

**School of Graduate and  
Postdoctoral Studies  
ACADEMIC CATALOGUE 2009 - 2010**





## **SCHOOL OF GRADUATE AND POSTDOCTORAL STUDIES**

### **Academic Catalogue 2009 – 2010**

Rosalind Franklin University of Medicine and Science and the School of Graduate and Postdoctoral Studies reserve the right to change, at any time and without notice, their requirements, regulations, course and program offerings, fees, charges, and other matters addressed in this catalogue. RFUMS must reserve the right to modify or terminate programs described herein. However, modification of program requirements will not adversely affect those students already enrolled in a program, nor will termination of a program affect anything other than the closure of admission thereto.

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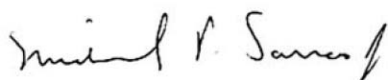
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*Dear Prospective Student,*

*The School of Graduate and Postdoctoral Studies at Rosalind Franklin University has a proud tradition of training students in the biomedical sciences. With the ongoing evolution of Rosalind Franklin University of Medicine and Science, the graduate school looks forward to an expansion of its research and education programs. Current research programs span from structural biology of proteins at the atomic level to mechanistic analysis of higher brain level functions. We hope that you will be inspired to join us in this exciting new phase of our existence, and be part of our long legacy of discovery and educational excellence.*

*Sincerely,*



*Michael P. Sarras, Jr., PhD*

*Dean and*

*Vice President for Research*

## HISTORY

Rosalind Franklin University of Medicine and Science is a four-college University, that was originally built around the Chicago Medical School (CMS), which has been educating physicians and furthering biomedical research for 95 years. From the first days in 1912, the physician and citizen founders of CMS aimed to establish a combined medical school and hospital where men and women could study medicine at night, a common practice at the time. The School's noteworthy period of development took place under the direction of John J. Sheinin, MD, PhD, DSc, who served as dean and president from 1932 to 1966. It was during his administration that CMS successfully met the challenges arising from the revolutionary restructuring of American medical education following the Flexner Report.

In 1930, the Medical School moved to what was to become one of the world's largest aggregations of medical facilities. Located just west of downtown Chicago, this complex contained three medical schools, seven hospitals, colleges of dentistry, pharmacy and nursing, and two undergraduate universities. CMS occupied an 11-story facility in the renowned research and educational center.

In 1980, the University relocated to its current campus in North Chicago, IL, adjacent to the North Chicago Veterans Affairs Medical Center and Naval Station Great Lakes. In 1993, the institution was renamed for its long time leader and Chairman of the Board of Trustees, Mr. Herman M. Finch. The University of Health Sciences/ The Chicago Medical School, granted full accreditation by the North Central Association of Colleges and Schools in 1980, represented one of the first educational institutions in the country devoted exclusively to educating men and women for a broad range of professional careers in health care and research. In 2001, The Dr. William M. Scholl College of Podiatric Medicine (established in 1912) became part of the University structure, which now comprises four colleges. On January 27, 2004, the University publicly announced its intent to change its name to Rosalind Franklin University of Medicine and Science, in honor of Rosalind Franklin, PhD, a pioneer in the field of DNA research. The name change became legal on March 1, 2004, at which time the School of Related Health Sciences also changed its name to College of Health Professions.

In addition to the name change and the announcement of several new strategic initiatives, the University is currently in the midst of profound physical growth. In October 2002, the University opened its Health Sciences Building, a 140,000-square-foot state-of-the-art facility that houses laboratories, auditoriums, classrooms, departmental offices, a student union, the Feet First Exhibition, University bookstore, recreational game room, exercise facility, and a café. The University became a residential campus for the first time in its history when three student housing facilities, totaling 180 apartments, opened in July 2003.

The University's Basic Sciences Building is a 400,000-square-foot facility that houses a 52,000-square-foot Library and The Daniel Solomon, MD, and Mary Ann Solomon Learning Resource Center, as well as administrative offices, classrooms, auditoriums, basic science departments, research and teaching laboratories, and dining areas.

Dr. Rosalind Franklin, through her pioneering work in the science of life and her unflagging perseverance, serves as a role model for our faculty and students, and represents the future of biomedical science and integrated health care. Her history mirrors our own in many profound ways, marked by dedication to discovery even in the midst of difficult times. Upon that history, her legacy guides the future of the University itself.

After 95 years of excellence in healthcare education, Rosalind Franklin University of Medicine and Science has only just begun to write its history. We hope you will join us in creating bold visions for an ambitious future. To learn more about Dr. Rosalind Franklin and the University's dedication to her legacy, visit [www.lifeindiscovery.com](http://www.lifeindiscovery.com).

## MISSION

The School of Graduate and Postdoctoral Studies was established to provide graduate-level education to meet the need for highly qualified biomedical teachers and research workers in the rapidly expanding health care field. Goals of the school have been enlarged to provide graduate education for specialized clinical and administrative services in health care. Graduate School programs are designed to prepare a student for a lifetime of scholarly pursuits in life sciences teaching, research, administration and care. This includes:

- Training for a career in basic biomedical research, which may be combined with teaching in medical or their health professions.
- Training for an investigative, teaching and clinical care career in the health sciences.
- Preparation for administration in institutions concerned with health care, planning and research.
- Provision of opportunities for practicing health professionals to keep abreast of new developments, learn new methodologies, or gain additional research experiences.

## EQUAL OPPORTUNITY

It is the policy of Rosalind Franklin University of Medicine and Science not to discriminate on the basis of race, sex, sexual orientation, color, creed, religion, national origin, disability or age in admissions or employment or in any programs or activities. It is the University's intent to comply with applicable statutes and regulations, including Title IX of the 1972 Education Amendments and Section 504 of the Rehabilitation Act of 1973. Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990 both prohibit discrimination against individuals with disabilities by mandating a provision of reasonable accommodations to make limitations to what services can be provided. It is the University's goal to assist students in developing their potential in light of what is feasible and reasonable under the law. Refer to the [RFUMS Student Handbook](#) for Educational Opportunity Policies and Procedures.

## ACCREDITATION

Rosalind Franklin University of Medicine and Science receives its degree-granting authority from the Illinois Board of Higher Education and is accredited through the North Central Association of Colleges and Schools.

North Central Association of Colleges and Schools  
Higher Learning Commission  
30 North LaSalle Street, Suite 2400  
800.621.7440  
312.263.0456



## LOCATION

The School of Graduate and Postdoctoral Studies is located on the campus of Rosalind Franklin University of Medicine and Science, at 3333 Green Bay Road, North Chicago, IL 60064. The University is situated in the northern suburbs of Chicago, with easy access to downtown Chicago and the surrounding areas by car or public transportation.

## CLASSIFICATION OF STUDENTS IN RELATION TO FIELDS OF STUDY

Applicants are admitted to the School of Graduate and Postdoctoral Studies in one of four categories: Graduate Student, Combined Degree Student (MD/Ph.D., or DPM/Ph.D.), Faculty Doctoral Ph.D. Student, or the Student at Large.

### Graduate Student

This student intends to seek either an MS or Ph.D. degree and pursues no other academic goal until degree requirements are completed. Further, the student has been judged by the School of Graduate and Postdoctoral Studies to have met the admissions requirements and to be qualified to pursue a graduate degree. The graduate student is expected to maintain all performance requirements of the School of Graduate and Postdoctoral Studies as well as any special requirements of the department for the duration of their graduate education.

### Combined MD/Graduate Student

- **MD/Ph.D.** This student pursues a combined degree and has been judged by the admission committees of both the graduate and medical schools to have met their respective admission requirements. The program is designed for individuals who are strongly motivated to have a career in academic medicine and research. Application may be made simultaneously to both schools or after the completion of the first year of medical education at the Chicago Medical School.
- **DPM/Ph.D.** The program is designed for individuals who are strongly motivated to have a career in academic medicine and research. Application may be made only after completion of the first year of podiatric medical education at Dr. William M. Scholl College of Podiatric Medicine. After studying for two years in the DPM program at RFUMS, DPM/Ph.D. students pursue their Ph.D. through a funded program before finishing their third- and fourth-year DPM clinical rotations. In the Ph.D. phase of the program, students are Mentored by experienced primary investigators and train in cutting-edge laboratories. The Ph.D. phase of the program must be completed before the student can return to their DPM studies.

### Faculty Doctoral Program

This program is designed for individuals who are full-time, salaried faculty members at RFUMS, who are qualified to pursue a Ph.D. in biomedical sciences within the IGPBS, while maintaining a faculty appointment within their home department. The graduate student in this program is expected to maintain all performance requirements of the School of Graduate and Postdoctoral Studies (SGPS), as well as any special requirements of the Faculty Doctoral Program and the Research Department for the duration of their graduate education.

## Student-at-Large

The student-at-large is an enrollment status reserved for non-degree seeking applicants who wish to take less than one year's worth of coursework at RFUMS, and who do not intend to enroll in a RFUMS degree program at the conclusion of that year. Use of this student type is rare and may be used for the purpose of bypassing deadlines, materials, or academic qualifications. The short-term educational goals for the enrollment period are agreed upon as a condition for admission as a student-at-large.

## ADMISSION

Prospective graduate school applicants should discuss their educational and career interests with a departmental chair and/or the Dean before applying.

*This section describes only the procedures and minimum requirements for admission to the Graduate School. It should be noted that some departments may have additional specific requirements for admission. Prospective applicants are urged to review these requirements in the individual department's section in this catalogue. Candidates are considered for admission without regard for disabilities, as required under the Americans with Disabilities Act and related legislation. However, the Graduate School has determined a series of abilities and skills that are required of all students. These Technical Standards are detailed in the [Graduate School Handbook](#).*

## APPLICATION PROCEDURES

Information about completing an application is available from:

Office of Graduate Admissions (IGPBS)

Rosalind Franklin University of Medicine and Science

3333 Green Bay Road North Chicago, Illinois 60064 Telephone: 847-578-3209

Application forms are available at: <http://www.rosalindfranklin.edu/tabid/1655/Default.aspx>

Completed applications should be returned **only** to the Office of Graduate Admissions (IGPBS Coordinator).

The following materials are required to complete an application as a degree candidate to the School of Graduate and Postdoctoral Studies:

1. Completed application form and transcripts from all colleges previously attended. International credentials submitted for certain programs may need to be evaluated for U.S. equivalency.
2. Current scores for the GRE (Graduate Record Examination). The subject score may be required by some Departments. (Not required for Faculty Doctoral Program)
3. Three letters of recommendation from persons involved in the student's previous educational or work experience, whichever was more extensive and recent.
4. A personal interview is recommended when possible. When an interview is not possible, the requirement may be waived and emphasis is placed, instead, on personal references. The interview cannot be waived, however, for students at large and combined degree students.
5. Proficiency in both written and verbal English language skills is required. A valid Test of English as a Foreign Language (TOEFL) and Test of Written English (TWE) or Computer Based TOEFL (CBT) is required of any international applicant from a country in which English is not the native language. Some

programs require a Test of Spoken English (TSE). These requirements may be waived for applicants who have been studying, full-time, at a United States institution for two consecutive years. A financial statement for international students, with supporting documentation, is required of all foreign applicants. (Not required for Faculty Doctoral Program).

6. (For Faculty Doctoral Program only – You must submit a letter from the Chair and/or Dean of the Department in which you hold your primary appointment. This letter must indicate their support for your pursuit of the Ph.D. degree completion by providing you with the time, relief of duties, alternate schedule, etc. (within reason)
7. Faculty Doctoral Program Only - Additional Documentation:
  - Professional CV
  - Outline of your research experience, including a chronological list of all publications or abstracts on which your name appears (title, date and all contributing author information is required).
  - One-page personal essay describing your motivation, career goal, and reasons for pursuing graduate studies at RFUMS. Include your anticipated department enhancement as a result of pursuing this degree.
  - Well-delineated research question or hypothesis that you plan to pursue during your course of study.

### **TRANSFER APPLICATIONS**

Students wishing to transfer from an external doctoral program into a doctoral program in the School of Graduate and Postdoctoral Studies may apply for a transfer with advanced standing. However, all aspects of the student's academic accomplishments will be reviewed to determine whether the candidate fulfills the requirements of SGPS. These applications are evaluated by the IGPBS Advisory Board on a case-by-case basis.

### **HOW DECISIONS ARE MADE CONCERNING AN APPLICATION**

Once an application for admission as a regular student is complete, the Admissions Office reviews the credentials and forwards them to the Graduate School Admissions Committee. The Committee submits its recommendation to the Dean. Those applications that are found acceptable by the Committee are forwarded to the appropriate department for evaluation, since individual departments may have additional requirements for admission. The department reviews the application and makes its recommendation to the Dean. **Notice of acceptance is issued only from the Office of the Dean.**

A candidate for Student-at-Large status not seeking a degree must request permission to apply from the department of interest. The department will develop a statement of objectives for the course work the student seeks to complete and set performance standards that the student will be expected to meet. Once approved by the Dean, these standards and objectives constitute the conditions under which a student is admitted as a "student-at-large". Applications from students who are degree candidates are reviewed by the Graduate School Admissions Committee as well as the department chair. These candidates may be accepted as special students with specific academic parameters if their level of academic achievement is not consistent with minimum SGPS criteria. The parameters set for these students will be used to evaluate their candidacy as a regular student after a predetermined number of quarters have been completed.

