



January 21, 2013

C. Darrell Jennings, M.D.
Senior Associate Dean for Medical Education
University of Kentucky Medical Center
138 Leader Avenue
Lexington, KY 40536-9983

Master's of Science in Medical Sciences Program
College of Medicine
University of Kentucky
138 Leader Avenue, Room 113
Lexington, KY 40506-9983
<http://www.mc.uky.edu/medicine/MasterOfScienceMS.asp>

Re: Proposal to Revise the Master's of Science in Medical Sciences (MSMS) Program

Dear Darrell,

Please find attached a proposal to redefine and revise the MSMS program that I am submitting on behalf of the MSMS Advisory Committee. The overall rationale for the revision is several-fold: first, the MSMS curriculum has historically followed the curriculum of the Integrated Biomedical Sciences (IBS) program, which is currently being revised; second, the current enrollment in the MSMS program is geared more towards pre-professional degree students rather than doctoral students opting to take the MSMS degree; third, the students who apply to and are currently enrolled in the MSMS program come from varied backgrounds with a diverse academic experience and different career objectives; and finally, the academic prerequisites for many biomedical/health care related professional degree programs require a discipline specific curriculum.

The proposed MSMS program will provide a more individualized curriculum that meets the unique needs of our students and provides an opportunity to enhance the academic credentials of various career paths. It is envisioned that the revised MSMS degree program will have a positive impact on career development in several biomedical related disciplines, enhance student recruitment and educational opportunities, and serve the health-related needs of the Commonwealth.

The content of the proposal was generated based on extensive feedback and input from:

- MSMS Advisory Committee (Dave Watt, Melinda Wilson, Mike Mendenhall, Zhigang Wang, and Jason Mitchell)
- College of Medicine Dean's office
- College of Medicine Basic Science chairs/center directors
- Graduate School Office of the Dean of the Graduate School (initial meeting with Dean Blackwell was held on September 28, 2012)
- Office of Graduate Admissions
- Office of Graduate Academic Services

see
blue.

- College of Dentistry Admissions
- Office of Assessment
- Brett Spear (Director of Graduate Studies for the IBS program)
- Brian Jackson (Senior Associate Dean Graduate School and Graduate Council Chair)
- Davy Jones
- Numerous past and current MSMS graduate students and their advisors.


Finally, the proposed changes reflected in this document were initiated, in part, by proposed changes to the IBS curriculum that are also under consideration. Therefore, I respectfully ask that both proposals be reviewed concurrently so as to give the different committees/councils an opportunity to view them in the appropriate context.

The attached document contains the following:

- Change Masters Degree Program Form and Signature Routing Log
- MSMS Proposal
- Plan A Worksheet and Checklist
- Plan B Worksheet and Checklist
- Description of Student Learning Objectives
- Rubrics-
 - Student Presentation
 - Final Exam
 - Program Completion

Thank you for your consideration of this proposal and please let me know if you have any questions or require additional information.

Kind regards,



Joe E. Springer, Ph.D.
Professor
Director of Graduate Studies
M.S. in Medical Science
Neurorehabilitation Endowed Chair
Spinal Cord and Brain Injury Research Center
Physical Medicine and Rehabilitation
University of Kentucky

cc: Mike Reid, Ph.D.
Don Gash, Ph.D.
David Watt, Ph.D.
Melinda Wilson, Ph.D.
Mike Mendenhall, Ph.D.
Zhigang Wang, Ph.D.
Brett Spear, Ph.D.
Jason Mitchell, M.A.

CHANGE MASTERS DEGREE PROGRAM FORM

1. GENERAL INFORMATION

College:	Medicine	Department:	8 Basic Science Departments/Centers participating in the IBS and MS in Medical Sciences programs.		
Current Major Name:		Proposed Major Name:			
Current Degree Title:	MS in Medical Sciences	Proposed Degree Title:	<i>MS in Medical Sciences</i>		
Formal Option(s):		Proposed Formal Option(s):			
Specialty Fields w/in Formal Option:		Proposed Specialty Fields w/in Formal Options:			
Date of Contact with Associate Provost for Academic Administration ¹ :	09/28/2012				
Bulletin (yr & pgs):	2012 pp. 254-256	CIP Code ¹ :	51.1399.02	Today's Date:	01/05/2013
Accrediting Agency (if applicable):					
Requested Effective Date:	<input type="checkbox"/> Semester following approval.	OR	<input checked="" type="checkbox"/> Specific Date ² :	Fall 2013	
Dept. Contact Person:	Joe Springer, Ph.D.	Phone:	323-1440	Email:	jspring@uky.edu

2. CHANGE(S) IN PROGRAM REQUIREMENTS

		<u>Current</u>	<u>Proposed</u>
1.	Number of transfer credits allowed (Maximum is Graduate School limit of 9 hours or 25% of course work)	9 or 25% of coursework	<i>9 or 25% of coursework</i>
2.	Residence requirement (if applicable)	n/a	<i>n/a</i>
3.	Language(s) and/or skill(s) required	n/a	<i>n/a</i>
4.	Termination criteria	Per Graduate School	<i>Per Graduate School</i>
5.	Plan A Degree Plan requirements ³ (thesis)	24 credit hours of coursework + thesis	<i>24 hours of coursework + thesis</i>
6.	Plan B Degree Plan requirements ³ (non-thesis)	30 credit hours of coursework	<i>30 credit hours of coursework</i>
7.	Distribution of course levels required (At least one-half must be at 600+ level & two-thirds must be in organized courses.)	Requirement as stated by Graduate School	<i>Requirement as stated by Graduate School</i>
8.	Required courses (if applicable)	See attached	<i>See attached</i>
9.	Required distribution of courses within program (if applicable)		

¹ Prior to filling out this form, you MUST contact the Associate Provost for Academic Administration (APAA). If you do not know the CIP code, the APAA can provide you with that during the contact.

