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MEMORANDUM

To: Julio Frenk
University President

From: Tomás A. Salerno
Chair, Faculty Senate

Date: March 23, 2017

Subject: Faculty Senate Legislation #2016-36(B) – Establishment of a Master of Science in Biomedical Sciences (MBS), Miller School of Medicine

The Faculty Senate, at its March 22, 2017 meeting, voted unanimously for the establishment of a Master of Science in Biomedical Sciences at the Miller School of Medicine effective fall 2017. This program is consistent with the Doctor of Philosophy (PhD) program. It requires 30-credits, will consist of existing core courses from Biochemistry, Molecular Biology, Cell Biology, Physiology and Anatomy, appealing to a wide range of students who are seeking an advance degree. Additionally, it will train students in the form of physician shadowing or clinical/bench research.

The program will not require the hiring of additional faculty or infrastructure resources.

This legislation is now forwarded to you for your action.


TAS/yv

Enclosure

cc: Thomas LeBlanc, Executive Vice President and Provost
Laurence Gardner, Interim Dean, Miller School of Medicine
Guillermo Prado, Dean, Graduate School
Zafar Nawaz, Sr. Associate Dean for Graduate and Postdoctoral Studies, Miller School of Medicine
Arun Malhotra, Associate Professor of Biochemistry, Miller School of Medicine

CAPSULE: Faculty Senate Legislation #2016-36(B) – Establishment of a Master of Science in Biomedical Sciences (MBS), Miller School of Medicine

PRESIDENT'S RESPONSE

APPROVED:  DATE: 4/10/17
(President's Signature)

OFFICE OR INDIVIDUAL TO IMPLEMENT: Dean Laurence Gardner

EFFECTIVE DATE OF LEGISLATION: IMMEDIATELY
(if other than June 1 next following)

NOT APPROVED AND REFERRED TO: _____

REMARKS (IF NOT APPROVED): _____

A request to implement a new degree program
Master of Science in Biomedical Sciences

Submitted by
Zafar Nawaz, Ph.D.

Senior Associate Dean for Graduate and Postdoctoral Studies
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The Office of Graduate and Postdoctoral Studies
University of Miami Miller School of Medicine

March 2017

Request to the Graduate School and the Faculty Senate for the Approval of MS Degree in Biomedical Sciences (MBS) at the University of Miami

Introduction

The Office of Graduate and Postdoctoral Studies (OGPS) at the University of Miami Miller School of Medicine is requesting approval to implement a new one-year, course-based Master of Science (MS) degree program in the area of Biomedical Sciences. OGPS already serves as the central admissions point for graduate training at the Miller School of Medicine and the new program will utilize existing procedures and policies.

The program will be designated as Master of Science in Biomedical Sciences (**MBS**) to be consistent with the PhD program theme and to appeal to a diverse range of students seeking an advanced degree. The program is intended to help students become stronger applicants to medical school or other science-based professional schools. The program will also specifically help those interested in strengthening their academic credentials so that they may pursue advanced degrees in the disciplines represented in graduate programs at the Miller School of Medicine.

The students will be selected by the MBS Admissions Committee. Admission into the MS program will be highly selective, but selection will be based on a number of criteria such as undergraduate performance, GRE or MCAT scores, letters of recommendation, and personal statements. We anticipate offering this program to up to 12-18 students during the inaugural year.

The MBS program has been developed and discussed with active input from the graduate program directors (GPDs) of the basic sciences programs at the UMMSOM. Several GPDs were part of the initial exploratory committee that developed the framework of the MBS program (The committee comprised of Drs. Bramlett, Capobianco, Deo, Larsson, Lee, Malhotra, Scott, Nawaz). In addition, the MBS program has been discussed in several of the monthly GPD meetings, and the programs have been kept apprised of the structure, coursework and budgetary issues in this proposal. Letters of support from program chairs are included in this proposal.

Rationale

The area of biomedical sciences continues to undergo a revolution as detailed mechanistic and translational approaches are increasingly necessary in academia, industry, and medicine. Top-tier universities such as Johns Hopkins, Tufts, and University of Massachusetts have pioneered the development of MS degree programs to meet various market demands including providing prospective medical school applicants, who need to enhance their resumes, with a more in-depth background in the Biomedical Sciences and a Master's degree. As an excellent institution of higher learning, the University of Miami Miller School of Medicine (UMMSM) is well positioned to contribute to educational innovation. Rather than providing a Post-Baccalaureate program which may improve the chances of acceptance to medical school, but will not substantively improve job prospects should these individuals not be accepted to medical school, a Master of Science degree in the Biomedical Sciences would increase career options.

Currently, in the greater South Florida area, few programs of this type exist. The high rankings of UMMSM in comparison would most certainly attract students who are more academically competitive and are cognizant of the added value of a UM degree. The secondary aim of the MS Program outlined in this proposal is to recruit and train individuals capable of populating an ever-diversifying and complex job market for careers in a wide range of biomedical sciences. This program will provide students with outstanding educational opportunities and a broad knowledge in the various aspects of modern biomedical research. After successful completion of this program, students will have more career options and an increasing likelihood of making important contributions to scientific progress and society. The new MS degree program will contribute significantly to the continued elevation in the quality and diversity of graduate training at the Miller School of Medicine.

See attached documents from comparable programs at other institutions.

Admission Requirements

In order to be admitted to this program, a student must have a Bachelor's degree from an accredited institution and sufficient undergraduate coursework in the areas of biological sciences, physical sciences, medicine, agricultural sciences, or chemical sciences. Course requirements will mirror prerequisites for Medical School, and we will follow the requirements for UMMSM (<http://admissions.med.miami.edu/md-programs/general-md/prerequisites>.) Individuals with industrial work experience and prospective medical students who wish to earn a Master's degree before applying to medical school are highly encouraged to apply for this program. Students with majors in the arts or humanities will also be welcome, as long as they have taken some of the prerequisite science courses.

An undergraduate cumulative grade point average of at least 3.0 is generally required; however, students with a lower GPA but compensatory credentials may be admitted into the program at the discretion of the MBS Admissions Committee. Applicants will be required to submit scores on at least one standardized test. This can be either the GRE or MCAT. We will require a percentile score of at least 60% (averaged) on these tests, but this will be more of a minimum criteria rather than an expected benchmark for admission. The standardized test scores will be just one component of the admissions process, which will be holistic and focus heavily on the applicant's undergraduate work (GPA and courses taken). We expect to adjust the minimum GRE/MCAT scores requirements after the first few years of the program to improve the applicant pool.

Applicants will also be required to submit two letters of recommendation and a personal statement. Foreign applicants who have not received a degree from a university in the United States must satisfy English proficiency requirements by submitting TOEFL scores.

The MBS admissions committee will be highly selective, and care will be taken to only admit students who are likely to be competitive for medical and graduate schools after completing the MBS program. In this endeavor, we will seek input from the UMMSM MD/MPH and PIBS/PhD admission committees. Our aim will be to attract strong students with gaps in their undergraduate training, rather than serving to improve the general credentials of weaker applicants.

Diversity

The University of Miami Miller School of Medicine values diversity and strives for inclusion with the selection of our medical school applicants for admission. The MS in Biomedical Sciences will help to prepare applicants of diverse backgrounds for acceptance into medical school or a graduate medical program. Successful completion of courses and clinical experiences at a level of content and intensity similar to those taught in medical school will provide significant reassurance to Admissions Committees that an applicant will be successful in medical school or a graduate medical program.

Because the program will generate its own revenue, applicants from ethnic, racial, disadvantaged, and low socio-economic groups, who are under-represented in the practice of medicine in South Florida, will be considered for scholarships for the MS in Biomedical Sciences in an effort to increase the pool of qualified applicants who will be applying to the Miller School of Medicine. OGPS will work with partners in the Advancement Office and Research, Research Education, and Innovative Medicine (RIM) to establish connections with charitable donors in order to expand the funding sources of scholarships. Scholarships will begin in Year 2 using the revenue generated in the previous year and charitable giving.

Recruitment and Marketing

We will advertise this program to all the science and premed undergraduate academic counselors, both within UM, and other universities and colleges in the south Florida area. In addition, we will make our medical school admissions counselors aware of this program. We will also inform regional biotechnology and pharmaceutical companies about this program. Finally, the Miller School of Medicine OGPS Website, which has been completely redesigned and updated, will include specific information regarding the MS program, with links to program-specific information. As with PhD candidates, applications will be submitted through the OGPS CollegeNet portal and handled using infrastructure already in place at the OGPS.

Barry University currently enrolls 289 students in its MS in Biomedical Sciences program (the only similar program in South Florida). Therefore, we expect the demand for such a program is high. The following table shows projected enrollments assuming 5% and 10% growth rates each year.

Year	Number of Students Assuming Certain Growth Rates (rounded to nearest person)		
	0% - No growth	5% Growth	10% Growth
1	15	16	17
2	15	17	18
3	15	17	20
4	15	18	22
5	15	19	24

While our aim is to start the MBS program with about 15 students in the first year (2018-19), the minimum number for the program to get off the ground will be 5 students which is close to the fiscal break-even point for the program (see budget section below). After the start-up phase, we expect to quickly ramp this up to about 25 students (the actual number

will depend on the number of slots available for rotations/shadowing, as well as classroom facilities).

Organization of the MBS Program

The MBS program will be an interdisciplinary program composed of faculty from the basic science programs at UMMSM. The program will be led by a graduate program director (MBS-GPD), and OGPS will provide a full-time program coordinator to manage all the administrative aspects of the program. The MBS program will constitute curriculum and operating committees to establish and oversee the curriculum, maintain standards and resolve academic issues, as well as manage student mentoring and advising duties. An admissions committee will be established to screen applicants into the program.

