Seminars	0		
MPHP602-002	Principles of Biostatistics	3		
GS604	Graduate Student Research Opportunities	0		
B648	Research Design in Biochemistry & Molecular Biology	3		
B650	Scientific Writing	1		

Advanced Courses:

At least 6 credits of Advanced Biochemistry & Molecular Biology Courses are required. (Note: GS628 Systems Biology of Genetics, Genomics, and Proteomics, PHA615 Apoptosis and Cancer Pharmacology and GS632 Biomolecular X-ray Diffraction: Theoretical Basis and Experimental Procedures, are considered advanced Biochemistry & Molecular Biology courses for this purpose).

B665	Bioenergetics and Metabolism	2		
B647	Gene Expression and Epigenetics	2		
B664	Protein Sorting	1		
B666	Protein Structure Determination	2		
GS628	Systems Biology of Genetics Genomics & Proteomics	4		
GS632	Biomolecular X-Ray Diffraction	4		
PHA615	Apoptosis and Cancer Pharmacology	2		

2. Total Didactic Graduate Course (minimum of 30 credit hours)**:** _____

3. Qualifying Examination (to be scheduled before or during the summer following the student's second year)**:**

Graduate Program Committee Approval: _____

Examination Date and Results: _____

Continued on next page

4. Dissertation Committee Meetings and Department Research Talk

(minimum of two meetings per year):

	Meeting Dates	Letter Received
Third Year:		
Fourth Year:		
Fifth Year:		

5. Dissertation Defense:

Date: _____

Committee Approval: _____

UPSTATE MEDICAL UNIVERSITY

Department of Biochemistry and Molecular Biology
MD/PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS637	Responsible Conduct of Scientific Research	2		
B620	Biochemistry Seminars	0		
MDPH601	Research Design for Physician Scientists	3		

Advanced Courses:

At least 6 credits of Advanced Biochemistry & Molecular Biology Courses are required. (Note: GS628 Systems Biology of Genetics, Genomics, and Proteomics, PHA615 Apoptosis and Cancer Pharmacology and GS632 Biomolecular X-ray Diffraction: Theoretical Basis and Experimental Procedures, are considered advanced Biochemistry & Molecular Biology courses for this purpose).

B665	Bioenergetics and Metabolism	2		
B647	Gene Expression and Epigenetics	2		
B664	Protein Sorting	1		
B666	Protein Structure Determination	2		
GS628	Systems Biol. of Genetics, Genomics & Proteomics	4		
GS632	Biomolecular X-Ray Diffraction	4		
PHA615	Apoptosis and Cancer Pharmacology	2		

2. Qualifying Examination (to be completed at the end of year 1):

Graduate Program Committee Approval: _____

Examination Date and Results: _____

Continued on next page

4. Dissertation Committee Meetings and Department Research Talk

(minimum of two meetings per year):

	Meeting Dates	Letter Received
Third Year:		
Fourth Year:		
Fifth Year:		

5. Dissertation Defense:

Date: _____

Committee Approval: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Cell and Developmental Biology
MS Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS616	Foundations of Molecular and Cellular Biology	4		
GS637	Responsible Conduct of Scientific Research	2		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
MPHP602-002	Principles of Biostatistics	3		
GS604	Graduate Student Research Opportunities	0		
A624	Seminar in Cell and Developmental Biology	0		

Advanced Courses:				
GS628	Systems Biology of Genetics, Genomics & Proteomics	4		
GS647-002	Nanocourse: Introduction to Flow Cytometry	0.5		
GS647-012	Nanocourse: Protein Expression & Purification	0.5		
GS647-020	Nanocourse: Introduction to Light Microscopy	0.5		
A507	Introduction to Neuroscience	3		
A613	Graduate Cellular Anatomy	2		
A614	Contemp. Cellular, Molecular & Developmental Biology	3		
A617	Methods of Cell & Developmental Research	Variable		
A622	Developmental Biology	2		
B666	Protein Structure Determination	2		
PHA615	Apoptosis and Cancer Pharmacology	2		
PHA621	Cancer Biology and Therapeutics	1		