² Program changes are typically made effective for the semester following approval. No changes will be made effective until all approvals are received.

³ If there is only one plan for the degree, plans involving a thesis (or the equivalent in studio work, etc.) should be discussed under Plan A and those not involving a thesis should be discussed under Plan B.

CHANGE MASTERS DEGREE PROGRAM FORM

10.	Final examination requirements	Final examination as required by Graduate School	<i>Final examination as required by Graduate School</i>
11.	Explain whether the proposed changes to the program (as described in sections 1 to 10) involve courses offered by another department/program. <u>Routing Signature Log must include approval by faculty of additional department(s).</u>		
12.	List any other requirements not covered above?		
13.	Please explain the rationale for changes. If the rationale involves accreditation requirements, please include specific references to those requirements.		
	<p>The MSMS curriculum has traditionally followed the College of Medicine Integrated Biomedical Sciences (IBS) curriculum. The IBS curriculum is being modified and this requires a modification of the MSMS curriculum. The proposed revised MSMS program would provide a more individualized curriculum that meets the unique needs of our students and is also flexible enough to enhance the academic credentials of varied career paths. It is envisioned that the revised MSMS degree program would have a positive impact on career development in several biomedical related disciplines, as well as student recruitment and education, and serve the health-related needs of the Commonwealth.</p>		

CHANGE MASTERS DEGREE PROGRAM FORM
Signature Routing Log

General Information:

Proposal Name: Revision to COM MSMS Program

Proposal Contact Person Name: Joe Springer Phone: 3-1440 Email: jspring@uky.edu

INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
COM Curriculum Committee	Vetted 2/18/13	Melissa Wilkeson / 7-5286 / melissa.wilkeson@uky.edu	
COM Faculty Council	Vetted 3/19/13	John D'Orazio 3-0239 / / jdorazio@uky.edu	
Dean, College of Medicine		Fred deBeer 3-5079 / / Fedebel@email.uky.edu	
		/ /	
		/ /	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision ⁴
Undergraduate Council			
Graduate Council			
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

⁴ Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

-Proposed Program Revision- Master's of Science in Medical Sciences

Proposal Summary-

The overall objective of this proposal is to redefine and refocus the current Master's of Science in Medical Sciences (MSMS) graduate program from a "fall back" program to one that strengthens and enhances biomedical-related career opportunities.

The driving force for revising the MSMS program is three-fold: first, the current enrollment in the MSMS program is geared more to pre-professional degree students rather than doctoral students opting to take the MSMS degree; second, the students who apply to and are currently enrolled in the MSMS program come from varied backgrounds with a diverse academic experience and different career objectives; and third, the academic prerequisites for many biomedical related professional degree programs require a discipline specific curriculum.

The proposed MSMS program will provide a more individualized curriculum that meets the unique needs of our students and provides an opportunity to enhance the academic credentials of various career paths. It is envisioned that the revised MSMS degree program will have a positive impact on career development in several biomedical related disciplines, enhance student recruitment and educational opportunities, and serve the health-related needs of the Commonwealth.

Proposal-

1. Program Description

The Master's of Science in Medical Sciences (MSMS) is a broad interdisciplinary degree program housed in the College of Medicine. Participating Departments and Centers include Anatomy and Neurobiology; Behavioral Sciences; Graduate Center for Nutritional Sciences; Graduate Center for Toxicology; Microbiology, Immunology and Molecular Genetics; Molecular and Biomedical Pharmacology; Molecular and Cellular Biochemistry; and Physiology. The MSMS may be used as a stand-alone degree by students seeking career enhancement in fields such as basic biomedical research, the pharmaceutical industry, or the health science professions; by students seeking academic credentials in the biomedical sciences prior to applying for medical school or other health related professional degree programs; or by students seeking to enhance their knowledge base prior to choosing a career direction.

The MSMS degree may also provide supplemental or joint training for practitioners in the health professions (e.g., physicians, dentists, pharmacists), or students in professional health science programs based on individual career goals and research training needs. Finally, the MSMS program provides students with the opportunity to opt out of a Ph.D. program and receive a master's degree.

2. Rationale for Core Curriculum Revision

The required coursework in the MSMS curriculum has historically followed selective courses in the Integrated Biomedical Sciences (IBS) curriculum. However, the IBS curriculum is being revised and this will require an amendment to the MSMS curriculum. In addition, the student make-up of the MSMS program is now geared more to pre-professional degree students rather than simply a "fall back" for IBS students opting to take the MSMS degree. Finally, the students who apply to and are currently enrolled in the MSMS program come from varied backgrounds with a diverse academic experience. They also have different career objectives. Therefore, the MSMS program requires an individualized curriculum that meets the unique needs of our students and is also flexible enough to enhance the academic credentials of varied career paths.