Graduation (Degree) Requirements

Thirty (30) graduate course hours will be required for graduation. Satisfactory progress in course work is required and a cumulative grade point average of at least 3.0 must be maintained to continue with the program. The students will be allowed to transfer up to six graduate credits from an accredited institution to contribute toward fulfillment of the requirements of the program.

Curriculum for the MS program in Biomedical Sciences

The curriculum for MBS will consist of core courses in Biochemistry, Molecular Biology, Cell Biology, Physiology and Anatomy. In addition, students will choose from a selection of biomedical courses depending on their interests and career plans. Students will be required to take a minimum of 24 credit hours of formal courses. Additional credits will come from practical work, in the form of physician shadowing or clinical/bench research.

The core courses will be offered primarily in the Fall semester, followed by more specialized courses in the spring. Shadowing/research practical courses can be taken in any semester or during the summer session. Students will work with a faculty advisor to design a schedule and course set that best matches their career goals.

The core courses will draw on existing courses taught by UMMSM faculty at the undergraduate and graduate levels, but will be designed to meet the needs of students with deficiencies in their premedical preparation (using pre-course testing, remedial reading, tutorials, etc.). The more specialized elective courses will include current UMMSM graduate courses that have been carefully vetted to meet the needs of MBS students. Enrollment into elective courses will be limited to 3-5 students each, and students will be carefully screened for their ability handle course materials (prior coursework, performance in core courses, and career interests). For example, students with prior statistical background and an interest in a career in research could take the PIBS Biostatistics course as an elective after their first semester. Similarly, students with an interest in drug discovery and planning a career in the pharmaceutical industry would be advised to take an elective course in drug discovery or drug action. In all cases, MBS students will not be permitted to enroll in PhD level courses without the instructor's expressed consent, and care will be taken not to dilute the level of the PhD level course.

A typical MBS student will take 21 credits of core courses (two 1 credit seminar courses – one each in the Fall and Spring semester; 12 credits of core courses in Biochemistry, Molecular Biology, Anatomy/Histology, and Pathobiology in the Fall semester; 4 credits of physiology modules and 3 credits of Cell Biology in the spring semester). and one elective course of 3 credits in the spring semester. An additional 6 credits will come from two semesters of laboratory research or physician shadowing, to add up to the 30 credits required for the Master's degree.

While the MBS program entails a heavy course load, the requirements outlined here are very similar to those in other similar MS and post-baccalaureate programs around the country. The MBS program will be a full-time program, and the one year duration is designed to allow students to go to another graduate or medical school with a minimal gap. Students will typically start MBS after their BS in early summer, and be finished in time to join a PhD/MD program in the following fall semester (August). Students will have the option to extend their coursework over an additional semester if their post-MS plans are flexible.

A curriculum committee will set academic standards for the MBS program, oversee the scope, content and range of courses offered, and ensure smooth running of the program (scheduling, grading, course evaluations, etc.). The MBS curriculum committee will include representative faculty from each of the participating UMMSM graduate programs. The curriculum committee will strive to come up with course schedules and syllabi that balance course load. Course schedules will be designed to leave at least two afternoons a week free for research/shadowing rotations.

The proposed curriculum for the program is listed below (specific course numbers and scheduling will be formalized by the MBS curriculum committee in Fall 2017).

Fall Semester (Core Curriculum; 12-15 credits total, selected from list below; Elective courses are marked with an asterisk; Faculty serving as the instructor or course organizer are listed for each course).

- 1. MBS 600 Journal Club/Seminars/Grand Rounds (1 credit; Coordinator: Malhotra)**
To develop insights into the practice of biomedical research and medical practice, MBS students will be required to attend one research seminar, journal club or grand round of their choice per week. Students will prepare a written summary of the main points discussed in each event attended, and these will be monitored by their faculty advisor.
- 2. MBS 601 Biochemistry for the Biosciences (3 credits; Harris)**
Based on BMB 401 and the Medical Biochemistry courses. Required for all students without a 300+ level biochemistry course.
- 3. MBS 602 Molecular Biology for the Biosciences (3 credits; Malhotra & Myers)**
Based on BMB 509 and the Medical Molecular Biology lectures. Required for all students without a 300+ level Molecular Biology course.
- 4. MBS 603 Gross Anatomy & Histology (3 credits; Champney/Broadfield)**
A new Masters level course will be designed to cover topics such as gross anatomy, histology, embryology, and neuroanatomy.

5. **MBS 604 Basic Pathobiology (3 credits; Altman)**
The course will cover essential nomenclature, causes of disease, cell injury and adaptation, tissue regeneration and repair, and neoplasia. The pathogenesis of diseases in major organs will be presented.
6. **MBS 631 * Special Topics – Laboratory Research or Physician Shadowing (3 credits; Coordinator: Xu)**
This course will consist of rotations (minimum 6-9 hours per week) in selected laboratories or shadowing with UMMSM physicians. Students will be rigorously monitored for progress by faculty advisors, and will present their work at a rotation symposium at the end of the semester.

Spring Semester (Core & Specialized courses; 12-15 credits total, selected from list below; Elective courses are marked with an asterisk; Existing courses already being taught at UMMSM are marked with a §. Faculty serving as the instructor or course organizer are listed for each course).

1. **MBS 600 Journal Club/Seminars/Grand Rounds (1 credit; Coordinator: Malhotra)**
To develop insights into the practice of biomedical research and medical practice, MBS students will be required to attend one research seminar, journal club or grand round of their choice per week. Students will prepare a written summary of the main points discussed in each event attended, and these will be monitored by their faculty advisor.
2. **MBS 605 – Cellular & Human Physiology (2-6 credits)**
 - a. **Cell Physiology – (2 credits; P. Larsson)**
General principles of cell physiology, chemical and physical structure of membranes, membrane transport and electrical phenomena, action potentials, muscle contraction, energy transduction, nerve impulse conduction and synaptic transmission.
 - b. **Human Neurophysiology * – (2 credits; G. Kerrick)**
Physiology of the human nervous system.
 - c. **Human Cardiovascular Physiology * – (2 credits; K. Muller)**
Physiology of the human cardiovascular systems.
3. **MBS 606 – Advanced Molecular and Cell Biology (3 credits; Hudson)**
Structure, function, biogenesis of cellular organelles, and the cytoskeleton including its regulation and dynamic interactions are discussed.
4. **MCP 604 *§ – Mechanisms of Drug Action (3 credits; Buchwald)**
Mechanisms underlying the therapeutical and pharmacodynamic properties of pharmacological agents. Emphasis is placed on cellular and molecular aspects and the quantitative factors governing equilibration within multicompartement systems and drug control of nervous and muscular function in relation to therapeutic action
5. **BMB 715 *§ – Structural Biology & Drug Design (2 credits; Malhotra)**
This course provides an introduction to structural biology, and illustrates how understanding the relationship between structure and function of biological macromolecules drives drug discovery.
6. **PIBS 705 *§ – Biostatistics for the Biosciences (3 credits; Pederson)**

This course introduces students to the fundamentals of statistics from a biomedical perspective, with an emphasis on the practical application of statistical tools and the R software package for analysis and interpretation of biological datasets.

7. **PIBS 706 * – Bioinformatics for the Biosciences (3 credits; Rudd/Isom)**
New course under development by OGPS will introduce graduate students to basic bioinformatics data retrieval and analysis as relevant to biomedical research.
8. **MBS 631 * Special Topics – Laboratory Research or Physician Shadowing (3 credits; Coordinator: Xu)**
This course will consist of rotations (minimum 6-9 hours per week) in selected laboratories or shadowing with UMMSM physicians. Students will be rigorously monitored for progress by faculty advisors, and will present their work at a rotation symposium at the end of the semester.

Summer Semester (3-6 credits of rotations)

1. **MBS 631 * Special Topics – Laboratory Research or Physician Shadowing (3 credits; Coordinator: Xu)**
This course will consist of rotations (minimum 2-3 hours per week for each credit hour) in selected laboratories or shadowing with UMMSM physicians. Students will be rigorously monitored for progress by faculty advisors, and present their work at a rotation symposium at the end of the semester.

Shadowing & Research Practical Work

Apart from grades and standardized test scores, a critical component for admission to medical or graduate school is the practical experience that the applicant has had in their field of interest. Medical school applicants are typically expected to have several semesters of bench or clinical research, and hundreds of hours of physician shadowing. Similarly, admission into competitive doctoral programs often hinges on research performed as an undergraduate.

Shadowing: Physician shadowing is actively observing physicians at work, especially doctor-patient interactions. The student follows a physician as he/she carry out their typical work activities in a clinic or hospital. The aims of physician shadowing are to give the student familiarity with the medical profession, and help them explore different fields and physician styles. While the level of mentoring by the physician will be limited, shadowing can include student participation in some clinical activities. Since UMMSOM has a significant number of physician scientists, many shadowing experiences will also include exposure to (or participation in) clinically related research.

Research: Exposure to bench or clinical research will provide MBS students with a first-hand experience in how biomedical research is carried out. Students will work on either an independent or on-going project in a research laboratory for a full semester. Training will be provided by advanced graduate students, postdocs or technicians working in the lab, and the student will be supervised by the laboratory principal investigator (PI).

MBS students will be expected to be actively involved in research and/or shadowing as a part of their Master's degree, and can take up to 6 credit hours of MBS 631 which covers such activities. For three credit hours of MBS 631, we will require a minimum of 6-9 hours

per week of work. Actual time spent in the lab/shadowing will vary depending on experiments and clinical schedules, but will average about 10 hours per week. We expect students to complete 125-140 hours of shadowing/research for each semester-long MBS 631 course. To lessen the student load during the academic year, students will be encouraged to use the summer sessions (either before or after their coursework) and spend significant hours in a research laboratory or shadowing physicians. Up to six credit hours of MBS 631 can be taken in the summer.