2. Total Didactic Graduate Course (minimum of 20 credit hours): _____

3. A624 Department Seminar (attendance required at all seminars): _____

4. Thesis Committee Meetings (minimum of one meeting per year):

Members: Sponsor: _____ **Dates:** _____

Chair: _____ _____

_____ _____

5. Thesis Defense:

Date: _____

Committee Approved: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Cell and Developmental Biology
PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS604	Graduate Student Research Opportunities	0		
GS612	Biomedical Sciences Laboratory Rotations	6		
GS616	Foundations of Molecular and Cellular Biology	4		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
GS637	Responsible Conduct of Scientific Research	2		
MPHP602-002	Principles of Biostatistics	3		
A623	Grant Writing in Cell and Developmental Biology	2		
A624	Seminar in Cell and Developmental Biology	0		
Advanced Courses:				
GS628	Systems Biology of Genetics, Genomics & Proteomics	4		
GS647-002	Nanocourse: Introduction to Flow Cytometry	0.5		
GS647-012	Nanocourse: Protein Expression & Purification	0.5		
GS647-020	Nanocourse: Introduction to Light Microscopy	0.5		
A507	Introduction to Neuroscience	3		
A613	Graduate Cellular Anatomy	2		
A614	Contemp. Cellular, Molecular & Developmental Biology	3		
A617	Methods of Cell & Developmental Research	Variable		
A622	Developmental Biology	2		
B666	Protein Structure Determination	2		
PHA615	Apoptosis and Cancer Pharmacology	2		
PHA621	Cancer Biology and Therapeutics	1		

2. Total Didactic Graduate Course (minimum of 30 credit hours): _____

3. A624 Department Seminar (attendance required at all seminars): _____

4. Qualifying Examination (to be completed by the end of the summer of the second year)**:**

Graduate Program Committee Approval: _____

Examination Date and Results: _____

5. A624 30 Minute Departmental Seminar (to be presented within 6 mos. of QE): _____

Continued on next page

6. Thesis Advisory Committee Meetings (minimum of one meeting every 6 months):

Members:		**Dates:**
(minimum 3 faculty members, including sponsor)		

7. Dissertation Committee (minimum 5 faculty members including Thesis Advisory Committee Members, maximum 3 members from the Department of Cell and Developmental Biology and at least one member from outside SUNY Upstate.

Members:

8. Dissertation Defense:

Date: _____

Committee Approval: _____

UPSTATE MEDICAL UNIVERSITY

Department of Cell and Developmental Biology
MD/PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS637	Responsible Conduct of Scientific Research	2		
A624	Biochemistry Seminars	0		
MDPH601	Research Design for Physician Scientists	3		

Advanced Courses:

There are no formal advanced didactic course requirements. Example of relevant courses that can be taken are list below.

GS628	Systems Biology of Genetics, Genomics & Proteomics	4		
GS647-002	Nanocourse: Introduction to Flow Cytometry	0.5		
GS647-012	Nanocourse: Protein Expression & Purification	0.5		
GS647-020	Nanocourse: Introduction to Light Microscopy	0.5		
A507	Introduction to Neuroscience	3		
A613	Graduate Cellular Anatomy	2		
A614	Contemp. Cellular, Molecular & Developmental Biology	3		
A617	Methods of Cell & Developmental Research	Variable		
A622	Developmental Biology	2		
B666	Protein Structure Determination	2		
PHA615	Apoptosis and Cancer Pharmacology	2		
PHA621	Cancer Biology and Therapeutics	1		

2. Qualifying Examination (to be completed at the end of year 1):

Graduate Program Committee Approval: _____

Examination Date and Results: _____

3. A624 30 min Departmental Seminar (to be presented within 6 mo. of qualifying exam): _____

Continued on next page

4. Dissertation Committee Meetings and Department Research Talk

(minimum of two meetings per year):

	Meeting Dates	Letter Received
Third Year:		
Fourth Year:		
Fifth Year:		

5. Dissertation Defense:

Date: _____

Committee Approval: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Microbiology and Immunology

MS Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS604	Graduate Student Research Opportunities	0		
GS616	Foundations of Molecular and Cellular Biology	4		
GS637	Responsible Conduct of Scientific Research	2		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
MPHP602-002	Principles of Biostatistics	3		
M627	Intro to Virology	2		
M628	Intro to Immunology	2		
*M616	Current Concepts in Virology	3		
*M610	Problems in Cell & Molecular Immunology	3		
M630	Seminar in Microbiology & Immunology	1 x 1		
M623	Directed Individual Study in Micro. & Immuno. Research	Variable		

**Either M616 or M610 is required.*

2. Degree Conferral:

Date: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Microbiology and Immunology
PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
First and Second Year:				
GS604	Graduate Student Research Opportunities	0		
GS612	Biomedical Sciences Laboratory Rotations	6		
GS616	Foundations of Molecular and Cellular Biology	4		
GS637	Responsible Conduct of Scientific Research	2		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
MPHP602-002	Principles of Biostatistics	3		
M627	Intro to Virology	2		
M628	Intro to Immunology	2		
*M616	Current Concepts in Virology	3		
*M610	Problems in Cell & Molecular Immunology	3		
M609	Grant Writing in Microbiology & Immunology	3		
M630	Seminar in Microbiology & Immunology	1 x 1		
M623	Directed Individual Study in Micro. & Immuno. Research	Variable		
Third and Fourth Year:				
M700	Research in Microbiology & Immunology			
M630	Seminar in Microbiology & Immunology	1 ea. sem.		