3. Core Curriculum Revision

The proposed revised MSMS core curriculum will be comprised of existing courses or courses that are currently being modified (e.g., IBS602 Molecular Biology and Genetics). The proposed plan of study for the MSMS program consists of an eight credit hour core curriculum and a recommended course of study based on career tracks. The eight credit hour core curriculum consists of the following courses:

- IBS 602 Molecular Biology and Genetics (3 credit hours)
- IBS 606 Integrated Biomedical Sciences (3 credit hours)
- TOX 600 Ethics in Scientific Research (1 credit hour)

- Seminar in area of interest/specialization (1 credit hour)

The proposed changes to the IBS curriculum will combine IBS 602 (Biomolecules and Molecular Biology) and IBS 605 (Experimental Genetics) into a single course (IBS 602 Molecular Biology and Genetics) that will be taught in the fall semester. The newly combined Molecular Biology and Genetics IBS 602 course will cover DNA/RNA structure, DNA repair, replication, transcription, and translation, as well as Mendelian principles, mouse genetics, genomics, and bioinformatics.

IBS 606 (Integrated Biomedical Sciences) will be reduced from four (4) to three (3) credit hours and taught in the spring semester. IBS 606 introduces and explores the function of four major systems- nervous system, cardiovascular system, endocrine system, and immune system.

IBS 602 and IBS 606 will provide MSMS students with a working knowledge of basic concepts and principles essential for advancing their academic careers.

Ethics in Scientific Research (TOX 600) and the Seminar course are part of the current MSMS curriculum and these two courses will be retained. The Seminar course may be conducted in any of the disciplines and would require that the students present a research topic of interest.

4. Other Course Requirements

Additional coursework to fulfill the MSMS degree requirement is selected from courses offered in the basic and biomedical science programs in the College of Medicine and other colleges. Students will work with their mentor to design a career-focused curriculum along discipline specific tracks that target the needs, training, and career goals of each student (e.g., medical school, dental school, doctoral, pharmaceutical industry, laboratory technician, etc.).

Examples of recommended courses that provide advanced scientific training are listed below and based on prerequisites that are consistent with different professional degree programs and areas of specialization. For example, students planning to pursue an advanced degree in biomedical research, such as the IBS program at UK, would benefit from taking IBS 601/BCH 607 Biomolecules and Metabolism.

The Fundamentals of Biochemistry course (BCH 401G) would provide sufficient exposure and background material for students wishing to pursue a non-research based health-related professional degree program.

Many, if not all, dental schools are now requiring microbiology as a prerequisite and students wishing to pursue this career path should take MI 598 Clinical Microbiology.

A student pursuing a career in the pharmaceutical industry would want to consider taking Principles of Drug Action (PHA 621) and Molecular Targets and Therapeutics (PHA 622).

Recommended Courses (representative list):

ANA 511 - Introduction to Human Anatomy
ANA 512 - Microscopy and Ultrastructure
ANA 611 - Regional Human Anatomy
ANA/PGY 605 - Neurobiology of CNS Injury and Repair
BCH 401G - Fundamentals of Biochemistry
BCH 419G – Molecular Basis of Human Disease*
BSC 626 - Survey of Health Psychology
BSC 731 - Methods and Technologies in Clinical and Translational Science
IBS 601/BCH 607 - Biomolecules and Metabolism
IBS 603 - Cell Biology and Signaling
IBS 611 – Practical Statistical Applications*
MI 494G - Immunobiology
MI 598 - Clinical Microbiology
MI 685 - Immunology, Infection, and Inflammation
NS 601/2/3 - Integrated Nutritional Sciences I/II/III
NS 605 - Wellness and Sports Nutrition
PGY 412G - Principles of Human Physiology
PGY 611 - Advanced Medical Physiology
PHA 522 - Systems Pharmacology
PHA 621 - Principles of Drug Action
PHA 622 - Molecular Drug Targets and Therapeutics
STA 570 - Basic Statistical Analysis
TOX 508 - Research Methods in Toxicology
TOX 690 - Practical Analytical Toxicology

**Course currently under consideration*

5. Plan Options

The division of the degree program into a Plan A thesis option and a Plan B non-thesis option will be retained. Specifically, students entering the MSMS program may choose either a thesis option (Plan A) requiring 24 hours of coursework and at least six hours of masters research, or a non-thesis option (Plan B) requiring 30 hours of coursework. For both Plan A and Plan B, at least 50% of the coursework must be at the 600 level or above and at least two-thirds of the coursework must be in formally organized courses.

The Plan A thesis option generally serves a limited and well-defined population. Often students in Plan A are either lab technicians who are already engaged in research or doctoral students who have completed part of their dissertation research before transferring to the masters' degree program. Therefore, most students enrolling in the MSMS program chose the Plan B platform. All students are encouraged to have at least a one semester of biomedical research experience with a faculty member in one of the disciplines cited above.

Plan A requires defense of a written formal master's thesis according to the guidelines established by the Graduate School. The complete thesis must be provided to the committee at least two weeks prior to the defense date. The defense follows an oral

presentation of the thesis research and is conducted by a committee of at least three faculty members. Typically the student's advisor chairs the committee. Student selecting the Plan A thesis option will participate in a research project requiring intensive supervision in a department or program of interest. Therefore, Plan A will be offered with an "Option" designation to emphasize the discipline of interest.