The shadowing/research course (MBS 631) will start with a short workshop (1-2 days) to introduce shadowing, lay out expectations and requirements, and cover basic rules and training (HIPAA, lab/animal safety, responsible conduct of research, ethics, etc.).

The MBS program will maintain a list of physicians and research groups that are willing to accept students. We will aggressively recruit UMMSOM faculty for shadowing/research slots, and also work with UM Office of pre-health advising and mentoring which maintains similar lists for undergraduates at the Coral Gables campus. Faculty offering research/shadowing slots will be provided with modest funds (included in the teaching/advising category of the budget) to cover part of the expenses of hosting MBS students. Students will work with their faculty advisor to pick the best group to join, and their progress during the semester will be regularly monitored. Students will submit periodic written reports on their rotations/shadowing and will also give oral presentations on their work at a research/shadowing symposium at the end of the semester. Students performance will be graded by their rotation mentor based on their work, reports, and presentation.

Access to world-class research laboratories and physicians at UMMSM will be an important selling point for the MBS program. In addition to contributing to the professional development of the students, these lab rotations and shadowing activities will also benefit UMMSM by providing a source of motivated workers for faculty research and clinical activities.

Monitoring Student Progress – Advising & Small Group Mentoring

Monitoring student progress will be critical to the success of the MBS program. Each student will have a faculty advisor who will advise the student about coursework and shadowing/research throughout their time in the MBS program. The advisor will meet regularly with the student and will have to sign-off on their course/shadowing/research choices. Each MBS faculty advisor will manage 4-5 students, and will be expected to be fully vested in their success. Funds are included in the budget to compensate faculty advisors for their time, to ensure that this task is taken seriously.

In addition, MBS will run a student mentoring program modeled after the mentoring program for 1st year PIBS students. MBS students will participate in small group mentoring that guides them in a group setting on study and life skills, course selection, choosing labs/physicians for rotations, and how best to benefit from practical work. Mentoring groups will also provide guidance on career options and applying to professional schools, and we will have separate groups for students interested in MD and PhD programs. Each small group will consist of 4-5 students, one faculty mentor, as well as one PhD/MD student mentor. The small-groups will meet several times during the semester with a formal mentoring agenda.

One on one advising and small-group mentoring will play a vital role in the success of MBS students, with faculty advisors actively shepherding them through the program and then helping them in their future endeavors.

Incentivizing Faculty Participation & Revenue Sharing

Enrollees in the MBS program will typically be students who will need additional guidance and resources compared to the more advanced doctoral and MD students that we usually see at UMMSM. MBS core courses will play an important role in preparing students to take on the more specialized graduate courses in their second semester. Core courses will thus be specifically tailored to be more teaching intensive and to keep students motivated. We will keep these classes small and encourage faculty to experiment with innovate approaches such as flipped classrooms, small group discussions, problem based learning, etc.

These new courses will need active faculty participation. OGPS will devote a significant fraction of the MBS tuition income to enhance teaching and develop revenue sharing mechanisms to compensate faculty for their efforts, especially for the development of new core courses and for mentoring/advising duties. These mechanisms may include sharing of faculty effort with individual programs and departments or direct administrative supplements to the faculty. OGPS will also look into providing support for lab supplies or faculty effort for rotations and shadowing activities done for credit by MBS students.

Monitoring Quality of the MBS Program & Future Plans

We will rigorously monitor the quality and effectiveness of the MBS program by keeping track of how students fare after graduation. Since the MBS program is designed to enhance student preparation for medical school and other science-based professional schools, outcomes can be measured directly by tracking admissions to MD & PhD programs. Exit interviews, as well as regular follow-ups with students 1-2 years after they graduate, will be used to make improvements in the curriculum and structure of the MBS program. OGPS will present periodic reports on the status and effectiveness of the MBS program to the graduate school and the UMMSM faculty council. These reports will be made yearly during the startup process, and then taper to once every 2-3 years after the program is mature.

If our model of a generalized Masters to enhance student preparation for medical and graduate school is successful, the MBS program can be expanded to also include students that are interested in biomedical career opportunities that do not require MD/doctoral level training. For this, we could add new courses and rotations that better prepare students to work in research laboratories or in industry. Courses in areas such as research ethics, GLP/GMP, drug screening, clinical trial management, biomedical regulations, genomics, personalized medicine, recombinant DNA/protein technologies, production of biologicals, etc., could be developed that harness expertise available here at UMMSM to educate and train a new class of professionals that are ready to enter the workforce.

Even with the proposed slate of courses, graduates from the MBS program will be well-trained to work as technicians and junior scientists in academic and pharmaceutical laboratories, or in other roles such as compliance, research management, biomedical legal or editorial work, etc. For example, a similar program at Tufts University reports its

graduates moving on to roles such as government research scientist, compliance manager for a pharmaceutical company, and research writer at a university.

Timeline

Startup of the MBS program is expected to flow according to the following timeline:

Date	Deadline
Fall 2017	Program advertisement and recruitment
December 2017 – March 2018	Receipt and evaluation of applications
April 2018	Admissions decisions communicated to applicants
Summer 2018	Students begin Summer rotations
Fall 2018	Classes begin Fall 2018 classes
June 2019	Graduation of the first cohort of MBS students

Biographies of Core Graduate Faculty



Norman Altman, V.M.D.
Professor, Department of Microbiology & Immunology

Dr. Altman's research involves comparative pathology and animal models of human disease. Current studies include the pathogenesis of mouse hepatitis virus, graft vs. host disease, and the speciation of cryptosporidium. Other studies in our laboratories include transgenic models for prostate cancer and viral carcinogenesis. He currently serves as the Ombudsperson for the Miller School of Medicine.



Douglas Broadfield, Ph.D.
Associate Professor, Department of Cell Biology

Dr. Broadfield's research focuses on the evolution of the human brain. His primary method is through examination of the human fossil record. His second area of research involves comparative neuroanatomy, which involves direct comparison of the brains of humans to other primates.



Peter Buchwald, Ph.D.
Associate Professor, Department of Molecular and Cellular Pharmacology

Peter Buchwald, Ph.D., is an Associate Professor at the Department of Molecular and Cellular Pharmacology and the Director of the Drug Discovery Program at the Diabetes Research Institute. He has worked in multi-disciplinary fields related to drug design and development both in the academic and industrial settings. He has published numerous articles in peer-reviewed journals focused on the physicochemical and metabolic aspects of drug design and drug action, as well as on computer-aided quantitative modeling.



Thomas Champney, Ph.D.
Professor, Department of Cell Biology

For over 20 years (1980 – 2003), Dr. Champney investigated the role of the pineal gland and its hormone, melatonin, on physiologic function in mammals. During his 25 year span of teaching, Dr. Champney has received over 20 teaching awards including college-wide and university-wide teaching awards from Texas A&M University. At the University of Miami, he has received the George Paff Award for Excellence in Medical Education every year since his arrival. At all the institutions he has taught, he has consistently ranked in the top five teaching faculty based on student evaluations and peer evaluations.



Thomas Harris, Ph.D.
Associate Professor, Department of Biochemistry and Molecular Biology

Dr. Harris joined UM in 2000 after highly productive post-doctoral research at Johns Hopkins University. He is highly regarded as a mentor and teacher and currently directs BMB undergraduate and medical educational activities. His established track record in structural and mechanistic enzymology contributes a rational perspective towards discovery of novel experimental therapeutics, especially towards cancer, inflammation, diabetes, and other metabolic disorders.



Barry Hudson, Ph.D.
Assistant Professor, Department of Cell Biology

Dr. Hudson studies how inflammation increases breast cancer metastasis and the role of obesity and diabetes in driving breast cancer progression and metastasis. In the long term, he hopes his work will change the clinical management of breast cancer and result in an effective therapy to help treat this deadly disease.



Daniel Isom, Ph.D.
Assistant Professor, Department of Molecular and Cellular Pharmacology

Dr. Isom studies how protonation guides the flow of information through cellular systems. Dr. Isom possesses expertise in Bioinformatics.



Glenn Kerrick, Ph.D.
Professor, Department of Physiology and Biophysics

Dr. Kerrick earned his doctoral degree from the University of Washington. His research interests include regulation of cell motility by Ca^{2+} and protein phosphorylation. He is the course director for the Cardiovascular Physiology courses for the MD and MPH programs.



H. Peter Larsson, Ph.D.
Professor, Department of Physiology and Biophysics

Dr. Larsson's research aims to understand the molecular mechanisms that open and close voltage-gated ion channels. Dr. Larsson currently serves as the Graduate Program Director for the Physiology and Biophysics doctoral program.



Arun Malhotra, Ph.D.
Associate Professor, Department of Biochemistry and Molecular Biology

Dr. Malhotra's research focuses on X-ray crystallography, structure/function studies of exoribonucleases and RNA modification enzymes, structural modeling and crystallization of a variety of other proteins. Dr. Malhotra currently serves as the Curriculum Committee Chair for the PIBS (Programs in Biomedical Science) first year doctoral program.



Ken Muller, Ph.D.

Professor, Department of Physiology and Biophysics

Dr. Muller studies developing circuitry in the retina and brainstem, the repair and functioning of synaptic connections, and control of microglia moving to nerve injuries.

Richard Myers, Ph.D.