Each student will assist in the Medical Microbiology laboratory (second, third, and possibly fourth, not final thesis year).

**Students must take either 6 credits of M616 or M610 or 3 credits of one of these advanced courses, plus 3 credits of another advanced course offered by College of Graduate Studies degree-granting programs.*

2. Qualifying Examination (to be completed by the end of the summer of the second year):

Graduate Program Committee Approval: _____

Examination Date and Results: _____

Committee Members:

Chair _____

_____

_____

_____

_____

Continued on next page.

3. Dissertation Advisory Committee (minimum of one meeting every six months):

Members: _____

5 members, but no more than 3 from the same department

_____

_____

_____

_____

_____

Meeting Dates

Third Year: _____ _____

Fourth Year: _____ _____

Fifth Year: _____ _____

Sixth Year: _____ _____

4. Submission of First-Author (or Co-First-Author) Research Paper (must be submitted prior to Dissertation Defense):

Journal Submitted to: _____

Date Submitted: _____

Current Status: _____

5. Dissertation Defense Committee:

Members: _____

5 members, plus 1 off-campus member

_____

_____

_____

_____

_____

Date: _____

Committee Approval: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Microbiology and Immunology
MD/PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS637	Responsible Conduct of Scientific Research	2		
MPHP602-002	Principles of Biostatistics	3		
*M616	Current Concepts in Virology	3		
*M610	Problems in Cell & Molecular Immunology	3		
M630	Seminar in Microbiology & Immunology	2 x 1		
M700	Research in Microbiology & Immunology	Variable		

**Students must take either 6 credits of M616 or M610 or 3 credits of one of these advanced courses, plus 3 credits of another advanced course offered by College of Graduate Studies degree-granting programs.*

2. Qualifying Examination (to be completed by the end of the summer of the second year):

Graduate Program Committee Approval: _____

Examination Date and Results: _____

Committee Members:

Chair _____

_____

_____

_____

_____

Continued on next page.

3. Dissertation Advisory Committee (minimum of one meeting every six months):

Members: _____

_____

5 members, but no more than 3 from the same department _____

_____

_____

_____

Meeting Dates

Third Year: _____ _____

Fourth Year: _____ _____

Fifth Year: _____ _____

Sixth Year: _____ _____

4. Submission of First-Author (or Co-First-Author) Research Paper (must be submitted prior to Dissertation Defense):

Journal Submitted to: _____

Date Submitted: _____

Current Status: _____

5. Dissertation Defense Committee:

Members: _____

5 members, plus 1 off-campus member _____

_____

_____

_____

_____

Date: _____

Committee Approval: _____

UPSTATE
MEDICAL UNIVERSITY

Neuroscience Program
PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS612	Biomedical Sciences Laboratory Rotations	6		
GS604	Graduate Student Research Opportunities	0		
MPHP602-002	Principles of Biostatistics	3		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
GS637	Responsible Conduct of Scientific Research	2		
GS616	Foundations of Molecular and Cellular Biology	4		
*N507	Intro to Neuroscience	3		
*N601	Neuroscience	3		
N629	Scientific Writing in Neuroscience	1		
N627	Grant Writing in Neuroscience	3		

**Either N507 or N601 is required.*

Elective Courses:				
N610	Topics in Developmental Neurobiology	2		
N616	Topics in Vision Research I	3		
N617	Methods in Neuroscience Research	2		
N618	Topics in Vision Research II	3		
N620	Advanced Topics in Receptors & Cell Signaling	1		
N621	Neuroanatomy Lab	2		
N628	Neurobiology of Addiction	2		
N630	Independent Studies in Neuroscience (1-3 credits)	Variable		
*N631	Topics in Neuroscience	1		
N635	Neurophysiology Methods	2		
N653	Topics in Cellular and Molecular Neurobiology	2		
N623	Systems Neuroscience	3		

**Only open to 1st year students-Fall, Weeks 8-14.*

2. Total Didactic Graduate Course (minimum of 30 credit hours): _____

3. Department Seminar Series (attendance required at all seminars): _____

4. Presentations (students are required to present once a year): _____

Continued on next page.

5. Qualifying Examination (to be completed by the end of the summer of the second year)**:**

Graduate Program Committee Approval: _____

Examination Date and Results: _____

6. Dissertation Advisory Committee Meetings (minimum of one meeting every 6 months):

Members:		**Dates:**	
(minimum 3 faculty members, including sponsor)	_____		_____
	_____		_____
	_____		_____