Plan B does not have a formal written thesis but does require a final master's exam that involves a written document covering a student's research project or, if no research is conducted, a research paper/literature review based on the student's area of specialization or interest. The general format of the Plan B final master's exam is up to the student's advisory committee. For example, the committee may require the student to prepare a PowerPoint-style presentation that will serve as the basis for questioning about the research report, which is provided to the committee at least two weeks prior to the date of the exam. The presentation would include the hypothesis to be tested, the methodology used, the results of the study, interpretation of the results, and future directions. Students who do not conduct any research would be asked to write a research paper/literature review in an area of interest and follow the same format.

Worksheets describing the requirements and steps for each plan are provided to all students and copies are included as attachments to this proposal.

6. Student Learning Objectives and Assessment Plan

Upon completion of the MSMS program, students will have achieved the following learning outcomes:

- *Objective 1: Students will have acquired skills in critical and analytical thinking and in communication that may be applied to career opportunities related to the biomedical field.*

Student Presentation Learning Outcomes:

LO1 - Demonstrate the ability to use technical tools.

LO2 - Able to speak effectively.

LO3 - Able to construct an effective oral presentation with a clear introduction, middle, and conclusion.

LO4 - Able to field questions effectively.

LO5 - Overall evaluation of presentation.

- *Objective 2: Students will have acquired extensive knowledge of the scientific literature and principles related to training and education in the biomedical sciences.*

Final Exam Learning Outcomes:

LO1 - Able to critically analyze literature related to the project and think intellectually about the direction of the project.

LO2 - Able to formulate relevant and testable hypotheses, devise clear experiments for addressing the hypotheses, and analyze and interpret data appropriately.

LO3 - Able to orally communicate data and interpretation effectively with scientific peers, answers questions, and communicates ideas.

LO4 - Able to communicate effectively through scientific writing.

- *Objective 3: Students will have obtained a level of professionalism essential for successful advancement towards entering a health-related professional degree program or furthering career opportunities in the biomedical field.*

Program Completion Learning Outcomes:

LO1 – Demonstrates an appreciation of the biomedical sciences that extends beyond a student’s area of specialization.

LO2 – Demonstrates an appreciation of ethical issues and follows ethical responsibilities related to biomedical studies and research.

LO3 – Demonstrates interpersonal skills as reflected by an ability to interact well and contribute to group dynamics as necessary.

LO4 – Demonstrates a positive attitude.

LO5 – Demonstrates a strong work ethic by committing effort required to complete the necessary tasks.

LO6 – Demonstrates the capacity to coordinate group activities and supervise others.

LO7 – Demonstrates a level of responsibility as reflected by the ability to perform essential tasks with minimal supervision.

The progress of each student will be assessed at three time points by the student’s advisory committee: at the time of the seminar presentation (Student Presentation rubric), during the final exam (Final Exam rubric), and following completion of the program (Program Completion rubric). The DGS will collect and summarize each assessment to generate an overall measure of student progress. The summary will be included in the annual review of the program. The rubrics for each objective are included as attachments to this proposal.

7. Application to Program

Students may apply for entry into the MSMS program for either the Fall or Spring semesters. An applicant should have at least one year of general or inorganic chemistry, one year of organic chemistry (or one semester of organic chemistry and one semester of biochemistry) and at least one year of biology. Applicants should meet the following requirements to be competitive for admission to the Graduate School and the MSMS program:

- A baccalaureate degree from a fully accredited institution of higher learning.
- A minimum undergraduate grade point average of 2.9 and graduate GPA of 3.0.
- An average GRE score on the verbal, quantitative and analytical sections equal to or greater than the 40th percentile.**

**The vast majority of students who apply to the MSMS program are looking to improve their academic credentials in order to pursue a professional degree in medicine or dentistry and have taken the MCAT or DAT (but not GRE) entrance exams. In such cases, the MSMS program will accept MCAT or DAT scores in lieu of the GRE to serve as the entrance exam. In such cases, it is recommended that applicants have a minimal score of 24 on the MCAT or an academic and science minimal average of 16 on the DAT. These scores capture those students who are competitive, but require additional academic proficiency, and are based on the entrance requirements of the respective professional programs at UK and consistent with many programs at our peer Universities.

International applicants will be required to have a minimum score of 550 on the paper-based TOEFL (maximum 667), a minimum score of 213 on the computer-based TOEFL (maximum 300), or a minimum score of 80 on the internet-based TOEFL (maximum 120); all applicants must demonstrate proficiency in verbal and written English.

8. Administration

It is anticipated that the revised MSMS program will begin with the Fall 2013 semester. Students currently enrolled in the MSMS program will continue with the existing core curriculum. Beginning in the Fall of 2013, all new students will participate in the revised MSMS program and enroll in the new core curriculum.

- A. MSMS Faculty Membership-** All faculty who are currently members of the Graduate Faculties in the eight biomedical Departments/Centers will be nominated and appointed to the MSMS graduate faculty. The appointed rank of associate or full member will depend on the faculty member's highest current standing.
- B. MSMS Director of Graduate Studies-** The MSMS program will have a Director of Graduate Studies (DGS) who will be appointed by the Dean of the College of Medicine with recommendations from the Department/Center chairs of the participating programs. The DGS will serve as the official liaison between the MSMS program and the Graduate School.

The DGS will work with the MSMS Advisory Committee (see below) to direct and oversee the duties and responsibilities as defined in the DGS Policies and Procedures manual. This includes administration of the MSMS program, maintenance of records, administration of program funds, admission of graduate students, fellowships, program requirement changes and new programs, advising and registration, appointment of advisory and examination committees, and other degree requirements related to the graduate program. Additionally, the DGS serves as the point person for dissemination of information from the Graduate School to the MSMS student population and the MSMS graduate faculty.