Lecturer in Biochemistry and Molecular Biology

In 1997, Dr. Myers joined the University of Miami's Department of Biochemistry and Molecular Biology, where his honors include the Stanley Glaser award for outstanding research productivity and achievement (1999), recognition as an "outstanding student mentor" (2002, 2005), recipient of the 2013 Faculty Senate Outstanding Teaching Award and the 2015 George Paff Outstanding Medical Educator Award. His lab studies genetic recombination in bacteria and human cells and develops innovative genetic systems for studying human diseases. Rik has consulted in the biotechnology industry and is co-inventor on patents for genetic engineering technologies. His innovative classes discuss ethics and public service to balance the excitement of scientific discovery with its impact on society.



Eric Pedersen, Ph.D.

Postdoctoral Fellow, Department of Psychology

Dr. Pedersen graduated from the University of Miami in 2015 with a Ph.D. in Psychology with an emphasis on evolution and behavior. He was hired later that year as a postdoctoral fellow in the Psychology Department. Dr. Pedersen's dissertation was titled "An Evolutionary and Computational Approach to Gratitude" and won the S.T. Calvin Award for Excellence in the Application of Statistical Methods. He currently holds an appointment as an adjunct instructor of biostatistics at the Miller School of Medicine.



Kenneth Rudd, Ph.D.

Associate Professor, Department of Biochemistry and Molecular Biology

Dr. Rudd's research encompasses bacterial genetics, bioinformatics, functional genomics, and small proteins in *E. coli*.



Xiang-Xi (Mike) Xu, Ph.D.

Professor, Department of Cell Biology

Dr. Xu's research explores the molecular mechanisms of epithelial differentiation and morphogenesis during embryogenesis and the alterations that lead to epithelial cell transformation in carcinogenesis. Dr. Xu currently serves as the Graduate Program Director of the doctoral program in Cell Biology.

LETTERS OF SUPPORT


**UNIVERSITY
OF MIAMI**



MEMORANDUM

DATE: February 27, 2017

TO: Mr. Charles Lowman, Director, Office of Graduate and Postdoctoral Studies
Miller School of Medicine

FROM: Dr. Patricia Murphy, Executive Director
Office of Assessment and Accreditation 

SUBJECT: New Concentration of Master of Science in Biomedical Sciences (MBS)

On February 24, 2017, the Miller School of Medicine submitted a proposal notifying our office of its intent to implement a new Master of Science (MS) degree program in Biomedical Sciences effective fall 2017.

The 30-credit program will be interdisciplinary in nature and consistent with the existing Doctor of Philosophy (PhD) program theme, while appealing to a diverse range of students seeking an advanced degree. The curriculum for the program will consist of existing core courses in Biochemistry, Molecular Biology, Cell Biology, Physiology and Anatomy. Additionally, students will be required to perform practical work in the form of physician shadowing or clinical/bench research. The program will be housed in the Miller School of Medicine and will not require the hiring of additional faculty or infrastructure resources.

Based on the details of the proposal, the addition of this new program is not considered a substantive change. Although a letter of notification will be submitted to the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), formal approval will not be required in order to proceed with implementation.

Please feel free to contact our office should you have any questions or require additional guidance (305) 284-9431.

cc: Faculty Senate
Dr. Guillermo Prado, Dean, Graduate School
Dr. Laurence Gardner, Interim Dean, Miller School of Medicine
Dr. Zafar Nawaz, Sr. Associate Dean, Graduate and Postdoctoral Studies, Miller School of Medicine

UNIVERSITY OF MIAMI
GRADUATE SCHOOL




Graduate School
P.O. Box 248125
Coral Gables, FL 33124-3220

Phone: 305-284-4154
Fax: 305-284-5441
graduateschool@miami.edu

MEMORANDUM

DATE: February 27, 2017

TO: Tomas Salerno
Chair, Faculty Senate

FROM: Guillermo ("Willy") Prado 
Dean, The Graduate School

SUBJECT: Master of Science degree program in Biomedical Sciences (MBS)

The Office of Graduate and Postdoctoral Studies (OGPS) at the Miller School of Medicine submitted a proposal for a Master of Science degree program in Biomedical Sciences (MBS). The proposal was discussed at the meeting of the Graduate Council on Tuesday, February 21, 2017, and was approved by those present.

cc: Laurence Gardner, Interim Dean, Miller School of Medicine
Zafar Nawaz, Senior Associate Dean, Graduate and Postdoctoral Studies
Charles Lowman, Director, Office of Graduate and Postdoctoral Studies
Office of Planning, Institutional Research and Assessment



UNIVERSITY OF MIAMI
**MILLER SCHOOL
of MEDICINE**

December 21, 2016

Tomas Salerno, M.D.
Chair, Faculty Senate
University of Miami
Ashe Building, Suite #325
252 Memorial Drive
Coral Gables, FL 33146

Re: Council Approved a Proposal for a Master of Science in Biomedical Sciences

Dear Dr. Tomas Salerno,

This is to inform the Faculty Senate that the Medical School Faculty Council met on December 13th, 2016 to review the **Proposal for a Master of Science in Biomedical Sciences**.

The development of a MBS degree program will provide prospective medical and graduate school applicants with robust coursework and practical experience in the biomedical sciences.

The council members voted to *approve* the proposal.

Respectfully submitted,

Carl Schulman, M.D., M.S.P.H., Ph.D.
Speaker, Medical Faculty Council



UNIVERSITY OF MIAMI
MILLER SCHOOL
of MEDICINE

Laurence B. Gardner, M.D., MACP
Interim Dean
University of Miami Miller School of Medicine

August 15, 2016

Dear Zafar,

On behalf of the University of Miami Miller School of Medicine (UMMSM), I am pleased to write in support of your proposal for a Master's degree program in the Biomedical Sciences.

As stated in your proposal, "The area of biomedical sciences continues to undergo a revolution as detailed mechanistic and translational approaches are increasingly necessary in academia, industry, and medicine." There is a recent trend among leading universities, such as Johns Hopkins and Tufts, to offer such programs, and UMMSM needs to remain competitive with our peers in this area.

In addition, there are several other advantages to adding an MS degree program on the Medical Campus. The primary target market is a strong one: Students who wish to improve their chances of being accepted to medical school by strengthening their foundation in the biomedical sciences. An important distinction from a post-baccalaureate program is that these students will earn a Master's degree. Some of these students may become interested in pursuing research education at the PhD level, and may choose to apply to one of our programs, providing the University with yet another recruitment resource. As the Miller School values diversity and inclusion, I am also optimistic such a program will aid in the recruitment of minority students. This will positively enrich the student body and move us closer to our goal of expanding access to historically marginalized groups. Completing a rigorous program of this caliber will significantly enhance students' chances of being accepted into doctoral programs and medical schools here at UM and other prestigious institutions.

Finally, the anticipated tuition dollars generated will provide an additional revenue stream to finance research and research education for the school and the departments involved in teaching the courses.

I appreciate your efforts to improve and enhance graduate education at UMMSM and fully support your program proposal.

Best regards,

Laurence B. Gardner, M.D.
Interim Dean, Miller School of Medicine



Medical Education
P.O. Box 016960 (R-160)
Miami, Florida 33101

Phone 305.243.0496
Fax 305.243.0419

February 24, 2016

Zafar Nawaz, Ph.D.
Senior Associate Dean for Graduate Studies
Professor, Biochemistry

Dear Dr. Nawaz,

We are pleased to support the proposal for a new Masters in Biomedical Sciences Program. The new program is in line with our overall strategic plan for education and could be pivotal in enhancing our efforts to recruit a diverse applicant pool to the Miller School of Medicine.

The proposed MS program has the potential to deliver quality education in the biomedical sciences helping to better prepare students for future careers in medicine and research. The Miller School of Medicine values diversity and strives for inclusion with the selection of our medical school applicants for admission. This MS Program could specifically help to prepare diversity applicants for acceptance into medical school. Successful completion of courses and clinical experiences at the same level of content and intensity as taught in medical school will provide significant reassurance to Admissions Committees that an applicant will be successful in medical school.

We look forward to working with you and your team as you fully develop this program. Please let us know how we can assist.

Sincerely,

A handwritten signature in black ink, appearing to be 'A. Mechaber'.

Alex J. Mechaber, M.D., FACP
Professor and Senior Associate Dean for
Undergraduate Medical Education

A handwritten signature in black ink, appearing to be 'L. Gardner'.

Laurence Gardner, M.D., MACP
Miller Professor and Executive Dean for
Education and Policy



UNIVERSITY OF MIAMI
MILLER SCHOOL
of MEDICINE

October 8, 2015

Zafar Nawaz, PhD, Senior Associate Dean, Graduate and Postdoctoral Studies
Professor, Department of Biochemistry and Molecular Biology
Associate Research Director, Braman Family Breast Cancer Institute
University of Miami Miller School of Medicine
Miami, FL 33136

Dear Dr. Nawaz:

It is with great pleasure, enthusiasm, and commitment that I submit this letter of support to the Graduate School and the Faculty Senate for the Approval of MS Degree in Biomedical Sciences.

Top-tier universities such as Johns Hopkins, Tufts, and the University of Massachusetts have pioneered the development of MS degree programs to meet various market demands, including providing prospective medical school applicants, who need to enhance their resumes, with a more in-depth background in the Biomedical Sciences and a Master's degree.

As an excellent institution of higher learning, the University of Miami, Miller School of Medicine is well positioned to contribute to educational innovations such as this. This program will provide the students with outstanding educational opportunities and a broad knowledge in the various aspects of biomedical research. After successful completion of this program, students will have more career options and an increasing likelihood of making important contributions to scientific progress and society. The new MS degree program will contribute significantly to the continued elevation in the quality and diversity of graduate training at the Miller School of Medicine.

We at the office of Research, Research Education and Innovative Medicine look forward to working closely with the Office of Graduate & Postdoctoral Studies and providing necessary seed funding and administrative support to ensure that this MS degree program will be a success.

Sincerely,

A handwritten signature in black ink, appearing to read 'Dushyantha T. Jayaweera', written over a horizontal line.