7. Dissertation Defense:

Date: _____

Committee Approval: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Pharmacology
MS Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS604	Graduate Student Research Opportunities	0		
GS616	Foundations of Molecular and Cellular Biology	4		
GS637	Responsible Conduct of Scientific Research	2		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
MPHP602-002	Principles of Biostatistics	3		
PHA610	Principles of Pharmacology	1		
PHA645	Pharmacology Seminar (one/academic year)	0		
Elective Courses:				
PHA617	Methods of Pharmacology Research	2		
*PHA612	Cardiovascular Physiology and Pharmacology	1		
*PHA615	Apoptosis and Cancer Pharmacology	2		
*PHA618	Current Topics in Pharmacology	1		
*PHA622	Principles and Practices of Drug Discovery and Dev.	1		
PHA623	Grant Writing in Pharmacology	3		

**Students are required to take a minimum of 4 Advanced Pharmacology course credits (including PHA610).*

2. Total Didactic Graduate Course (minimum of 20 credits): _____

3. Research Credits (minimum of 10 research credits):

PHA700	Research in Pharmacology	_____	_____	_____

UPSTATE
MEDICAL UNIVERSITY

Department of Pharmacology
PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS616	Foundations of Molecular and Cellular Biology	4		
GS637	Responsible Conduct of Scientific Research	2		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
MPHP602-002	Principles of Biostatistics	3		
GS612	Biomedical Sciences Lab Rotations	6		
GS604	Graduate Student Research Opportunities	0		
PHA610	Principles of Pharmacology	1		
PHA645	Pharmacology Seminar (one/academic year)	0		
PHA623	Grant Writing in Pharmacology	3		
Elective Courses:				
*PHA612	Cardiovascular Physiology and Pharmacology	1		
*PHA615	Apoptosis and Cancer Pharmacology	2		
*PHA618	Current Topics in Pharmacology	1		
*PHA622	Principles and Practices of Drug Discovery and Development	1		

**Students are required to take a minimum of 4 Advanced Pharmacology course credits (including PHA610).*

2. Total Didactic Graduate Courses (minimum of 30 credits): _____

3. Qualifying Examination (to be scheduled before or during the summer following the student's second year)**:**

Graduate Program Committee Approval: _____

Examination Date and Results: _____

Continue on next page.

4. Dissertation Committee Meetings

(minimum of one meeting per year):

	Meeting Dates	Letter Received
Third Year:		
Fourth Year:		
Fifth Year:		

5. Dissertation Defense:

Date: _____

Committee Approval: _____

UPSTATE
MEDICAL UNIVERSITY

Department of Pharmacology
MD/PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS637	Responsible Conduct of Scientific Research	2		
PHA645	Pharmacology Seminars	0		
MDPH601	Research Design for Physician Scientists	3		

Advanced Courses:				
*PHA610	Principles of Pharmacology	1		
PHA612	Cardiovascular Physiology and Pharmacology	1		
PHA615	Apoptosis and Cancer Pharmacology	2		
PHA618	Current Topics in Pharmacology	1		
PHA622	Principles and Practices of Drug Discovery and Development	1		

**Attendance of MS2 PK/PD lectures in PHA610 can be waived, and 1 credit will be granted upon completion of the rest of lectures and course requirements.*

All Pharmacology MD/PhD students must take a minimum of 6 credits of advanced courses chosen from the Pharmacology Program or other Graduate Programs or Nanocourses in College of Graduate Studies

2. Qualifying Examination (to be completed at the end of year 1):

Graduate Program Committee Approval: _____

Examination Date and Results: _____

Continued on next page

4. Dissertation Committee Meetings and Department Research Talk

(minimum of two meetings per year):

	Meeting Dates	Letter Received
Third Year:		
Fourth Year:		
Fifth Year:		

5. Dissertation Defense:

Date: _____

Committee Approval: _____

UPSTATE
MEDICAL UNIVERSITY

Physiology Program
PhD Degree Requirements Checklist

Student Name: _____ Semester Entered: _____

1. Required Graduate Courses:		Credit Hours	Year Completed	Grade
GS616	Foundations of Molecular and Cellular Biology	4		
MPHP602-002	Principles of Biostatistics	3		
GS604	Graduate Student Research Opportunities	0		
GS892	Introduction to the Presentation and Analysis of Scientific Literature: Journal Club	1		
GS637	Responsible Conduct of Scientific Research	2		
GS612	Biomedical Sciences Laboratory Rotations	6		
PHY627	Grant Writing in Neuroscience and Physiology	3		
PHY659	Physiology Seminar	1		

2. Advanced Courses:

Specialty courses selected to support and enrich the student's research area.

2. Total Didactic Graduate Courses (minimum of 30 credits): _____

3. Qualifying Examination (to be scheduled before or during the summer following the student's second year)**:**

Graduate Program Committee Approval: _____

Examination Date and Results: _____

4. Department Seminar Series (present each year and at oral defense): _____

Continue on next page.

5. Dissertation Committee Meetings

(minimum of one meeting per year):

	Meeting Dates	Letter Received
Third Year:		
Fourth Year:		
Fifth Year:		

6. Dissertation Defense:

Date: _____

Committee Approval: _____

College of Graduate Studies

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