The DGS will report to the Dean of the College of Medicine as well as the Dean of the Graduate School and consult from time to time with the chairs and directors of the eight Departments/Centers affiliated with the MSMS program. Accordingly, the DGS plays an important role in ensuring the quality of MSMS graduate program. The current size of the MSMS graduate program and the strong potential for growth over the next few years will require a significant administrative distribution of effort assigned to this position.

- C. MSMS Advisor/Mentor and Committee-** All MSMS students will be required to have an advisor who works with the student to develop their individualized curriculum and overall plan. Initially, the DGS of the MSMS program may fulfill this obligation until an advisor in the student's area of interest/specialization can be identified. The advisor in the area of interest/specialization should be identified by the end of the second semester of the year in which the student entered the program.

The advisor will also help establish the student's advisory committee that will oversee the student's progress and also serve as the final examination committee. In consultation with their advisor/committee, the student will use the Plan Option worksheets (see attachments) to document the proposed set of courses to be taken and forward the completed worksheet to the DGS.

All students will be required to meet with their advisory committee to review the student's progress. The results of this meeting will be communicated to the student in writing with a copy sent to the DGS, and the student's advisory committee will address any deficiencies in a student's academic background.

- D. MSMS Graduate Program Advisory Committee-** The DGS will rely on input and assistance from an Advisory Committee made up of graduate faculty from the Departments/Centers affiliated with the MSMS program. This committee will be responsible for the overall direction and guidance of the MSMS program and contribute to curriculum and program development, evaluation, recruitment, and reviewing applications for admission. Members of the Advisory Committee will be chosen by the DGS and the Chairs/Directors of the participating departments, in consultation with the program faculty, and be appointed to a three-year term.

E. MSMS Administrative Unit- The administrative office of the MSMS program will be housed in the IBS program office, which will handle the administrative duties. This includes recruitment, admissions inquiries, processing admissions materials and handling requirements for master's candidates that are not specifically the duties of the DGS.

9. Termination from the Program

If necessary, termination procedures will be conducted as specified in the rules of the Graduate School. Reasons for termination include one or more of the following: failure of the final examination; scholastic probation for more than two semesters; failure to make satisfactory progress toward completion of a satisfactory thesis as determined by the thesis advisor and the student's Advisory Committee. In addition, misconduct of a serious nature during the master's program, e.g., cheating, plagiarism, scientific misconduct such as falsification of scientific data, misuse of data or misuse of equipment, are causes for dismissal from the program following procedures outlined in the UK Student Code.

10. Program Evaluation

An annual report summarizing student enrollment, graduation rates, and assessment of learning outcomes will be submitted to the Dean of the College of Medicine, the Dean of the Graduate School, and the Chairs/Directors of the participating Departments and Centers. The annual report will also include information regarding the number of students who successfully completed their pre-program career goals and data on the career path and current status of past graduates. When necessary, improvement action plans will be developed for future program directions based on feedback and input from the Graduate School, College of Medicine, and Chairs/Directors of the participating Departments and Centers.

11. Attachments

Plan A Worksheet and Checklist
Plan B Worksheet and Checklist
Description of Student Learning Objectives
Rubrics:

- Student Presentation
- Final Exam
- Program Completion

Master of Science in Medical Sciences

Requirements, Curriculum, and Checklist for the Thesis (Plan A) Option

Student Name _____ **Date** _____

The Master of Science degree in Medical Sciences Plan A option requires:

- successful completion of the MSMS core curriculum
- at least 24 credit hours of course work with at least 2/3 of the course work in a traditional classroom setting (no special project, independent study, etc.) and at least 12 hours must be at the 600 or 700 level (excluding thesis credit)
- at least 6 hours of Master's Thesis Research (does not count towards the 24 credit hours of coursework)
- a minimum 3.0 grade point average for all course work
- successful completion of a Seminar course
- successful defense of a Master's thesis*
- submission of an approved written thesis to the Graduate School

The student should work with their mentor and/or the MSMS DGS to identify appropriate coursework beyond the required Core Curriculum.

MSMS Core Curriculum (8 credits)

COURSE PREFIX-NUMBER	COURSE TITLE	CREDIT HR
IBS6XX	Molecular Biology and Genetics (Fall)	3
IBS606	Integrated Biomedical Sciences (Spring)	3
TOX600	Ethics (Spring)	1
Seminar	Seminar in Dept/Ctr of specialization	1
		Total Credits: 8

Remaining Coursework (16 credits plus 6 hours of Master's Thesis Research)

COURSE PREFIX-NUMBER	COURSE TITLE	CREDIT HR
XXX-768	Master's Thesis Research	6
		Total Credits: 22

Total Credits for the M.S. in Medical Sciences Plan A Option: 30

Student Signature _____

Student Name _____ **Date** _____

Student Advisory/Thesis Committee

Signature of Chair (advisor) _____

Name and Department/Center _____

Signature of Member _____

Name and Department/Center _____

Signature of Member _____

Name and Department/Center _____

Signature of Departmental/Center DGS _____

Name and Department/Center _____

Signature of Medical Sciences DGS _____

Name of Medical Sciences DGS _____

* Plan A requires defense of a written formal master's thesis according to the guidelines established by the Graduate School. The complete thesis must be provided to the student's committee at least 2 weeks prior to the defense date. The defense follows an oral presentation of the thesis research and is conducted by a committee of at least three faculty members. Typically the student's advisor chairs the committee. Students should consult with their advisor regarding the selection of committee members and scheduling of the exam (also see attached Checklist).