Dushyantha T. Jayaweera MD, MRCOG (UK), FACP, CIP
Executive Dean for Research, Research Education, and Innovative Medicine
Professor of Medicine, Miller School of Medicine
Faculty Member AIDS Education and Training Center
Clinical Research Building Suite 360L
Miami, Florida 33136
Phone: 305.243.0810

January 29th, 2016

Dr. Zafar Nawaz
University of Miami Miller School of Medicine
1011 NW 15th Street
Gautier Building, Room # 315
Miami, FL 33136

Dear Zafar:

I am pleased to write in support of your proposal for a Master of Science in Biomedical Sciences degree program. A significant number of top-tier institutions offer similar master's degree programs, which have several benefits.

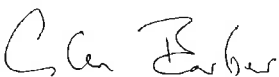
The program would attract tuition-paying students who wish to improve their chances of getting into medical school. Students who do not get into medical school, but have enrolled in this program, may become interested in the course topics and decide to pursue a PhD degree after their MS degree. They would already have taken a number of relevant courses, thus speeding their entry into research.

Given your vision for the proposed degree and how it aligns with our program goals, I would be happy to commit our faculty for participation as the proposed curriculum includes Molecular Cell and Developmental Biology courses. The many benefits to the department would not be limited to anticipated revenue sharing, but would also include recruitment potential for our PhD program.

We support your commitment to improving the graduate programs at the Miller School of Medicine, and we believe that this program will provide an option at UMMSM for the non-traditional student as well as expand our audience.

Best wishes for a successful proposal.

Sincerely,



Glen N. Barber, Ph.D.

SYLVIA DAUNERT
PROFESSOR AND LUCILLE P. MARKEY CHAIR



UNIVERSITY OF MIAMI
MILLER SCHOOL
of MEDICINE

Department of Biochemistry and Molecular Biology ♦ R. Bunn Gautier Bldg. ♦ 1011 NW 15th Street
Miller School of Medicine ♦ University of Miami ♦ Miami, FL 33136 ♦ (305) 243-4005 ♦ sdaunert@med.miami.edu

December 14, 2016

Zafar Nawaz, Ph.D.
Senior Associate Dean, Graduate and Postdoctoral Studies
Professor of Biochemistry and Molecular Biology

Dear Zafar:

I am pleased to write in support of your proposal for a Master of Science in Biomedical Sciences degree program. This program would bridge a clear gap in our program offerings which currently only include undergraduate and Ph.D. studies. Such a master's degree would not only benefit the Biochemistry department, other basic sciences departments, and the University of Miami, it would also benefit our larger society by increasing the number of individuals with scientific understanding beyond the undergraduate level. This master's program will promote the acquisition of advanced scientific knowledge and skills which will open numerous career opportunities in industry, education, and research. I am delighted by the possibilities!

Your vision for the proposed degree aligns with our program goals for expanding educational offerings, and I would be happy to commit our faculty for participation as the proposed curriculum includes BMB courses. The many benefits to the department would not be limited to anticipated revenue sharing, but would also include recruitment potential for our PhD programs.

Thank you for your continued commitment to the success of graduate education at the University of Miami Miller School of Medicine!

Sincerely,

Sylvia Daunert PharmD., MS, PhD.
Professor and Lucille P. Markey Chair
Department of Biochemistry & Molecular Biology
Associate Director, Dr. JT Macdonald Biomedical Nanotechnology Institute
Executive Editor, Analytical Biochemistry
University of Miami Miller School of Medicine



November 16, 2015

Zafar Nawaz, Ph. D.
Professor of Biochemistry and Molecular Biology
Senior Associate Dean for Graduate and Postdoctoral Studies
University of Miami Miller School of Medicine

Dear Zafar:

I am pleased to write in support of your proposal for a Master of Science in Biomedical Sciences degree program. A significant number of top-tier institutions offer similar master's degree programs, which have several benefits.

The program would attract tuition-paying students who wish to improve their chances of getting into medical school. Students who do not get into medical school, but have enrolled in this program, may become interested in the course topics and decide to pursue a PhD degree after their MS degree. They would already have taken a number of relevant courses, thus speeding their entry into research.

Given your vision for the proposed degree and how it aligns with our program goals, I would be happy to commit our faculty for participation as the proposed curriculum includes Molecular and Cellular Pharmacology courses. The many benefits to the department would not be limited to just the anticipated revenue sharing, but would also include recruitment potential for our PhD program.

We support your commitment to improving the graduate programs at the Miller School of Medicine, and we believe that this program will provide an option at UMMSM for the non-traditional student, as well as serve to expand our audience.

Best wishes for a successful proposal.

Sincerely,

A handwritten signature in black ink, appearing to read 'Charles W. Luetje'.

Charles W. Luetje, Ph.D.
Professor and Chairman

Department of Molecular and Cellular Pharmacology
Post Office Box 016189 (R-189) · Miami, Florida 33101
Location: 1600 NW 10th Avenue, Room 6079 (RMSB) · Miami, Florida 33136
305-243-5909 · Fax: 305-243-4555



Department of Physiology & Biophysics

Mailing Address:
P.O. Box 016430 (R430)
Miami, FL 33101-6430

Ph: 305-342-6236
Fax: 305-243-6898
kmagleby@miami.edu

Location:
RMSB, Room 5046
1600 NW 10th Avenue (R-430)
Miami, FL 33136

Karl L. Magleby, Ph.D.
Professor and Chairman

December 14, 2016

Zafar Nawaz, Ph.D.
Senior Associate Dean, Graduate and Postdoctoral Studies
Professor of Biochemistry and Molecular Biology

Dear Zafar:

I am pleased to write in support of your proposal for a Master of Science in Biomedical Sciences degree program. As you know, one of the recommendations in our recent Graduate Program Review was to create a Master's degree in Physiology. Unfortunately, such a program would be of limited interest, but the broad nature of your proposed master's degree could fill this need. I feel this would be a better approach that makes the best use of time and resources.

I would be happy for members of my department's faculty to teach in this program. The benefits to our department would extend beyond mere revenue sharing and could even assist us in recruiting excellent students for our PhD program. I commend your ingenuity for proposing such a widely beneficial program.

I wish you great success at each stage in the approval process.

Sincerely,

A handwritten signature in blue ink, appearing to read 'K. Magleby'.

Karl L. Magleby, Ph.D.
Professor and Chair
Department of Physiology and Biophysics

UNIVERSITY OF MIAMI
MILLER SCHOOL
of **MEDICINE**



Office of Admissions

P.O. Box 016159 (R-159)
Miami, FL 33101

Ph: 305-243-3234
Fax: 305-243-6548
Email: med.admissions@miami.edu

September 29, 2015

Zafar Nawaz, Ph. D.

Professor of Biochemistry and Molecular Biology

Senior Associate Dean for Graduate and Postdoctoral Studies

Research Associate Director, Braman Family Breast Cancer Institute at Sylvester Comprehensive Cancer Center

University of Miami Miller School of Medicine

Gautier Building, Room 314 (R629)

1011 NW 15th Street

Miami, FL 33136

Dear Dr. Nawaz:

I am writing to provide my strongest support for a Master of Science in Biomedical Sciences at the University of Miami Miller School of Medicine.

As Dean for Admissions at the Miller School of Medicine, I am contacted every year by perspective applicants to medical school who need to improve their foundation in the biomedical sciences to become competitive applicants. This often requires additional experience with the advanced science courses and mastery in the foundation courses of the MCAT examination. Currently, the only options to accomplish this in the South Florida region is to attend a program at Barry University.

While there are other options for students to remain in South Florida and complete Post Baccalaureate study, a Master's program in Biomedical Sciences is a far more desirable option. The currently designed program allows students upon completion to either apply for admission to medical school or to continue along a career path in science and apply through Graduate Studies for a Ph.D. and a future career as a researcher.

I remain hopeful that this program will be brought to fruition and will become a viable option for students requiring additional preparation prior to application to medical school.

Sincerely,

A handwritten signature in blue ink, appearing to read 'R. Weisman'.

Richard S. Weisman, Pharm.D., FAACT

Associate Dean for Admissions and

Professor of Pediatrics

University of Miami Miller School of Medicine

Office of Admissions
P.O. Box 016159 (R-159) | Miami, FL 33101
Ph: 305-243-3234 | Fax: 305-243-6548
Email: med.admissions@miami.edu



SCHOOL OF MEDICINE

COMPARATIVE PATHOLOGY LABORATORY

ROSENSTIEL MEDICAL SCIENCE BUILDING - 1600 N.W. 10TH AVENUE, RM 7101A, MIAMI, FL 33136

December 11, 2015

Dear Zafar:

I am pleased to write in support of your proposal for a Master of Science in Biomedical Sciences degree program. A significant number of top-tier institutions offer similar master's degree programs, which have several benefits.

The program would attract tuition-paying students who wish to improve their chances of getting into medical school. If these students excel in the program, they will likely be evaluated somewhat more favorably by a medical school admissions committee. Students who do not get accepted into medical school may become interested in research and decide to pursue a PhD degree after their MS degree. They would already have taken a number of relevant courses, thus ensuring a smooth transition into the PhD programs.

Given your vision for the proposed degree and how it aligns with the University's educational goals, I would be happy to participate by teaching a Basic Pathology course. Because this course works synergistically with the Gross Anatomy course, I would suggest scheduling the Gross Anatomy course during the same semester to provide the maximum benefit to the students. After reviewing the proposal, I was impressed by the overall scope, goals, and projected outcomes of the program.

I fully support your commitment to improving the graduate programs at the Miller School of Medicine, and I believe that this program will provide an option at UMMSM for the non-traditional student as well as serve as another recruiting tool for both the PhD and MD programs.