### **SECURING INFORMATION CONCERNING THE STATUS OF AN INDIVIDUAL APPLICATION**

The Admissions Office is glad to provide the applicant with information about the status of their application. In addition, the Office periodically notifies the applicant concerning items missing from their application.

Once an application is complete, it is forwarded to the appropriate University and Departmental admissions committees. Although the University cannot predict when a particular application will be decided upon, the applicant is notified of a decision as soon as possible. Applicant information is not released to third parties outside of the University admissions process without the applicant's written permission.

### **MINIMUM REQUIREMENTS FOR ADMISSION TO THE SCHOOL OF GRADUATE AND POSTDOCTORAL STUDIES**

Candidates for admission must have a bachelor's degree or its equivalent from an accredited college or university. Applicants are selected on the basis of previous academic work, adequate preparation in the field of proposed graduate study (as determined by the graduate faculty in that field), grade point average, satisfactory scores on the required examinations, recommendations from persons involved in the student's previous educational and work experience, a personal interview whenever possible and such other considerations that the applicable University and departmental admissions committee deem appropriate. When an interview is not feasible (as in the case of students in foreign countries), emphasis is placed on letters of recommendation.

### **WHAT ADMISSIONS COMMITTEES LOOK FOR IN A SUCCESSFUL APPLICANT**

***NOTE:** Departmental criteria for successful applicants are discussed in the appropriate departmental section of this catalogue.*

In general, the graduate school's admissions committee considers criteria it deems appropriate in recommending applicants for admission. It looks for, among other things, the following demonstrated or potential characteristics in applicants it recommends for admission:

1. Evidence that the applicant can meet the scholastic requirements of the graduate school on the basis of past academic performances.
2. A high level of academic learning, especially a strong aptitude for abstract thought and conceptualization.
3. Capacity for conducting well-organized, independent scientific investigations.
4. Ability to cope successfully with the academic research and/or clinical performance required in a graduate school curriculum.
5. Motivation to make a lifetime commitment to academic study, scientific research, health administration, or clinical service.
6. Commitment to the highest standards of ethical and professional behavior.

### **MINIMUM REQUIREMENTS FOR ADMISSION AS STUDENT-AT-LARGE**

To be considered for admission as a special student, the applicant should:

1. Hold at least a bachelor's degree or its equivalent from an accredited college or university. A transcript from the institution where the applicant received the BS degree is required.
2. State clearly the objective the applicant seeks to achieve by completing, successfully, the special course work.
3. The TOEFL and TWE is required if you are a foreign applicant who is from a country where English is not the primary language and have not attended a United States university/college for two consecutive years.

### **CONDITIONAL ACCEPTANCE**

In some cases, a conditional acceptance may be offered for one of the degree-seeking programs of the University. Acceptance conditions could include items such as verification of materials, successful completion of external coursework or exams, or program performance benchmarks in the program to which the person has been accepted. In all cases, the conditions and deadline for meeting the conditions will be clearly articulated in the acceptance letter for the program.

### **WHAT ADMISSIONS COMMITTEES LOOK FOR IN A SUCCESSFUL STUDENT-AT-LARGE**

In general, the Dean, the appropriate departmental chairs, and admissions committees consider criteria they deem important in deciding whether to admit an applicant as a special student. Among the criteria they look for are the following:

1. Evidence that the desired educational objective can realistically be achieved.
2. Evidence that the academic performance criteria chosen by the applicant realistically reflect the educational objective sought. (For example, if the objective of the special educational experience is to secure admission to a graduate school, then the criterion for academic performance should be at least a "B" average for a full academic load.)
3. A maximum of one academic year in the special student status is permitted
4. A special student who intends to be a degree candidate must enroll for at least 10-12 units per quarter to permit a judgment of the candidate's ability to carry a full course load successfully.
5. For students assigned to a department, their status must be reviewed at the end of the year by the Graduate Admissions Committee and appropriate recommendation made to the Dean. This may include one of the following:
  - That the student's status be continued.
  - That the student's status be changed to that of a regular graduate student.
  - That the student be dropped from school.

### **MINIMUM REQUIREMENTS FOR THE FACULTY DOCTORAL PROGRAM**

Prior to acceptance in the program, the applicant must demonstrate evidence of the following:

- An earned masters degree or entry level professional degree from an accredited university or college, with a GPA  $\geq 3.0$
- Evidence of an academic and/or scholarly background in current basic science or clinical research.
- Current faculty appointment in RFUMS.
- School dean and department chair written endorsement/support of degree pursuit and plan of study.
- Three letters of recommendation from applicant's own school/department, at assistant professor or higher, previous research supervisors or equivalent.
- A developed, feasible research question congruent with RFU resources.
- An identified mentor who will intellectually and finally support the applicant's doctoral work.
- Completion of a preliminary laboratory rotation with selected mentor.

## WHAT ADMISSIONS COMMITTEES LOOK FOR IN A SUCCESSFUL FACULTY DOCTORAL APPLICANT

### *Successful Applicants*

- Already have an academic appointment within the University which they will maintain while pursuing a terminal degree.
- Applicants have an established track record of maturity, diplomacy and successful time management skills within their appointment.
- Applicants enter the program with a well defined research agenda including procurement of an appropriate mentor.
- Display significant drive and independence, as well as responsibility for their own learning process.
- They will follow the established matriculation process established by IGPBS, but each plan of study, including course work and research will be individually established.
- Pre-Application Lab Rotation Assessments – Each candidate for the program must complete a lab rotation with the prospective mentor, for a minimum of 3 months (can be part time). Both the prospective student and the mentor must complete an assessment of the rotation using the pre-formatted forms.

### MINIMUM REQUIREMENT FOR COMBINED DEGREE APPLICANT

To be accepted as a combined degree student, the applicant must be accepted into both the Chicago Medical School or Dr. Wm. M. Scholl College of Podiatric Medicine **and** SGPS. Application to the Combined Degree Program may be made simultaneously to both schools.

### ENTRY-LEVEL MD/PHD STUDENTS

The application process begins with an application to the Chicago Medical School through AMCAS ([www.amcas.org](http://www.amcas.org)). Students designate their application to the Chicago Medical School as “Combined Medical/PhD” when applying. Candidates must submit all required documents for completion of the medical school file (supplementary application, letters of recommendation and application fee, etc.). Accepted MD/PhD candidates are admitted jointly to both the Chicago Medical School and the School of Graduate and Postdoctoral Studies.

### INTERNAL STUDENTS (MD/PHD OR DPM/PHD)

Current RFUMS students beginning their M2 year at the Chicago Medical School or P2 year at Dr. William M. Scholl College of Podiatric Medicine are also eligible to apply for the Combined Degree program, with what is known as a “Track II application”. These are highly motivated students who have found a calling to become physician scientists. These students must have maintained a 3.5 GPA while enrolled at RFUMS.

These students, if admitted, would enter the Graduate phase of the program after completion of their M2 or P2 year, and begin working immediately with a research mentor towards their Ph.D.

Prospective Track II students should submit an application to the Graduate School Admissions Office. The following items must be submitted in support of the application.

- Completed Track II Application Form
- RFUMS Student File and Transcript Release
- Two letters of recommendation from professors who can evaluate your research activities and research potential. These letters may be from RFUMS faculty, or undergraduate research advisors.
- Physician Scientist and Research Background Essays.

*Only upon completion of the PhD may Combined Degree Students re-enter the clinical phase of their respective (M3 or P3).*

### **TRANSFERRING COURSE CREDIT FROM ANOTHER SCHOOL**

The Dean and the appropriate departmental chair are glad to consider transferring course credits from another institution. Normally, such determination is made individually, based on available information concerning the course work at the outside institution.

### **FOR ADDITIONAL INFORMATION**

Because the University recognizes that interested persons need more information than this catalogue can provide, prospective applicants and their advisors are encouraged to contact department heads, the Dean of the School of Graduate and Postdoctoral Studies, or the Office of Admissions and Records. Visit us on the Web at [www.rosalindfranklin.edu](http://www.rosalindfranklin.edu). In addition, the [Graduate School Handbook](#) orients entering students and details the school's daily routine and is provided to entering students.

### **NON-IMMIGRANT INTERNATIONAL STUDENTS**

The School of Graduate and Postdoctoral Studies is authorized under federal law to enroll non-immigrant international students. For questions regarding immigration matters, please contact the Office of Multicultural Student Services at Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, IL 60064 847/578-8354.

### **POSTDOCTORAL FELLOWS**

The School of Graduate and Postdoctoral Studies encourages the appointment of postdoctoral fellows whenever worthwhile educational and research objectives can be achieved and the availability of resources can be established prior to the appointment. The purpose of postdoctoral training is to provide the fellow with training in an advanced field and in the skills necessary to succeed as an independent investigator. Persons interested in becoming postdoctoral fellows are encouraged to discuss the matter with a graduate school faculty member who is working in the candidate's field of interest. When a mutually satisfactory arrangement can be reached, the faculty member seeks the approval of the Departmental Chair and the Dean.

## DEGREE REQUIREMENTS

### DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree is awarded in recognition of proficiency in research and scholarship relating to a specific field. The candidate must demonstrate ability in a field by passing recommendation to candidacy examinations in both general and specialty areas, and by preparing a doctoral dissertation. This dissertation must demonstrate the student's ability to master the literature, to do independent research and to make an original contribution the chosen field.

Students will be enrolled in the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS) core curriculum their first year of studies and then take the advanced graduate courses of the department (program) of the advisor they have selected for their doctoral studies.

Students in the doctorate program may be awarded a MA or MS under special circumstances. These include: 1) the MA or MS is an integrated sub-section of the overall doctoral project. (In this case, the MA or MS is simply one of the integrated chapters of the final dissertation (thesis) document); or 2) it is awarded as a terminal MA or MS degree because of failure on the part of the student to successfully complete the Ph.D. degree using established matriculation markers (preliminary exams, research phase, etc.). The MA or MS degree will be based on a body of original research at the limited scope of a MA or MS degree.

All Ph.D. students will take their doctoral recommendation to candidacy at the beginning of the third year after admittance to the program (between August and November of the third year). MD/Ph.D. and DPM/Ph.D. students will take their recommendation to candidacy as quickly as possible, taking into consideration any advanced courses they may take and preparation of preliminary data for their grant proposal that is "Part A" of the recommendation to candidacy. It is preferred that MD/Ph.D. and DPM/Ph.D. students complete the recommendation to candidacy within one year of entering their Mentor's laboratory.

All doctoral students will select a primary advisor (Mentor) within the first year of studies (MD/Ph.D. and DPM/Ph.D. select prior to entering their Ph.D. phase). Once this selection is made, the Mentor and student, with the approval of the department's Graduate Oversight Committee and the Dean of the Graduate School, will select a "Research Committee" for the student. This Research Committee is composed of the Mentor and four additional members, one of which must be from outside the department and can be from outside the University. The Chair of the Research Committee is someone other than the Mentor. The Research Committee will provide scientific support and oversight of the student's doctoral research program, and will also serve as the examining committee that evaluates the student at the Recommendation to Candidacy comprehensive exams and Doctoral Defense. During the first summer with the Mentor, the Mentor and student will develop a doctoral research project. Based on this research project, the Mentor and student will select faculty members that best complement this research project to serve on the Research Committee. During the first summer with the advisor and during the second year, the student will develop preliminary data showing the feasibility of the The Mentor is responsible for all research costs associated with the student's research project. The Mentor and Research Committee are accountable to the department Oversight Committee and the Dean of the Graduate School on all matters pertaining to the matriculation of the student.

## Recommendation to Candidacy (Ph.D.) – Comprehensive Examination

The doctoral recommendation to candidacy will be composed of two parts as described below:

**Part A** of the recommendation to candidacy will be a Grant Writing Experience in the format of an NIH RO1 with modifications and a reduced page limit (10 pages versus 25). The grant application will be based on the student's doctoral research project. The grant will NOT BE A TEST, but rather will be a learning experience for the student on what is involved in writing an NIH grant, as well as a structured roadmap of the student's research project that will serve to guide that student during their research project phase. Initially, the student will write (with the mentor) an overall Research Aim, followed by the proposal's Specific Aims (with a brief rationale and general approaches for each specific aim). This one-page document will be presented to the student's Research Committee for approval and suggestions for improvement. Once approval is granted by the entire Research Committee, the student can begin to write the full proposal. The student can and should receive input from the mentor and Research Committee members during this writing process, as it is considered a "learning experience" and not a test.

The grant application will be a total of 10 pages (single spaced) in length and be composed of the following sections:

- 1) Abstract.
- 2) Overall Research Aim followed by the Specific Aims of the proposal and the rationale and sub-hypotheses of those Specific Aims.
- 3) Background and Significance.
- 4) Preliminary Data showing proof of principle (not counted in the 10 page limit because of the inclusion of figures if needed).
- 5) Experimental Design that is formatted based on the each Specific Aim. Each Experimental Design Section will include appropriate methods and analytic procedures (to include required statistical tests where appropriate) and describe alternative approaches if problems arise during the studies.

The following sections are required, but will not be included within the 10 page limit:

- 6) Reference/Citation listing.
  - 7) Overall supplies budget (general categories).
- (The format of the grant proposal is designed so that it can be converted into a NRSA or private foundation research proposal for future funding of the student.)