Student Checklist for Masters of Science in Medical Sciences -Plan A Option-

1. Be sure to enroll in the semester for which you were accepted.
2. You must be enrolled EVERY Fall and Spring semester until you complete your degree
3. Establish a course curriculum with your advisor, advisory committee, or DGS of the MSMS program.
4. Identify, design, and conduct a research project with your advisor.
5. Identify an examination/thesis committee.
6. Complete your thesis based on the format described by the Graduate School.
7. Successfully pass your Master's examination (thesis defense).

-Please follow the guidelines below during the semester that you intend to graduate-

Forms: Be sure check the "[Forms](#)" page on the Graduate School web site under "Students in Master's/Specialist Programs" for accessing, filling out, and submitting important forms.

Application for Degree: The application for a degree is due within 30 days after the beginning of the semester (15 days for 2nd summer session). Go to "myuk" and click on "Student Services" then "myRecords" and then "Graduate Degree Application". You need to check the [Academic Calendar](#) in the registrar's office for specific deadlines related to the semester you intend to graduate.

Request for Final Master's Examination (Thesis Defense): You must submit the Request for Final Master's Examination form at least 2 weeks prior to examination. You may access and submit the form [here](#).

Date of examination: The thesis defense must take place no later than eight days prior to the last day of classes during the semester in which you intend to graduate. The defense may not be scheduled during the period between semesters or between the end of the eight-week summer session and the beginning of the fall semester. Check the [Academic Calendar](#) for deadlines to schedule your thesis defense.

Thesis: The final, accepted thesis document must be submitted to the Graduate School no later than 60 days following the date of your defense. You will not have the entire 60 days if you defend late in the semester that you intend to graduate (check the [Academic Calendar](#) for submission deadlines). Prior to the final submission you must have your thesis reviewed by the Graduate School to check for correct formatting. This process takes about 48 hours but may take longer during peak periods, especially during the end of the semester.

Note: The Graduate School policy states that you will not be allowed to sit for the exam if you have unresolved academic issues. Therefore, you need to check your transcript to ensure there are no missing grades or coursework in which you received a grade of "I". In addition, you must be in good academic standing (your GPA is 3.00 or higher).

Master of Science in Medical Sciences

Requirements, Curriculum, and Checklist for the Non-Thesis (Plan B) Option

Student Name _____ **Date** _____

The Master of Science degree in Medical Sciences Plan B option requires:

- successful completion of the MSMS core curriculum
- at least 30 credit hours of course work with at least 2/3 of the course work in a traditional classroom setting (no special project, independent study, etc.) and at least 15 hours must be at the 600 or 700 level
- a minimum 3.0 grade point average for all course work
- successful completion of a Seminar course
- successful completion of a final exam*

The student should work with their major advisor and/or the MSMS DGS to identify appropriate coursework beyond the required Core Curriculum.

MSMS Core Curriculum (8 credits)

COURSE PREFIX-NUMBER	COURSE TITLE	CREDIT HR
IBS6XX	Molecular Biology and Genetics (Fall)	3
IBS606	Integrated Biomedical Sciences (Spring)	3
TOX600	Ethics (Spring)	1
Seminar	Seminar in Dept/Ctr of specialization	1

Total Credits: **8**

Remaining Coursework (22 credits)

COURSE PREFIX-NUMBER	COURSE TITLE	CREDIT HR

Total Credits: **22**

Total Credits for the M.S. in Medical Sciences Plan B Option: 30

Student Signature _____

Student Name _____ **Date** _____

Student Advisory Committee

Signature of Committee Chair (advisor) _____

Name and Department/Center _____

Signature of Committee Member _____

Name and Department/Center _____

Signature of Committee Member _____

Name and Department/Center _____

Signature of Departmental/Center DGS _____

Name and Department/Center _____

Signature of Medical Sciences DGS _____

Name of Medical Sciences DGS _____

* Plan B does not have a formal written thesis but does require a final master's exam that involves a written document covering a student's research project or, if no research is conducted, a research paper based on their area of specialization. The general format of the Plan B final master's exam is up to the student's advisory committee. For example, the committee may require the student to prepare a PowerPoint-style presentation that will serve as the basis for questioning about the research report, which is provided to the committee at least two weeks prior to the date of the exam. The presentation would include the hypothesis to be tested, the methodology used, the results of the study, interpretation of the results, and future directions. Students who do not conduct any research would be asked to write a research proposal in an area of interest and follow the same format. Students should consult with their advisor regarding the selection of committee members and scheduling of the exam (also see attached Checklist).

Student Checklist for Masters of Science in Medical Sciences

-Plan B Option-

1. Be sure to enroll in the semester for which you were accepted.
2. You must be enrolled EVERY Fall and Spring semester until you complete your degree
3. Establish a course curriculum with your advisor, advisory committee, or DGS of the MSMS program.
4. Outline and conduct research (if applicable).
5. Identify an examination committee.
6. Successfully pass your Master's examination.

-Please follow the guidelines below during the semester that you intend to graduate-

Forms: Be sure check the "[Forms](#)" page on the Graduate School web site under "Students in Master's/Specialist Programs" for accessing, filling out, and submitting important forms.