Best wishes for a successful submission.

Sincerely,

A handwritten signature in cursive script, appearing to read "Norman H. Altman".

Norman H. Altman, V.M.D., DACVP
Professor and Director
Division of Comparative Pathology
Department of Pathology and Laboratory Medicine
Ombudsman, UMMSM
305-243-1635 naltman@miami.edu

BENCHMARKING

Biomedical Sciences Degree (Master of Science)

[About the Program](#) [Admissions](#) [Financial Aid](#) [Life at Barry](#)

Medical Curriculum

The medical curriculum represents an intense program of study that provides a broad biomedical education by an international team of expert faculty at a level consistent with the first year of medical school. Students take the following courses:

Course Code	Description	Number of
BMS 527	Biochemistry I	3
BMS 528	Biochemistry II	3
BMS 547	Neuroanatomy w/ Lab	5
BMS 550	Histology and Cell Biology w/ Lab	4
BMS 553	Health Law and Ethics	3
BMS 590	Gross Anatomy w/ Lab	6
BMS 595	Human Physiology w/ Lab	6
BMS ###	Electives	6
CMP 699	BMS Comprehensive Exam	CR/NC (credit/no credit)
TOTAL		36

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Barry University - College of Nursing and Health Sciences

11300 NE 2nd Avenue, Miami Shores, FL 33161-6695 Phone number:305-899-3899 Toll-free:1-800-756-6000, ext. 3899
E-mail: bms@barry.edu

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Biomedical Sciences Degree (Master of Science)

[About the Program](#) [Admissions](#) [Financial Aid](#) [Life at Barry](#)

Research Curriculum

For students interested in research. This program will help students develop knowledge and skills that pr in research or in the biomedical industry. Students are required to take the following courses:

Course Code	Description	Number
BMS 527	Biochemistry I	3
BMS 528	Biochemistry II	3
BIOE 521	Laboratory Safety- Principles & Practices	3
BIOE 545	Microtechnique	3
BMS 553	Health Law & Ethics	3
HSA 535 or BIOE 648	Applied Biostatistics or Epidemiology	3
BMS 507	Basic Research Methodology	3
BMS 675	Research	3
BMS/BIOE	Electives*	12
BIOE 671	Capstone	CR/NC (credit/r
TOTAL		36

*Elective Options: (minimum of 12 credits)

Course Code	Description	Number o
BMS 590	Gross Anatomy w/ Lab	6
BMS 547	Neuroanatomy w/ Lab	5
BMS 550	Histology and Cell Biology w/ Lab	4
BMS 555	Human Embryology	3
BMS/BIOE 547	Molecular Genetics	3
BMS/BIOE 555	Immunology	3
BIOE 644	Cancer Biology	3
BMS 665	Advanced Study	1-3
BIO 603	Advanced Histotechnology	3
BIOE 505	Biotechnology	3

Graduate Biomedical Sciences Course Descriptions

Non-Thesis One & Two Year Programs Core Courses

527 Biochemistry I (3)

Biochemistry I provide an introduction to the fundamental aspects of biochemistry. It gives an overview of the structure and metabolism of biologically important molecules; carbohydrates, fatty acids, proteins and nucleic acids. Allosteric regulation, enzyme inhibition and control are considered in detail. The course concludes with a review of a number of clinical biochemistry techniques to disease diagnosis is described and the biochemistry of exercise and disease. Same as GMS 527.

528 Biochemistry II (3)

Biochemistry II considers the application of biochemistry to disease etiology, diagnosis and treatment. Cell structure, function and replication of the cell's genetic material are described. The digestion and absorption of nutrients are reviewed and the consequences of malfunction considered. A number of disease states are used to illustrate the relationship between nutrition and disease; atherosclerosis, hyperlipidemia, obesity and diabetes. Clinical biochemistry techniques to disease diagnosis is described and the biochemistry of exercise and disease. Prerequisites: BMS 527. Same as GMS 528.

547 Neuroanatomy (4)

This course will provide an in-depth review of the neuroanatomy of the central and peripheral nervous system, including presentation of the morphologic and physiologic aspects of the nervous system, including examination models, dissections and histological preparations. Clinical correlations using case studies including normal imaging studies (e.g. MRI, CT etc) are incorporated to emphasize the important anatomic structures and their functions. (Special fee)

550 Histology and Cell Biology (5)

The course provides an in-depth study of the microscopic anatomy dealing with the structure of cells, bacterial physiology including structure and function of cellular membranes and organelles, cell growth and cell division, protein structure and synthesis. The course presents the normal microscopic structure of the human body tissues in relation to their functions. Emphasis will be placed on the integration of the morphology with the biochemical processes of the body. Lecture and laboratory. (Special fee)

553 Health Law and Ethics

This course will provide a basic understanding of the legal issues as civil liabilities including medical malpractice, malpractice fees splitting, self-referrals, and licensing, administrative and corporate law/governance pertaining to health care. It provides an understanding of applicable laws and regulations, as well as ethical and social issues in health care. The course provides a practical and applicable framework to analyze the many complex issues in the modern health care system. Same as HSA 530 Health Law and Ethics (3)

559 General Dentistry-Principles and Practices (3)

(for students interested in a career in dentistry)

This introductory course will provide students with a career interest in dentistry, an overview of the dental practice, related specialties and business aspects of dentistry. The course will provide students with a basic understanding of legal issues including medical malpractice, licensing, administrative and corporate law/governance pertaining to dental services.

590 Gross Anatomy (6)

An intensive study of the human anatomy that emphasis the gross structural anatomy of the human body for clinical medicine. The human body will be correlated with surface anatomy, radiology, osteology and other information. Lecture and lab.

591 Head and Neck Anatomy (3)

An in-depth study of human anatomy that emphasis the gross anatomy of the head and neck and its correlation with medicine and dentistry. The human body will be correlated with surface anatomy, radiology, skull osteology and other information. Lecture and lab.

595 Human Physiology (6)

This course is a comprehensive study of the function and regulation of human organ systems of the body and the integration of the systems to maintain homeostasis. Course will include neural & hormonal homeostatic study of the musculoskeletal, circulatory, respiratory, digestive, urinary, immune, reproductive, endocrine and electrolyte balance. Lecture and Lab. Prerequisite/Co-requisite: BMS 527/528. (Special fee)

Thesis Masters Program Core Courses

BMS 527, Biochemistry I; (3 sh)

BMS 528, Biochemistry II; (3 sh)

BMS 553, Health Law and Ethics; (3 sh)

BMS 550, Histology and Cell Biology; (3 sh)

501 Biostatistics *

This course provides a survey of fundamental statistical concepts. Methods of data collection, management, descriptive and inferential statistics are included in this course. Theoretical concepts, as well as the descriptive research methods used in research and evaluation of health status and health services. Prerequisite: Alg
Applied Biostatistics (3)

507 Basic Research Methodology (3)

Introduction to principles of biomedical research and critical analysis of the current literature. The course covers experimental design, statistical analysis and publication preparation.

555 Immunology (3)

A study of antibody formation, antigen-antibody interactions. Review of the biological effects of immunological specificity of normal and diseased cells and tissues will be discussed.

670 Seminar (1)

This course is specifically designed to expose the student to selected current topics in biomedical and clinical research. The course includes discussion, assigned reading, reports and presentations. The course is specifically designed to improve student skills and potential for collaborative work. Courses may be evaluated by peer presentations throughout the semester.

675 Research (3 s.h.)

A research project under the guidance of an advisor. Specific guidelines and protocols must be approved by the advisor. (Require approval of program director).

Elective Courses

505A Biotechnology: Immunochemistry (1)

The immunochemistry module will provide students with a working understanding and the application of immunochemistry, ELISA techniques, and gel electrophoresis. (Special fee)

505B Biotechnology: Molecular Biology (1)

The molecular biology module will provide students with a working understanding and application of DNA extraction and purification, protein identification, electrophoresis, ELISA and PCR techniques. (Special fee)

510 Pathophysiology (3)

A study of the alterations in biological processes that affect homeostasis in the human. Includes the dynamic mechanisms involved, signs and symptoms. Physical and laboratory findings are emphasized. Prerequisite: 595/597 or equivalent or permission of instructor

511 Forensic Pathology (3)

An Examination into the field of Forensic Pathology and how this branch of medicine applies the principles of medical sciences in recognizing and interpreting diseases and injuries to the human body in the medicolegal death.

535 Human Embryology (3)

A study of human embryological development including fertilization, and the cellular and molecular mechanisms of embryogenesis. Congenital abnormalities and clinical applications will also be discussed.

537 Human Genetics (3)

This course discusses the genetic influences that affect the course of human development from reproduction through prenatal, neonatal, pediatric, adolescent, and adult periods. Screening protocols, early intervention, and modalities will be discussed.

558 General Microbiology (3)

This course presents the biology of eucaryotic and procaryotic microorganisms as well as a consideration of their structure, function, physiology, metabolism, growth and genetics. Some applications of microbiology cover human bacterial, viral, rickettsial, fungal, and parasitic diseases; identification, pathogenicity, modes of transmission and methods of control.

600 (4), 601 (2) Pathology

Fundamental principles of disease processes such as, tissue injury and repair, inflammation, the immune response, neoplasia, as well as mechanisms of hemodynamic and metabolic derangement; illustrated by means of case studies. Prerequisite/Co-requisite: BMS 550, 595.

620 Pharmacology (3)

Course encompasses basic pharmacological principles/classes of drugs. Include drug interactions with receptors, absorption, distribution, metabolism, and excretion. Drugs are covered on a systems basis. Prerequisites: 528, 595 or 597

623 Medical Microbiology (3)

The fundamentals of microbial physiology, genetics and immunology are presented with important bacterial and mycotic infections discussed from the standpoint of etiology, epidemiology, and pathogenesis and laboratory diagnosis. Treatment, prevention, and control of microorganisms are also discussed.