**Part B** is the actual examination for recommendation to candidacy and will be composed of an oral examination that is given to the student by the Research Committee members. The proposal will be submitted at least one week before the oral examination. The oral exam will begin with a PowerPoint presentation by the student giving the Research Aim, Specific Aims and Preliminary Data showing feasibility of the study. This presentation will be no longer than 30 minutes. The Research Committee members can then use the Research Proposal as a starting point to broader questions showing competency of the student in their field of study. This oral exam is based on the Research Proposal and the core and advanced courses taken by the student in years one and two of the program. The Research Committee should have a pre-exam meeting in which they decide on what broad areas of study should be examined (based on the student's research proposal and

courses) and which committee member should pursue a particular area of questioning. On passing the examination, the student is considered a “Candidate for the Doctoral Degree” and will pursue their research project until ready for the defense. The student may elect to take an additional course(s) with the approval of the Mentor

If, however, the student is found to be deficient in one or more areas of the oral examination, the Research Committee Chair is to point out to the student the areas of their understanding of the research proposal or course that were deficient. The student will then be assigned to one or more of the research committee members for “readings” on the subject. The student will do further study in these areas based on input from the research committee member. It is the student’s responsibility to obtain command of these areas. The assigned committee member serves as a facilitator that refers the student to appropriate papers or book chapters and is available for questions the student may have while studying for the second oral examination. The second oral examination will be taken within 3 to 4 months of the first.

If the student fails the second oral examination, an option will be given to earn a MA or MS degree. This terminal degree must be research based. The degree will be awarded once a journal-formatted paper is completed (in the format of an appropriate peer-reviewed journal). Acceptance of the paper to a journal is not required for degree completion, but submission of the journal-formatted paper to the SGPS with approval of the Research Committee is necessary for the student to receive a MA or MS degree. In an optimal situation, this paper could later be submitted as an article for a peer-reviewed journal or be incorporated with other studies as a larger study for publication

Completion of the Recommendation to Candidacy Examination form is required by the Research Committee and will be submitted to the Office of the Dean upon completion. Once the student has passed the recommendation to candidacy, progress reports (forms located online at the SGPS Web site) will be submitted to the department Graduate Oversight Committee (copies provided to the Dean) on the dates indicated on the forms (approximately every 6 months). The second progress report of the year will also entail a PowerPoint presentation by the student to the Research Committee so that optimal input is given to the student by all members of that committee and any research problems that have developed can be properly addressed. Completion of the research project will be determined by the Mentor and the Research Committee. As stated previously, it is expected that under normal conditions, the Ph.D. programs will be completed within 5 to 6 years. The date of the defense will be approved by the Dean of the Graduate School. No more than seven years may elapse between matriculation and completion of all requirements for the Ph.D. degree. After this time, the student’s Research Committee must petition the Dean for revalidation of the student’s course work.

### **Thesis Format**

Title page with acknowledgments as stated for doctoral dissertation.

- A. Table of Contents.
- B. Literature review.
- C. Each section of the study that comprises a “paper” will be written as a chapter, in the format of the journal that the article will be submitted to. As the research is completed, each article can be submitted for publication when ready. Figures, tables, and charts will be placed at the end of the chapters as would

normally occur in an article submitted to a journal for peer review. However, references will not be listed until the end of the thesis; therefore, references for ALL chapters will be combined into one Literature Citation section.

- D. A summary section that ties the thesis chapters together and describes future direction for the research. This is normally a short section of 5 to 10 pages maximum.
- E. List of references for entire thesis (introduction, chapters, and summary section).
- F. Optional appendices (details of new methodologies, data not permitted in the paper as dictated by the journal, etc.) can be added as needed.

### **Steps for Thesis Defense**

When the Research Committee feels that the student is ready to defend the dissertation, the Mentor will submit a written notice to the Dean advising him of the Final Thesis Defense date, time and location.

The Research Committee will serve at the final defense of this dissertation. The student will submit a final copy of the dissertation to the Research Committee no less than 3 weeks prior to that date.

The student must defend the dissertation satisfactorily before the Committee, which is documented in the Final Report of Examination. This document must be submitted to the Office of the Dean within thirty days of the Defense, signifying all rewrites and final edits have been completed.

Once the Final Report of Examination has been completed, the Office of the Dean will distribute copies to the Registrar, Mentor, Student and Department.

The Student will then publish this Thesis according to the on-line instructions for publication, found on the SGPS website.

While the student may “walk through commencement” or “enter the M3 or P3 years of clinical study,” the degree cannot be awarded until the corrected thesis has been approved by the Research Committee. The Research Committee will then execute the Final Report of Examination to the Office of the Dean of the Graduate School. The thesis is submitted for publication, per the SGPS Web Instructions; a copy of which is distributed from that source to the University Library and to the Dean. The thesis is designed to optimize successful publication of the body of research in peer re-reviewed journals.

## PHD CURRICULUM

	August	September	October	November	December	January	February	March	April	May	June	July	
	Fall Quarter			Winter Quarter			Spring Quarter			Summer Quarter			
G1 IGPBS CORE YEAR	MCB I (Core) Art of Scientific Presentation (Spec) Computers in Biomedical Sci (Spec)			MCB II (Core) Ethics & Regulations in Research (Spec) Systems Lectures (Core)			Biostatistics (Spec) Neuroscience (Elective) Systems Physiology (Elective) Developmental Biology (Elective)						
	Dept Interactions		Lab Rotation #1			Lab Rotation #2		Lab Rotation #3		Lab Rotation #4			
G2 PRELIM PHD YR IN DEPT	Advanced Coursework			Advanced Coursework			Advanced Coursework			Advanced Coursework			
	Mentor Selected Department Assigned Work on research problem begins. Candidate Research Committee Selected by Nov 1			Define and refine research problem with mentor. Begin preparing NIH-R01 grant-style paper due by Fall Quarter of G3 year.						Define and refine research problem with mentor. Begin preparing NIH-R01 grant-style paper due by Fall Quarter of G3 year.			
G3 PhD CANDIDACY & RESEARCH	<u>By Fall Quarter</u>  Part A. Turn in grant Part B. Oral Exam			Research towards thesis						6-Month Eval		Research towards thesis	
	<b>Pass:</b> Recommended for Candidacy <b>Fail:</b> <u>August through November</u> Study to retake failed exams <i>(Failed exams may lead to terminal MS or dismissal)</i>  Following the Recommendation to Candidacy, Bi-Annual Reviews of the Student's Progress will be Conducted												
G4-Gx PHD YRS IN DEPT	Research towards thesis			6-Month Eval		Research towards thesis			6-Month Eval		Research towards thesis		
DEGREE	Final Defense (Examination by Committee) Following Successful defense. Student has 30 days to complete edits & submit for publication. Publication of Thesis required for degree to be issued. Degree CAN be issued at time earned, but formal commencement in June.												

### FACULTY DOCTORAL PROGRAM

The mission of the Faculty Doctoral Program is to provide full time faculty members of RFUMS who are life-long learners an opportunity to expand their area of expertise to include a collaborative model of research and scholarly advancement within the University. The program is an opportunity for full time, salaried faculty members to obtain a Ph.D. in biomedical sciences within the IGPBS while maintain an appointment within their home department. These internal applicants are unique from traditional graduate students in several ways:

- They already have an academic appointment within the University, which they will maintain while pursuing a terminal degree.
- They have an established track record of maturity, diplomacy and successful time management skills within their appointment.

- They enter the program with a well defined research agenda including procurement of an appropriate mentor.
- They display significant drive, independence and responsibility for their own learning process.
- They will follow the established matriculation process established by IGPBS, but each plan of study, including course work and research, will be individually established.

If this program description fits you, please discuss the application process with program director Roseanne Thomas, Ph.D., [Rosanne.thomas@rosalindfranklin.edu](mailto:Rosanne.thomas@rosalindfranklin.edu), phone 847/578-8695. The application process is lengthy and includes a pre-admission lab rotation.

## **MASTER OF SCIENCE DEGREE**

MS student applicants apply to the Basic Science Departments through the Office of Admissions (Graduate Admissions). The student's academic records must meet the minimal standards of the Graduate School (BA/BS degree; 3.00 GPA, etc.), although appeals to the Dean can be made on a case-by-case basis.

Students enrolled in the other colleges (Chicago Medical School, Scholl College of Podiatric Medicine, and College of Health Professions) at RFUMS can apply for entrance to the MS program

A tuition waiver can be granted by the Dean of the Graduate School for a given MS student. The stipend (if one is awarded) must come from the Department or Mentor.

The Mentor is determined at the time of acceptance and the Mentor already has a MS thesis research project identified for the student (the student knows what this project is prior to acceptance). A Research Committee (Mentor and 2 to 3 members – those who can provide research input on the student's research project) is formed at the time the student has identified a Mentor prior to acceptance. Within one month of acceptance, the student (under the guidance of the Mentor) presents the MS research thesis proposal to the Research Committee. At that meeting, the Research Committee determines, with the Mentor and student, what coursework (if any) is needed by the student.

Coursework is custom designed for each student. There is great flexibility in this determination based on the educational background of the student. Some students may need the entire first year of the IGPBS, a course or two from the first year, or courses only from the Advanced Courses of the department. In some cases, because of the strong background of the student, only special reading course(s) with a faculty member on the area of research may be required. All students will be required to take the specialty courses of the IGPBS, unless they have previously completed such a course from an accredited university and it can be documented on official transcripts, or they obtain special waiver approval from the Dean of the Graduate School because of training they previously received through work experience (a request for waiver must be submitted to the Dean by the Mentor). These courses include: 1) scientific presentations and computer use; 2) computers in data acquisition and analysis; 3) Bioethics (with all certification components such as radiation safety, IRB, IACUC, etc. These certification components are listed in the requirements of the Bioethics course); and 4) Biostatistics.

### The Research Thesis Project Presentation Involves:

- a. Title and main hypothesis of the research project.
- b. Specific Aim or Aims to test the hypothesis.
- c. Experimental design for each Specific Aim with appropriate statistical tests, controls, etc. Preliminary data of Mentor indicating feasibility of the project is also presented. (Preliminary data cannot come from student because the project is developed at the time of acceptance and therefore it must be a project that is a spin-off of the Mentor's previous research – REMEMBER that a MS degree is completed NO LATER than by the END of the SECOND YEAR after the student enters the program).
- d. Research project budget and listing of grant funds, discretionary funds or department funds available to the Mentor that will support the research.

The normal oversight procedures of a doctoral student are used for all MS students. See the Policies and Standards Document of the SGPS voted into implementation by the University Graduate Council on May 5, 2007 (6 month progress reports, yearly presentations to the Research Committee, etc.).

Upon the approval of the Mentor and the Research Committee, an MS examination date is scheduled for the end of the second year of study. With input from the Mentor, the student will write an article for submission to a peer reviewed journal and submit the article to the Research Committee. That article is delivered to all members of the Research Committee at least two weeks prior to the examination date. At the examination (which is open to any faculty member in SGPS), the student presents a PowerPoint of the research project.

At the end of the presentation, the Mentor opens the floor for questions by the members of the Research Committee. When all members have asked their questions, the floor is also open to other graduate faculty members that are present. At the end of questions, all in the room are asked to leave except the members of the Research Committee. The Research Committee then has an open discussion of the student's performance and votes whether the Student has passed or failed the examination. The student is asked to return to the room and the Mentor informs the student of the results of the examinations. Proper forms are signed by the Mentor and Research Committee members, then are forwarded to the Dean

Research Committee members also give the "article" back to the student with editorial or other changes indicated in the page margins. The student must address these changes. The Mentor works with the student and gives direction on what modifications must be made to meet the Research Committee's criticisms. The corrected article is shown to the members of the committee for final signature. The Dean's Office will route final copies to all parties. Having received the Final Examination Documentation, the student can then submitted the thesis for publication using electronic submission procedures of the school. This process is monitored by the Dean's office. Once the process is successfully processed, the student is notified. The Office of the Dean will coordinate the award of the student's degree. The MS thesis format should follow that of the journal to which the student and Mentor will submit the body of research. The following format is typical:

The MS thesis format should follow that of the journal to which the student and Mentor will submit the body of research. The following format is typical:

Title page with acknowledgments as stated for doctoral dissertations.

(Department name, University name, etc.)

Abstract

Introduction Section

Materials and Methods Section

Results

Discussion/Conclusions

Literature Citations

Figures, Tables, and Graphs

### **REQUIREMENTS FOR THE COMBINED DEGREE, MD/PHD DEGREE**

In general, requirements for the combined degrees combine the requirements for each degree, with the following specifications:

1. A student in good standing in the Combined Program, with the approval of the Dean of the Medical School, may claim credit for 8 units of Sophomore or Senior Medical School elective time by substituting 8 units research work completed in the Graduate School, provided competency without reservation has been demonstrated in the third-year required clerkships. Combined MD/PhD and DPM/PhD students will be allowed to substitute graduate-level electives for medical-level sophomore electives.
2. University requirements for either the MD or MS degrees may be satisfied by courses taken in either the Medical School or Graduate School within the University.

### **REQUIREMENTS FOR THE COMBINED DEGREE, DPM/PHD DEGREE**

**Purpose:** The DPM/PhD Dual Degree Program is specially designed for those students who are interested in pursuing a career in research or would like clinical or basic science research to play a significant role in their future practice. Each student participating in this program is required to meet the academic requirements of both Scholl College and the School of Graduate and Postdoctoral Studies. The purpose of the program is to provide the student with highly advanced research training to complement the clinical training provided at Scholl College. This program is geared toward individuals who are interested in careers in research or academics, in conjunction with podiatric medicine.

**Applications:** Students who are interested in this program should inquire to Dr. David Armstrong during their first year of education. Students applying for this program must meet all entrance requirements for the PhD program. The student is strongly encouraged to plan for this program well in advance.

**Funding:** Typically, PhD graduate students are provided a stipend by Scholl College.

## ACADEMIC PERFORMANCE STANDARDS AND MEASUREMENT

### Grading

A pass/fail grading system customarily is used for seminar and research courses. All other course work is graded as follows:

A = High Achievement

B = Above Average Achievement

C = Average Achievement

F = Fail

P = Pass

I = Incomplete. Evidence required for a qualitative grade has not yet been submitted, but arrangements have been made.

**Note:** The privilege of completing all work required to change a grade of I (Incomplete) cannot be extended beyond the end of the quarter following the quarter this grade is received. On or before this date, a final grade must be entered.

W = Withdrawal

PP = Pass Proficiency Exam

# = Graded at Sequence End

IP = In Progress

NC = No Credit Given

AU = Audit

### COURSE CREDIT

Academic work at RFUMS is measured by “units of credit.” In conjunction with the letter grade a student receives from the course instructor, units of credit give a fairly accurate evaluation of the amount of time that has been devoted to a given subject.

The number of credit hours assigned to a course needs to be proportional to “student workload,” which entails lecture, laboratory work, clinical/internship work, and other out-of-class work associated with a course. It is neither practical nor desirable to precisely measure these quantities in an ongoing fashion. Therefore, the RFUMS policy provides a set of general guidelines for the assignment of credit hours to courses in the curriculum.

All classes offered for credit at RFUMS are equated a standard credit hour. One credit hour is equivalent to one hour (50 minutes) of lecture per week or two hours per week for laboratory, clinical experience, or small group discussion. Courses may last for one or more quarters. Grades are reported at the end of each course. Details of the curriculum for each program and the specifics of each course are described in the catalogues of each of the four schools and colleges.

The Registrar’s Office is responsible for the final determination of credit hours for a course.

RFUMS uses the quarter system to measure the length of a term. The quarter system is generally 12 weeks of classes including final examinations.

## ACADEMIC RECORDS

A copy of each student's complete academic record at the University is furnished upon request to him/her after each academic quarter attended – a written request form is available on the Registrar's Website. Students are encouraged to periodically monitor their academic progress via WebAdvisor.

## ACADEMIC CALENDAR

All Schools within Rosalind Franklin University operate under a quarter calendar, and credit is expressed in quarter hours.

## HOLIDAYS, VACATION TIME AND BREAKS

The nature of research is on-going. SGPS Students are required to follow the University Holiday Calendar. This is true for all degree seeking doctoral students (combined, regular and IGPBS).

New Year's Eve (½ Day)	Labor Day
New Year's Day	Columbus Day
Martin Luther King, Jr., Day	Thanksgiving Day
President's Day	Day After Thanksgiving Day
Memorial Day	½ Day Christmas Eve
Independence Day	Christmas Day

These days are noted in the University's [Human Resource Website](#), and also on the [SGPS Student Handbook](#).

- There are no interim breaks for SGPS Students.
- Students are allowed a Vacation of 2 weeks per year, with Mentor's approval
- Days off must be approved (or called in cases of emergency) to your Mentor

IGPBS Students are to consider the IGPBS Program Director as their Mentor

## MAINTAINING ACADEMIC STANDARDS FOR SGPS

All SGPS doctoral students (including regular, combined degree, student-at-large, and faculty doctoral students) are expected to maintain a cumulative quality point average of 3.0 to remain in good academic standing.

In addition, certain departments require the student to maintain a specific quality point level in the major subject area to remain in good standing. The academic performance of the student is evaluated by the department at the end of each quarter. A student who falls below any of the required standards in any given quarter is notified by the department chair of the status and the recommended course of action to be taken. The department chair also notifies the Dean of the departmental recommendation.

If a student's academic performance falls below the school or departmental standards for either two consecutive quarters or three nonconsecutive quarters, the following steps are taken:

1. The Dean of the Graduate School is notified in writing by the departmental chair of the student's status and of the departmental recommendation.
2. The Dean may refer the question of the student's future status at this school to the Committee on Academic Standards, requesting a recommendation.
3. The Dean decides, based on these recommendations, whether the student shall be dismissed or continued as a student on academic probation. The student is informed in writing of this decision.

The student has the right and the opportunity to present evidence and to discuss the situation with the departmental chair, the Committee on Academic Standards and the Dean before each submits a decision.

### **RETAKEING COURSES**

The Graduate School discourages the retaking of courses or examinations to improve grades. Courses and examinations may be retaken only after approval of a petition to the Dean, endorsed by the course director, program director and chair of the student's department. Such petition is a document detailing the student's concern and stating their request. It is preferred to be type-written, including the names of those endorsing the document.

### **WITHDRAWAL FROM A COURSE**

With written approval from the instructor and the Dean, a student may withdraw from a course by petitioning the Dean at any time within six weeks after registration. The student's grade is recorded as W (withdrawn). Full tuition for the course may be refunded up to the end of the first week following registration. A 75 percent refund is allowed up to the end of the second week; a 50 percent refund, up to the end of the third week; and no refund, after the end of the third week.

### **NON-ACADEMIC PERFORMANCE STANDARDS**

Students in the School of Graduate and Postdoctoral Studies are subject to dismissal for unethical and/or unprofessional behavior in their student role.

### **STATEMENT OF POLICY ON PROFESSIONALISM AND ETHICS**

All students at Rosalind Franklin University are expected to exhibit professional, responsible and ethical behavior. Students should display this behavior as students in the University, as health care providers in the clinical setting and as researchers in the laboratory or clinic. All students should, therefore, possess the highest degree of personal integrity and be able to reason about ethical issues in their professional life. Students are expected to treat patients and research subjects with respect, compassion and sincerity, irrespective of race, color, creed, ethnic origin, religion, disability, gender, sexual orientation, or socioeconomic class, and to maintain strict confidentiality. Students are expected to be honest and trustworthy, to respect the property of others, and to follow the code of professional ethics appropriate to their discipline. Any departures from these standards may result in disciplinary action.

### **PROCEDURES FOR CONSIDERATION OF VIOLATIONS OF ETHICAL AND PROFESSIONAL STANDARDS**

A student under suspicion of ethical or professional misconduct shall be afforded appropriate notice and an expedient process in the investigation, deliberation, and decision about such allegations and potential penalties. The student shall also be afforded the right to appeal any negative outcomes to the Dean of the

School in which the student is enrolled. Refer to the [School of Graduate and Postdoctoral Studies Handbook](#) for procedures described to ensure such rights for the student and the University.

### **STUDENT TREATMENT**

Students have a right to work and study in an environment free from harassment; as such, the University will not tolerate student mistreatment. A primary goal of RFUMS is the education of students who will meet the health care needs of society in a caring, competent, and professional manner. Insensitivity during training/education runs counter to the fundamental tenets of health care and impairs the ability of many students to maintain their idealism, caring, and compassion past training into their careers. Refer to the [RFUMS Student Handbook](#) for the Student Mistreatment Statement.

### **STUDENT RECORDS**

All documents and records pertaining to a student's admission and academic performance in the University are filed in the Office of the Registrar. Refer to the [RFUMS Student Handbook](#) for information regarding Students' Personal and Academic Information.

### **STUDENT PETITIONS**

Students may petition the Dean to waive or deviate from the stated requirements or for any other academic matter requiring resolution by the Dean. Petitions are submitted in Memo form from the Student to the Office of the Dean. The Mentor should be copied.

### **LEAVE-OF-ABSENCE** (see also [Registrar's Policy](#))

Regular students in the School of Graduate and Postdoctoral Studies are expected to maintain continuity and diligence in pursuing a specified advanced degree. When a student must be absent from academic work at the University for any reason, departmental approval must be obtained. For periods longer than three weeks, the student shall petition the Dean for a leave-of-absence, and receive approval before leaving.

Unauthorized leave may be considered as withdrawal from graduate school. Graduate students may be allowed a leave-of-absence for a period of up to one year by the Dean, upon the recommendation of the chair of the department (or Committee). Registration after an absence of more than one year shall require resubmission of a new application for admission. Time spent on an approved leave-of-absence will not be included within the maximum period in which a degree program must be completed.

### **PERMANENT WITHDRAWAL FROM THE SCHOOL OF GRADUATE AND POSTDOCTORAL STUDIES**

If a student permanently withdraws from graduate school (does not seek and receive a leave-of-absence), full tuition is refunded only if the withdrawal occurs during the first week following registration. A 75 percent refund is allowed up to two weeks following the registration deadline, a 50 percent refund up to three weeks following registration and before the end of the fourth week, a 25 percent refund. No tuition is refunded after the fourth week. As a condition for refund, the student must first file appropriate documentation as stated in Registrar's Policy (linked above)

## TUITION AND EDUCATIONAL EXPENSES, 2009 – 2010

Graduate School (per year)	\$22,176
Student Services Fee	\$90
Student Council Fee	\$40
Books and Supplies (Estimate)	\$900 - \$1,000

### Credit Hours

The number of hours credited for any course in SGPS is determined by the individual department. Such determination is based on the time a student is expected to spend preparing for and participating in a particular course. Full Time Status is not dependent on number of quarterly registered credit hours, but on enrollment as an SGPS Student. Faculty-Doctoral, Student-at-Large are considered part time..

### Tuition for Part Time Students

Tuition for students who, for whatever reason, are taking a part-time academic load is assessed per credit hour (e.g., Student-at-Large, Faculty Doctoral Students, and Students in a concurrent master's program).

### Tuition for Student-at-Large

The University reserves the right to assess students-at-large at a higher tuition rate per credit hour than is assessed regular graduate students.

### Tuition and Auditing a Course

In general, students auditing a course are charged the same tuition as those taking the course for credit. The University does distinguish, however, between a passive and active audit.

- Passive Audit (participating only by listening, viewing, and reading)
- Active Audit (discussing, conducting laboratory work, practice teaching, participation in exams, etc.).

The University reserves the right to assess a passive audit at a different rate from tuition for an active audit of the same course. Tuition assessments are due and payable each quarter at registration.

## UNIVERSITY TUITION AND FEES PAYMENT POLICY

This policy is applicable to all RFUMS students who have not received an approved deferral of tuition.

1. Tuition and fees are due on the designated registration day (Monday) for each quarter. A five-day grace period for payment will be allowed including and ending on the Friday of the week in which registration day occurs.
2. Beginning on the following Monday, the sixth day, after the five-day grace period has expired, a late charge will be assessed for each day until paid, based upon a rate of 18% per annum computed on a day-to-day basis using a 365-day-year.
3. Students with outstanding balances still remaining at the end of the quarter will receive an incomplete grade in all courses in which the student was enrolled. The incomplete grade will be registered on their transcript and the reason for the incomplete grade will be noted (i.e. for non-payment of tuition and fees). Also,

students who have not paid in full by the end of the quarter will not be allowed to register for the following quarter.

### **REFUND OF TUITION**

With written approval from the instructor and the Dean SGPS, a student may withdraw from a course (see instructions for same Section 3.7. Tuition for the course shall be refunded as follows

- Full refund up to the end of the first week of class
- 75% refund up to the end of the second week
- 50% refund up to the end of the third week
- 25% refund up to the end of the fourth week f
- No refund will be allowed after the end of the 4<sup>th</sup> week.

### **FINANCIAL ASSISTANCE**

#### **University Fellowships and Tuition Waivers**

The School of Graduate and Postdoctoral Studies offers a limited number of research assistantships, graduate student tuition waivers and graduate student stipends to full-time students in good standing. University stipends may be supplemented by individual departments. The particular form and amounts of graduate student support available vary among different departments. Prospective students are invited to explore this subject with their departmental chair at their earliest opportunity. In general, financial support to individual graduate students is based on academic excellence and economic need. When resources are limited, doctoral students are given preference over masters' degree students. At present, the University does not provide a stipend to all regular students, but most regular students in good standing are receiving financial support in some form.

#### **Student Loan Programs**

To meet the cost of attending The School of Graduate and Postdoctoral Studies, students, spouses and parents are expected to provide financial support to the extent that they are able. When family resources are insufficient to meet college costs, students are encouraged to seek assistance from the following currently existing loan programs. Refer to the [RFUMS Financial Aid Office](#) website for more information regarding financial resources.

### **HEALTH INSURANCE**

Health Insurance options for students of the School of Graduate and Postdoctoral Studies are the same as for employees of this University. Please see the Summary Plan Descriptions on the [RFUMS Human Resources webpage](#).

### **STUDENT ORGANIZATIONS**

#### **Student Participation in University Governance**

Student representatives participate as active members on most committees of each school. A few of the committees on which students are serving include Admissions, Graduate Faculty Council, Curriculum,

Academic Standards, Faculty Search Committees and the Financial Aid Committee.

### **Graduate Student Association**

Graduate students at the University have organized a Graduate Student Association (GSA) to help meet their individual and group needs. The concerns of the GSA range from social and academic events to availability of library resources and evaluation of students' academic performance. Prospective students are invited to discuss GSA activities with its president, who may be reached through the Office of the Dean.

### **University Student Council**

Students in all schools participate in the University Executive Student Council. This group, organized and run entirely by students, concerns itself with the overall policy and direction of the institution as these relate to student concerns. In addition, the Council plans and supports campus social events and student delegate trips to national professional group meetings. It also names student representatives to school committees.

## **STUDENT POLICIES, STUDENT RECORDS AND STUDENT RESOURCES**

Refer to the [RFUMS Student Handbook](#) for information topics which include:

### **STUDENT CONDUCT POLICY**

#### **CAMPUS LIFE**

#### **EDUCATIONAL OPPORTUNITY POLICIES AND PROCEDURES**

#### **INFORMATION TECHNOLOGY SERVICES: PRINCIPLES AND POLICIES**

#### **MISSING PERSON POLICY**

#### **STUDENT HEALTH AND WELL-BEING**

- I. ACCOMMODATIONS AND STUDENT DISABILITY
- II. EXPOSURE INCIDENTS
- III. IMMUNIZATION REQUIREMENTS AND RESOURCES
- IV. INSURANCE
  - Health Insurance
  - Dental and Vision Insurance

#### **STUDENTS' PERSONAL AND ACADEMIC INFORMATION**

- I. ACADEMIC PERIOD
- II. STUDENT RECORDS
- III. POLICY STATEMENTS AND GUIDELINES
  - Public Information
  - Confidential Information
  - Rights of Access and Review of Records
  - Limitation on Access
  - Supplementary Exceptions
  - Custodians of Student Records
  - Release of Grades
  - Right to Challenge Content of Records
  - Creation, Permanence, and Disposal of Student Records
  - Transferring Admissions Records to the Registrar's Office

#### **RESOURCES**

- I. BUSINESS SERVICES
- II. CAMPUS SECURITY
- III. DIVISION OF STUDENT AFFAIRS

- Academic Support Services
- Disability Support Services
- Fitness and Recreation
- Multicultural Student Services
- Student Counseling Service
- Student Housing
- Student Life
- Tutoring and Study Skills Assistance
- IV. FINANCIAL AID OFFICE
- V. FOOD SERVICE
- VI. INFORMATION TECHNOLOGY SERVICES
  - Desire2Learn (D2L)
  - Student E-mail
  - Student Housing Network and Telephone Access
  - Technology Purchase Information
  - WebAdvisor
  - Wireless Network Information
- VII. INSURANCE
  - Disability Insurance
  - Health Insurance
  - Malpractice Insurance
- VIII. LEARNING RESOURCES
  - Academic Computing Labs
  - Boxer University Library
  - Educational Technology
  - Information Commons
  - Presentation Practice Room
  - Small Group Rooms
  - 24-Hour Study Space
- IX. PARKING ON CAMPUS
- X. STUDENT COUNCIL AND STUDENT ORGANIZATIONS
- XI. STUDENT EMPLOYMENT
- XII. STUDENT HEALTH
- XIII. TRANSPORTATION OPTIONS
  - Airport Transportation
  - Metra Train Service
  - University Van Shuttle to Metra Station
  - Pace Bus Service

**DEPARTMENTAL INFORMATION**

*The chair of a department and the Dean may approve faculty and other professional staff members who are not members of the graduate faculty for teaching of appropriate graduate courses.*

All doctoral students enter through the IGPBS program and then transition to a department once they select their advisor at the end of their first year of studies.

Following the first year of studies in the IGPBS, students entering a department will 1) satisfy the requirements of the department's advanced course requirements, 2) pass their recommendation to candidacy (by the end of their second year of the entering the School of Graduate and Postdoctoral Studies), 3) conduct their doctoral research under the direction of their Mentor and Research Committee, and 4) defend their doctoral dissertation.

Following the first year of studies in the IGPBS, students entering a department will 1) satisfy the requirements of the department's advanced course requirements, 2) pass their recommendation to candidacy (by the end of their second year of the entering the School of Graduate and Postdoctoral Studies), 3) conduct their doctoral research under the direction of their Mentor and Research Committee, and 4) defend their doctoral dissertation.

## DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

Degree Programs offered are PhD, MS\*, M.D./Ph.D. and D.P.M./Ph.D. The primary objective of these programs is to train students to become scientists capable of pursuing independent research. Students will be exposed to the latest interdisciplinary approaches to modern biochemical research by the ten investigators within the Department. Our research aims to elucidate the molecular basis of action of important biomedical systems ranging from receptors and transporters to enzymes in key pathways to protein-RNA complexes needed for cell growth. The emphasis on the study of proteins (i) allows a common research bond and language among faculty, (ii) complements ongoing research in other CMS departments, (iii) coincides with the cutting edge of modern biomedical research, and (iv) provides teaching capability across a spectrum of biochemical topics.

### Degree Requirements for all PhD Tracks

Entry into the Ph.D. training program follows successful completion of the IGPBS core year and follows the SGPS Advanced Phase timeline for selection of research committee, preliminary exam, thesis proposal, progress review, and thesis defense. The Ph.D. will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### Department Requirements for PhD Degree (following completion of IGPBS Core Coursework)

#### Advanced Coursework Requirements

- GBCH-600A/B** Biochemical Pathways (fall/winter)  
**GBCH-543** Enzyme Structure and Mechanisms (spring 2<sup>nd</sup> or 3<sup>rd</sup> year)\*  
**GCH-544A/B** Physical Biochemistry (winter/spring 2<sup>nd</sup> or 3<sup>rd</sup> year)\*

\*offered on alternate years

Preliminary examination offered at the end of the second year will only cover the courses that the student has taken up until that point.

#### Teaching Requirements

None

#### Department Program Requirements: second year through graduation

- GBCH-537** Doctoral Research in Biochemistry and Molecular Biology  
**GBCH-532** Biochemistry and Molecular Biology Journal Club  
**GBCH-533** Biochemistry and Molecular Biology Seminar

#### Elective Seminars

- GMTD-709** MCS Seminar Series (2<sup>nd</sup> Wednesday of each month)

**MD/PhD and DPM/PhD** students will follow the guidelines of the SGPS (IGPBS Specialty Course, and a course curriculum designed by the Student's Research Committee, with approval by the Dean)

**Department Requirements for Masters Degree** (following completion of IGPBS Core Coursework)  
Masters programs are tailored to each candidate. The following minimum requirements must be met before the candidate will be eligible for the degree. Entry into the MS training program follows successful completion of the IGPBS core year and follows the SGPS Advanced Phase timeline for selection of research committee, preliminary exam, thesis proposal, progress review, and thesis defense. The MS will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### **Advanced Coursework Requirements**

- GBCH-600A/B** Biochemical Pathways (fall/winter)  
**GBCH-543** Enzyme Structure and mechanisms (spring 2<sup>nd</sup> or 3<sup>rd</sup> year)\*  
**GBCH-544A/B** Physical Biochemistry (A-winter/B-spring 2<sup>nd</sup> or 3<sup>rd</sup> year)\*

\*offered on alternate years

### **Teaching Requirements**

None

### **Department Program Requirements: second year through graduation**

- GBCH-531** Master's Research in Biochemistry and Molecular Biology  
**GBCH-532** Biochemistry and Molecular Biology Journal Club  
**GBCH-533** Biochemistry Seminar (Departmental seminars)

### **Graduate Faculty**

- Chair:** Ronald S. Kaplan, PhD, Professor  
 Jun-yong Choe, PhD, Assistant Professor  
 Carl C. Correll, PhD, Associate Professor  
 Marc J. Glucksman, PhD, Professor  
 David H. Harrison, PhD, Associate Professor  
 Min Lu, PhD, Assistant Professor  
 David M. Mueller, PhD, Professor  
 Kenneth E. Neet, PhD, Professor and Associate Dean for Research  
 Kyoung Joon Oh, PhD, Assistant Professor  
 D. Eric Walters, PhD, Professor

## DEPARTMENT OF CELL BIOLOGY AND ANATOMY

The program in Cell Biology and Anatomy offers graduate study leading to the M.S. and Ph.D. degrees. In addition, we participate in combined degree programs offered by our affiliated Schools in the University, leading to the M.D./Ph.D. and D.P.M./Ph.D. degrees. These programs provide essential training for careers that would include faculty positions at research and/or educational institutions, and for research positions in the biotechnology and pharmaceutical industry.

### Degree Requirements - PhD Track

Entry into the PhD training program follows successful completion of the IGPBS core year and follows the SGPS Advanced Phase timeline for selection of research committee, preliminary exam, thesis proposal, progress review, and thesis defense. The PhD will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### Department Requirements for PhD Degree (following completion of IGPBS Core Coursework)

#### Advanced Courses - Required

<b>GCBA-600</b>	Advanced Cell Biology (winter)
<b>GCBA-604</b>	Techniques in Cell Biology (fall)

#### Advanced Courses - Elective

<b>GCBA-504</b>	Embryology
<b>GCBA-500A/B</b>	Clinical Anatomy - Selected Modules (fall/winter)
<b>GCBA-502A/B</b>	Histology - Selected Modules (fall/winter)
<b>GCBA-602A</b>	Special Topics in Cell Biology I (spring)
<b>GCBA-602B</b>	Special Topics in Cell Biology II (spring)
<b>GCBA-605</b>	Special Topics in Developmental Biology (spring)

### Teaching Requirements

Departmental graduate students are required to participate as Teaching Assistants in at least one course offered by the department, typically either Gross Anatomy or Histology.

### Department Program Requirements

<b>GCBA-533</b>	Cell Biology and Anatomy Seminars
<b>GCBA-532</b>	Cell Biology and Anatomy Journal Club

### Elective Seminars

<b>GMTD-709</b>	MCS Seminar Series (2 <sup>nd</sup> Wednesday each month)
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**MD/PhD and DPM/PhD** students will follow the guidelines of the SGPS (IGPBS Specialty Course) and a course curriculum designed by the Student's Research Committee, with approval by the Dean.

## Department Requirements for Masters Degree

Masters programs are tailored to each candidate. The following minimum requirements must be met before the candidate will be eligible for the degree.

### Graduate Faculty

**Chair:** William Frost, PhD, Professor  
Christopher Brandon, PhD, Associate Professor  
Joe DiMario, PhD, Professor  
Dominik Duelli, PhD, Assistant Professor  
Mirek Dundr, PhD, Assistant Professor  
Michelle Hastings, PhD, Assistant Professor  
Robert Intine, PhD, Assistant Professor  
David McCandless, PhD, Professor  
Monica Oblinger, PhD, Professor  
Thanos Tzounopoulos, PhD, Assistant Professor  
Barbara Vertel, PhD, Professor

## DEPARTMENT OF CELLULAR AND MOLECULAR PHARMACOLOGY

Graduate training in the Department of Cellular and Molecular Pharmacology provides students with the opportunity to gain comprehensive instruction covering all areas in pharmacology. Students are expected to develop and carry out their own research project while receiving individual mentorship from their thesis advisor and committees. During the program, students will get involved in teaching pharmacology, learn to write grant proposals, and attend and present work at local and national scientific meetings. Career opportunities for those holding the doctorate in Cellular and Molecular Pharmacology are outstanding and cover a wider spectrum than those of most other medical sciences.

Areas of research strength in the department:

- Drug addiction, Parkinson's disease, Schizophrenia
- Neurodegeneration
- Neurobiology of normal and aberrant learning; Neurobiology of emotion and behavior
- Neuronal plasticity, Synaptic integration, Ion channel function
- Basal ganglia anatomy, physiology, and function
- Gene expression; Regulation of alternative splicing
- Neuronal morphology and ultrastructure; Actin cytoskeleton regulation

Departmental research facilities and approaches are devoted to a wide-range of molecular, physiological, genetic, anatomical, and behavioral techniques.

- Cell culture
- In vivo and in vitro electrophysiology
- Protein and mRNA quantification; In situ hybridization; RT-PCR
- Electron microscopy; Fluorescence microscopy; Morphological reconstruction
- Behavioral assays (drug self-administration, locomotor behavior, anxiety, startle, etc...)

### Degree Requirements – PhD Track

Entry into the PhD training program follows successful completion of the IGPBS core year and follows the SGPS Advanced Phase timeline for selection of research committee, preliminary exam, thesis proposal, progress review, and thesis defense (see page 19). The PhD will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### Department Requirements for PhD Degree (following completion of IGPBS Core Coursework)

#### Advanced Courses – Required

<b>GCMP-605</b>	Pharmacology Core
<b>GCMP-600</b>	Neuropharmacology I
<b>GCMP-601</b>	Neuropharmacology II

#### At least two (1) optional course offered by our or other departments, such as:

<b>GNSC-607</b>	Neuronal Signaling (Neuroscience)
<b>GNSC-606</b>	Neurodegeneration (Neuroscience)
<b>GNSC-600</b>	Neurophysiology (Neuroscience)

## Teaching Requirements

**GCMP-700** Teaching in Pharmacology

## Department Program Requirements

**GCMP-502** Cellular and Molecular Pharmacology Journal Club

**GCMP-509** Seminar in Cellular and Molecular Pharmacology

**GCMP-539** Research in Pharmacology – Introduction (before passing the candidacy exam)

**GCMP-535** Research in Pharmacology – theses (after passing the candidacy exam)

**GMTD-709** MCS Seminar Series (2<sup>nd</sup> Wednesday each month)

MCS Seminar Series (meets the 2<sup>nd</sup> Wednesday of each month – September through May)

**Electives** (Students are encouraged to take at least one elective)

**GNSC-605** Techniques in Microscopy (Neuroscience)

**GNSC-505** Brain Dissection (Neuroscience)

**GCMP-500** Electrophysiology Journal Club (Cellular and Molecular Pharmacology)

**GCMP-new** Research Skills – Beyond the Bench (Cellular and Molecular Pharmacology)

**MD/PhD and DPM/PhD** students will follow the guidelines of the SGPS (IGPBS Specialty Course) and a course curriculum designed by the Student's Research Committee, with approval by the Dean.

## Graduate Faculty

**Chair:** Charles Barsano, MD, PhD, Acting Chair and Senior Associate Dean for Clinical Affairs  
 Patricia Loomis, PhD, Research Assistant Professor  
 Michela Marinelli, PhD, Associate Professor, Director of Graduate Studies  
 Gloria Meredith, PhD, Professor  
 Gary Oltmans, PhD, Associate Professor  
 Judith Potashkin, PhD, Associate Professor  
 David Rademacher, PhD, Research Assistant Professor  
 J. Amiel Rosenkranz, PhD, Assistant Professor  
 Ann Snyder, PhD, Associate Professor  
 Heinz Steiner, PhD, Associate Professor  
 Kuei Tseng, MD, PhD, Assistant Professor  
 Kuei-Yuan Tseng, MD, PhD, Assistant Professor

## DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY

The Department of Microbiology and Immunology offers advanced degree programs leading to the MD/PhD, DPM/PhD, and PhD in Microbiology and Immunology. These programs prepare candidates for careers in research and teaching in the field of modern Microbiology and Immunology.

The aim of the graduate training program is to develop competent researchers and teachers in all fields of medical microbiology and immunology. Emphasis is placed on helping the student explore creative potential and develop essential research skills and teaching competence that will enable him/her to secure a faculty appointment in a medical or related health professions' school, or a position as a research scientist in a biomedical research institute or in the biotechnology and/or pharmaceutical industry. The department offers formal courses covering both basic and clinical microbiology and immunology and specializes in advanced teaching of immunology, molecular biology, clinical immunology, molecular virology, cell biology, parasitology, and molecular parasitology.

The PhD in Microbiology and Immunology will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### Degree Requirements – PhD Track

Entry into the Ph.D. training program follows successful completion of the IGPBS core year and follows the SGPS Advanced Phase timeline for selection of research committee, preliminary exam, thesis proposal, progress review, and thesis defense. The Ph.D. will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### Department Requirements for PhD Degree (following completion of IGPBS Core Coursework)

#### Completion of Core Courses

- GMIC-600 A & B** Medical Microbiology and Immunology (PhD students) (fall/winter)
- MMIC 600 A & B** Medical Microbiology and Immunology (MD/PhD students) (fall/winter)
- GMIC-605** Molecular Biology Techniques (fall)

#### Completion of two (2) advanced courses from the following list:

- GMIC-503** Virology (spring)
- GMIC-560** Advanced Immunology (winter)
- GMIC-606** Cancer Biology and Signaling (winter)

#### Additional Program Requirements – participation required in all quarters

- GMIC-532** Journal Club
- GMIC-533** Microbiology and Immunology Seminar

#### Elective Seminar

- GMTD-709** MCS Seminar Series (2nd Wednesday each month)

**Research** (Participation required in all quarters)**GMIC-539** Intro to Research – before passing the Candidacy Exam**GMIC-535** Doctoral Dissertation in Microbiology and Immunology – after passing the Candidacy Exam**Optional Advanced Courses****GMIC-510** Introductory Immunology (fall)**GMIC-520** Molecular Parasitology (winter)**GMIC-542** Selected Topics of Microbiology, Virology, Parasitology, Immunology, and Molecular Biology**GMIC-549** Flow Cytometry Techniques**GMIC-564** Contemporary topics in Clinical Immunology**Graduate Faculty**

**Chair:** Bala Chandran, PhD, Professor  
Kenneth Beaman, PhD, Professor  
Kwang-Poo Chang, PhD, Professor  
David Everly, PhD, Assistant Professor  
Michael Fennewald, PhD, Associate Professor  
Alice Gilman-Sachs, PhD, Associate Professor  
Patricio I. Meneses, PhD, Assistant Professor  
Neelam Sharma-Walia, PhD, Research Assistant Professor  
Gulam Waris, PhD, Assistant Professor  
Chao-Lan Yu, PhD, Associate Professor

## DEPARTMENT OF NEUROSCIENCE

Graduate training in Neuroscience is coordinated by the Interdepartmental Neuroscience Ph.D. Program (IDNP), which includes all faculty members in the Dept. of Neuroscience as well as approximately 20 faculty members from four other basic science departments whose research interests are in nervous system-related topics. (Other participating departments include Cellular and Molecular Pharmacology, Physiology and Biophysics, Cell Biology and Anatomy, and Biochemistry and Molecular Biology).

### Degree Requirements – PhD Track

Entry into the Ph.D. training program follows successful completion of the IGPBS core year and follows the SGPS Advanced Phase timeline for selection of research committee, preliminary exam, thesis proposal, progress review, and thesis defense. The Ph.D. will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### IDNP Requirements for PhD Degree (following completion of IBPBS Core Coursework)

#### Advanced Coursework Requirements

<b>GNSC-600</b>	Neurophysiology (fall)
<b>GNSC-606</b>	Neurodegeneration (spring)
<b>GNSC-607</b>	Neuronal Signaling (winter)
<b>GCMP-600</b>	Neuropharmacology I
<b>GCMP-601</b>	Neuropharmacology II
<b>GNSC-605</b>	Techniques in Microscopy (fall)
<b>GNSC-505</b>	Human Brain Dissection (fall)

#### Teaching Requirements

<b>GNSC-570</b>	Neuroscience Teaching Assistant
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#### Additional IDNP Requirements

<b>GNSC-553</b>	Neuroscience Journal Club
<b>GNSC-504</b>	Neuroscience Seminar

#### Elective Seminars and Journal Clubs

<b>GMTD-709</b>	MCS Seminar Series (2 <sup>nd</sup> Wednesday each month)
<b>GCMP-500</b>	Electrophysiology Journal Club
<b>GCMP-502</b>	CMP Journal Club (required for Neuropharmacology Track)
<b>GCMP-509</b>	Seminar in Pharmacology (required for Neuropharmacology Track)

**MD/PhD and DPM/PhD** students will follow the guidelines of the SGPS (IGPBS Specialty Course) and a course curriculum designed by the Student and Research Committee, with approval by the Dean.

#### Neuropharmacology Track

For students seeking a degree in Neuroscience (PhD or MD/PhD or DPM/PhD), but whose mentors are

members of the Department of Cellular and Molecular Pharmacology, a second track is offered, emphasizing Neuropharmacology. The requirements for this track are similar to the regular Interdepartmental Neuroscience Program, except for the addition of one required course, Pharmacology Core (GCMP-605), which replaces Human Brain Dissection (GNSC-505) and Techniques in Microscopy (GNSC-605). The latter two courses may be taken as electives. Another difference is that the teaching requirement for the Neuropharmacology Track is GCMP-700, Teaching in Pharmacology, in lieu of GNSC-570. The required Journal Club is GCMP-502 and the required Seminar Series is GCMP-509, although these may be adjusted based on the needs of individual students.

### **Graduate Faculty**

**Chair:** Marina Wolf, PhD, Professor  
Marjorie Ariano, PhD, Vice Chair and Professor  
Lise Eliot, PhD, Associate Professor  
Robert Marr, PhD, Assistant Professor  
Daniel Peterson, PhD, Associate Professor  
Grace (Beth) Stutzmann, PhD, Assistant Professor  
Anthony West, PhD, Associate Professor

## DEPARTMENT OF PHYSIOLOGY AND BIOPHYSICS

The Department of Physiology and Biophysics offers advanced degree programs leading to the MD/PhD, DPM/PhD, and PhD in Physiology and Biophysics. These programs prepare candidates for careers in research and teaching in the field of modern Physiology and Biophysics.

The aim of the graduate training program is to develop competent researchers and teachers in all fields of Physiology and Biophysics. Emphasis is placed on helping the student explore creative potential and develop essential research skills and teaching competence that will enable him/her to secure a faculty appointment in a medical or related health professions school, or a position as a research scientist in a biomedical research institute, or in the biotechnology and/or pharmaceutical industry. The department offers formal courses covering both basic and clinical physiology, ad cell physiology, and specializes in advanced teaching of transport biology and cell physiology.

Entry into the PhD training program follows successful completion of the IGPBS core year, and follows the SGPS Advanced Phase timeline for selection of research committee, candidacy exam, thesis proposal, progress review, and thesis defense.

### Degree Requirements – PhD Track

Entry into the Ph.D. training program follows successful completion of the IGPBS core year and follows the SGPS Advanced Phase timeline for selection of research committee, preliminary exam, thesis proposal, progress review, and thesis defense. The Ph.D. will be granted upon successful completion of the following requirements, as well as thesis defense and publication.

### Department Requirements for PhD Degree (following completion of IGPBS Core Coursework)

#### Advanced Coursework Requirements

<b>GPHY-500 A&amp;B</b>	Medical Physiology (fall/winter)
<b>GPHY-539</b>	Introduction to Research
<b>GPHY-535</b>	Doctoral Research in physiology

#### Advanced Coursework (Electives)

<b>GIGP-506</b>	Systems Physiology (spring)
<b>GPHY-512</b>	Physiology of the Autonomic Nervous System (fall)
<b>GPHY-513</b>	Pulmonary Pathophysiology (spring)
<b>GPHY-514</b>	Physiology of the Liver (winter)
<b>GPHY-516</b>	Cardiovascular Physiology (fall/winter)
<b>GPHY-542</b>	Electrogenic Ion Pumps (winter)
<b>GPHY-545</b>	Acid-Base Physiology (spring)
<b>GPHY-618</b>	Molecular Biophysics of Ion Channels (spring)

### Teaching Requirements

**GPHY-534** Teaching Methods (fall)  
Physiology Problem Sets for MPHY 500A/B

### Department Program Requirements

**GMTD-711** Department Journal Club  
**GPHY-505** Department Seminar

### Elective Seminars

**GMTD-709** MCS Seminars (2<sup>nd</sup> Wednesday each month)

**MD/PhD and DPM/PhD** students will follow the guidelines of the SGPS (IGPBS Specialty Course) and a course curriculum designed by the Student and Research Committee, with approval by the Dean.

### Department Requirements for Masters Degree

Masters programs are tailored to each candidate. The following minimum requirements must be met before the candidate will be eligible for the degree.

**GPHY-522A** Topics in Physiology I  
**GPHY-522B** Topics in Physiology II

### Graduate Faculty

**Chair:** Robert J. Bridges, PhD, Professor  
Dmitri Boudko, PhD, Assistant Professor  
Neil A. Bradbury, PhD, Associate Professor  
Lisa Ebihara, MD, PhD, Associate Professor  
Timothy Hansen, PhD, Professor  
Richard Hawkins, PhD, Professor  
Donghee Kim, PhD, Professor  
Charles E. McCormack, PhD, Professor and Vice Chair  
Darryl Peterson, PhD, Professor  
Gordon Pullen, PhD, Assistant Professor  
Hector Rasgado-Flores, PhD, Associate Professor  
Henry Sackin, PhD, Professor  
Ernest Sukowski, PhD, Associate Professor  
Janice Urban, PhD, Associate Professor  
Carl White, PhD, Assistant Professor

### Secondary and Adjunct Faculty

Sarah Garber, PhD, Associate Professor  
Raul Gazmuri, MD, PhD, Associate Professor  
Gordon Pullen, PhD, Assistant Professor  
Bruce Riser, PhD, Adjunct Professor

**INTERDISCIPLINARY GRADUATE PROGRAM IN BIOMEDICAL SCIENCE (IGPBS) CORE****GIGP-500** First Year Research Rotations (1.00 cr.)

REQUIRED for IGPBS – First year IGPBS students complete four self-selected laboratory rotations with research faculty. These eight-week rotations are designed to introduce student and mentor in the laboratory setting with the goal of determining student/mentor match. At the end of the rotations, the student will select their thesis advisor from among those faculty members with whom the rotations were held. Lab

**GIGP-501** Molecular – Cell Biology I (6.00 cr.)

REQUIRED for IGPBS - Based on MBCH 502, this course consists of 36 formal MCB lectures plus seven Physiology lectures; weekly student presentation and discussion of research papers; MD/PhD students also attend 2 clinical correlation lectures and participate in 2 integrated problem based learning sessions. In this course, the molecular and cellular processes common to all eukaryotic cells are studied and, where appropriate, comparisons to prokaryotic cells are made. The molecular and cellular processes of specific cell types and tissue types are also considered, and related to their morphological appearance. A unique aspect of the course is a self-teaching program that covers certain facts and concepts basic to biochemistry; this is an individual, self-learning, self-evaluation program. The course is taught by Dr. Walters and faculty from the Departments of Biochemistry and Molecular Biology and Cell Biology & Anatomy. Grading is based 30% on written midterm exam; 30% on written final exam; 40% on participation in discussion sessions. Lecture Only, Seminar/Discussion. Fall

**GIGP-502** MCB II (4.00cr.)

REQUIRED for IGPBS A continuation and expansion of the principles taught in Molecular - Cell Biology I, this course covers the following topics: protein structure & molecular recognition, enzyme action & adaptation principles of biomolecular action & regulation receptors, signal transduction, gene expression – pre-mRNA to targeted protein degradation, antibodies-structure and function, and current methods of cell biology. Lecture Only, Seminar/Discussion. Winter

**GIGP-503** Systems Lectures

REQUIRED for IGPBS - The Systems Lectures are a series of short, 1 credit modules (2 weeks each) that focus on particular diseases and take the student from the disease's primary underlying mechanism (at the cellular level or gene level, if known) to the integrated physiological systems level. The modules are a combination of lectures and/or directed paper discussions by faculty with expertise in a particular disease area. Lecture Only, Seminar/Discussion. Winter

**GIGP-503 A** – Fundamentals of Immunology and Human Immunodeficiency Virus (1.00 cr.)

**GIGP-503 B** – Cystic Fibrosis (1.00 cr.)

**GIGP-503 C** – Cancer (1.00 cr.)

**GIGP-503 D** – Parkinson's Disease (1.00 cr.)

**GIGP-504** Neuroscience (7.00 cr.)

ELECTIVE for IGPBS - Students must take a minimum of 1 elective option in the first year. This course provides a broad introduction to modern neuroscience, emphasizing: 1) cellular neuroscience, including the neurochemistry of transmitters and receptor function; 2) systems neuroscience, encompassing sensory, motor, affect, memory, language, and other high cognitive functions; 3) human neuroanatomy, taught using a combination of atlases, realistic models, cadaver brains, and interactive computer programs; and 4) clinical neuroscience, focusing on the neurobiological basis of major neurological and psychiatric disorders. It is recommended that students take this in conjunction with Systems Physiology (GIGP-506). . Lecture and lab. Spring.

**GIGP-505** Cell & Mole Develop Biology (3.00 cr.)

ELECTIVE for IGPBS - Students must take a minimum of 1 elective option. This course will introduce the students to the prominent experimental model systems used today by developmental biologists and then focus on particular underlying developmental control mechanisms that are important to the processes of cell differentiation and morphogenesis. The course is made up of a combination of lectures and/or directed paper discussions by faculty with expertise in the various sub-topics of the course. Lecture Only. Spring

**GIGP-506** Systems Physiology (4.00 cr.)

ELECTIVE for IGPBS - Students must take a minimum of 1 elective in their first year. The Systems Physiology elective includes the study of: cardiac, respiratory, renal, gastrointestinal and endocrine physiology. It is designed for graduate students who have successfully completed Molecular and Cell Biology 1 and 2, but require a more complete understanding of organ-systems physiology. The text required is Principles of Physiology, 4th edition by Robert Berne and Matthew Levy. Papers, discussions and presentations relevant to the system being presented may supplement the topics. Examinations are in written format. Nota bene: This course is recommended for those students also taking the Neuroscience elective. Those students studying toward the PhD, degree with an advisor in Physiology and Biophysics will be required to complete the full course in Medical Physiology MMPH500A and B (14 units). Lecture Only, Seminar/Discussion. Spring

**GIGP-507** The Art of Scientific Presentation (2.00 cr.)

REQUIRED for IGPBS - Students learn to improve their oral presentation skills by weekly presentations and by giving and receiving peer evaluation. The successful scientific career requires clear communication of scientific results. Participants in this course practice giving and evaluating oral presentations of technical material. Topics to be covered include organization of a talk, targeting the material to the appropriate level of the audience, overcoming "stage fright", effective visual aids, developing eye contact, effective use of voice, overcoming language barriers and handling question-and-answer sessions. Lecture Only, Seminar/Discussion. Fall

**GIGP-508** Ethics and Regulatory Issues (2.00 cr.)

REQUIRED for IGPBS - This course covers most of the major issues related to the responsible conduct of research in the biomedical sciences, including: overt falsification, fabrication, plagiarism (FFP); authorship and publication guidelines; conflict of interest; mentor/trainee responsibilities, and human subject research. Online

component includes certification for using radioisotopes and using animals in research. Lecture, discussions, and online modules. Coordinated by Dr. Eliot. Winter

**GIGP-509** Biostatistics (4.00 cr.)

REQUIRED for IGPBS Specialty Course - Study of descriptive and inferential statistics with relevance to research will be included. Use of the computer for statistical analysis will be covered. There will be opportunity to use statistics for a small pilot project. Lecture Only, Seminar/Discussion. Spring

**GIGP-510** Computer Applications in Biomedical Sciences (2.00 cr.)

REQUIRED for IGPBS - Combination of lecture and hands-on application of computer databases and tools to research problems. Grading is based on student projects carried out during the quarter. Lecture Only. Winter

**DEPARTMENT: BIOCHEMISTRY AND MOLECULAR BIOLOGY**

**GBCH-530** Master's Thesis in Biochemistry (1.00 – 12.00 cr.)

After completing coursework, the student writes his/her thesis. Thesis.

**GBCH-531** Master's Research in Biochemistry (1.00 – 12.00 cr.) Research.

**GBCH-532** Bio/Molecular Journal (1.00 cr.)

Presentations on current literature or personal research by faculty, staff and students. Seminar/Discussion.

**GBCH-533** Seminar (1.00 cr.)

Presentations on current research by invited speakers. Seminar/Discussion.

**GBCH-535** Doctoral Dissertation in Biochemistry (1.00- 12.00 cr.)

After completing course work and all research, the student writes his/her doctoral. Doctoral Dissertation.

**GBCH-537** Methods in Research (1.00 – 12.00 cr.)

Doctoral dissertation research. Research.

**GBCH-538 A** Advanced Molecular Biology (3.00 cr.)

Advanced Molecular Biology. Lecture Only. Winter

**GBCH-538 B** Advanced Molecular Biology (5.00 cr.)

Advanced Molecular Biology. Lecture Only. Spring

**GBCH-539** The Art of Science. Presentation(2.00 cr.)

The Art of Scientific Presentation Lecture Only. Fall

**GBCH-543** Enzyme Structure & Mechanism (3.00 cr.)

This is a course of lectures, student presentations and seminars by outside speakers on aspects of enzyme/protein structure and function; topics include: proteomics, X-ray structure determination, computer graphic modeling as well as enzyme kinetics, regulation and mechanism. Lecture Only. Spring

**GBCH-544 A&B** Physical Biochemistry (3.00 cr.)

This course deals with the physical chemical properties of biological macromolecules and the techniques used for their characterization. Molecular weight, hydrodynamic properties, and spectroscopic properties of proteins and nucleic acids; secondary structure, tertiary structure, and conformational changes of proteins; dynamics of protein-protein and protein-DNA interactions; and kinetics and thermodynamics of protein folding. Lecture Only. Winter/Spring

**GBCH-554** Computer Applications in Biological Chemistry (2.00 cr.)

Computer Applications in Biological Chemistry Lecture Only. Winter

**GBCH-600 A/B** BIOCHEMICAL PATHWAYS (7.00 CR.)

The fundamental chemical properties and biological reactions of the various compounds important to the normally functioning human organism are studied. As far as possible, mechanisms of life processes at the cellular and molecular level are explained in terms of these properties. Papers from the primary literature will be discussed in conference.

- **A-** Fall Quarter, 5 lecture hours per week for 4 weeks and up to 2 conference hours per week.
- **B-** Winter Quarter, 3 lecture hours per week and up to 2 conference hours per week (total of 7 credits).

**DEPARTMENT: CELL BIOLOGY AND ANATOMY****GCBA-500 A&B** Clinical Anatomy (11 cr.)

In this course, human anatomy is studied by using a regional approach that also includes functional and clinical correlations. Laboratory time is devoted exclusively to the regional dissection of a human cadaver. Supplementary offerings within the course include computerized images, guides and videos, prosected cadavers and bone sets for individual study.

- **A-**Fall Quarter, three lectures and five laboratory hours per week (5.0 cr.)
- **B-**Winter Quarter, four lectures and five laboratory hours per week (6.0 cr.)

**GCBA-502 A&B** Histology (5 cr.)

The principal educational goal of this course is an understanding of organ structure and organ function through the detailed study of light microscopic preparations and electron micrographs.

- Fall Quarter (3 units)
- Winter Quarter (2 units)

**GCBA-504** Embryology**GCBA-530** Master's Thesis Cell Biology/Anatomy (1.00 – 12.00 cr.)

Master's Thesis in Cell Biology and Anatomy. Lecture Only.

**GCBA-532** Cell Biology/Anatomy. Journal Club (1.00 cr.)

Presentations on current literature or personal research by faculty, staff and students. This is a required course for all Cell Biology and Anatomy doctoral students. Seminar/Discussion.

**GCBA-533** Cell Biology/Anatomy Seminar (1.00 cr.)

Presentations on current research by invited speakers. This is a required course for all Cell Biology and Anatomy doctoral students. Lecture Only.

**GCBA-535** Doctoral Dissertation in Cell Biology and Anatomy (1.00 – 12.00 cr.)

Doctoral Dissertation in Cell Biology and Anatomy. for research done following Candidacy Exam Lecture Only.

**GCBA-537** Methods in Research (1.00 – 12.00 cr.) Research done prior to Candidacy Exam. Lecture Only.**GCBA-551** Basic Electron Microscopy Technique (2.00 cr.)

Basic Electron Microscopy Technique. Lecture Only.

**GCBA-600** Advanced Cell Biology (2.00 cr.)

Advanced treatment of key topic areas in modern cell biology. Course involves critical evaluation of primary literature and discussion with concentrations in nuclear organization, gene expression, cell trafficking, mitosis, meiosis, cell cycle ,apoptosis, extra cellular matrix, cancer and metastatic disease. This is a required course for all Cell Biology and Anatomy doctoral students metastatic. Seminar/Discussion. Winter

**GCBA-602 A & B** Special Topics in Cell Biology (1.00 cr. each)

Topics of current interest in Cell Biology will be covered in a format that involves primary literature and discussion as well as a didactic component. Seminar/Discussion. Spring

**GCBA-604** Techniques in Cell Biology (2.00 cr.)

Theory and application of fundamental techniques used to visualize cells and cellular processes. Course is partly didactic and partly student participation/observation of techniques for: tissue cultures, live cell imaging, electron microscopy, immunocytochemistry, confocal microscopy, visualizing molecules. This is a required course for all Cell Biology and Anatomy doctoral students. Lecture-Lab. Fall

**GCBA-605** Special Topics in Developmental Biology (1.00 cr.)

Current topics of particular interest in the field of developmental biology with emphasis in discussion of current literature and relevance to the conceptual framework of the field Seminar/Discussion Spring

**GMTD-711** Cell Journal Club (1.00 cr.)

Cell Journal Club. Lecture Only.

**DEPARTMENT: CELLULAR AND MOLECULAR PHARMACOLOGY****GCMP-500** Electrophysiology Journal Club (1.00 – 3.00 cr.)

The purpose of the electrophysiology journal club is to facilitate the understanding and discussion of electrophysiological data, from published papers to preliminary/exciting yet unpublished observations from different electrophysiology laboratories in our school.

**GCMP-502** Journal Club in Cellular & Molecular Pharmacology (1.00 – 2.00 cr.)

Consists of informal presentation and discussion of current and novel literature in pharmacology. May be repeated for credit. One hour every two weeks, Tuesdays at noon.

**GCMP-509** Seminar in Cellular & Molecular Pharmacology (1.00 cr.)

Internationally-recognized scientists present their most recent research. Students meet for lunch with the speakers, allowing for informal interactions. May be repeated for credit.

**GCMP-535** Research in Pharmacology - Thesis (1.00 – 12.00 cr.)

This designation is utilized for students who have passed their candidacy exam, and are performing thesis work/research in pharmacology. Credit hours to be arranged with thesis mentor.

**GCMP-539** Research in Pharmacology - Introduction (1.00 – 12.00 cr.)

This designation is utilized for students who have yet to pass their candidacy exam, and are performing research in pharmacology. Credit hours to be arranged with research mentor.

**GCMP-600** Neuropharmacology I (2.00 cr.)

Lectures present a comprehensive overview of the cellular foundations of neuropharmacology, techniques used in neuropharmacology, and experimental design. Principles of excitable membranes and ion channels will be discussed. Subject matters are covered in lectures and with interactive problem-solving approaches. These lectures will provide a background to the topics covered in GCMP601 Neuropharmacology II. 2 hours/week (Tuesdays 1-3PM). Fall

**GMCP-601** Neuropharmacology II (2.00 cr.)

Lectures focus on neurotransmitter systems and how these participate on specific behaviors and disease states. Final lecture will integrate basic neuropharmacology research with the translational aspects of drug discovery. Scholarly publications will accompany discussion lectures. 2 hours/week (Tuesdays 1-3PM). Winter

**GCMP-605** Pharmacology Core (6.00 cr.)

This course will introduce students to the basic principles of drug action. The first quarter will cover basic principles of the autonomic drugs and the therapeutic uses, side effects, and interactions of prostaglandins, NSAIDs, and central nervous system agents. The second quarter will continue the study of selected drug categories, including antimicrobials, anti cancer drugs, general and local anesthetics, cardiac drugs, and sedative/hypnotics. The third quarter will continue with drug categories that include endocrine and metabolic

modulators, and treatment of asthma. Subject matters are covered in lectures, tutorials, and discussions.  
Fall/Winter/Spring

**GCMP-700** Teaching in Pharmacology (1.00 - 3.00 cr.)

Part of our mission is to prepare students for academic and educational positions. Students will be trained in teaching strategies and will serve as facilitators in the Medical Pharmacology small-group problem-solving sessions, and as lecturers in the Basic Biomedical Science pharmacology review sessions. Fall/Winter/Spring

**GCMP-new** Research Skills – beyond the bench (1.00 – 4.00 cr.)

This course will review the skills required for a successful career in academic research, providing tools to help students develop such skills. Modules are geared towards real-life experiences that students will encounter while performing scientific research in academic settings. The course will also increase professionalism and communication skills. The course has four modules and focuses on (1) meetings, (2) manuscripts, (3) grants, and (4) administrative research duties. Lecture/Seminar-Discussion Spring

**DEPARTMENT: MICROBIOLOGY AND IMMUNOLOGY**

**GMIC-503** Virology (4.00 cr.)

This course covers fundamental animal virology including virus structure, classification, replication and genetics. Viruses of current interest that produce human disease (for example, HIV) will be discussed. Other topics may include molecular mechanisms of viral latency, role of viruses in oncogenesis, emerging viral infections of man and viruses and gene transfer vectors in human gene therapy. The course is lecture-based and discussion of original research articles. Spring

**GMIC-510** Introductory Immunology (3.00 cr.)

This course is appropriate for non-microbiology and immunology majors who have had no formal training in immunology or who wish to review the fundamentals in preparation for the Advanced Immunology course. An overview of specific and nonspecific immunity, structure and function of immunoglobulins, molecular basis of antibody diversity, T cell and B cell differentiation, cell-cell interactions in the immune response, humoral and cell-mediated immunity, lymphokines and mediators, immunogenetics and major histo-compatibility complexes, complement, inflammation, hypersensitivity, autoimmune and immunodeficiency diseases, tumor immunology and transplantation immunology are among the topics discussed. Lecture Only. Fall

**GMIC-520** Molecular Parasitology (3.00 cr.)

This course involves theoretical and practical aspects of applying new biological technology to study parasites and parasitic mechanisms of major tropical diseases. Emphasis is on molecular biology (especially DNA and RNA interactions). The depth of coverage depends on the prior training of the participants. Students are expected to actively participate in discussing recent literature as well as in project-oriented research. Research topics may be directed to the background or training and interests of the students. Winter

**GMIC-530** Master's Thesis in Microbiology/Immunology (5.00 – 15.00 cr.)  
Research.

**GMIC-532** Journal Club (1.00 cr.)  
Faculty, post-doctoral fellows, and students discuss current research efforts. Participants present their “work in progress” in an informal presentation, which includes an introduction to the field of interest. This series covers topics of research currently being pursued in the department and is geared towards learning of each other’s work and assisting one another in defining science and presentation skills. Required for all Microbiology and Immunology students. Lecture Only.

**GMIC-533** Seminar in Microbiology & Immunology (1.00 cr.)  
Presentations on current research in the field of Microbiology and Immunology by invited speakers, faculty and students. Required of all Microbiology and Immunology students. Lecture Only.

**GMIC-535** Doctoral Dissertation in Microbiology and Immunology (5.00 – 15.00 cr.)  
Research. Lecture Only.

**GMIC-539** Introduction to Research  
Graduate students, early in their course of study, work with a member of the faculty in research, to learn specific basic procedures to enable students to select their graduate research work. Research Only.

**GMIC-542** Selected Topics in Microbiology (2.00 cr.) Lecture Only. Fall, Winter, Spring, Summer

**GMIC-549** Flow Cytometric Techniques (1.00 cr.)  
Students learn flow cytometric technology including immunophenotyping, cell sorting, DNA kinetics and cellular ploidy analysis. Lecture Only.

**GMIC-560** Advanced Immunology (3.00 cr.)  
Lectures, discussion and assigned reading for in-depth studies to cover properties of antigens and antibodies; mechanisms of antibody formation; phylogeny and ontogeny of the immune system; structural and functional aspects of the immune system; molecular basis of antibody and lymphocyte diversity; major histocompatibility complexes in man and animals; immunogenetics of differentiation; effector mechanisms of antibody and cell-mediated immunity; immunodeficiency diseases; regulation and control of the immune response; genetics and immunology of transplants and tumors. Lecture Only. Winter

**GMIC-600A&B** Medical Microbiology & Immunology.  
This course consists of two parts: [1] ~55 lectures of relevance from Medical Microbiology and Immunology (MMIC 600 A-B) taken along with medical students on immunology, basic bacteriology and pathogenic bacteria. [2] Students’ review, presentation and discussion of latest articles related to subjects of the lectures. Evaluation will be based on essay type exams, topic papers, oral presentation and discussion of articles.

**GMIC 600A** Fall Quarter, six lecture hours (when scheduled) per week (4.00 cr.)

**GMIC 600B** Winter Quarter, six lecture hours (when scheduled) per week (4.00 cr.)

**GMIC-605** Cancer Biology and Signaling (2.00 cr.)

This course will give students a working knowledge of various molecular experimental approaches and to understand the advantages and limitations of each. Lecture only. Fall

**GMIC-606** Cancer Biology and Signaling (2.00 cr.)

This course covers the basic biology of cancer at the cellular and molecular levels with special emphasis on aberrant signal transduction pathways in cancer cells. The course involves lectures and discussion of original research/review articles. Lecture only. Winter

**DEPARTMENT: NEUROSCIENCE****GNSC-504** Neuroscience Seminar (1.00 cr.)

Presentations on current research in the field of Neuroscience by invited speakers. Required of all Neuroscience PhD and MD/PhD students. Fall, Winter and Spring Quarters, one hour per week. Lecture Only.

**GNSC-505** Brain Dissection (1.00 cr.)

An intensive short course, where students will carry out a detailed dissection of a human cadaver brain. This dissection will expose them to all the major areas of the human forebrain, brainstem, and cerebellum, including major fiber tracts subcortical nuclei, and their connections to brainstem and cortical structures. Special emphasis will be placed on human limbic structures and the circuitry underlying emotion, addiction, and other psychiatric disorders. Dr. Eliot, Fall quarter, 1 credit. Lab Only.

**GNSC-535** Doctoral Dissertation in Neuroscience (2.00 – 12.00 cr.)

This course is for the PhD student who has successfully passed the Candidacy Exam. May be repeated for credit. Fall, Winter, Spring and Summer Quarters, hours and units to be arranged. All Faculty. Research.

**GNSC-539** Introduction to Research (2.00 – 12.00 cr.)

This course is for the second-year PhD student or third year MD/PhD or DPM/PhD student who has chosen a laboratory but not yet passed the Candidacy Exam. Laboratory experience is geared toward learning techniques and obtaining preliminary data toward the student's dissertation proposal and Candidacy Exam. May be repeated for credit. Fall, Winter, Spring and Summer Quarters, hours and units to be arranged. All Faculty. Lecture Only.

**GNSC-553** Neuroscience Journal Club (1.00 cr.)

Presentations on current literature, personal research and newsworthy developments in neuroscience by faculty, staff and students. Required of all Neuroscience PhD and MD/PhD students. Fall, Winter and Spring Quarters, one hour per week. Coordinated by Dr. Marr. Seminar/Discussion.

**GNSC-570** Neuro Teaching (1.00 cr)

**GNSC-600** Neurophysiology (2.00 cr.)

A thorough review of neurophysiological function, including the ionic basis of the neuronal membrane potential and action potentials, pre- and post-synaptic signaling, signal transduction, cable properties, and synaptic plasticity. Fall Quarter, two hours per week. Coordinated by Dr. Stutzmann. Seminar/Discussion.

**GNSC-605** Techniques in Microscopy (1.00 cr.)

A comprehensive instruction to state-of-the-art microscopy and design-based stereology. Lectures cover the fundamentals of tissue preparation and staining, microscopy, digital imaging and confocal stereology. Fall Quarter, 1 credit, Dr. Peterson. Lecture-Lab.

**GNSC-606** Neurodegeneration (2.00 cr.)

Mechanisms of brain death and neuronal degeneration resulting from chronic or acute diseases and their prospects for recovery. Topics include the clinical features and animal models of traumatic brain injury, stroke, spinal cord injury, Parkinson's, Alzheimer's and Huntington's diseases. Spring, two hours per week. Coordinated by Drs. Ariano and West. Seminar/Discussion.

**GNSC-607** Neuronal Signaling (2.00 cr.)

This course covers intracellular signaling mechanisms including G proteins, phosphoinositides, cyclic nucleotides, calcium, serine and threonine phosphorylation, and tyrosine phosphorylation. Faculty will present basic information on each topic. Students are responsible for leading discussions based on the text and journal articles. Winter, two hours per week. Dr. Wolf. Seminar/Discussion.

**DEPARTMENT: PHYSIOLOGY AND BIOPHYSICS****GPHY-500A & B** Medical Physiology (14.00 cr.)

The course offers the basic principles of organ system physiology. Through lectures, demonstrations, conferences and laboratory work, students receive a quantitative and integrated concept of subcellular, cellular and organ system function. (N.B. This course is required for all graduate students majoring in physiology.)

- GPHY 500A Fall, five lectures and three hours of laboratory work and conferences per week (7 units).
- GPHY 500B Winter, six lectures and two hours of conferences per week (7 units).

**GPHY-505** Physiology Seminar (1.00 cr.)

Students, staff and invited guests present their current research programs in physiology for discussion and analysis. Lecture Only.

**GPHY-512** Physiology of Autonomic Nervous System (2.00 cr.)

An advanced course with the material covering autonomic nervous regulation and integration of vital functions such as respiration, circulation and temperature regulation. Seminar/Discussion. Fall

**GPHY-513** Pulmonary Pathophysiology (2.00 cr.)

The biophysics of pulmonary mechanics and gas transport are presented as a basis for evaluating pulmonary function. Modern pulmonary function-testing equipment is utilized in the laboratory, and an emphasis is placed on recognizing abnormal lung volumes and air flows. Lecture Only. Spring

**GPHY-514** Physiology of the Liver (2.00 cr.)

In addition to an in-depth discussion of the functions of the liver and experimental techniques used in studying the liver, the effects of complete and partial hepatectomy are described as well as the pathophysiology of the liver. Seminar/Discussion. Winter

**GPHY-516** Cardiovascular Pathophysiology (2.00 cr.)

Clinical aspects of cardiovascular function are emphasized, e.g. heart sounds and murmurs, electrocardiogram, monitoring of central venous pressure, and cardiac function curves. Lecture Only. Fall/Winter

**GPHY-534** Teaching Methods (1.00 – 2.00 cr.)

To provide graduate students with practical experience in teaching physiology, advanced students present lectures and assist in the planning and direction of laboratory and discussion sessions and in the presentation of technical material under the careful supervision of the staff. Hours and credit hours to be arranged. Lecture Only. Fall

**GPHY-535** Doctoral Research in Physiology (5.00 – 15.00 cr.)

Research for doctoral work after Candidacy Exam is passed. Hours and units of credit to be arranged (5-15 hours per quarter). Lecture Only.

**GPHY-539** Introduction to Research

In their second year of study, students assist a member of the faculty with research as a step towards determining and planning their own graduate research work. Hours and units of credit to be arranged. Lecture Only.

**GPHY-542** Electrogenic Ion Pumps (3.00 cr.)

The objective of this course is to conduct an in-depth survey of the current state of knowledge of the mechanisms of electrogenic active transport of ions and of other substrates whose movement is coupled to the movement of a charged substrate. This objective will be achieved primarily by lectures presented by the instructors. In addition, students will be given written homework assignments that will be discussed in class. In general there will be two lecture hours presented per week and one hour of classroom discussion time. Topics to be discussed include: 1) basic principles of pump function, 2) electrogenic properties of ion pumps, 3) ion pumps and electrical properties of cell membranes, 4) bacteriorhodopsin, 5) proton pumps, 6) Na/K ATPase, 7) Ca-ATPase of sarcoplasmic reticulum, 8) FoFI-ATPases, and 9) cytochrome oxidase. A written final examination will be given at the end of the course. Lecture Only. Winter

**GPHY-545** Acid-Base Physiology (2.00 cr.)

Group discussions of assigned readings on the mechanisms of body defenses against changes in acid-base balance. Seminar/Discussion. Spring

**GPHY-618** Molecular Biology of Ionic Channels (3.00 cr.)

This course will cover both experimental and theoretical aspects of ionic channels in biological membranes. Topics to be discussed include the following: 1) classical biophysics of the squid giant axon, 2) Na and K

channels, 3) calcium channels, 4) K and chloride channels, 5) endplate channels, 6) properties of ions in solution, 7) properties of pores, 8) counting channels, 9) ionic selectivity, 10) ion saturation and binding, 11) mechanisms of drug block, and 12) gating mechanisms. Lecture Only. Spring