Application for Degree: The application for a degree is due within 30 days after the beginning of the semester (15 days for 2nd summer session). Go to "myuk" and click on "Student Services" then "myRecords" and then "Graduate Degree Application". You need to check the [Academic Calendar](#) in the registrar's office for specific deadlines related to the semester you intend to graduate.

Request for Final Master's Examination: You must submit the Request for Final Master's Examination form at least 2 weeks prior to examination. You may access and submit the form [here](#).

Date of examination: The final examination must take place no later than eight days prior to the last day of classes during the semester in which you intend to graduate. Final examinations may not be scheduled during the period between semesters or between the end of the eight-week summer session and the beginning of the fall semester. Check the [Academic Calendar](#) for deadlines to schedule your final examination.

Note: The Graduate School policy states that you will not be allowed to sit for the exam if you have unresolved academic issues. Therefore, you need to check your transcript to ensure there are no missing grades or coursework in which you received a grade of "I". In addition, you must be in good academic standing (your GPA is 3.00 or higher).

Master's of Science in Medical Sciences Program Student Learning Objectives

The goal of the MSMS program is to provide students with instructional, educational, and research opportunities that will result in the following learning outcomes:

- *Objective 1: Students will have acquired skills in critical and analytical thinking and in communication that may be applied to career opportunities related to the biomedical field.*

This will be determined at the time of the student's seminar presentation using the following learning outcomes (see attached rubric):

LO1 - Demonstrate the ability to use technical tools.

LO2 - Able to speak effectively.

LO3 - Able to construct an effective oral presentation with a clear introduction, middle, and conclusion.

LO4 - Able to field questions effectively.

LO5 - Overall evaluation of presentation.

- *Objective 2: Students will have acquired extensive knowledge of the scientific literature and principles related to training and education in the biomedical sciences.*

This will be determined at the time of the final exam using the following learning outcomes (see attached rubric):

LO1 - Able to critically analyze literature related to the project and think intellectually about the direction of the project.

LO2 - Able to formulate relevant and testable hypotheses, devise clear experiments for addressing the hypotheses, and analyze and interpret data appropriately.

LO3 - Able to orally communicate data and interpretation effectively with scientific peers, answers questions, and communicates ideas.

LO4 - Able to communicate effectively through scientific writing.

- *Objective 3: Students will have attained their pre-program career goals and demonstrated successful advancement towards entering a health-related professional degree program or furthering career opportunities in the biomedical field.*

This will be evaluated when the student completes the program using the following learning outcomes (see attached rubric):

LO1 – Demonstrates an appreciation of the biomedical sciences that extends beyond their area of specialization.

LO2 – Demonstrates an appreciation of ethical issues and follows ethical responsibilities related to biomedical studies and research.

LO3 – Demonstrates interpersonal skills as reflected by an ability to interact well and contribute to group dynamics as necessary.

LO4 – Demonstrates a positive attitude.

LO5 – Demonstrates a strong work ethic by committing effort required to complete the necessary tasks.

LO6 – Demonstrates the capacity to coordinate group activities and supervise others.

LO7 – Demonstrates a level of responsibility as reflected by the ability to perform essential tasks with minimal supervision.

**Masters of Science in Medical Sciences
Graduate Student Presentation Review Form**

Student Speaker:
Reviewer:

Date:

Learning outcomes	Excellent 4	Good 3	Average 2	Deficient 1	Score
Demonstrate the ability to use technical tools	Familiar with the A/V equipment, slides easy to read and not overcrowded, heard audibly from every seat in the room, all crucial slides presented long enough for viewing, projected images easily viewable, no typos or slides out of order	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Technical bugs not worked out in advance, projection of color choices and slide layouts difficult to read, speaker didn't project well enough to be heard all over the room, went through some slides too fast, overcrowded slides, multiple typos	
Able to speak effectively	Speaker spoke clearly and with an appropriate tempo, there were no distractive movements or gestures by the speaker, the speaker maintained audience attention with eye contact, voice inflection, facial expression, avoided jargon and used simple language, talk was targeted appropriately to the audience	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Tempo was either too fast or too slow, speaker had a distractive movement, speaker didn't engage with the audience, speech was full of jargon and not targeted appropriately to the audience	
Able to construct an effective oral presentation with a clear introduction, middle, and conclusion	There was a distinct introduction making it clear what the talk would be about and providing rationale for the work. The middle section was distinct with clear explanation of the techniques and main results, complex ideas simply explained, crucial technical terms clearly defined. The conclusion section was distinct with a summary of the important results and ideas, a clear take home message, applications to future work were clearly defined.	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Important background information and rationale for the work was not clearly articulated in the introduction. The middle section was technically difficult to follow and not appropriately targeted to the audience. The conclusions section was just a summary without the speaker putting the work into a larger context including how the results contribute to the scientific knowledge in the field and what future directions to take.	
Able to field questions effectively	The talk stimulated interesting questions, not just clarification of the technical aspects of the work. The speaker repeated questions or paraphrased to clarify and strived to understand questions that were unclear. Questions were answered appropriately. The speaker demonstrated a depth of knowledge about the field and was able to critically apply this knowledge to his/her own work.	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	There were few questions generated about the content, just clarification of technical aspects that were not clearly presented. The speaker answered questions inappropriately due to failure to understand the question or a failure to understand the larger context of the field. The speaker became flustered or frustrated during the questioning.	
Overall evaluation of presentation	All of the elements of this talk were excellent.	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Most of the elements of this talk were deficient.	