629 Matriculation Continued (1)

Continued registration.

635 Nutrition (2)

The course considers the principles of nutrition and its applications. In particular, selected biochemical and physiological effects of excess or deficiency of nutrients will be reviewed. The course has been designed to provide necessary information to allow the student to make informed decisions with regard to nutritional well-being. The student will learn more about themselves, their diet and the maintenance of sustainable good health. It will increase the student's awareness of topical nutrition issues.

644 Cancer Biology (3)

Major topics considered in this course include: Introduction to concepts and principles of cancer; cellular mechanisms involved in cancer development and progression; epidemiology and current and future diagnostic regimens involved in the treatment of the disease.

648 Epidemiology / HSA 520 Managerial Epidemiology (3)*

This is a general course in epidemiology with emphasis on current topics and applications in the Public Health. The behavioral models of health and disease, the social barrier to care and the effectiveness of the health care system, optimal health behavior in patients and health care personnel as well as the organizations in which they work are expected to gain a fundamental working knowledge of epidemiology methodology. A study of health and health assessment in the community is an important goal of this course.

665 Advanced Study (Credit not to exceed 3 s.h.)

Courses in Advanced Study include courses in emerging interdisciplinary fields of biomedical science. Course readings from current literature, reports and presentations.

* These courses also serve as part of the Graduate Certificate in Quality Improvement and Outcome Management Health Service Administration program. For full description see the Health Service Administration program.

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Barry University - College of Nursing and Health Sciences

11300 NE 2nd Avenue, Miami Shores, FL 33161-6695 Phone number:305-899-3899 Toll-free:1-800-756-6000. ext. 3899

E-mail: bms@barry.edu

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Curriculum

The curriculum in the M.A. in Medical Sciences (MAMS) Program is closely aligned with the first year medical curriculum at Boston University School of Medicine and several courses, including the required Biochemistry and Cell Biology (BI 751) and Medical Physiology (PH 730/731) courses have identical content. Other graduate level courses allow students to explore additional areas of medicine and biomedical research.

MAMS candidates are required to complete a minimum of 32 graduate credit hours; at least 24 course credits and up to 8 credits of thesis research. Students select from current course offering in consultation with their Faculty Advisor



Advisor to best reflect their interests and background.

In general, the MAMS program consists of two semesters of fundamental course work and two semesters of supervised laboratory or library research leading to the completion of a thesis. All students in the program must be registered for four semesters in order to graduate. Students who wish to complete the requirements for the MAMS program in 12 months must register for 12-16 credits in the fall and spring semesters and for at least 2 credits (or as a continuing student) in both summer sessions.

Students who wish to complete the requirements for the MAMS program over 2 years must register for 12-16 credits in the fall and spring semesters of Year 1 and at for at least 2 credits (or as a continuing student) in the fall and spring semesters of Year 2.

Oral Health Track students have a different curriculum.

A complete listing of GMS Course Offerings can be found here.

[Current Students](#)

[Prospective Students](#)

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[M.D./Ph.D. Program](#)

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Instructions for the online application

MS Biomedical Sciences Curriculum

The MS in Biomedical Sciences (with an emphasis in Systems Medicine) is a 34 credit, 10 month program that is offered full-time and during the day. It is a joint degree program between George Mason University College of Science and Georgetown University Medical Center and is designed to enhance the academic credentials for applicants interested in acceptance to medical school. Sixty percent of the courses are medical courses and the remaining 40% are graduate courses with an emphasis in systems medicine. The medical courses are live-captured lectures from the Georgetown University School of Medicine, and then the lectures are rebroadcast at the Mason's Prince William Campus by supplemental instructors. The diploma for the degree bears the seals of both institutions.

Applicants must have completed all prerequisite courses for medical/dental school (biology, chemistry, organic chemistry, physics, and math). Ideal candidates for the M.S. in Biomedical Sciences Program should hold a BA or BS degree in biology, chemistry, physics, or a related field from an accredited university with a minimum GPA of 3.0. Applicants must present one of the following official acceptable test scores: MCAT (minimum 27) or GRE General Test (minimum 308 which is 1200 under the previous scoring system) with MCAT score preferred. In addition, applicants are required to submit 3 letters of recommendation or a pre-medical committee letter; statement of desire to pursue a career in medicine, biomedical research or a related field; a self assessment or department form, a completed Mason graduate application (on-line application is preferable) along with a the appropriate application fee; two copies of official transcripts from each institution attended; and a resume. Candidates interested in medicine should have substantial and relevant clinical experiences. Candidates interested in biomedical research should have substantial and relevant research experiences.

In addition to the above, international applicants must submit official transcripts and degree certificate and/or diploma in both the original language and English, and an international transcript evaluation (Mason will do for you at no cost if you prefer). Proof of English proficiency is required in one of the following exams: TOEFL (computer – min. 230, paper – min. 570, internet – min. 88 with at least 20 in each section), IELTS (min 6.5) academic exam, or Pearson Test of English (min. 59) is required for all non-native English speakers regardless of current residence. Students who may request exemption from such a test include those who have completed a degree from a university or college in Australia, Canada, New Zealand, the United Kingdom and the United States.

What is the curriculum?

Fall Semester (16 credits)

- BMED 610 – Principles of Systems Biology (2)
- BMED 611 – Molecular Genetics (2)
- BMED 612 – Principles of Gross Anatomy (1)
- BMED 652 – Biomedical Career Pathways (1)
- BMED 660 – *Molecular & Cellular Physiology (3)
- BMED 661 – *Metabolism, Nutrition & Endocr (4)

BMED 662 – *Cardiopulmonary Biology (3)

Spring Semester (18 credits)

BMED 662 – *Cardiopulmonary Biology (2)

BMED 613 – Adv Physiol & Pathophysiology (3)

BMED 614 – Intro to Neuroscience (3)

BMED 653 – Biomedical Forum & Research (3)

BMED 663 – *Gastrointestinal Biology (2)

BMED 664 – *Renal Biology (2)

BMED 665 – *Sexual Development & Reprod (3)

All medical courses (*) will be live captured from Georgetown Medical School and rebroadcasted at the Prince William Campus approximately one week later. Fifty minute lectures at GU will be presented in a 70-minute format with additional instructional support.

How do I apply? On-line application is available at admissions.gmu.edu

[More info.....](#)

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2012 George Mason University GeorgeSquared.Graduate Biomedical Sciences Programs College of Science, 10900 University Blvd MSN 6E3, Manassas, VA 20110 | Phone: 703-993-7136



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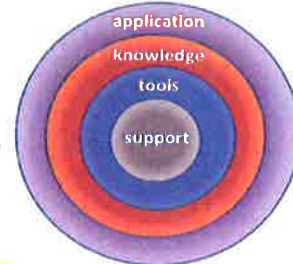
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Post-Baccalaureate Health Science Intensive Program

The Johns Hopkins University Post-Baccalaureate Health Science Intensive Program is a unique concentration in the MS in Biotechnology program. In one-year as a full-time student, you will be immersed in an innovative 360° curriculum specifically created to help students like you who want to build a more competitive medical school application.

This 360° curriculum includes the traditional advanced science academic coursework necessary to bolster your academic record for a successful medical school application (knowledge) along with the practical skills (tools) necessary to use them in the field (application) as well as the advice and mentoring necessary to be successful (support).



This unique approach is designed to help you prepare simultaneously for application to medical school and success in medical school while concurrently earning a Master of Science in Biotechnology degree from Johns Hopkins University.

Benefits of the Post-Bac Health Science Intensive Program

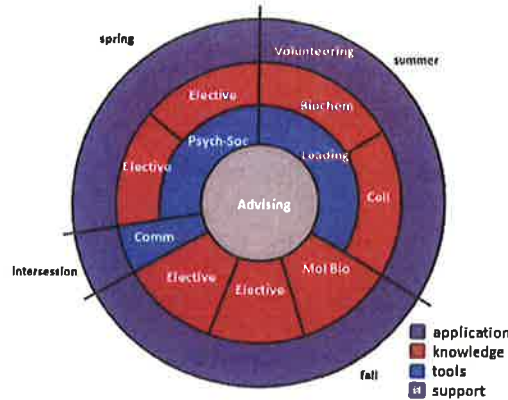
- Attend a premier research university known for its excellence in the sciences.
- High quality courses on a number of unique and interesting scientific topics that will strengthen and broaden your scientific knowledge
- To complement the science courses, you will complete three non-science courses that focus on skill building in communication, leadership-teamwork, and understanding the social and psychological determinants of health.
- Through group seminars and one-to-one advising, you will gain a thorough understanding of the medical school application philosophy and strategy, and how to best highlight your strengths.
- Through one-to-one advising, you will develop a personalized academic and volunteering plan. You will identify your weak points and troubleshoot how these can be addressed effectively.
- You will utilize volunteering opportunities to explore medicine and your own professional goals.
- At the culmination of the program, you can request a committee letter of recommendation to support your application.
- You will have assistance throughout the medical school application process. Target school section, application review, personal statement review, secondary essay advice, and mock interviews will help you present your best, most authentic application.
- MCAT preparation course

Innovative 360° Curriculum

We believe that being a physician requires individuals who have a solid foundation in the sciences and are armed with an interpersonal skill set necessary to apply science knowledge in

a way that is both sensitive and effective. Yet without a place to apply that knowledge and these skills, what you learn in the classroom lacks meaning.

We believe that to TRULY prepare you for medical school, you need MORE than classes.



Knowledge

Building a solid foundation in rigorous science courses is important.

Through the HSI Program, you will be required to take Biochemistry, Cell Biology I and Molecular Biology.

Choose 4 additional science electives and PERSONALIZE YOUR EXPERIENCE. We want you to LOVE YOUR CLASSES, so take the ones that interest you.

Tools

You also need soft-skills.

Physicians need more than book-smarts; they are leaders, community members, communicators, educators and advocates.

Through the HSI Program, you will take three innovative courses SPECIFICALLY TAILORED FOR YOU.

- **Communication for Health Care Professionals:** Written or oral, formal or informal, there is no greater strength than a doctor with the gift of communication.
- **Building and Leading Teams in Health Care:** Providing quality care is a team sport. Strong leadership and teamwork skills are a necessity for the next generation of physicians.
- **The Psychosocial Determinants of Health; Implications on Diagnostics:** This capstone course explores the balance between the science of diagnostics and the art of providing care for a complex and unique individual.

Application

Use what you've learned to help others.

Medicine is a lot of things to a lot of people, but it's always about helping others. Your post-bac experience should be too.

Whatever challenges you face, there is always an opportunity to make a difference in the lives of others. HSI students are strongly encouraged to get involved in their community through clinical or research opportunities.

Support

You have questions. We have answers.

Application to medical school is complicated. Good thing we've done it a few hundred times. Through seminars and individual advising, we've got you covered. From application strategy to picking target schools, we're here to make sure you have everything you need to succeed.

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Course Listing

The degree requires completion of 35 graduate credit hours in MIP and other science related courses. For coursework oriented students, 3 credits are required in the Spring term to complete a Capstone project. For research oriented students, 17 credits are independent research in the laboratory setting taken over the 12 months of the program.

1. For M.S. in Physiology, Research Track:

Fall Term:	17 credits (11 course credits, 6 research credits)
Winter Term:	15 credits (7 course credits, 8 research credits)
Spring/Summer Term:	3 credits (Research and Thesis)
Total Credits:	35 credits (18 course credits and 17 research credits)

Required Physiology Courses:

Physiology 502: Human Physiology	4 credits
OR	
Physiology 510: Human Physiology	4 credits
Physiology 404: Human Physiology Lab	2 credits
Physiology 605: Seminar in Physiology	1 credit (taken both Fall and Winter Terms)
Physiology 610: Translational Physiology	3 credits
Physiology 702: Masters Research Project	3-8 credits per term, 17 credits total

Required Non-Physiology Courses:

Biostatistics 553: Applied Biostatistics	4 credits
OR	
Biochemistry 515: Introductory Biochemistry	3 credits

Electives: (Only to be taken if the student has successfully completed "Required" courses.)

Pharmacology 601: From Molecules To Patients: Basic Quantitative Principles of Pharmacology	3 credits
Physiology 520: Computational Systems Biology for Physiology	3 credits
Physiology 555: Integrative Genomics	3 credits
Human Genetics 541	3 credits
Kinesiology 545	3 credits

Courses approved for PIBS students will be considered as substitutions on a case-by-case basis.

2. For M.S. in Physiology, Coursework Track:

Fall semester:	17 credits
Winter term:	15 credits
Spring term	3 credits
Total:	35 credits

Required Physiology Courses:

Physiology 502: Human Physiology	4 credits
Physiology 404: Human Physiology Lab	2 credits

Physiology 592: Integrative Neuroscience	4 credits
Physiology 605: Seminar in Physiology	1 credit (taken both Fall and Winter Terms)
Physiology 600: Pathophysiology	3 credits
Physiology 610: Translational Physiology	3 credits
Physiology 700: Capstone Project	3 credits

Required Non-Physiology Courses:

Biochemistry 515: Introductory Biochemistry	3 credits
OR	
Biochemistry 550: Macromolecular Structure and Function	3 credits
Biostatistics 553: Applied Biostatistics	4 credits
MedAdm 403: Anatomy	4 credits
OR	
CDB 550: Histology	4 credits
MCDB 436: Intro Immunology	3 credits

Electives: (Only to be taken if the student has successfully completed "Required" courses.)

Pharmacology 601: From Molecules To Patients: Basic Quantitative Principles of Pharmacology	3 credits
Physiology 520: Computational Systems Biology for Physiology	3 credits
Physiology 555: Integrative Genomics	3 credits

Sample Programs

Sample 1: M.S., Research Track:

FALL TERM COURSES		CREDITS	WINTER TERM COURSES		CREDITS
Physiol 502- Human Physiology <i>M-W-F 9:30-11</i>	4		Physiology 610- Translational Physiology	3	
Physiol 404- Human Phys Lab <i>4 hours, 1x per week.</i>	2		Physiol 555 <i>M-W-F 11-12</i>	3	
			OR		
Physiol 605- Seminar	1		Physiol 520 <i>F 1-4</i>	1	
Biostatistics 553-Applied Biostatistics <i>T-Th 8-10</i>	4		Physiol 605- Seminar	1	
Physiology 702: Masters Research Project	6		Physiology 702: Masters Research Project	8	
Fall Total	17		Winter Total	15	
SPRING TERM			SUMMER TERM COURSE		
<i>Laboratory Research Continues</i>			Physiology 702- Masters Research Project		
			3		

TOTAL CREDIT HOURS FOR MASTERS = 35

Georgetown UNIVERSITY MEDICAL CENTER

SMP Program in Physiology

The SMP Curriculum and the School of Medicine

Like most major medical schools, Georgetown University School of Medicine is continually reforming the curriculum to produce a more integrated program that will enhance the student's problem-solving abilities, and build a strong connection between the basic and clinical medical sciences. **Major curricular changes were instituted in 2008-2009, and were very successful-- the SMP students did a great job with the rigorous integrated curriculum, and the new non-cadaveric gross anatomy was a huge success.** We continue to make minor modifications in the curriculum with structure noted below:

General Structure of the SMP:

- SMP students take six medical courses, and the courses are integrated with material from the different disciplines.
- Grades from **3 medical courses** are available to medical schools after the fall semester, and all of the medical courses are completed by the end of March. This is great for the medical application process.
- The medical curriculum includes Biochemistry, Physiology, Microanatomy (Histology), Embryology, and Gross Anatomy. SMP students receive the systems Gross Anatomy components (full lectures with faculty facilitated labs and multiple on-line resources, but without cadaveric dissection-- however, prosected cadavers are viewed). Gross anatomy is a great addition to the SMP educational experience.
- Medical courses have many integrative case-based workshops and small group sessions to reinforce concepts. The information base builds over the year.
- SMP students take a graduate Introduction to Neurophysiology course in the spring. In addition, there is a Principles of Gross Anatomy course given in the Fall, before the gross anatomy begins in the systems-based medical courses.
- Several other graduate courses including Advanced Physiology & Pathophysiology are given to complement the medical courses and provide a strong foundation in the biomedical sciences.

This program continues to serve the SMP students well, providing the finest medical and graduate education and support towards your career and academic goals.

Integrated SMP Curriculum (includes 6 medical courses)

Medical courses are in **BOLD**, and the curriculum integrates relevant concepts of gross anatomy, histology, embryology, biochemistry, and physiology. Graduate courses are italicized.

Course descriptions

Fall Semester 2013

Molecular & Cellular Physiology (MCP), 3 cr

Metabolism, Nutrition & Endocrinology (MNE), 4 cr.

Medical Immunology & Micro, 2 cr

Fundamentals of Molecular Biology & Genetics, 1 cr

Biomedical Career Pathways, 1 cr

Physiology Forum, 1 cr

Principles of Gross Anatomy (PGA), 1 cr

Cardiopulmonary Biology (CP), 5 cr (*Cardiopulmonary finishes after winter break*)

Total Fall Credits = 18

Spring Semester 2014

Gastrointestinal Biology (GI), 2 cr
Renal Biology (Renal), 2 cr
Sexual Development & Repro. (SDR), 3 cr
Adv. Physiol & Pathophysiology, 3 cr
Intro to Neuroscience, 3 cr
Library Research Paper, 2 cr

Total Spring Credits = 15

Total SMP Credits = 33

Class Schedule/Curriculum Format for 2013-2014- Final schedule for fall 2013 will not be available until June, 2013

Summary of curriculum:

- The overall content for Biochemistry, Embryology, Microscopic Anatomy, and Human Physiology, is integrated into the medical courses.
- The curriculum also includes medical Gross Anatomy (with innovative non-dissection lab curriculum and prosected cadavers) in the Cardiopulmonary, Gastrointestinal and Sexual Development & Reproduction modules.
- The graduate courses include Medical Immunology & Microbiology, Nutrition, Biomedical Career Pathways, Advanced Physiology & Pathophysiology, Intro to Neuroscience and Library Research Paper. These courses all support the physiologic science training available for the MS degree.

Grading

Grading for SMP students will remain unchanged: it is done in such a way that grades illustrate competence in medical school courses. This is achieved because the SMP student's grades are based on the medical school grading curve. At Georgetown, medical students are graded on a Honors, High Pass, Pass, Low Pass, Fail grading curve. Physiology students are graded based on the medical school scale. The following grade conversion chart illustrates this.

Grade on Graduate Transcript Interpretation
A Honors for medical students
(top 10 to 15% of med class)
A- or B+ High Pass for medical students
(next 10 to 15% of med class)
B or B- Pass for medical students
(majority of first year med class)
C Unsatisfactory performance
F Unsatisfactory performance
No credit given for grad course

Daily Schedule

The daily schedule varies throughout the year, depending on the classes that are being taken at any given time. However, in general, students can expect to spend 8-12 hours per week in morning classes and 4 hours per week in afternoon classes. All classes take place between the hours of 9 am and 5 pm. Most of the students spend a majority of the rest of the day studying.