Comments:

Suggestions for improvement:

Masters of Science in Medical Sciences Final Exam Assessment

Student:

Date of Exam:

Exam Committee Member:

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Score
Able to critically analyze literature related to the project and think intellectually about the direction of the project.	Demonstrates a thorough understanding of knowledge in the project area and the ability to consistently discern meaning and relative validity of data in scientific publications. Clear demonstration of independent intellectual contribution, creativity, and original thinking.	Demonstrates an adequate understanding of knowledge in the project area and displays many examples of the ability to discern meaning and relative validity of data in scientific publications. Demonstrates some insight and creativity.	Demonstrates some understanding of knowledge in the project area and some ability to discern meaning and relative validity of data in scientific publications. Minimal evidence of original thinking.	Demonstrates minimal understanding of knowledge in the project area and is unable in most cases to discern meaning and relative validity of data in scientific publications. Lack of creativity or original thinking.	
Able to formulate relevant and testable hypotheses, devise clear experiments for addressing the hypotheses, and, if appropriate, analyze and interpret data appropriately.	Demonstrates a thorough understanding of the scientific method, clear ability to generate hypotheses, understand and design complex experimental protocols, and analyze data with a clear and proper interpretation.	Demonstrates a good understanding of scientific method, generating hypotheses, designing experiments appropriate for addressing hypotheses, and presenting data in an appropriate context.	Demonstrates some understanding of scientific method, needs assistance with complex experimental design and analyzing data, can present and interpret data with some guidance from the PI.	Demonstrates minimal understanding of scientific method, limited ability to conceive of experimental designs to address hypotheses, needs significant faculty input for data analysis and interpretation.	
Able to orally communicate data and interpretation effectively, answer questions, and communicate ideas.	Articulates detailed understanding of project, is able to orally communicate and defend new ideas, thinks effectively on his/her feet, is consistently able to integrate knowledge from multiple disciplines and experience to answer questions or solve problems.	Has appropriate understanding of project, is able to articulate ideas but lacks creativity, can think through basic problems when questioned, and in many cases can integrate knowledge appropriately to answer questions or solve problems.	Has a basic understanding of project but lacks depth, answers basic questions but has difficulty thinking on his/her feet, and is sometimes able to integrate knowledge to answer questions or solve problems.	Lacks understanding of project and is not able to communicate rationale for interpretation of data or direction of the project, and is unable to draw from different areas or experiences to answer questions or solve problems.	
Able to communicate effectively through scientific writing.	Demonstrates a thorough understanding of context, audience, and purpose of the scientific work; uses appropriate, relevant, and compelling content to convey the contribution to the scientific discipline; pays detailed attention to and successfully uses conventions particular to manuscript and grant writing including organization, content presentation, formatting, and style; uses relevant and credible references appropriately, uses appropriate language that skillfully communicates meaning to readers with clarity and fluency, and is nearly error free.	Demonstrates adequate consideration of context, audience and purpose of the scientific work; uses many examples of appropriate, relevant and compelling content to convey the contribution to the scientific discipline; consistently uses manuscript and grant writing conventions including organization, content, presentation, and style; consistently uses appropriate references to support ideas; uses clear language that generally conveys meaning to readers, with few errors.	Demonstrates awareness of context, audience, and purpose of the scientific work; uses some examples of appropriate, relevant and compelling content; follows expectations appropriate to manuscript and grant writing for basic organization, content, and presentation; attempts to use credible and/or relevant references to support ideas; uses language that generally conveys meaning with clarity, though with errors	Demonstrates minimal attention to context, audience, purpose of the scientific work; uses appropriate and relevant content to develop simple ideas in parts of the work; attempts to use a consistent system for basic organization and presentation; attempts to use sources to support ideas; uses language that sometimes impedes meaning because of errors in usage.	

Comments:

Masters of Science in Medical Sciences Program Completion Assessment

Student:
Committee Member:

Date of Assessment:

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Score
Basic interest in biomedical science. Does the student demonstrate an appreciation of biomedical sciences that extends beyond their area of specialization?	Interested in broad area of biomedical sciences	Interested in sciences that support area of specialization	Limited interest in biomedical science	No interest in biomedical science	
Ethical considerations. Does the student appreciate and follow established norms of ethical responsibility in biomedical studies and research?	Highly ethical	Ethical	Inconsistent ethical behavior	Some question of ethical behavior	
Interpersonal skills. Does the student interact well and contribute to groups as necessary?	Team player, collegial	Potential for collegiality as maturity develops	Somewhat collegial, but no evidence for further development	Not a team player, inappropriate behavior	
Attitude. Is the student personable and interactive?	Makes a positive impression on first contact that is sustained	Has potential and indicators suggest improvement with maturity	Some potential for improvement exists	Negative interactions and no indication for improvement	
Work habits. Does the student commit the effort required to complete assigned tasks?	Dedicated and takes initiative to be productive	Productive	Not very productive	No initiative to be productive	
Leadership. Does the student demonstrate the capacity to coordinate group activities and supervise others?	Evidence of exceptional leadership	Acceptable level of leadership and potential with maturity	Some leadership potential with less clear potential for future development	No leadership capability or potential	
Responsibility. Can the student be counted on to perform required tasks with minimal supervision?	Highly responsible	Appropriate level of responsibility	Limited level of responsibility with some evidence for improvement	Minimal responsibility with no evidence for improvement	

Comments: