Request for Graduate Non-Curricular Changes

PLEASE USE THIS FORM FOR ALL NON-CURRICULAR CHANGE REQUESTS (changes in admission requirements or requirements for graduation, changes in existing or new policies/procedures, changes in program descriptions in catalog, general language changes in catalog).

SIGNATURES may not be required, depending on the nature of the request and from where it originates. Consult Graduate Council Chair.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.**

College: Medicine Dept/Division: Biomedical Research

Contact Person: Todd Green Phone: x6-3531

Rationale for Request:

There are several changes to the catalog that have been approved previously by Graduate Council over the last few months. The name of the program was changed from Biomedical Sciences (BMS) to Biomedical Research (BMR). Areas of Emphasis were added. Application deadlines were changed. Course alpha designators were changed. This form combines all of these changes into one document and corrects errors in the previous catalog description.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.
NOTE: all requests may not require all signatures.

Department/Division Chair _____ Date Summer 2018

Registrar _____ Date _____

College Curriculum Committee Chair _____ Date _____
(or Dean if no college curriculum committee)

Graduate Council Chair _____ Date _____

NOTE: please complete information required on the following pages before obtaining signatures above.

Request for Graduate Non-Curricular Changes – Page 2

1. **Current Catalog Description (if applicable)**: Please insert the catalog description from the current catalog for entries you would like to change.

Attached

2. **Edits to current description**: Attach or insert a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

Attached

3. **New Catalog Description**: Provide a “clean” copy of your proposed description without strikethroughs or highlighting. This should be what you are proposing for the new description.

Attached

Request for Graduate Non-Curricular Changes – Page 5

Please insert below your proposed change information for the Graduate Council agenda.

Type of change request: Non-curricular catalog change

Department: Biomedical Research

Degree program: M.S., Ph.D.

Effective date (fall/spring/summer, year): Summer 2018

1. Current catalog description - pages 217-226

School of Medicine

Dr. Joseph Shapiro, Dean
http://musom.marshall.edu

BIOMEDICAL SCIENCES, M.S., Ph.D., M.D./Ph.D.

Areas of Emphasis
Cancer Biology
Cardiovascular Disease, Obesity, and Diabetes
Infectious and Immunological Diseases
Medical Sciences (M.S. only)
Neuroscience and Developmental Biology
Toxicology and Environmental Health Sciences

Program Description

The basic science departments of the Joan C. Edwards School of Medicine offer an interdisciplinary program leading to the Master of Science and Doctor of Philosophy degrees in Biomedical Sciences. The primary aim of the Biomedical Sciences (BMS) program is to produce graduate students who are broadly based in the biomedical sciences with defined interests and special in-depth training in one of the following areas of emphasis: cancer biology; cardiovascular disease, obesity, and diabetes; infectious and immunological diseases; neuroscience and developmental biology; and toxicology and environmental health sciences. These areas are designed to be flexible and research oriented in order to develop the interests, capabilities and potential of all students pursuing careers in academic or industrial biomedical sciences.

In addition, the BMS program offers a non-thesis Master of Science degree in the medical sciences area of emphasis to improve the science foundation of students seeking admission into doctoral programs in medicine or other health-related professions.

Admission into this program does not guarantee admission into medical school. Students in this area of emphasis are required to pay the Health Professions Fee each semester while enrolled in the program. Because of the nature of the curriculum, applicants to the medical sciences area of emphasis will only be considered for admission for the fall semester.

The Biomedical Sciences Doctor of Philosophy degree program accepts a very limited number of students to study concurrently with the Doctor of Medicine degree.

Admission Requirements

Applicants must meet the admissions requirements of the Graduate Studies Committee of Marshall University's Joan C. Edwards School of Medicine. Interested persons should contact the Biomedical Sciences Graduate Program at the Byrd Biotechnology Science Center, Marshall University School of Medicine, One John Marshall Drive, Huntington, WV 25755 or via the Internet at *www.marshall.edu/bms/future-students/contact-us, mubiomed@marshall.edu,* or 304-696-3365.

Minimum Requirements for Admission into Master of Science or Doctor of Philosophy Program

All applicants must have baccalaureate degrees, with one year of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. Biochemistry is not currently a requirement, but it is highly recommended to take it.

- Graduate Record Examination (GRE) General Test scores (scores may not be more than three (3) years old at the application deadline for the Ph.D. program or at the start of the semester when matriculating for the M.S. program) or MCAT scores (Medical Sciences area of emphasis only, minimum of 22 total)
- Three letters of recommendation from references familiar with the applicant's relevant academic/professional performance
- A personal statement describing educational and career goals.

Ph.D. Applications

The completed application, application fee, official transcripts and official GRE or MCAT scores should be received in the Graduate Admissions Office by January 15th for summer or fall applications in order for the application to be considered by the program.

Letters of recommendation and personal statements should be received in the BMS Office by January 15th in order for the application to be considered complete and for an admission decision to be rendered.

Applications completed very soon after the above stated deadlines may be considered at the discretion of the BMS Graduate Studies Committee.

New Ph.D. students will matriculate in July (Summer III term).

M.S. Applications

The completed application, application fee, official transcripts, three letters of recommendation, written statement, and official GRE or MCAT scores (MCAT scores accepted for medical sciences area of emphasis only) should be received in the Graduate Admissions Office by June 1st for fall applications in order for the application to be considered by the program.

Duration of Degree Programs

Students are expected to complete the requirements for the Master of Science degree within two years. Doctoral students are expected to complete the degree requirements within five year. Students who possess an M.S. degree in biomedical sciences or the equivalent when admitted into the doctoral degree program generally require three years to complete the Doctor of Philosophy degree.

BIOMEDICAL SCIENCES, M.S. (Cancer Biology; Cardiovascular Disease, Obesity, and Diabetes; Infectious and Immunological Diseases; Neuroscience and Developmental Biology; Toxicology and Environmental Health Sciences Areas of Emphasis)

Degree Requirements

A minimum of 36 credit hours is required for a non-thesis degree, while a minimum of 32 credit hours is required for the thesis degree. No more than six hours of thesis (BMS 681) may be credited toward the 32-hour requirement. Each student will specialize in one of the five areas of emphasis as defined in the program description. All students are required to successfully complete:

BMS 601	Introduction to Nucleic Acids and Proteins
BMS 602	Introduction to Cell Structure and Metabolism
BMS 603	Regulation of Cell Function
BMS 604	Cellular Basis of Disease
BMS 617	Statistical Techniques for the Biomedical Sciences
BMS 644	Responsible Conduct of Research
BMS 660/661	Communication Skills for Biomedical Sciences
BMS 680	Seminar (minimum of 4 hrs.)
BMS 785	Introduction to Research

In addition, the student must successfully complete other courses required by his/her area of emphasis and advisory committee and pass an oral comprehensive examination.

Advisory Committee for M.S. Students

The advisory commitlee should be formed no later than the end of the first year of graduate education. As soon as the committee has been identified, a Thesis Committee Formation form is completed and submitted to the Director of Graduate Studies.

The committee will be selected by the student and research advisor and approved by the Director of Graduate Studies. The advisory commitlee will be composed of at least three faculty members with appropriate expertise. One of the members may be from another institution. The student's research advisor will act as the chairperson of the committee.

In addition, after 12 hours of coursework has been completed, the student must submit to the Dean of the Graduate College a Plan of Study form.

BIOMEDICAL SCIENCES, M.S. (Medical Sciences Area of Emphasis)

A minimum of 36 credit hours is required for the non-thes is degree. In addition, the student musr pass a writlen comprehensive examination covering BMS 601-604, MCB 631, MCB 632, and PHS 628. All students will also participate in laboratory-based research, and either present at a research conference or submit a peer-reviewed ublication. All students are required to successfully complete:

BMS 601	Introduction to Nucleic Acids and Proteins
BMS 602	Introduction to Cell Structure and Metabolism
BMS 604	Cellular Basis of Disease
BMS 603	Regulation of Cell Function
BMS 617	Statistical Techniques for the Biomedical Sciences (or MTH 518, BSC 517, PSY 517, EDF 517 or equivalent)
BMS 680	Seminar (minimum of 4 hrs.)
BMS 785	Introduction to Research
MCB 631	Medical Microbiology I
MCB 632	Medical Microbiology II
PHS 628	Neurophysiology

Elective classes include PHS 629 (Mammalian Physiology), PMC 621 (Medical Phamrncology I). and PMC 622 (Medical Pharmacology II).

In addition, after 12 hours of coursework has been completed, the student must submit to the Dean of the Graduate College a Plan of Study form.

BIOMEDICAL SCIENCES, M.S., AND SCHOOL OF PHARMACY, PHARM.D.

Students can receive both an M.S. degree from the Biomedical Sciences Program and a Pharrn.D. degree from the School of Pharmacy. Prospective students must apply to and meet the admission requirements for both programs. The curriculum takes five years to complete. In the first year students take BMS courses; in years 2-5 students t.akc School of Pharmacy courses. All students are required to successfully complete:

Year 1 Fall

BMS	601	Introduction to Nucleic Acids and Proteins
BMS	602	Introduction to Cell Structure and Metabolism
BMS	680	Seminar
PHS	628	Neurophysiology

Year I Spring

BMS	603	Regulation of Cell Function
BMS	604	Cellular Basis of Disease
BMS	680	Seminar
BMS	785	Introduction to Research
PHS	629	Mammalian Physiology

Year 2 Fall

PHAR	511	Clinical Immunology
PHAR	531	Biopharmaceutics I
PHAR	541	Pharmacy Practice I
PHAR	542	Immunology and Microbiology
PHAR	551	Biomedical Chemistry
PHAR	811	Introductory Pharmacy Practice Experiences in Community Settings

Year 2 Spring

PHAR	521	Integrated Laboratory I
PHAR	532	Biopharmaceutics 11.
PHAR	543	Pharmacy Practice II
PHAR	544	Principles of Disease and Drug Action
PHAR	545	Therapeutics I
PHAR	812	Introductory Pharmacy Practice Experiences in Institutional Settings I

Year 3 Fall

PHAR	611	Integrated Laboratory II
PHAR	621	Pharmacy Law and Ethics
PHAR	622	Drug Information and Communication Skills
PHAR	631	Pharmacometrics
PHAR	632	Pharmacy Practice Management I
PHAR	661	Therapeutics II
PHAR	813	Introductory Pharmacy Practice Experiences in Community Settings II

Year 3 Spring

PHAR	612	Therapeutic Drug Dosing
PHAR	633	Patient Care Skills Lab
PHAR	634	Pharmacy Practice Management II
PHAR	635	Bridging Research Outcomes and Patient Care
PHAR	671	Therapeutics III
PHAR	814	Introductory Pharmacy Practice Experiences in Institutional Settings II

Year 4 Fall

PHAR	711	Medication Therapy Management
PHAR	722	Pharmacy Practice Management III
PHAR	741	Therapeutics V
PHAR	751	Therapeutics IV
PHAR	815	Ambulatory Care Skills
PHAR	816	Inpatient Practice Skills
		Elective I

Year 4 Spring

PHAR	721	Therapeutics VII
PHAR	731	Case Studies in Pharmacy Practice
PHAR	761	Therapeutics VI
PHAR	817	Introductory Pharmacy Practice Experiences in Practice Management
PHAR	818	Introductory Pharmacy Practice Experiences in Education
		Elective 2

Year 5 Fall and Spring

PHAR	881	Advanced Pharmacy Practice Experiences in Practice Management
PHAR	882	Advanced Pharmacy Practice Experiences in Ambulatory Care/Primary Care
PHAR	883	Advanced Pharmacy Practice Experiences in Community Pharmacy
PHAR	884	Advanced Pharmacy Practice Experiences in Institutional Settings
PHAR	885	Advanced Pharmacy Practice Experiences in Geriatrics
PHAR	886	Advanced Pharmacy Practice Ex eriences in Diverse Popul ations

Elective 3
Elective 4
Capstone 1
Capstone 2

PHAR 635 substitutes for MTH 518, Biostatistics, a BMS Program requirement.

PHAR 542 substitutes for the BMS course MCB 631, Medical Microbiology I.

PHAR 531 and PHAR 551 substitute for the BMS courses PMC 625, Drug Metabolism, and PMC 630, Chemical Aspects of Pharmacology.

PHAR 545 and PHAR 671 substitute for the BMS course BMS 680, Seminar. This will meet the 4 hr. minimum requirement for Seminar for the M.S. degree.

A minimum of 36 credit hours is required for a non-thesis degree in the BMS Program.

BMS	601	3 hrs.
BMS	602	3 hrs.
BMS	680	1 hr.
PHS	628	2 hrs.
BMS	603	2 hrs.
BMS	604	1 hr.
BMS	680	1 hr.
BMS	785	3 hrs.
PHS	629	6 hrs.
PHAR	531	3 hrs.
PHAR	542	4 hrs.
PHAR	545	4 hrs.
PHAR	551	5 hrs.
PHAR	635	3 hrs.
PHAR	671	7 hrs.

In addition. the student must pass a written and/or an oral comprehensive examination to receive the M.S. degree.

BIOMEDICAL SCIENCES, Ph.D.

The doctorate is a research or performance degree and does not depend solely on the accumulation of credit hours. The degree requirements are admission to candidacy and successful completion and defense of a dissertation. The degree signifies that the holder has the competence to function independently at the highest professional level.

Degree Requirements

To qualify for the Doctor of Philosophy degree, the student must pass (*C* or better or *CR*) the following courses:

BMS	601	Introduction to Nucleic Acids and Proteins
BMS	602	Introduction to Cell Structure and Metabolism
BMS	603	Regulation of Cell Function
BMS	604	Cellular Basis of Disease
BMS	644	Responsible Conduct of Research
BMS	617	Statistical Techniques for the Biomedical Sciences
BMS	660/661	Communication Skills for Biomedical Sciences

BMS	680	Seminar (minimum of 6 hrs.)
BMS	785	Introduction to Research

In addition, the student must successfully complete other courses required by his/her area of emphasis and advisory committee. All courses will be defined in the student's Course of Study. The student must also pass a written and oral exam prior to becoming a Ph.D. candidate. These exams are set by the advisory committee and are outlined below under Admission to Candidacy.

Students are required to write and publish three peer-reviewed manuscripts, two of which must be as first author.

BIOMEDICAL SCIENCES, M.D./Ph.D.

The Joan C. Edwards School of Medicine offers a combined M.D./Ph.D. degree in partnership with the Biomedical Sciences Graduate Program at Marshall University. The curriculum takes seven to eight years to complete. Students first take years one and two of medical school. During that time they complete the requirements for BMS 785 (Introduction to Research). After passing the USMLE Step I exam al the end of year two, students begin their Ph.D. coursework and research. This takes three to four years. After completing the Ph.D. requirements, students then complete years three and four of medical school. All of the requirements for both the M.D. and Ph.D. degrees must be met.

The medical student course Elements of Medicine (MDC 710) meets the requirements for BMS 601, 602, 603, and 604. Other medical school courses can meet area of emphasis requirements, as determined by the student's advisory committee and the Graduate Studies Committee.

M.D./Ph.D. Applications

Students interested in pursuing the combined degree should indicate this on their medical school AMCAS application. A separate M.D./Ph.D. admissions subcommittee consisting of members of the medical school and BMS graduate admission committees will review the applications.

All applicants must take the MCAT. A score of 30 or better on the MCAT taken between January 2013 and January 2015 is preferredd for considertion for admission. An MCAT score of 28 will be considered if the applicant has extensive research experience. A minimum score of 505 on the new MCAT is required for consideration for admission.

AMCAS applications must be submitted by November 1. Completed appl ications should be received by December 1. Completed applications received after December 1 may be reviewed for a position on a waiting list.

Advisory Committee for Ph.D. and M.D./Ph.D. Students

The advisory committee should be formed no later than the end of the first year of graduate education or upon completion of 18 semester hours of credit. As soon as the committee has been identified, an Approval for Dissertation Topic and Committee Membership form is completed and submitted to the Director of Graduate Studies and the Dean of the Graduate College.

The committee will be selected by the student and research advisor and approved by the Director of Graduate Studies and the Dean of the Graduate College. The advisory committee will be composed of at least five faculty members with appropriate expertise. One of the members may be from another institution. The student's research advisor will act as the chairperson of the committee.

Approval of Course of Study

It is essential for the student and advisory committee to carefully define a Course of Study by the end of the first year. This is considered a basic contract between the student and the program and includes:

- Proposed dissertation topic;
- All transfer credits;
2. Required and elective courses to be taken at Marshall University.;
3. All competencies to be achieved by the student during graduate study. These details must be recorded on a Course of Study form and submitted for approval by the Director of Graduate Studies and the Dean of the Graduate College.

Graduate Assistantships for the Doctor of Philosophy Program

Research assistantships are available for students in the doctoral degree program on a competitive basis. The base stipend is renewable annually for up to six years. Priority consideration for the Ph.D. assistantships will be given to West Virginia residents.

Academic Performance

- The student must maintain a Grade Point Average of 3.0, and no more than six hours of *C* and no grades below *C* may be applied toward the degree.
- If the GPA falls below 3.0, the student will be placed on academic probation. Following notification of probation, the student will be counseled by his/her advisor. At this time, the deficiency will be identified and a written plan will be prepared for removing it within the next semester. This plan, co-signed by the student and the advisor, must be approved by the Graduate Studies Committee and the Director of Graduate Studies before the student can register for additional coursework.
- If probationary status is not removed within the next semester hours, the student is dismissed from the program. The dismissal is automatically appealed to the Graduate Studies Committee, who will determine whether the student is retained or dismissed from the program. Retention must be recommended by the advisor and student's advisory committee and endorsed by the Graduate Studies Committee.

Transfer Credit

The student may transfer credits completed at other regionally accredited graduate institutions. Approval of the Graduate Studies Committee and the Dean of the Graduate College is contingent on:

1. the grades earned were *B*'s or better;
2. the credits are appropriate to the student's program and acceptable to the advisory committee; and
3. the time limitations were not exceeded.

The number of transfer hours acceptable for the Ph.D. degree will be determined by the student's advisory committee. Approval must be received from both the Graduate Studies Committee and the Dean of the Graduate College. Transfer credit will not become part of the Marshall University Grade Point Average.

Transfer of credits should be accomplished as early as possible. This should be accomplished either when the student is admitted to candidacy or submits an approved Course of Study. Attempts to transfer credits during the last semester may delay graduation. Official transcripts must be on file in the Graduate College office by the date that grades are due in the Marshall University Registrar's Office.

Validation of Outdated Coursework

The advisory committee has the option to require validation, by special examination, of courses which members deem to be outdated.

Time Limitations

Students must meet all requirements for the Doctor of Philosophy degree within seven years from the date of enrollment in the first course to be used in the degree program. The Graduate Dean may grant an extension upon recommendation by the Graduate Studies Committee. Absence due to military obligations, long serious illnesses, or similar circumstances beyond
the student's control may be considered valid reasons for an extension. It is the option of the advisory committee to require validation of outdated courses by special examination.

Admission to Candidacy

Admission to graduate study and enrollment in graduate courses does not guarantee acceptance as a candidate for the Doctor of Philosophy degree. This is only accomplished by satisfactorily passing a comprehensive qualifying examination and meeting all other specified requirements. The qualifying examination assesses whether the student has attained sufficient knowledge to undertake independent research. The examination should be completed at the end of the second year of study. The examination consists of written and oral components covering all areas specified in the Course of Study. The examination is prepared, administered and graded by the advisory committee. The written portion includes all coursework and relevant topics determined by the advisory committee. The student will be given 2-3 days to complete the written component of
the examination. Upon passing the written examination, the student must submit a grant proposal on the topic of his/her dissertation research or a related topic approved by the advisory committee. The proposal must be in the style of an NIH Predoctoral grant proposal. Links to the instructions for the proposal format can be found on the BMS Graduate Program website. The grant proposal must be submitted within 2 months of completion of the written exam and given to the advisory committee members at least 2 weeks in advance of the oral defense. The oral examination consists of a defense of the grant proposal and, at the discretion of the advisory committee, may include topics from the written portion of the exam in which the student was deemed to be deficient. Successful completion of the qualifying examination is based on approval of the committee. Only one dissenting vote is permitted on each component. If necessary, a single portion of the examination may be repeated at the discretion of the advisory committee. The student must have the approval of the advisory committee

to repeat either the written or oral component of the qualifying examination. The committee assesses the deficiencies and determines the time required for the student to make corrections. A student may take a given component of the qualifying examination no more than three times. Failure to pass this examination on the third attempt will result in dismissal. The advisory committee must complete an Admission to Candidacy for Ph.D. form after the student completes the examinations and submit it for approval by the Director of Graduate Studies and the Dean of the Graduate College.

Dissertation

All candidates must successfully complete a biomedical research project and prepare, submit, and defend a dissertation. The dissertation must present the results of the candidate's individual investigation and make a definite contribution to the current state of knowledge. While conducting research and writing a dissertation, the student must register for Research (BMS 882) at the beginning of each semester or summer term for which progress is to be earned. No more than 15 hours of doctoral research may be credited toward the degree.

Candidates are to follow the general guidelines outlined in *Publishing Your Dissertation: How to Prepare Your Manuscript for Publication* and *General Information About Dissertations*. Copies of these documents are on file in the Biomedical Sciences Graduate Program office.

Oral Defense of the Dissertation

The oral defense of the dissertation is held during the semester or summer session in which all other degree requirements have been met. The advisory committee must read and tentatively approve the dissertation before the examination can be scheduled. The committee chairperson will complete an Approval to Schedule Dissertation Defense form and submit it for approval of the Director of Graduate Studies and the Dean of the Graduate College before the examination can be given. Such notification must occur at least two weeks before the proposed date of the defense. A portion of the defense is an open examination and sufficient time is required for adequate public notice.

The open examination usually takes the form of a one-hour seminar. This is followed by a thorough review of the dissertation by the advisory committee and the candidate. Successful completion of the defense requires the approval of all but one of the members of the advisory committee. The results (pass/fail) must be recorded on a Results of Dissertation Examination form, which is to be reported to the Office of Research and Graduate Education and forwarded to the Graduate College Office within 24 hours. Should the candidate fail the defense, reexamination may not be scheduled without the approval of the advisory committee, the Director of Graduate Studies, and the Dean of the Graduate College.

All advisory committee members are to be present for the defense. If this is not possible, the Dean of the Graduate College, or designee, may permit one substitute for any member of the committee except the chairperson. A request for a substitute must be submitted in writing to, and approved by, the Director of Graduate Studies and the Dean of the Graduate College. The committee chairperson, the student, and both the original member of the committee to be replaced, and the substitute must sign this request. The substitute must have the same, or higher, graduate faculty status as the original member and represent the same academic discipline or area of emphasis.

Acceptance of Dissertation

Acceptance of the dissertation is a requirement for the doctoral degree. An accepted dissertation must bear the original signatures of at least all but one member of the advisory committee. If more than one member cannot approve the dissertation, the doctoral degree cannot be recommended. If the substitute member attends and approves the dissertation defense, he or she signs the dissertation. For complete information on the preparation and submission of electronic theses and dissertations see *www.marshall.edu/graduate/current-students/edt.*

Survey of Earned Doctorates

Please complete and submit the online Survey of Earned Doctorates. Survey of Earned Doctorate information is used by a number of government agencies to assess the state of doctoral education in the U.S., and also to inform their decisions concerning funding of U.S. graduate institutions. The online survey is available at *http://survey.norc.uchicago.edu/ doctorate/index.jsp.*

Publication

All doctoral dissertations and their abstracts will be microfilmed through University Microfilms, Ann Arbor, Michigan. This requirement cannot be satisfied by any other publication, but other publication of material in the dissertation is both permitted and encouraged.

Process Summary

- Inquiry from prospective student to the Biomedical Sciences Graduate Program or Graduate Admissions Office.
- Submission of the application to the Biomedical Sciences Graduate Program, the Graduate Admissions Office, or online.

- Receipt of the following official application materials and required fee by the Graduate Admissions Office: application, GRE scores, and transcript(s). International students must apply through the Center for International Programs.
- Referral of application materials by the Graduate Admissions Office.
- The Biomedical Sciences Graduate Program notifies the Graduate Admissions Office and the prospective student of the admission decision of the Graduate Studies Committee.
- The accepted student arrives, reports to the Biomedical Sciences Graduate Program, is assigned an interim advisor, and registers for coursework.
- Selection of an area of emphasis/advisor must be achieved by the end of the first year. After a permanent advisor has been selected, an advisory committee is formed. A Course of Study should be developed by the end of the first year.
- The student completes requisite coursework and other program requirements.
- The student takes written and oral qualifying examinations for admission to candidacy to the Ph.D. These examinations should be scheduled within two months of each other.
- The student continues doctoral research under the guidance of his/her advisory committee. The dissertation phase begins with the approval of a dissertation prospectus by the advisory committee, the Biomedical Sciences Graduate Program and the Graduate College Dean.
- The student applies for graduation at the beginning of his or her last semester no later than the university deadline in the academic calendar. The diploma fee must be paid by this time.
- A copy of the preliminary draft of the dissertation is given to each member of the advisory committee no later than two weeks prior to the final defense of the dissertation.
- The chair of the advisory committee requests clearance for the defense from the Biomedical Sciences Graduate Program and the Graduate College for approval no later than two weeks before the scheduled date of the defense.
- The time and place of the defense of the dissertation are announced.
- The student defends the dissertation in an oral defense.
- The student follows the steps to prepare and submit the electronic thesis or dissertation at *www.marshall.edu/graduate/ current-students/edt*.

CLINICAL AND TRANSLATIONAL SCIENCE, M.S.

Program Description

The Clinical and Translational Science (CTS) Department in the Marshall University Joan C. Edwards School of Medicine offers a Master of Science (M.S.) degree in Clinical and Translational Science. The goal of this program is to equip physicians in-training and other biomedical scientists with the information and training they need to translate basic clinical advances into improved patient care that will enhance the quality of life for patients in the Appalachian region, particularly southern West Virginia.

Students will receive education in clinical trial design, epidemiology, statistics, informatics, and translational research. Graduates of this program will be able to lead clinical trials of new drugs and procedures in West Virginia, particularly in its rural regions. CTS graduates also will be strong applicants for positions in schools of medicine and medical centers that have clinical and translational science centers.

Clinical and Translational Science M.S. Admission Policy

Applicants must meet both the requirements of Graduate Admissions and the Marshall University Joan C. Edwards School of Medicine Clinical and Translational Science Department Admissions Committee. Interested persons may contact the Office of Research and Graduate Education via e-mail at *mubiomed@marshall.edu* or learn more at w*ww.marshall.edu/bms/ future-students/application-information*.

Entrance into the Clinical and Translational Science, M.S. program is restricted to fall semester only. Applicant materials should be received by March 1 in the Graduate Admissions Office to have the best chance for admission.

The complete application process includes:

1. Submission of the Marshall University Graduate College Application available online at www.marshall.edu/graduate. Select "Degree Seeking."
2. Receipt of the application fee (submitted on line at the time of application).
3. Receipt of official transcript(s) from every institution attended documenting that the applicant has:
    a. Completed a bachelor's degree from an accredited institution of higher learning. The degree must be completed prior to matriculation.

b. Achieved an overall Grade Point Average of 3.0 or better.
c. Successfully completed one academic year of biology and its associated labs.
d. Successfully completed one academic year of general chemistry and its associated labs.
e. Successfully completed one academic year of organic chemistry and its associated labs.
f. Successfully completed one academic year of physics and its associated labs.
g. It should be noted that successful completion of undergraduate courses in biochemistry and cell biology are highly recommended, but not required.

4. Official letters
   a. Three letters of recommendation signed and on formal letterhead from individuals familiar with the applicant's relevant academic/professional performance (May be e-mailed as attachments)
   b. Written statement describing the applicant's educational and career goals, and why he or she should be admitted to the CTS, M.S. program. (May be e-mailed as an attachment)

Completed applications received in the Graduate Admissions Office by March 1 will be considered for admission. The CTS Admissions Committee will review completed applications, then interview the top applicants.

Who Should Apply

- Undergraduates.
- Medical students at an LCME-accredited U.S. medical school with a current GPA of at least a 3.0.
- Postgraduate medical residents or fellows who have an M.D. or D.O. with a graduating GPA of 3.0 or better (equivalent GPA for foreign medical graduates).
- Ph.D.'s in biomedical sciences or Pharm.D.'s with graduating GPAs of 3.0 or better.

Medical students will apply to the program during their third year of training. After completing the requirements for the M.S. degree, students will finish the fourth year of medical school.

Medical residents and fellows who are admitted into this program will need to integrate coursework into a reduced clinical workload, thus extending their postgraduate medical education by two years.

Duration of the Program

Students will attend full-time and complete the requirements for the Master of Science degree in two years. This indudes attending during the summer between years one and two.

Degree Requirements

All students are required to meet the general requirements of the Graduate College for receipt of a master's degree. A minimum of 36 credit hours is required for a non-thesis degree. In addition, all students must pass a written and/or oral comprehensive exam.

All students will take the following courses.

Fall Semester 1

BMS	660	Communication Skills I
BMS	680	Biomedical Sciences Seminar
CTS	600	Epidemiology and Biostatistics Used in Medical Research
CTS	620	Basic Clinical Research Operations
CTS	635	Writing and Peer Review of Scientific Publications
CTS	640	Clinical Trials Journal Club

Spring Semester 1

BMS	661	Communication Skills II
BMS	680	Biomedical Sciences Seminar
CTS	610	Study Design and Applied Statistics in Medical Research
CTS	614	Online Survey Tools, Relational and Data Warehousing, and Data Manipulation
CTS	630	Fundamentals of Team Science

CTS 640 Clinical Trials Journal Club

Summer Semester

CTS 650 Rural Clinic Experience

Fall Semester 2

BMS 680 Biomedical Sciences Seminar
CTS 625 Clinical Research Operations Lab
CTS 640 Clinical Trials Journal Club
CTS 660 Molecular Phenotype of Appalachian Disorders

Spring Semester 2

BMS 680 Biomedical Sciences Seminar
CTS 625 Clinical Research Operations
CTS 640 Clinical Trials Journal Club

BIOMEDICAL SCIENCE (BMS)

601 Introduction to Nucleic Acids and Proteins. 3 hrs.
A molecular and cell biological study of the structure and function of nucleic acids and proteins. (PR: Consent of instructor)

602 Introduction to Cell Structure and Metabolism. 3 hrs.
A molecular and cell biological study of the structure of cells and of cellular metabolism. (CR: BMS 601; PR: Consent of instructor)

603 Regulation of Cell Function. 2 hrs.
An advanced molecular and cell biological study of cell metabolism and the regulation of cell function. (PR: BMS 601, BMS 602, and consent of instructor

604 Cellular Basis of Disease. 1 hr.
A molecular and cell biological study of the basis of diseases prevalent in Appalachia. (PR: BMS 601, BMS 602, and consent of instructor)

617 Statistical Techniques for the Biomedical Sciences. 3 hrs.
An application-oriented course in statistical concepts and techniques aimed at prospective researchers in the biomedical sciences.

628 Neuroscience I: Major Structures of the Brain, Neuron Function, and Spinal Cord. 3 hrs.
To study and understand the structure and function of the nervous system and disorders of neuronal function. (PR: BMS 600 or permission of instructor)

629 Neuroscience II: Structures and Functions of the Brain Stem and Forebrain. 3 hrs.
To study and understand the structure and function of the nervous system and disorders of neuronal function. (BMS 628 or permission of instructor)

631 Neuroscience and Developmental Biology Literature Review. 1 hr.
A seminar course where published articles in the fields of neuroscience and developmental

biology will be presented by students and faculty. (PR: Permission of instructor)

632 Neuroscience Research Techniques. 3 hrs.
Class participants will be exposed to state-of-the-art neuroscience research techniques while in the laboratories of the neuroscience faculty. (PR: Permission of instructor)

641 Molecular Developmental Biology. 3 hrs.
An in-depth discussion of current literature in developmental biology with emphasis on early embryo development, morphogenesis, lineage determination and regulation of developmental processes. (PR: Permission of instructor)

644 Responsible Conduct of Research. 1 hr. CR/NC.
Responsible conduct of research, including human subjects, live vertebrate animals, conflict of interest, mentor/mentee responsibilities, collaborative research, peer review, data management, research misconduct, and responsible authorship, with case discussions.

651 Cancer Biology. 4 hrs.
An advanced graduate course on the core principles of initiation, progression, treatment and prevention of cancer, based on current literature. (PR: BMS 600, and permission of instructor)

652 Cancer Biology Colloquium. 1 hr.
This is a mentored journal club for graduate students covering selected areas of current interest in cancer biology research. (PR: Permission of instructor)

660 Communication Skills for Biomedical Sciences I. 1 hr.
Biomedical graduate students are trained to plan, prepare, and deliver effective scientific presentations.

661 Communication Skills for Biomedical Sciences II. 1 hr.
Biomedical graduate students are trained to plan, prepare, and deliver effective scientific presentations.

665 Cardiovascular Disease, Obesity, Diabetes Research Colloquium. 1 hrs. CR/NC.
A seminar-style series that will focus on recent advances in topics related to cardiovascular disease, diabetes and obesity.

674 Teaching Practicum. 1 hr. CR/NC.
Students gain experience in teaching using a variety of methods in a supervised setting.

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679 Special Problems. I, II, S. CR/NC
Intensive study of a selected topic or problem. Emphasizes independent study. (PR: Consent of advisor)

680 Seminar. 1 hr. I, II. CR/NC
Study and discussion of current topics related to the Biomedical Sciences.

681 Thesis. 1-6 hrs. I, II, S. CR/NC.

785 Introduction to Research. 1-6 hrs. I, II, S. CR/NC
Directed research activities requiring a completed prospectus for an advanced research project, a written report, or a research thesis. A minimum of three (3) hours required for all M.S. candidates. (PR: Consent of instructor)

882 Research. 1-15 hrs. I, II, S. CR/NC

2. Edits to current catalog description - pages 217-226

School of Medicine

Dr. Joseph Shapiro, Dean
http://musom.marshall.edu

~~**BIOMEDICAL SCIENCES, M.S., Ph.D., M.D./Ph.D.**~~

~~**Areas of**~~
~~**Emphasis**~~
~~**Cancer**~~
~~**Biology**~~
~~**Cardiovascular Disease, Obesity, and Diabetes**~~
~~**Infectious and Immunological Diseases**~~
~~**Medical Sciences (M.S. only)**~~
~~**Neuroscience and Developmental Biology**~~
~~**Toxicology and Environmental Health Sciences**~~

BIOMEDICAL RESEARCH, M.S. (THESIS), M.S. (NON-THESIS), Ph.D., M.D./Ph.D.

Areas of Emphasis
Cardiovascular Disease
Cell Biology
Medical Sciences (M.S. only)
Neurobiology and Addiction
Obesity and Related Diseases
Toxicology and Environmental Health

~~**Program Description**~~

~~The basic science departments of the Joan C. Edwards School of Medicine offer an interdisciplinary program leading to the Master of Science and Doctor of Philosophy degrees in Biomedical Sciences. The primary aim of the Biomedical Sciences (BMS) program is to produce graduate students who are broadly based in the biomedical sciences with defined interests and special in-depth training in one of the following areas of emphasis: cancer biology; cardiovascular disease, obesity, and diabetes; infectious and immunological diseases; neuroscience and developmental biology; and toxicology and environmental health sciences. These areas are designed to be flexible and research oriented in order to develop the interests, capabilities and potential of all students pursuing careers in academic or industrial biomedical sciences.~~

~~In addition, the BMS program offers a non-thesis Master of Science degree in the medical sciences area of emphasis to improve the science foundation of students seeking admission into doctoral programs in medicine or other health-related professions.~~

~~Admission into this program does not guarantee admission into medical school. Students in this area of emphasis are required to pay the Health Professions Fee each semester while enrolled in the program. Because of the nature of the curriculum, applicants to the medical sciences area of emphasis will only be considered for admission for the fall semester.~~

~~The Biomedical Sciences Doctor of Philosophy degree program accepts a very limited number of students to study concurrently with the Doctor of Medicine degree.~~

Program Description

The Biomedical Sciences and Clinical and Translational Sciences departments of the Joan C. Edwards School of Medicine offer the following degrees: Doctor of Philosophy (Ph.D.), M.D./Ph.D., and Master of Science (M.S.), both thesis and non-thesis.

The primary goal of the Biomedical Research (BMR) program is to use biomedical and translational research approaches to help reduce the numerous health disparities and improve the health of the population in West Virginia and Central Appalachia. To do this, students will take an interdisciplinary approach with defined interests and special in-depth training in one of the following research areas of emphasis: Cardiovascular Disease; Cell Biology; Obesity and Related Diseases; Neurobiology and Addiction; and Toxicology and Environmental Health. These areas are designed to be flexible and research oriented in order to develop the interests, capabilities and potential of all students pursuing careers in academic, government, or industrial biomedical sciences.

In addition, the BMR program offers a non-thesis Master of Science degree with a medical sciences area of emphasis to improve the science foundation of students seeking admission into doctoral programs in medicine or other health-related professions. Admission into the BMR M.S. Medical Sciences program does not guarantee admission into medical school. Additionally, a research component to this emphasis is available, but not required. Students choosing the research component may work up to 19 hours per week while earning a minimum of $10/hour. Students are expected to stay in good academic standing.

Also offered is the combined M.D./Ph.D. Students in this program blend the discovery of new knowledge with clinical medicine at the intersection of science and medicine. M.D./Ph.D. Most graduates work as physician-scientists at medical schools, conducting disease-related research and applying the results to the treatment of patients. They have a unique perspective on both the basic science and clinical science behind disease. Further general information is available at the Association of American Medical Colleges website (aamc.org).

~~Admission Requirements~~

~~Applicants must meet the admissions requirements of the Graduate Studies Committee of Marshall University's Joan C. Edwards School of Medicine. Interested persons should contact the Biomedical Sciences Graduate Program at the Byrd Biotechnology Science Center, Marshall University School of Medicine, One John Marshall Drive, Huntington, WV 25755 or via the Internet at *www.marshall.edu/bms/future-students/contact-us, mubiomed@marshall.edu,* or 304-696-3365.~~

Admission Requirements

Applicants must meet the admission requirements of both Marshall University Graduate Admissions as outlined on their website – *www.marshall.edu/graduate/admissions/how-to-apply-for-admission* – and the Biomedical Research Program of the Marshall University Joan C. Edwards School of Medicine. Interested persons should visit https://jcesom.marshall.edu/research, email mubiomed@marshall.edu and/or call 304-696-3365.

~~Minimum Requirements for Admission into Master of Science or Doctor of Philosophy Program~~

~~All applicants must have baccalaureate degrees, with one year of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. Biochemistry is not currently a requirement, but it is highly recommended to take it.~~

- ~~Graduate Record Examination (GRE) General Test scores (scores may not be more than three (3) years old at the application deadline for the Ph.D. program or at the start of the semester when matriculating for the M.S. program) or MCAT scores (Medical Sciences area of emphasis only, minimum of 22 total)~~
- ~~Three letters of recommendation from references familiar with the applicant's relevant academic/professional performance~~
- ~~A personal statement describing educational and career goals.~~

~~Ph.D. Applications~~

~~The completed application, application fee, official transcripts and official GRE or MCAT scores should be received in the Graduate Admissions Office by January 15th for summer or fall applications in order for the application to be considered by the program.~~

~~Letters of recommendation and personal statements should be received in the BMS Office by January 15th in order for the application to be considered complete and for an admission decision to be rendered.~~

~~Applications completed very soon after the above stated deadlines may be considered at the discretion of the BMS Graduate Studies Committee.~~

~~New Ph.D. students will matriculate in July (Summer III term).~~

~~M.S. Applications~~

~~The completed application, application fee, official transcripts, three letters of recommendation, written statement, and official GRE or MCAT scores (MCAT scores accepted for medical sciences area of emphasis only) should be received in the Graduate Admissions Office by June 1st for fall applications in order for the application to be considered by the program.~~

~~Duration of Degree Programs~~

~~Students are expected to complete the requirements for the Master of Science degree within two years. Doctoral students are expected to complete the degree requirements within five year. Students who possess an M.S. degree in biomedical sciences or the equivalent when admitted into the doctoral degree program generally require three years to complete the Doctor of Philosophy degree.~~

Biomedical Research M.S. (Thesis and Non-Thesis) Applicants

Minimum Admission Requirements

- A baccalaureate degree from a regionally accredited college or university
- Successfully completed, with a grade of C or better, one year of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. A semester of biochemistry or molecular biology with associated laboratory is also required.
- A recommended minimum Grade Point Average (GPA) of 3.0
- A recommended minimum GPA of 3.0 in combined science and math courses
- Graduate Record Examination (GRE) General Test scores - REQUIRED for M.S. THESIS ONLY
- Official transcript from degree granting institution/s and institutions where relevant post-baccalaureate or graduate coursework was taken
- Departmental materials: three recommendations, program online form, written statement addressing educational and career goals, CV/résumé

PRIORITY Deadline – June 1 for best chance of admission

Applications are accepted on a rolling basis and are reviewed until the class is filled. Applications will be considered after the priority deadline until June 30, if openings are available. The completed application, application fee, official transcript(s), three recommendations, written statement, and official GRE scores should be received in the Graduate Admissions Office by June 1. *For the Medical Sciences area of emphasis only, no entrance exam is required*. The program online form should be received in the Office of Research and Graduate Education by June 1.

Duration of Degree Program

Students are expected to complete the degree within two years. This includes the summer between years one and two for M.S. (thesis) students.

Ph.D. Applicants

Minimum Admission Requirements

- A baccalaureate degree from a regionally accredited college or university
- Successful completion, with a grade of C or better, of one year each of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. A semester of biochemistry or molecular biology with associated laboratory is also required.
- A recommended minimum Grade Point Average (GPA) of 3.0
- A recommended minimum GPA of 3.0 in combined science and math courses
- Graduate Record Examination (GRE) General Test scores
- Official transcript from degree granting institution/s and institutions where relevant post-baccalaureate or graduate coursework was taken
- Departmental materials: three recommendations, program online form, written statement addressing educational and career goals, CV/résumé

PRIORITY Deadline – March 1 for best chance of admission

Applications are accepted on a rolling basis and are reviewed until the class is filled. Applications will be considered after the priority deadline until June 30, if openings are available. International applicants must meet the international application deadline of March 15. The completed application, application fee, official transcript(s), and official

GRE scores should be received in the Graduate Admissions Office by March 1. MCAT scores will be considered for admission on a case-by-case basis. For the application to be complete, the program online form, written statement addressing educational and career goals, and three recommendations should be received in the Office of Research and Graduate Education by March 1.

Duration of Degree Program

Doctoral degree students are expected to complete the requirements within five years. Students who possess an M.S. degree in Biomedical Research or the equivalent when admitted into the doctoral degree program generally require three to four years to complete the Doctor of Philosophy degree.

Entry Term

BMR Ph.D. students will matriculate in July (summer III term). The first week will be devoted to orientation and Preparation for Graduate Academics (PGA) Boot Camp. This allows students to learn more about research opportunities, get to know their cohort and current students, acclimate to a new environment, and get a head start on their research rotations.

~~BIOMEDICAL SCIENCES, M.S. (Cancer Biology; Cardiovascular Disease, Obesity, and Diabetes; Infectious and Immunological Diseases; Neuroscience and Developmental Biology; Toxicology and Environmental Health Sciences Areas of Emphasis)~~

~~Degree Requirements~~

~~A minimum of 36 credit hours is required for a non-thesis degree, while a minimum of 32 credit hours is required for the thesis degree. No more than six hours of thesis (BMS 681) may be credited toward the 32-hour requirement. Each student will specialize in one of the five areas of emphasis as defined in the program description. All students are required to successfully complete:~~

~~BMS 601 Introduction to Nucleic Acids and Proteins~~
~~BMS 602 Introduction to Cell Structure and Metabolism~~
~~BMS 603 Regulation of Cell Function~~
~~BMS 604 Cellular Basis of Disease~~
~~BMS 617 Statistical Techniques for the Biomedical Sciences~~
~~BMS 644 Responsible Conduct of Research~~
~~BMS 660/661 Communication Skills for Biomedical Sciences~~
~~BMS 680 Seminar (minimum of 4 hrs.)~~
~~BMS 785 Introduction to Research~~

~~In addition, the student must successfully complete other courses required by his/her area of emphasis and advisory committee and pass an oral comprehensive examination.~~

BIOMEDICAL RESEARCH, M.S. (Thesis – Cardiovascular Disease; Cell Biology; Neurobiology and Addiction; Obesity and Related Diseases; Toxicology and Environmental Health)

Degree Requirements

All students are required to meet the general requirements of the Graduate College for receipt of a master's degree. A minimum of 36 credit hours is required for a non-thesis degree, while a minimum of 32 credit hours is required for the thesis degree. No more than six hours of thesis (BMR 681) may be credited toward the 32 credit hour requirement. Each student will specialize in one of the five areas of emphasis as defined in the program description. All students are required to successfully complete the following core curriculum:

BMR 601	Introduction to Nucleic Acids and Proteins
BMR 602	Introduction to Cell Structure and Metabolism
BMR 603	Regulation of Cell Function
BMR 604	Cellular Basis of Disease
BMR 617	Statistical Techniques for Biomedical Sciences
BMR 644	Responsible Conduct of Research
BMR 660/661	Communication Skills for Biomedical Sciences

BMR 680 Seminar (minimum of 4 hrs.)
BMR 785 Introduction to Research

In addition, the student must successfully complete other courses required by his/her area of emphasis and advisory committee, and pass a written and/or oral comprehensive examination.

To remain in good academic standing and to graduate, the student must have a minimum graduate GPA of 3.0.

~~**Advisory Committee for M.S. Students**~~

~~The advisory committee should be formed no later than the end of the first year of graduate education. As soon as the committee has been identified, a Thesis Committee Formation form is completed and submitted to the Director of Graduate Studies.~~

~~The committee will be selected by the student and research advisor and approved by the Director of Graduate Studies. The advisory committee will be composed of at least three faculty members with appropriate expertise. One of the members may be from another institution. The student's research advisor will act as the chairperson of the committee.~~

~~In addition, after 12 hours of coursework has been completed, the student must submit to the Dean of the Graduate College a Plan of Study form.~~

Advisory Committee for M.S. (Thesis) Students

The advisory committee should be formed no later than the end of the first year of graduate education. As soon as the committee has been identified, a Thesis Committee Formation form is completed and submitted to the Director of Graduate Studies.

The committee will be selected by the student and research advisor and approved by the Director of Graduate Studies. The advisory committee will be composed of at least three faculty members with appropriate expertise. One of the members may be from another institution. The student's research advisor will act as the chairperson of the committee.

In addition, after 12 hours of coursework has been completed, the student must submit an M.S. Plan of Study form to the Dean of the Graduate College.

~~BIOMEDICAL SCIENCES, M.S. (Medical Sciences Area of Emphasis)~~

~~A minimum of 36 credit hours is required for the non-thesis degree. In addition, the student must pass a written comprehensive examination covering BMS 601-604, MCB 631, MCB 632, and PHS 628. All students will also participate in laboratory-based research, and either present at a research conference or submit a peer-reviewed publication. All students are required to successfully complete:~~

~~BMS 601 Introduction to Nucleic Acids and Proteins~~
~~BMS 602 Introduction to Cell Structure and Metabolism~~
~~BMS 604 Cellular Basis of Disease~~
~~BMS 603 Regulation of Cell Function~~
~~BMS 617 Statistical Techniques for the Biomedical Sciences~~
~~(or MTH 518, BSC 517, PSY 517, EDF 517 or equivalent)~~
~~BMS 680 Seminar (minimum of 4 hrs.)~~
~~BMS 785 Introduction to Research~~
~~MCB 631 Medical Microbiology I~~
~~MCB 632 Medical Microbiology II~~
~~PHS 628 Neurophysiology~~

~~Elective classes include PHS 629 (Mammalian Physiology), PMC 621 (Medical Phamrnecology I). and PMC 622 (Medical Pharmacology II).~~

~~In addition, after 12 hours of coursework has been completed, the student must submit to the Dean of the Graduate College a Plan of Study form.~~

BIOMEDICAL RESEARCH, M.S. (Non-Thesis Medical Sciences Area of Emphasis)

A minimum of 36 credit hours is required for the non-thesis degree. In addition, the student must pass a written comprehensive examination covering BMR 601-604, MCB 631, MCB 632, and PHS 628. All students are required to successfully complete the following core curriculum:

BMR 601 Introduction to Nucleic Acids and Proteins
BMR 602 Introduction to Cell Structure and Metabolism

BMR 603	Introduction to Cell Function
BMR 604	Cellular Basis of Disease
BMR 617	Statistical Techniques for Biomedical Sciences (or MTH 518, BSC 517, PSY 517, EDF 517 or equivalent)
BMR 680	Seminar (minimum of 4 hrs.)
BMR 785	Introduction to Research
MCB 631	Medical Microbiology I
MCB 632	Medical Microbiology II
PHS 628	Neurophysiology

Elective classes include PHS 629 (Mammalian Physiology), PMC 621 (Medical Pharmacology I), and PMC 622 (Medical Pharmacology II).

In addition, after 12 hours of coursework has been completed, the student must submit an M.S. Plan of Study form to the Dean of the Graduate College.

To remain in good academic standing and to graduate, the student must have a minimum graduate GPA of 3.0.

Qualifying for Admission into Marshall University Joan C. Edwards School of Medicine without the MCAT (Pathway Program)

Requirements:

- Have a minimum 3.4 GPA in the BMR, M.S. Medical Sciences program at the time of the Marshall University Joan C. Edwards School of Medicine (MUJCESOM) interview
- Graduate from the program with a minimum of a 3.4 GPA
- Pass the M.S. comprehensive exam on the first attempt in May of the program's second year

Benefits:

- An MCAT score will not be required for admittance to MUJCESOM
- For interview purposes, out-of-state applicants will be considered the same as in-state students, regardless of residency. Marshall University JCESOM tuition cost will be based on residency status.
- With satisfactory standing, students will receive the mandatory program letter of support.

BIOMEDICAL ~~SCIENCES~~ RESEARCH, M.S., AND SCHOOL OF PHARMACY, PHARM.D.

Students can receive both an M.S. degree from the Biomedical ~~Sciences~~ Research Program and a Pharrn.D. degree from the School of Pharmacy. Prospective students must apply to and meet the admission requirements for both programs. The curriculum takes five years to complete. In the first year students take ~~BMS~~ BMR courses; in years 2-5 students ~~t.ake~~ take School of Pharmacy courses. All students are required to successfully complete:

~~Year 1 Fall~~

~~BMS~~	~~601~~	~~Introduction to Nucleic Acids and Proteins~~
~~BMS~~	~~602~~	~~Introduction to Cell Structure and Metabolism~~
~~BMS~~	~~680~~	~~Seminar~~
~~PHS~~	~~628~~	~~Neurophysiology~~

~~Year I Spring~~

~~BMS~~	~~603~~	~~Regulation of Cell Function~~
~~BMS~~	~~604~~	~~Cellular Basis of Disease~~
~~BMS~~	~~680~~	~~Seminar~~
~~BMS~~	~~785~~	~~Introduction to Research~~
~~PHS~~	~~629~~	~~Mammalian Physiology~~

Year 1 Fall

BMR	601	Introduction to Nucleic Acids and Proteins
BMR	602	Introduction to Cell Structure and Metabolism
BMR	680	Seminar
PHS	628	Neurophysiology

Year 2 Spring

BMR 603	Introduction to Cell Function
BMR 604	Cellular Basis of Disease
BMR 680	Seminar
BMR 785	Introduction to Research
PHS 629	Mammalian Physiology

~~**Year 2 Fall**~~

PHAR	511	Clinical Immunology
PHAR	531	Biopharmaceutics I
PHAR	541	Pharmacy Practice I
PHAR	542	Immunology and Microbiology
PHAR	551	Biomedical Chemistry
~~PHAR~~	~~811~~	~~Introductory Pharmacy Practice Experiences in Community Settings~~

PHAR 811 Introductory Pharmacy Practice Experiences in Community Settings I

Year 2 Spring

PHAR	521	Integrated Laboratory I
PHAR	532	Biopharmaceutics 11.
PHAR	543	Pharmacy Practice II
PHAR	544	Principles of Disease and Drug Action
PHAR	545	Therapeutics I
PHAR	812	Introductory Pharmacy Practice Experiences in Institutional Settings I

Year 3 Fall

PHAR	611	Integrated Laboratory II
PHAR	621	Pharmacy Law and Ethics
PHAR	622	Drug Information and Communication Skills
PHAR	631	Pharmacometrics
~~PHAR~~	~~632~~	~~Pharmacy Practice Management I~~
PHAR	661	Therapeutics II
~~PHAR~~	~~813~~	~~Introductory Pharmacy Practice Experiences in Community Settings II~~

PHAR 632 Pharmacy Practice Management I: Leadership

PHAR 813 Introductory Pharmacy Practice Experiences in Community Settings 2

Year 3 Spring

PHAR 612 Therapeutic Drug Dosing
PHAR 633 Patient Care Skills Lab
~~PHAR 634 Pharmacy Practice Management II~~
PHAR 634 Pharmacy Practice Management II: Finance
PHAR 635 Bridging Research Outcomes and Patient Care
PHAR 671 Therapeutics III
~~PHAR 814 Introductory Pharmacy Practice Experiences in Institutional Settings II~~
PHAR 814 Introductory Pharmacy Practice Experiences in Institutional Settings 2

Year 4 Fall

PHAR 711 Medication Therapy Management
~~PHAR 722 Pharmacy Practice Management III~~
PHAR 722 Pharmacy Practice Management III: Patient Safety
PHAR 741 Therapeutics V
PHAR 751 Therapeutics IV
PHAR 815 Ambulatory Care Skills
PHAR 816 Inpatient Practice Skills
Elective I

~~Year 4 Spring~~

~~PHAR 721 Therapeutics VII~~
PHAR 721 Therapeutics - Special Populations
~~PHAR 731 Case Studies in Pharmacy Practice~~
PHAR 731 Case Studies
~~PHAR 761 Therapeutics VI~~
PHAR 761 Therapeutics - Hematology, Oncology, Nutrition, Hepatic and Musculoskeletal Disorders
PHAR 817 Introductory Pharmacy Practice Experiences in Practice Management
PHAR 818 Introductory Pharmacy Practice Experiences in Education
Elective 2

~~Year 5 Fall and Spring~~

~~PHAR 881 Advanced Pharmacy Practice Experiences in Practice Management~~
PHAR 881 Advanced Pharmacy Practice Experiences in General Medicine
PHAR 882 Advanced Pharmacy Practice Experiences in Ambulatory Care/Primary Care
PHAR 883 Advanced Pharmacy Practice Experiences in Community Pharmacy
PHAR 884 Advanced Pharmacy Practice Experiences in Institutional Settings
PHAR 885 Advanced Pharmacy Practice Experiences in Geriatrics
~~PHAR 886 Advanced Pharmacy Practice Ex eriences in Diverse Popul ations~~
PHAR 886 Advanced Pharmacy Practice Experiences in Diverse Populations

Elective 3
Elective 4
Capstone 1
Capstone 2

~~PHAR 635 substitutes for MTH 518, Biostatistics, a BMS Program requirement.~~
PHAR 635 substitutes for BMR 617, Statistical Techniques for Biomedical Sciences, a BMR requirement.

~~PHAR 542 substitutes for the BMS course MCB 631, Medical Microbiology I.~~

PHAR 542 substitutes for MCB 631, Medical Microbiology I.

~~PHAR 531 and PHAR 551 substitute for the BMS courses PMC 625, Drug Metabolism, and PMC 630, Chemical Aspects of Pharmacology.~~

PHAR 531 and PHAR 551 substitute for PMC 625, Drug Metabolism, and PMC 630, Chemical Aspects of Pharmacology.

~~PHAR 545 and PHAR 671 substitute for the BMS course BMS 680, Seminar. This will meet the 4 hr. minimum requirement for Seminar for the M.S. degree.~~

PHAR 545 and PHAR 671substitute for BMR 680, Seminar. This will meet the 4-hour minimum requirement for Seminar for the M.S. degree.

A minimum of 36 credit hours is required for a non-thesis degree in the ~~BMS~~ BMR Program.

~~BMS~~	~~601~~	~~3 hrs.~~
~~BMS~~	~~602~~	~~3 hrs.~~
~~BMS~~	~~680~~	~~1 hr.~~
~~PHS~~	~~628~~	~~2 hrs.~~
~~BMS~~	~~603~~	~~2 hrs.~~
~~BMS~~	~~604~~	~~1 hr.~~
~~BMS~~	~~680~~	~~1 hr.~~
~~BMS~~	~~785~~	~~3 hrs.~~
PHS	629	6 hrs.
PHAR	531	3 hrs.
PHAR	542	4 hrs.
PHAR	545	4 hrs.
PHAR	551	5 hrs.
PHAR	635	3 hrs.
PHAR	671	7 hrs.

BMR	601	3 hrs.
BMR	602	3 hrs.
BMR	680	1 hr.
PHS	628	2 hrs.
BMR	603	2 hrs.
BMR	604	1 hr.
BMR	680	1 hr.
BMR	785	3 hrs.

In addition. the student must pass a written and/or an oral comprehensive examination to receive the M.S. degree.

~~BIOMEDICAL SCIENCES, Ph.D.~~
BIOMEDICAL RESEARCH, Ph.D.

The doctorate is a research or performance degree and does not depend solely on the accumulation of credit hours. The degree requirements are admission to candidacy and successful completion and defense of a dissertation. The degree signifies that the holder has the competence to function independently at the highest professional level.

Degree Requirements

To qualify for the Doctor of Philosophy degree, the student must pass (*C* or better or *CR*) the following courses:

~~BMS~~	~~601~~	~~Introduction to Nucleic Acids and Proteins~~
~~BMS~~	~~602~~	~~Introduction to Cell Structure and Metabolism~~

~~BMS 603 Regulation of Cell Function~~
~~BMS 604 Cellular Basis of Disease~~
~~BMS 644 Responsible Conduct of Research~~
~~BMS 617 Statistical Techniques for the Biomedical Sciences~~
~~BMS 660/661 Communication Skills for Biomedical Sciences~~

~~BMS 680 Seminar (minimum of 6 hrs.)~~
~~BMS 785 Introduction to Research~~
~~BMS 882 Research~~

BMR 601	Introduction to Nucleic Acids and Proteins
BMR 602	Introduction to Cell Structure and Metabolism
BMR 603	Regulation of Cell Function
BMR 604	Cellular Basis of Disease
BMR 617	Statistical Techniques for Biomedical Sciences
BMR 644	Responsible Conduct of Research
BMR 660/661	Communication Skills for Biomedical Sciences
BMR 680	Seminar (minimum of 6 hrs.)
BMR 785	Introduction to Research
BMR 882	Research

In addition, the student must successfully complete other courses required by his/her area of emphasis and advisory committee. All courses will be defined in the student's Ph.D. Course of Study form. The student must also pass a written and oral exam prior to becoming a Ph.D. candidate. These exams are set by the advisory committee and are outlined below under Admission to Candidacy.

Students are required to write and publish three peer-reviewed manuscripts, two of which must be as first author.

To remain in good academic standing and to graduate, the student must have a minimum graduate GPA of 3.0.

~~BIOMEDICAL SCIENCES, M.D./Ph.D.~~
BIOMEDICAL RESEARCH, M.D./Ph.D.

The Joan C. Edwards School of Medicine offers a combined M.D./Ph.D. degree. ~~in partnership with the Biomedical Sciences Graduate Program at Marshall University.~~ The curriculum takes seven to eight years to complete. Students first take years one and two of medical school. During that time they complete the requirements for ~~BMS~~ BMR 785 (Introduction to Research). After passing the USMLE Step I exam al the end of year two, students begin their Ph.D. coursework and research. This takes three to four years. After completing the Ph.D. requirements, students then complete years three and four of medical school. All of the requirements for both the M.D. and Ph.D. degrees must be met.

The medical student course Elements of Medicine (MDC 710) meets the requirements for ~~BMS~~ BMR 601, 602, 603, and 604. Other medical school courses can meet area of emphasis requirements, as determined by the student's advisory committee and the Graduate Studies Committee.

~~**M.D./Ph.D. Applications**~~

~~Students interested in pursuing the combined degree should indicate this on their medical school AMCAS application. A separate M.D./Ph.D. admissions subcommittee consisting of members of the medical school and BMS graduate admission committees will review the applications.~~

~~All applicants must take the MCAT. A score of 30 or better on the MCAT taken between January 2013 and January 2015 is preferredd for considertion for admission. An MCAT score of 28 will be considered if the applicant has extensive research experience. A minimum score of 505 on the new MCAT is required for consideration for admission.~~

~~AMCAS applications must be submitted by November 1. Completed appl ications should be received by December 1. Completed applications received after December 1 may be reviewed for a position on a waiting list.~~

Biomedical Research M.D./Ph.D. Applications

Applicants interested in pursuing the combined degree should indicate this on their medical school AMCAS application.

The AMCAS application period is from June 1 to November 1, with supplemental material due by December 15.

Applications are accepted on a rolling basis and reviewed November 1 through December 15. Final decisions will be made by January 31. Applications and supplemental material will not be accepted beyond the above deadlines. A separate M.D./Ph.D. admissions subcommittee will review the applications.

Consistent with JCESOM MD program admissions policy, all applicants are required to take the MCAT. An MCAT score of 498 or better is preferred. Provided they meet the requirements for not taking the MCAT, students from the JCESOM Medical Sciences Pathway Program who have fulfilled both the criteria for admittance to the MU JCESOM MD program and who have extensive research experience (e.g., co-authorship in multiple publications in peer reviewed journals) will be considered for interviews.

~~Advisory Committee for Ph.D. and M.D./Ph.D. Students~~
Advisory Committee for Ph.D. Students

The advisory committee should be formed no later than the end of the first year of graduate education or upon completion of 18 semester hours of credit. As soon as the committee has been identified, an Approval for Dissertation Topic and Committee Membership form is completed and submitted to the Director of Graduate Studies and the Dean of the Graduate College.

The committee will be selected by the student and research advisor and approved by the Director of Graduate Studies and the Dean of the Graduate College. The advisory committee will be composed of at least five faculty members with appropriate expertise. One of the members may be from another institution. The student's research advisor will act as the chairperson of the committee.

Approval of Course of Study

It is essential for the student and advisory committee to carefully define a Course of Study by the end of the first year. This is considered a basic contract between the student and the program and includes:

1. Proposed dissertation topic.
2. All transfer credits.
3. Required and elective courses to be taken at Marshall University.
4. All competencies to be achieved by the student during graduate study. These details must be recorded on ~~a~~ the Ph.D. Course of Study form and submitted for approval by the Director of Graduate Studies and the Dean of the Graduate College.

Graduate Assistantships for the Doctor of Philosophy Program

~~Research assistantships are available for students in the doctoral degree program on a competitive basis. The base stipend is renewable annually for up to six years. Priority consideration for the Ph.D. assistantships will be given to West Virginia residents.~~

Accepted Ph.D. students receive tuition remission, an annual stipend, and health insurance, which are renewable for up to five years. Students also have access to Marshall University's Student Health Clinic. Students are required to pay some fees each term.

~~Academic Performance~~
Academic Performance for all BMR Graduate Students

- The student must maintain a Grade Point Average of 3.0, and no more than six hours of *C* and no grades below *C* may be applied toward the degree.
- If the GPA falls below 3.0, the student will be placed on academic probation. Following notification of probation, the student will be counseled by his/her advisor. At this time, the deficiency will be identified and a written plan will be prepared for removing it within the next semester. This plan, co-signed by the student and the advisor, must be approved by the Graduate Studies Committee and the Director of Graduate Studies before the student can register for additional coursework.
- ~~If probationary status is not removed within the next semester hours, the student is dismissed from the program. The dismissal is automatically appealed to the Graduate Studies Committee, who will determine whether the student is retained or dismissed from the program. Retention must be recommended by the advisor and student's advisory committee and endorsed by the Graduate Studies Committee.~~
- If probationary status is not removed within nine semester hours, the Dean of the Graduate College, in consultation with the Vice Dean for Research and Graduate Education and the Graduate Studies Committee, will determine whether the student is retained or dismissed from the program. Retention must be recommended by the advisor and student's advisory committee and endorsed by the Graduate Studies Committee.

Transfer Credit

The student may transfer credits completed at other regionally accredited graduate institutions. Approval of the Graduate Studies Committee and the Dean of the Graduate College is contingent on:

1. the grades earned were *B*'s or better;
2. the credits are appropriate to the student's program and acceptable to the advisory committee; and
3. the time limitations were not exceeded.

The number of transfer hours acceptable for the Ph.D. degree will be determined by the student's advisory committee and should not exceed 12 credit hours. Approval must be received from both the Graduate Studies Committee and the Dean of the Graduate College. Transfer credit will not become part of the Marshall University Grade Point Average.

Transfer of credits should be accomplished as early as possible. This should be accomplished ~~either~~ when the student ~~is admitted to candidacy or~~ submits an approved Course of Study form (Ph.D.) or an approved Plan of Study form (M.S.). Attempts to transfer credits during the last semester may delay graduation. Official transcripts must be on file in the Graduate College office by the date that grades are due in the Marshall University Registrar's Office.

Validation of Outdated Coursework

The advisory committee has the option to require validation, by special examination, of courses ~~which~~ that members deem to be outdated.

Time Limitations

Students must meet all requirements for the Doctor of Philosophy degree within seven years from the date of enrollment in the first course to be used in the degree program. The Graduate Dean may grant an extension upon recommendation by the Graduate Studies Committee. Absence due to military obligations, long serious illnesses, or similar circumstances beyond the student's control may be considered valid reasons for an extension. It is the option of the advisory committee to require validation of outdated courses by special examination.

Admission to Candidacy

Admission to graduate study and enrollment in graduate courses does not guarantee acceptance as a candidate for the Doctor of Philosophy degree. This is only accomplished by satisfactorily passing a comprehensive qualifying examination and meeting all other specified requirements. The qualifying examination assesses whether the student has attained sufficient knowledge to undertake independent research. The examination should be completed at the end of the second year of study. The examination consists of written and oral components covering all areas specified in the Course of Study. The examination is prepared, administered and graded by the advisory committee. The written portion includes all coursework and relevant topics determined by the advisory committee. The student will be given 2-3 days to complete the written component of the examination. Upon passing the written examination, the student must submit a grant proposal on the topic of his/her dissertation research or a related topic approved by the advisory committee. The proposal must be in the style of an NIH Predoctoral grant proposal. Links to the instructions for the proposal format can be found on the ~~BMS~~ BMR Graduate Program website. The grant proposal must be submitted within 2 months of completion of the written exam and given to the advisory committee members at least 2 weeks in advance of the oral defense. The oral examination consists of a defense of the grant proposal and, at the discretion of the advisory committee, may include topics from the written portion of the exam in which the student was deemed to be deficient. Successful completion of the qualifying examination is based on approval of the committee. Only one dissenting vote is permitted on each component. If necessary, a single portion of the examination may be repeated at the discretion of the advisory committee. The student must have the approval of the advisory committee to repeat either the written or oral component of the qualifying examination. The committee assesses the deficiencies and determines the time required for the student to make corrections. A student may take a given component of the qualifying examination no more than three times. Failure to pass this examination on the third attempt will result in dismissal. The advisory committee must complete an Admission to Candidacy for Ph.D. form after the student completes the examinations and submit it for approval by the Director of Graduate Studies and the Dean of the Graduate College.

Dissertation

All candidates must successfully complete a biomedical research project and prepare, submit, and defend a dissertation. The dissertation must present the results of the candidate's individual investigation and make a definite contribution to the current state of knowledge. While conducting research and writing a dissertation, the student must register for Research (~~BMS~~ BMR 882) at the beginning of each semester or summer term for which progress is to be earned. No more than 15 hours of doctoral research may be credited toward the degree.

Candidates are to follow the general guidelines outlined in *Publishing Your Dissertation: How to Prepare Your Manuscript for Publication* and *General Information About Dissertations*. Copies of these documents are on file in the ~~Biomedical Sciences Graduate Program office~~ Office of Research and Graduate Education. Candidates must also follow the current Graduate College Guide for Preparation and Submission of Electronic Theses and Dissertations, which can be

downloaded from the Graduate College website.

Oral Defense of the Dissertation

The oral defense of the dissertation is held during the semester or summer session in which all other degree requirements have been met. The advisory committee must read and tentatively approve the dissertation before the examination can be scheduled. The committee chairperson will complete an Approval to Schedule Dissertation Defense form and submit it for approval of the Director of Graduate Studies and the Dean of the Graduate College before the examination can be given. Such notification must occur at least two weeks before the proposed date of the defense. A portion of the defense is an open examination and sufficient time is required for adequate public notice.

The open examination usually takes the form of a one-hour seminar. This is followed by a thorough review of the dissertation by the advisory committee and the candidate. Successful completion of the defense requires the approval of all but one of the members of the advisory committee. The results (pass/fail) must be recorded on a Results of Dissertation Examination form, which is to be reported to the Office of Research and Graduate Education and forwarded to the Graduate College Office within 24 hours. Should the candidate fail the defense, reexamination may not be scheduled without the approval of the advisory committee, the Director of Graduate Studies, and the Dean of the Graduate College.

All advisory committee members are to be present for the defense. If this is not possible, the Dean of the Graduate College, or designee, may permit one substitute for any member of the committee except the chairperson. A request for a substitute must be submitted in writing to, and approved by, the Director of Graduate Studies and the Dean of the Graduate College. The committee chairperson, the student, and both the original member of the committee to be replaced, and the substitute must sign this request. The substitute must have the same, or higher, graduate faculty status as the original member and represent the same academic discipline or area of emphasis.

Acceptance of Dissertation

Acceptance of the dissertation is a requirement for the doctoral degree. An accepted dissertation must bear the original signatures of at least all but one member of the advisory committee. If more than one member cannot approve the dissertation, the doctoral degree cannot be recommended. If the substitute member attends and approves the dissertation defense, he or she signs the dissertation. For complete information on the preparation and submission of electronic theses and dissertations see *www.marshall.edu/graduate/current-students/edt.*

Survey of Earned Doctorates

Please complete and submit the online Survey of Earned Doctorates. Survey of Earned Doctorate information is used by a number of government agencies to assess the state of doctoral education in the U.S., and also to inform their decisions concerning funding of U.S. graduate institutions. The online survey is available at ~~*http://survey.norc.uchicago.edu/_doctorate/index.jsp.*~~ *https://sed.norc.org.*

Publication

All doctoral dissertations and their abstracts will be microfilmed through ~~University Microfilms, Ann Arbor, Michigan~~ ProQuest. This requirement cannot be satisfied by any other publication, but other publication of material in the dissertation is both permitted and encouraged.

~~Process Summary~~

- ~~Inquiry from prospective student to the Biomedical Sciences Graduate Program or Graduate Admissions Office.~~
- ~~Submission of the application to the Biomedical Sciences Graduate Program, the Graduate Admissions Office, or online.~~
- ~~Receipt of the following official application materials and required fee by the Graduate Admissions Office: application, GRE scores, and transcript(s). International students must apply through the Center for International Programs.~~
- ~~Referral of application materials by the Graduate Admissions Office.~~
- ~~The Biomedical Sciences Graduate Program notifies the Graduate Admissions Office and the prospective student of the admission decision of the Graduate Studies Committee.~~
- ~~The accepted student arrives, reports to the Biomedical Sciences Graduate Program, is assigned an interim advisor, and registers for coursework.~~
- ~~Selection of an area of emphasis/advisor must be achieved by the end of the first year. After a permanent advisor has been selected, an advisory committee is formed. A Course of Study should be developed by the end of the first year.~~
- ~~The student completes requisite coursework and other program requirements.~~
- ~~The student takes written and oral qualifying examinations for admission to candidacy to the Ph.D. These~~

~~examinations should be scheduled within two months of each other.~~

- ~~The student continues doctoral research under the guidance of his/her advisory committee. The dissertation phase begins with the approval of a dissertation prospectus by the advisory committee, the Biomedical Sciences Graduate Program and the Graduate College Dean.~~
- ~~The student applies for graduation at the beginning of his or her last semester no later than the university deadline in the academic calendar. The diploma fee must be paid by this time.~~
- ~~A copy of the preliminary draft of the dissertation is given to each member of the advisory committee no later than two weeks prior to the final defense of the dissertation.~~
- ~~The chair of the advisory committee requests clearance for the defense from the Biomedical Sciences Graduate Program and the Graduate College for approval no later than two weeks before the scheduled date of the defense.~~
- ~~The time and place of the defense of the dissertation are announced.~~
- ~~The student defends the dissertation in an oral defense.~~
- ~~The student follows the steps to prepare and submit the electronic thesis or dissertation at *www.marshall.edu/graduate/ current-students/edt*.~~

- **Process Summary**

1. Inquiry from prospective student to the Biomedical Research Graduate Program or Graduate Admissions Office.
2. Receipt of the following official application materials and required fee by the Graduate Admissions Office: application, GRE scores, and transcript(s). International applicants must meet the application requirements of the International Admissions Office.
3. Receipt of the program online form, written statement addressing educational and career goals, and three recommendations in the Office of Research and Graduate Education by March 1
4. The Ph.D. Admissions Committee will review completed applications, then interview the top applicants.
5. The Biomedical Research Graduate Program notifies the Graduate Admissions Office and the applicant of the decision of the Admissions Committee.
6. The accepted student arrives in July for boot camp, starts their first laboratory rotation, and registers for course work.
7. An advisor is selected by the end of the first year. After the dissertation advisor has been selected, an advisory committee is formed. A Ph.D. Course of Study should be completed by the start of the second year.
8. The student completes requisite coursework and other program requirements.
9. The student takes written and oral qualifying examinations for admission to candidacy to the Ph.D. These examinations should be scheduled within two months of each other.
10. The student continues doctoral research under the guidance of his/her advisory committee. The dissertation phase begins with the approval of a dissertation project by the advisory committee, the Biomedical Research Graduate Program, and the Graduate College Dean.
11. The student applies for graduation at the beginning of his or her last semester, no later than the Graduate College deadline. The diploma fee must be paid by this time.
12. A copy of the preliminary draft of the dissertation is given to each member of the advisory committee no later than two weeks prior to the final defense of the dissertation.
13. The chair of the advisory committee requests approval for the defense from the Biomedical Research Graduate Program and the Graduate College no later than two weeks before the scheduled date of the defense.
14. The time and place of the defense of the dissertation are announced.
15. The student defends the dissertation in an oral defense.
16. The student follows the steps to prepare and submit the electronic thesis or dissertation at *www.marshall.edu/graduate/current-students/edt.*

CLINICAL AND TRANSLATIONAL SCIENCE, M.S.

Program Description

The Clinical and Translational Science (CTS) Department in the Marshall University Joan C. Edwards School of Medicine offers a Master of Science (M.S.) degree in Clinical and Translational Science. The goal of this program is to equip physicians in-training and other biomedical scientists with the information and training they need to translate basic

clinical advances into improved patient care that will enhance the quality of life for patients in the Appalachian region, particularly southern West Virginia.

Students will receive education in clinical trial design, epidemiology, statistics, informatics, and translational research. Graduates of this program will be able to lead clinical trials of new drugs and procedures in West Virginia, particularly in its rural regions. CTS graduates also will be strong applicants for positions in schools of medicine and medical centers that have clinical and translational science centers.

Clinical and Translational Science M.S. Admission Policy

~~Applicants must meet both the requirements of Graduate Admissions and the Marshall University Joan C. Edwards School of Medicine Clinical and Translational Science Department Admissions Committee. Interested persons may contact the Office of Research and Graduate Education via e-mail at *mubiomed@marshall.edu* or learn more at *www.marshall.edu/bms/ future-students/application-information*.~~

Applicants must meet the admission requirements of both Marshall University Graduate Admissions as outlined on their website – *www.marshall.edu/graduate/admissions/how-to-apply-for-admission* – and the Marshall University Joan C. Edwards School of Medicine Clinical and Translational Science Department Admissions Committee. Interested persons should visit https://jcesom.marshall.edu/research, email mubiomed@marshall.edu and/or call 304-696-3365.

PRIORITY Deadline June 1 for best chance of admission

Applications are accepted on a rolling basis and are reviewed until the class is filled. Applications will be considered after the priority deadline until June 30, if openings are available. The completed application, application fee, official transcript(s) from the degree-granting institution(s), three recommendations, and a written statement on educational and career goals should be received in the Graduate Admissions Office by June 1. For the application to be complete, the program online form should be received in the Office of Research and Graduate Education by June 1. The CTS Admissions Committee will review completed applications, then interview the top applicants.

Minimum Admission Requirements

- A baccalaureate degree from a regionally accredited college or university
- Successful completion, with a grade of C or better, of one year of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. Successful completion of undergraduate courses in biochemistry and cell biology are highly recommended but not required.
- A recommended minimum Grade Point Average (GPA) of 3.0
- A recommended minimum GPA of 3.0 in combined science and math courses
- Official transcript from degree granting institution/s and institutions where relevant post-baccalaureate or graduate coursework was taken
- Departmental materials: three recommendations, program online form, written statement addressing educational and career goals, CV/résumé

Entrance into the Clinical and Translational Science, M.S. program is restricted to fall semester only.

~~Entrance into the Clinical and Translational Science, M.S. program is restricted to fall semester only. Applicant materials should be received by March 1 in the Graduate Admissions Office to have the best chance for admission.~~

~~The complete application process includes:~~

1. ~~Submission of the Marshall University Graduate College Application available online at www.marshall.edu/graduate. Select "Degree Seeking."~~
2. ~~Receipt of the application fee (submitted on line at the time of application).~~
3. ~~Receipt of official transcript(s) from every institution attended documenting that the applicant has:~~
    a. ~~Completed a bachelor's degree from an accredited institution of higher learning. The degree must be completed prior to matriculation.~~
    b. ~~Achieved an overall Grade Point Average of 3.0 or better.~~
    c. ~~Successfully completed one academic year of biology and its associated labs.~~
    d. ~~Successfully completed one academic year of general chemistry and its associated labs.~~
    e. ~~Successfully completed one academic year of organic chemistry and its associated labs.~~
    f. ~~Successfully completed one academic year of physics and its associated labs.~~
    g. ~~It should be noted that successful completion of undergraduate courses in biochemistry and cell biology are highly recommended, but not required.~~
4. ~~Official letters~~
    a. ~~Three letters of recommendation signed and on formal letterhead from individuals familiar with the applicant's relevant academic/professional performance (May be e-mailed as attachments)~~
    b. ~~Written statement describing the applicant's educational and career goals, and why he or she~~

~~should be admitted to the CTS, M.S. program. (May be e-mailed as an attachment)~~

~~Completed applications received in the Graduate Admissions Office by March 1 will be considered for admission. The CTS Admissions Committee will review completed applications, then interview the top applicants.~~

Who Should Apply

- Undergraduates.
- Medical students at an LCME-accredited U.S. medical school with a current GPA of at least a 3.0.
- Postgraduate medical residents or fellows who have an M.D. or D.O. with a graduating GPA of 3.0 or better (equivalent GPA for foreign medical graduates).
- Ph.D.'s in biomedical sciences or Pharm.D.'s with graduating GPAs of 3.0 or better.

Medical students will apply to the program during their third year of training. After completing the requirements for the M.S. degree, students will finish the fourth year of medical school.

Medical residents and fellows who are admitted into this program will need to integrate coursework into a reduced clinical workload, thus extending their postgraduate medical education by two years.

Duration of the Program

Students will attend full-time and complete the requirements for the Master of Science degree in two years. This ~~indudes~~ includes attending during the summer between years one and two.

Degree Requirements

All students are required to meet the general requirements of the Graduate College for receipt of a master's degree. A minimum of 36 credit hours is required for a non-thesis degree. In addition, all students must pass a written and/or oral comprehensive exam.

All students will take the following courses.

Fall Semester 1

~~BMS 660 Communication Skills I~~
~~BMS 680 Biomedical Sciences Seminar~~

BMR 660 Communication Skills I
BMR 680 Seminar
CTS 600 Epidemiology and Biostatistics Used in Medical Research
CTS 620 Basic Clinical Research Operations
CTS 635 Writing and Peer Review of Scientific Publications
CTS 640 Clinical Trials Journal Club

~~Spring Semester 1~~
Spring Semester 1

BMR 661 Communications Skills II
BMR 680 Seminar

~~BMS 661 Communication Skills II~~
~~BMS 680 Biomedical Sciences Seminar~~
CTS 610 Study Design and Applied Statistics in Medical Research
CTS 614 Online Survey Tools, Relational and Data Warehousing, and Data Manipulation
CTS 630 Fundamentals of Team Science
CTS 640 Clinical Trials Journal Club

Summer Semester

CTS 650 Rural Clinic Experience

Fall Semester 2

BMR	680	Seminar
~~BMS~~	~~680~~	~~Biomedical Sciences Seminar~~
CTS	625	Clinical Research Operations Lab
CTS	640	Clinical Trials Journal Club
CTS	660	Molecular Phenotype of Appalachian Disorders

Spring Semester 2

BMR	680	Seminar
~~BMS~~	~~680~~	~~Biomedical Sciences Seminar~~
CTS	625	Clinical Research Operations
CTS	640	Clinical Trials Journal Club

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~~BIOMEDICAL SCIENCE (BMS)~~

BIOMEDICAL RESEARCH (BMR)

601 Introduction to Nucleic Acids and Proteins. 3 hrs.
A molecular and cell biological study of the structure and function of nucleic acids and proteins. (PR: Consent of instructor)

602 Introduction to Cell Structure and Metabolism. 3 hrs.
A molecular and cell biological study of the structure of cells and of cellular metabolism. (CR: ~~BMS~~ BMR 601; PR: Consent of instructor)

603 Regulation of Cell Function. 2 hrs.
An advanced molecular and cell biological study of cell metabolism and the regulation of cell function. (PR: ~~BMS~~ BMR 601, ~~BMS~~ BMR 602, and consent of instructor

604 Cellular Basis of Disease. 1 hr.
A molecular and cell biological study of the basis of diseases prevalent in Appalachia. (CR: BMR 603; PR: ~~BMS~~ BMR 601, ~~BMS~~ BMR 602, and consent of instructor)

617 Statistical Techniques for the Biomedical Sciences. 3 hrs.
An application-oriented course in statistical concepts and techniques aimed at prospective researchers in the biomedical sciences.

628 Neuroscience I: Major Structures of the Brain, Neuron Function, and Spinal Cord. 3 hrs.
To study and understand the structure and function of the nervous system and disorders of neuronal function. (PR: BMS 600 or permission of instructor)

629 Neuroscience II: Structures and Functions of the Brain Stem and Forebrain. 3 hrs.
To study and understand the structure and function of the nervous system and disorders of neuronal function. (~~BMS~~ BMR 628 or permission of instructor)

631 Neuroscience and Developmental Biology Literature Review. 1 hr.
A seminar course where published articles in the fields of neuroscience and developmental biology will be presented by students and faculty. (PR: Permission of instructor)

~~**632 Neuroscience Research Techniques. 3 hrs.**~~

~~Class participants will be exposed to state-of-the-art neuroscience research techniques while in the laboratories of the neuroscience faculty. (PR: Permission of instructor)~~

641 Molecular Developmental Biology. 3 hrs.

An in-depth discussion of current literature in developmental biology with emphasis on early embryo development, morphogenesis, lineage determination and regulation of developmental processes. (PR: Permission of instructor)

644 Responsible Conduct of Research. 1 hr. CR/NC.

Responsible conduct of research, including human subjects, live vertebrate animals, conflict of interest, mentor/mentee responsibilities, collaborative research, peer review, data management, research misconduct, and responsible authorship, with case discussions.

651 Cancer Biology. 4 hrs.

An advanced graduate course on the core principles of initiation, progression, treatment and prevention of cancer, based on current literature. (PR: ~~BMS 600~~ BMR 601, 602, 603, 604, and permission of instructor)

652 Cancer Biology Colloquium. 1 hr.

This is a mentored journal club for graduate students covering selected areas of current interest in cancer biology research. (PR: Permission of instructor)

660 Communication Skills for Biomedical Sciences I. 1 hr. CR/NC

Biomedical graduate students are trained to plan, prepare, and deliver effective scientific presentations.

661 Communication Skills for Biomedical Sciences II. 1 hr. CR/NC

Biomedical graduate students are trained to plan, prepare, and deliver effective scientific presentations.

664 Obesity and Related Diseases Journal Club. 1 hr. CR/NC

A seminar course where published articles in the field of obesity and obesity-related diseases are presented and discussed.

~~**665 Cardiovascular Disease, Obesity, Diabetes Research Colloquium. 1 hrs. CR/NC.**~~

~~A seminar-style series that will focus on recent advances in topics related to cardiovascular disease, diabetes and obesity.~~

665 Cardiovascular Disease Research Colloquium. 1 hr. CR/NC.

A seminar-style series that will focus on recent advances in topics related to cardiovascular disease.

674 Teaching Practicum. 1 hr. CR/NC.

Students gain experience in teaching using a variety of methods in a supervised setting.

679 Special Problems. I, II, S. CR/NC

Intensive study of a selected topic or problem. Emphasizes independent study. (PR: Consent of advisor)

680 Seminar. 1 hr. I, II. CR/NC

Study and discussion of current topics related to the Biomedical Sciences.

681 Thesis. 1-6 hrs. I, II, S. CR/NC.

785 Introduction to Research. 1-6 hrs. I, II, S. CR/NC

Directed research activities requiring a completed prospectus for an advanced research

project, a written report, or a research thesis. A minimum of three (3) hours required for all M.S. candidates. (PR: Consent of instructor)

882 Research. 1-15 hrs. I, II, S. CR/NC

3. New catalog description

School of Medicine

Dr. Joseph Shapiro, Dean
http://musom.marshall.edu

BIOMEDICAL RESEARCH, M.S. (THESIS), M.S. (NON-THESIS), Ph.D., M.D./Ph.D.

Areas of Emphasis

- Cardiovascular Disease
- Cell Biology
- Medical Sciences (M.S. only)
- Neurobiology and Addiction
- Obesity and Related Diseases
- Toxicology and Environmental Health

Program Description

The Biomedical Sciences and Clinical and Translational Sciences departments of the Joan C. Edwards School of Medicine offer the following degrees: Doctor of Philosophy (Ph.D.), M.D./Ph.D., and Master of Science (M.S.), both thesis and non-thesis.

The primary goal of the Biomedical Research (BMR) program is to use biomedical and translational research approaches to help reduce the numerous health disparities and improve the health of the population in West Virginia and Central Appalachia. To do this, students will take an interdisciplinary approach with defined interests and special in-depth training in one of the following research areas of emphasis: Cardiovascular Disease; Cell Biology; Obesity and Related Diseases; Neurobiology and Addiction; and Toxicology and Environmental Health. These areas are designed to be flexible and research oriented in order to develop the interests, capabilities and potential of all students pursuing careers in academic, government, or industrial biomedical sciences.

In addition, the BMR program offers a non-thesis Master of Science degree with a medical sciences area of emphasis to improve the science foundation of students seeking admission into doctoral programs in medicine or other health-related professions. Admission into the BMR M.S. Medical Sciences program does not guarantee admission into medical school. Additionally, a research component to this emphasis is available, but not required. Students choosing the research component may work up to 19 hours per week while earning a minimum of $10/hour. Students are expected to stay in good academic standing.

Also offered is the combined M.D./Ph.D. Students in this program blend the discovery of new knowledge with clinical medicine at the intersection of science and medicine. M.D./Ph.D. Most graduates work as physician-scientists at medical schools, conducting disease-related research and applying the results to the treatment of patients. They have a unique perspective on both the basic science and clinical science behind disease. Further general information is available at the Association of American Medical Colleges website (aamc.org).

Admission Requirements

Applicants must meet the admission requirements of both Marshall University Graduate Admissions as outlined on their website – *www.marshall.edu/graduate/admissions/how-to-apply-for-admission* – and the Biomedical Research Program of the Marshall University Joan C. Edwards School of Medicine. Interested persons should visit https://jcesom.marshall.edu/research, email mubiomed@marshall.edu and/or call 304-696-3365.

Biomedical Research M.S. (Thesis and Non-Thesis) Applicants

Minimum Admission Requirements

- A baccalaureate degree from a regionally accredited college or university
- Successfully completed, with a grade of C or better, one year of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. A semester of biochemistry or molecular biology with associated laboratory is also required.
- A recommended minimum Grade Point Average (GPA) of 3.0
- A recommended minimum GPA of 3.0 in combined science and math courses

- Graduate Record Examination (GRE) General Test scores - REQUIRED for M.S. THESIS ONLY
- Official transcript from degree granting institution/s and institutions where relevant post-baccalaureate or graduate coursework was taken
- Departmental materials: three recommendations, program online form, written statement addressing educational and career goals, CV/résumé

PRIORITY Deadline – June 1 for best chance of admission

Applications are accepted on a rolling basis and are reviewed until the class is filled. Applications will be considered after the priority deadline until June 30, if openings are available. The completed application, application fee, official transcript(s), three recommendations, written statement, and official GRE scores should be received in the Graduate Admissions Office by June 1. *For the Medical Sciences area of emphasis only, no entrance exam is required*. The program online form should be received in the Office of Research and Graduate Education by June 1.

Duration of Degree Program

Students are expected to complete the degree within two years. This includes the summer between years one and two for M.S. (thesis) students.

Entry Term

BMR M.S. (thesis) students may matriculate in July (summer III term) or in August (fall term). BMR M.S. (non-thesis) students with an area of emphasis in Medical Sciences must matriculate in the fall term only.

Ph.D. Applicants

Minimum Admission Requirements

- A baccalaureate degree from a regionally accredited college or university
- Successful completion, with a grade of C or better, of one year each of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. A semester of biochemistry or molecular biology with associated laboratory is also required.
- A recommended minimum Grade Point Average (GPA) of 3.0
- A recommended minimum GPA of 3.0 in combined science and math courses
- Graduate Record Examination (GRE) General Test scores
- Official transcript from degree granting institution/s and institutions where relevant post-baccalaureate or graduate coursework was taken
- Departmental materials: three recommendations, program online form, written statement addressing educational and career goals, CV/résumé

PRIORITY Deadline – March 1 for best chance of admission

Applications are accepted on a rolling basis and are reviewed until the class is filled. Applications will be considered after the priority deadline until June 30, if openings are available. International applicants must meet the international application deadline of March 15. The completed application, application fee, official transcript(s), and official GRE scores should be received in the Graduate Admissions Office by March 1. MCAT scores will be considered for admission on a case-by-case basis. For the application to be complete, the program online form, written statement addressing educational and career goals, and three recommendations should be received in the Office of Research and Graduate Education by March 1.

Duration of Degree Program

Doctoral degree students are expected to complete the requirements within five years. Students who possess an M.S. degree in Biomedical Research or the equivalent when admitted into the doctoral degree program generally require three to four years to complete the Doctor of Philosophy degree.

Entry Term

BMR Ph.D. students will matriculate in July (summer III term). The first week will be devoted to orientation and Preparation for Graduate Academics (PGA) Boot Camp. This allows students to learn more about research opportunities, get to know their cohort and current students, acclimate to a new environment, and get a head start on their research rotations.

BIOMEDICAL RESEARCH, M.S. (Thesis – Cardiovascular Disease; Cell Biology; Neurobiology and Addiction; Obesity and Related Diseases; Toxicology and Environmental Health)

Degree Requirements

All students are required to meet the general requirements of the Graduate College for receipt of a master's degree. A minimum of 36 credit hours is required for a non-thesis degree, while a minimum of 32 credit hours is required for the thesis degree. No more than six hours of thesis (BMR 681) may be credited toward the 32 credit hour requirement. Each student will specialize in one of the five areas of emphasis as defined in the program description. All students are required to successfully complete the following core curriculum:

BMR 601	Introduction to Nucleic Acids and Proteins
BMR 602	Introduction to Cell Structure and Metabolism
BMR 603	Regulation of Cell Function
BMR 604	Cellular Basis of Disease
BMR 617	Statistical Techniques for Biomedical Sciences
BMR 644	Responsible Conduct of Research
BMR 660/661	Communication Skills for Biomedical Sciences
BMR 680	Seminar (minimum of 4 hrs.)
BMR 785	Introduction to Research

In addition, the student must successfully complete other courses required by his/her area of emphasis and advisory committee, and pass a written and/or oral comprehensive examination.

To remain in good academic standing and to graduate, the student must have a minimum graduate GPA of 3.0.

Advisory Committee for M.S. (Thesis) Students

The advisory committee should be formed no later than the end of the first year of graduate education. As soon as the committee has been identified, a Thesis Committee Formation form is completed and submitted to the Director of Graduate Studies.

The committee will be selected by the student and research advisor and approved by the Director of Graduate Studies. The advisory committee will be composed of at least three faculty members with appropriate expertise. One of the members may be from another institution. The student's research advisor will act as the chairperson of the committee.

In addition, after 12 hours of coursework has been completed, the student must submit an M.S. Plan of Study form to the Dean of the Graduate College.

BIOMEDICAL RESEARCH, M.S. (Non-Thesis Medical Sciences Area of Emphasis)

A minimum of 36 credit hours is required for the non-thesis degree. In addition, the student must pass a written comprehensive examination covering BMR 601-604, MCB 631, MCB 632, and PHS 628. All students are required to successfully complete the following core curriculum:

BMR 601	Introduction to Nucleic Acids and Proteins
BMR 602	Introduction to Cell Structure and Metabolism
BMR 603	Introduction to Cell Function
BMR 604	Cellular Basis of Disease
BMR 617	Statistical Techniques for Biomedical Sciences (or MTH 518, BSC 517, PSY 517, EDF 517 or equivalent)
BMR 680	Seminar (minimum of 4 hrs.)
BMR 785	Introduction to Research
MCB 631	Medical Microbiology I
MCB 632	Medical Microbiology II
PHS 628	Neurophysiology

Elective classes include PHS 629 (Mammalian Physiology), PMC 621 (Medical Pharmacology I), and PMC 622 (Medical Pharmacology II).

In addition, after 12 hours of coursework has been completed, the student must submit an M.S. Plan of Study form to the Dean of the Graduate College.

To remain in good academic standing and to graduate, the student must have a minimum graduate GPA of 3.0.

Qualifying for Admission into Marshall University Joan C. Edwards School of Medicine without the MCAT (Pathway Program)

Requirements:

- Have a minimum 3.4 GPA in the BMR, M.S. Medical Sciences program at the time of the Marshall University Joan C. Edwards School of Medicine (MUJCESOM) interview
- Graduate from the program with a minimum of a 3.4 GPA
- Pass the M.S. comprehensive exam on the first attempt in May of the program's second year

Benefits:

- An MCAT score will not be required for admittance to MUJCESOM
- For interview purposes, out-of-state applicants will be considered the same as in-state students, regardless of residency. Marshall University JCESOM tuition cost will be based on residency status.
- With satisfactory standing, students will receive the mandatory program letter of support.

BIOMEDICAL RESEARCH, M.S., AND SCHOOL OF PHARMACY, PHARM.D.

Students can receive both an M.S. degree from the Biomedical Research Program and a Pharm.D. degree from the School of Pharmacy. Prospective students must apply to and meet the admission requirements for both programs. The curriculum takes five years to complete. In the first year students take BMR courses; in years 2-5 students take School of Pharmacy courses. All students are required to successfully complete:

Year 1 Fall

BMR	601	Introduction to Nucleic Acids and Proteins
BMR	602	Introduction to Cell Structure and Metabolism
BMR	680	Seminar
PHS	628	Neurophysiology

Year 1 Spring

BMR 603	Introduction to Cell Function
BMR 604	Cellular Basis of Disease
BMR 680	Seminar
BMR 785	Introduction to Research
PHS 629	Mammalian Physiology

Year 2 Fall

PHAR 511	Clinical Immunology
PHAR 531	Biopharmaceutics I
PHAR 541	Pharmacy Practice I
PHAR 542	Immunology and Microbiology
PHAR 551	Biomedical Chemistry
PHAR 811	Introductory Pharmacy Practice Experiences in Community Settings I

Year 2 Spring

PHAR 521	Integrated Laboratory I
PHAR 532	Biopharmaceutics II
PHAR 543	Pharmacy Practice II
PHAR 544	Principles of Disease and Drug Action
PHAR 545	Therapeutics I
PHAR 812	Introductory Pharmacy Practice Experiences in Institutional Settings I

Year 3 Fall

PHAR 611	Integrated Laboratory II
PHAR 621	Pharmacy Law and Ethics

PHAR 622	Drug Information and Communication Skills
PHAR 631	Pharmacometrics
PHAR 632	Pharmacy Practice Management I: Leadership
PHAR 661	Therapeutics II
PHAR 813	Introductory Pharmacy Practice Experiences in Community Settings 2

Year 3 Spring

PHAR 612	Therapeutic Drug Dosing
PHAR 633	Patient Care Skills Lab
PHAR 634	Pharmacy Practice Management II: Finance
PHAR 635	Bridging Research Outcomes and Patient Care
PHAR 671	Therapeutics III
PHAR 814	Introductory Pharmacy Practice Experiences in Institutional Settings 2

Year 4 Fall

PHAR 711	Medication Therapy Management
PHAR 722	Pharmacy Practice Management III: Patient Safety
PHAR 741	Therapeutics V
PHAR 751	Therapeutics IV
PHAR 815	Ambulatory Care Skills
PHAR 816	Inpatient Practice Skills
	Elective 1

Year 4 Spring

PHAR 721	Therapeutics - Special Populations
PHAR 731	Case Studies
PHAR 761	Therapeutics - Hematology, Oncology, Nutrition, Hepatic and Musculoskeletal Disorders
PHAR 817	Introductory Pharmacy Practice Experiences in Practice Management
PHAR 818	Introductory Pharmacy Practice Experiences in Education
	Elective 2

Year 5 Fall and Spring

PHAR 881	Advanced Pharmacy Practice Experiences in General Medicine
PHAR 882	Advanced Pharmacy Practice Experiences in Ambulatory Care/Primary Care
PHAR 883	Advanced Pharmacy Practice Experiences in Community Pharmacy
PHAR 884	Advanced Pharmacy Practice Experiences in Institutional Settings
PHAR 885	Advanced Pharmacy Practice Experiences in Geriatrics
PHAR 886	Advanced Pharmacy Practice Experiences in Diverse Populations
	Elective 3
	Elective 4
	Capstone 1
	Capstone 2

PHAR 635 substitutes for BMR 617, Statistical Techniques for Biomedical Sciences, a BMR requirement.

PHAR 542 substitutes for MCB 631, Medical Microbiology I.

PHAR 531 and PHAR 551 substitute for PMC 625, Drug Metabolism, and PMC 630, Chemical Aspects of Pharmacology.

PHAR 545 and PHAR 671substitute for BMR 680, Seminar. This will meet the 4-hour minimum requirement for Seminar for the M.S. degree.

A minimum of 36 credit hours is required for a non-thesis degree in the BMR Program.

BMR 601	3 hrs.
BMR 602	3 hrs.
BMR 680	1 hr.
PHS 628	2 hrs.
BMR 603	2 hrs.
BMR 604	1 hr.
BMR 680	1 hr.
BMR 785	3 hrs.
PHS 629	6 hrs.
PHAR 531	3 hrs.
PHAR 542	4 hrs.
PHAR 545	4 hrs.

PHAR 551	5 hrs.
PHAR 635	3 hrs.
PHAR 671	7 hrs.

In addition, the student must pass a written and/or an oral comprehensive examination to receive the M.S. degree.

BIOMEDICAL RESEARCH, Ph.D.

The doctorate is a research or performance degree and does not depend solely on the accumulation of credit hours. The degree requirements are admission to candidacy, and successful completion and defense of a dissertation. The degree signifies that the holder has the competence to function independently at the highest professional level.

Degree Requirements

To qualify for the Doctor of Philosophy degree, the student must pass (*C* or better or *CR*) the following courses:

BMR 601	Introduction to Nucleic Acids and Proteins
BMR 602	Introduction to Cell Structure and Metabolism
BMR 603	Regulation of Cell Function
BMR 604	Cellular Basis of Disease
BMR 617	Statistical Techniques for Biomedical Sciences
BMR 644	Responsible Conduct of Research
BMR 660/661	Communication Skills for Biomedical Sciences
BMR 680	Seminar (minimum of 6 hrs.)
BMR 785	Introduction to Research
BMR 882	Research

In addition, the student must successfully complete other courses required by his/her area of emphasis and advisory committee. All courses will be defined in the student's Ph.D. Course of Study form. The student must also pass a written and oral exam prior to becoming a Ph.D. candidate. These exams are set by the advisory committee and are outlined below under Admission to Candidacy.

Before graduating, students are required to write and publish three peer-reviewed manuscripts, two of which must be as first author.

To remain in good academic standing and to graduate, the student must have a minimum graduate GPA of 3.0.

BIOMEDICAL RESEARCH, M.D./Ph.D.

The Joan C. Edwards School of Medicine offers a combined M.D./Ph.D. degree. The curriculum takes seven to eight years to complete. Students first take years one and two of medical school. During that time they complete the requirements for BMR 785 (Introduction to Research). After passing the USMLE Step I exam at the end of year two, students begin their Ph.D. coursework and research. This takes three to four years. After completing the Ph.D. requirements, students then complete years three and four of medical school. All of the requirements for both the M.D. and Ph.D. degrees must be met.

The medical student course Elements of Medicine (MDC 710) meets the requirements for BMR 601, 602, 603, and 604. Other medical school courses can meet area of emphasis requirements, as determined by the student's advisory committee and the Graduate Studies Committee.

Biomedical Research M.D./Ph.D. Applications

Applicants interested in pursuing the combined degree should indicate this on their medical school AMCAS application.

The AMCAS application period is from June 1 to November 1, with supplemental material due by December 15.

Applications are accepted on a rolling basis and reviewed November 1 through December 15. Final decisions will be made by January 31. Applications and supplemental material will not be accepted beyond the above deadlines. A separate M.D./Ph.D. admissions subcommittee will review the applications.

Consistent with JCESOM MD program admissions policy, all applicants are required to take the MCAT. An MCAT score of 498 or better is preferred. Provided they meet the requirements for not taking the MCAT,

students from the JCESOM Medical Sciences Pathway Program who have fulfilled both the criteria for admittance to the MU JCESOM MD program and who have extensive research experience (e.g., co-authorship in multiple publications in peer reviewed journals) will be considered for interviews.

Advisory Committee for Ph.D. Students

The advisory committee should be formed no later than the end of the first year of graduate education or upon completion of 18 semester hours of credit. As soon as the committee has been identified, an Approval for Dissertation Topic and Committee Membership form is completed and submitted to the Director of Graduate Studies and the Dean of the Graduate College.

The committee will be selected by the student and research advisor and approved by the Director of Graduate Studies and the Dean of the Graduate College. The advisory committee will be composed of at least five faculty members with appropriate expertise. One of the members may be from another institution. The student's research advisor will act as the chairperson of the committee.

Approval of Course of Study

It is essential for the student and advisory committee to carefully define a Course of Study by the end of the first year. This is considered a basic contract between the student and the program and includes:

1. Proposed dissertation topic.
2. All transfer credits.
3. Required and elective courses to be taken at Marshall University.
4. All competencies to be achieved by the student during graduate study. These details must be recorded on the Ph.D. Course of Study form and submitted for approval by the Director of Graduate Studies and the Dean of the Graduate College.

Graduate Assistantships for the Doctor of Philosophy Program

Accepted Ph.D. students receive tuition remission, an annual stipend, and health insurance, which are renewable for up to five years. Students also have access to Marshall University's Student Health Clinic. Students are required to pay some fees each term.

Academic Performance for all BMR Graduate Students

- Maintain a minimum of a 3.0 Grade Point Average (GPA). No more than six hours of C and no grades below C may be applied toward the degree.
- If the GPA falls below 3.0, the student will be placed on academic probation. Following notification of probation, the student will be counseled by his/her advisor. At this time, the deficiency will be identified and a written plan will be prepared for removing it within the next nine semester hours. This plan, co-signed by the student and the advisor, must be approved by the Dean of the Graduate College before the student can register for additional coursework.
- If probationary status is not removed within nine semester hours, the Dean of the Graduate College, in consultation with the Vice Dean for Research and Graduate Education and the Graduate Studies Committee, will determine whether the student is retained or dismissed from the program. Retention must be recommended by the advisor and student's advisory committee and endorsed by the Graduate Studies Committee.

Transfer Credit

The student may transfer credits completed at other regionally accredited graduate institutions. Approval of the Graduate Studies Committee and the Dean of the Graduate College is contingent on:

1. the grades earned were B's or better;
2. the credits are appropriate to the student's program and acceptable to the advisory committee; and
3. the time limitations were not exceeded.

The number of transfer hours acceptable for the Ph.D. degree will be determined by the student's advisory committee and should not exceed 12 credit hours. Approval must be received from both the Graduate Studies Committee and the Dean of the Graduate College. Transfer credit will not become part of the Marshall University Grade Point Average.

Transfer of credits should be accomplished as early as possible. This should be accomplished when the student submits an approved Course of Study form (Ph.D.) or an approved Plan of Study form (M.S.). Attempts to

transfer credits during the last semester may delay graduation. Official transcripts must be on file in the Graduate College office by the date that grades are due in the Marshall University Registrar's Office.

Validation of Outdated Coursework

The student's advisory committee has the option to require validation, by special examination, of courses that members deem to be outdated.

Time Limitations

Students must meet all requirements for the Doctor of Philosophy degree within seven years from the date of enrollment in the first course to be used in the degree program. The Graduate Dean may grant an extension upon recommendation by the Graduate Studies Committee. Absence due to military obligations, long serious illnesses, or similar circumstances beyond the student's control may be considered valid reasons for an extension. It is the option of the student's advisory committee to require validation of outdated courses by special examination.

Admission to Candidacy

Admission to graduate study and enrollment in graduate courses does not guarantee acceptance as a candidate for the Doctor of Philosophy degree. This is only accomplished by satisfactorily passing a comprehensive qualifying examination and meeting all other specified requirements. The qualifying examination assesses whether the student has attained sufficient knowledge to undertake independent research. The examination should be completed at the end of the second year of study. The examination consists of written and oral components covering all areas specified in the Course of Study. The examination is prepared, administered and graded by the student's advisory committee. The written portion includes all coursework and relevant topics determined by the advisory committee. The student will be given two to three days to complete the written component of the examination.

Upon passing the written examination, the student must submit a grant proposal on the topic of his/her dissertation research or a related topic approved by the advisory committee. The proposal must be in the style of a National Institutes of Health (NIH) Predoctoral grant proposal. Links to the instructions for the proposal format can be found on the BMR Graduate Program website. The grant proposal must be submitted within two months of completion of the written exam and given to the advisory committee members at least two weeks in advance of the oral defense. The oral examination consists of a defense of the grant proposal and, at the discretion of the advisory committee, may include topics from the written portion of the exam in which the student was deemed to be deficient. Successful completion of the qualifying examination is based on approval of the advisory committee. Only one dissenting vote is permitted on each component. If necessary, a single portion of the examination may be repeated at the discretion of the advisory committee. The student must have the approval of the advisory committee to repeat either the written or oral component of the qualifying examination. The committee assesses the deficiencies and determines the time required for the student to make corrections. A student may take a given component of the qualifying examination no more than three times. Failure to pass this examination on the third attempt will result in dismissal. The advisory committee must complete an Admission to Candidacy for Ph.D. form after the student completes the examinations and submit it for approval by the Director of Graduate Studies and the Dean of the Graduate College.

Dissertation

All candidates must successfully complete a biomedical research project and prepare, submit, and defend a dissertation. The dissertation must present the results of the candidate's individual investigation and make a definite contribution to the current state of knowledge. While conducting research and writing a dissertation, the student must register for Research (BMR 882) at the beginning of each semester or summer term for which progress is to be earned. No more than 15 hours of Research may be credited toward the Ph.D. degree.

Candidates are to follow the general guidelines outlined in Publishing Your Dissertation: How to Prepare Your Manuscript for Publication and General Information about Dissertations. Copies of these documents are on file in the Office of Research and Graduate Education. Candidates must also follow the current Graduate College Guide for Preparation and Submission of Electronic Theses and Dissertations, which can be downloaded from the Graduate College website.

Oral Defense of the Dissertation

The oral defense of the dissertation is held during the semester or summer session in which all other degree

requirements have been met. The advisory committee must read and tentatively approve the dissertation before the examination can be scheduled. The committee chairperson will complete an Approval to Schedule Dissertation Defense form and submit it for approval of the Director of Graduate Studies and the Dean of the Graduate College before the examination can be given. Such notification must occur at least two weeks before the proposed date of the defense. A portion of the defense is an open examination and sufficient time is required for adequate public notice.

The open examination usually takes the form of a one-hour seminar. This is followed by a thorough review of the dissertation by the advisory committee and the candidate. Successful completion of the defense requires the approval of all but one of the members of the advisory committee. The results (pass/fail) must be recorded on a Results of Dissertation Examination form, which is to be reported to the Office of Research and Graduate Education and forwarded to the Graduate College Office within 24 hours. Should the candidate fail the defense, reexamination may not be scheduled without the approval of the advisory committee, the Director of Graduate Studies, and the Dean of the Graduate College.

All advisory committee members are to be present for the defense. If this is not possible, the Dean of the Graduate College, or designee, may permit one substitute for any member of the committee except the chairperson. A request for a substitute must be submitted in writing to, and approved by, the Director of Graduate Studies and the Dean of the Graduate College. The committee chairperson, the student, the original member of the committee to be replaced, and the substitute must sign this request. The substitute must have the same, or higher, graduate faculty status as the original member and represent the same academic discipline or area of emphasis.

Acceptance of Dissertation

Acceptance of the dissertation is a requirement for the doctoral degree. An accepted dissertation must bear the original signatures of at least all but one member of the student's advisory committee. If more than one member cannot approve the dissertation, the doctoral degree cannot be recommended. If the substitute member attends and approves the dissertation defense, he or she signs the dissertation. For complete information on the preparation and submission of electronic theses and dissertations, see *www.marshall.edu/graduate/current-students/edt*.

Survey of Earned Doctorates

Students are asked to complete and submit the online Survey of Earned Doctorates. Survey of Earned Doctorate information is used by a number of government agencies to assess the state of doctoral education in the U.S., and also to inform their decisions concerning funding of U.S. graduate institutions. The online survey is available at *https://sed.norc.org.*

Publication

All doctoral dissertations and their abstracts will be microfilmed through ProQuest. This requirement cannot be satisfied by any other publication, but other publication of material in the dissertation is both permitted and encouraged.

Process Summary

1. Inquiry from prospective student to the Biomedical Research Graduate Program or Graduate Admissions Office.
2. Receipt of the following official application materials and required fee by the Graduate Admissions Office: application, GRE scores, and transcript(s). International applicants must meet the application requirements of the International Admissions Office.
3. Receipt of the program online form, written statement addressing educational and career goals, and three recommendations in the Office of Research and Graduate Education by March 1
4. The Ph.D. Admissions Committee will review completed applications, then interview the top applicants.
5. The Biomedical Research Graduate Program notifies the Graduate Admissions Office and the applicant of the decision of the Admissions Committee.
6. The accepted student arrives in July for boot camp, starts their first laboratory rotation, and registers for course work.
7. An advisor is selected by the end of the first year. After the dissertation advisor has been selected, an advisory committee is formed. A Ph.D. Course of Study should be completed by the start of the second year.
8. The student completes requisite coursework and other program requirements.
9. The student takes written and oral qualifying examinations for admission to candidacy to the Ph.D. These examinations should be scheduled within two months of each other.
10. The student continues doctoral research under the guidance of his/her advisory committee. The dissertation phase begins with the approval of a dissertation project by the advisory committee, the

Biomedical Research Graduate Program, and the Graduate College Dean.
11. The student applies for graduation at the beginning of his or her last semester, no later than the Graduate College deadline. The diploma fee must be paid by this time.
12. A copy of the preliminary draft of the dissertation is given to each member of the advisory committee no later than two weeks prior to the final defense of the dissertation.
13. The chair of the advisory committee requests approval for the defense from the Biomedical Research Graduate Program and the Graduate College no later than two weeks before the scheduled date of the defense.
14. The time and place of the defense of the dissertation are announced.
15. The student defends the dissertation in an oral defense.
16. The student follows the steps to prepare and submit the electronic thesis or dissertation at *www.marshall.edu/graduate/current-students/edt.*

CLINICAL AND TRANSLATIONAL SCIENCE, M.S.

Program Description

The Clinical and Translational Science (CTS) Department in the Marshall University Joan C. Edwards School of Medicine offers a Master of Science (M.S.) degree in Clinical and Translational Science. The goal of this program is to equip physicians in-training and other biomedical scientists with the information and training they need to translate basic clinical advances into improved patient care that will enhance the quality of life for patients in the Appalachian region, particularly southern West Virginia.

Students will receive education in clinical trial design, epidemiology, statistics, informatics, and translational research. Graduates of this program will be able to lead clinical trials of new drugs and procedures in West Virginia, particularly in its rural regions. CTS graduates also will be strong applicants for positions in schools of medicine and medical centers that have clinical and translational science centers.

Clinical and Translational Science M.S. Admission Policy

Applicants must meet the admission requirements of both Marshall University Graduate Admissions as outlined on their website – *www.marshall.edu/graduate/admissions/how-to-apply-for-admission* – and the Marshall University Joan C. Edwards School of Medicine Clinical and Translational Science Department Admissions Committee. Interested persons should visit https://jcesom.marshall.edu/research, email mubiomed@marshall.edu and/or call 304-696-3365.

PRIORITY Deadline June 1 for best chance of admission

Applications are accepted on a rolling basis and are reviewed until the class is filled. Applications will be considered after the priority deadline until June 30, if openings are available. The completed application, application fee, official transcript(s) from the degree-granting institution(s), three recommendations, and a written statement on educational and career goals should be received in the Graduate Admissions Office by June 1. For the application to be complete, the program online form should be received in the Office of Research and Graduate Education by June 1. The CTS Admissions Committee will review completed applications, then interview the top applicants.

Minimum Admission Requirements

- A baccalaureate degree from a regionally accredited college or university
- Successful completion, with a grade of C or better, of one year of general biology, physics, general chemistry, and organic chemistry, all with associated laboratories. Successful completion of undergraduate courses in biochemistry and cell biology are highly recommended but not required.
- A recommended minimum Grade Point Average (GPA) of 3.0
- A recommended minimum GPA of 3.0 in combined science and math courses
- Official transcript from degree granting institution/s and institutions where relevant post-baccalaureate or graduate coursework was taken
- Departmental materials: three recommendations, program online form, written statement addressing educational and career goals, CV/résumé

Entrance into the Clinical and Translational Science, M.S. program is restricted to fall semester only.

Who Should Apply

- Undergraduates
- Medical students at an LCME-accredited U.S. medical school with a current GPA of at least a 3.0

- Postgraduate medical residents or fellows who have an M.D. or D.O. with a graduating GPA of 3.0 or better (equivalent GPA for foreign medical graduates)
- Ph.D.'s in biomedical sciences or Pharm.D.'s with graduating GPAs of 3.0 or better

Medical students will apply to the program during their third year of training. After completing the requirements for the M.S. degree, students will finish the fourth year of medical school.

Medical residents and fellows who are admitted into this program will need to integrate coursework into a reduced clinical workload, thus extending their postgraduate medical education by two years.

Duration of the Program

Students will attend full-time and complete the requirements for the Master of Science degree in two years. This includes attending during the summer between years one and two.

Degree Requirements

All students are required to meet the general requirements of the Graduate College for receipt of a master's degree. A minimum of 36 credit hours is required for a non-thesis degree. In addition, all students must pass a written and oral comprehensive exam.

All students will take the following courses.

Fall Semester 1

BMR	660	Communication Skills I
BMR	680	Seminar
CTS	600	Epidemiology and Biostatistics Used in Medical Research
CTS	620	Basic Clinical Research Operations
CTS	635	Writing and Peer Review of Scientific Publications
CTS	640	Clinical Trials Journal Club

Spring Semester 1

BMR	661	Communications Skills II
BMR	680	Seminar
CTS	610	Study Design and Applied Statistics in Medical Research
CTS	614	Online Survey Tools, Relational and Data Warehousing, and Data Manipulation
CTS	630	Fundamentals of Team Science
CTS	640	Clinical Trials Journal Club

Summer Semester

CTS	650	Rural Clinic Experience

Fall Semester 2

BMR	680	Seminar
CTS	625	Clinical Research Operations Lab
CTS	640	Clinical Trials Journal Club
CTS	660	Molecular Phenotype of Appalachian Disorders

Spring Semester 2

BMR	680	Seminar
CTS	625	Clinical Research Operations Lab
CTS	640	Clinical Trials Journal Club

BIOMEDICAL RESEARCH (BMR)

601 Introduction to Nucleic Acids and Proteins. 3 hrs.
A molecular and cell biological study of the structure and function of nucleic acids and proteins. (PR: Consent of instructor)

602 Introduction to Cell Structure and Metabolism. 3 hrs.
A molecular and cell biological study of the structure of cells and of cellular metabolism. (CR: BMR 601; PR: Consent of instructor)

603 Regulation of Cell Function. 2 hrs.
An advanced molecular and cell biological study of cell metabolism and the regulation of cell function. (PR: BMR 601, BMR 602, and consent of instructor

604 Cellular Basis of Disease. 1 hr.
A molecular and cell biological study of the basis of diseases prevalent in Appalachia. (CR: BMR 603; PR: BMR 601, BMR 602, and consent of instructor)

617 Statistical Techniques for the Biomedical Sciences. 3 hrs.
An application-oriented course in statistical concepts and techniques aimed at prospective researchers in the biomedical sciences.

628 Neuroscience I: Major Structures of the Brain, Neuron Function, and Spinal Cord. 3 hrs.
To study and understand the structure and function of the nervous system and disorders of neuronal function. (PR: BMR 601, 602, 603, 604, or consent of instructor)

629 Neuroscience II: Structures and Functions of the Brain Stem and Forebrain. 3 hrs.
To study and understand the structure and function of the nervous system and disorders of neuronal function. (BMR 628 or consent of instructor)

631 Neuroscience and Developmental Biology Literature Review. 1 hr.
A seminar course where published articles in the fields of neuroscience and developmental biology will be presented by students and faculty. (PR: Consent of instructor)

641 Molecular Developmental Biology. 3 hrs.
An in-depth discussion of current literature in developmental biology with emphasis on early embryo development, morphogenesis, lineage determination and regulation of developmental processes. (PR: Consent of instructor)

644 Responsible Conduct of Research. 1 hr. CR/NC.
Responsible conduct of research, including human subjects, live vertebrate animals, conflict of interest, mentor/mentee responsibilities, collaborative research, peer review, data management, research misconduct, and responsible authorship, with case discussions.

651 Cancer Biology. 4 hrs.
An advanced graduate course on the core principles of initiation, progression, treatment and prevention of cancer, based on current literature. (PR: BMR 601, 602, 603, 604, and consent of instructor)

652 Cancer Biology Colloquium. 1 hr.
This is a mentored journal club for graduate students covering selected areas of current interest in cancer biology research.

660 Communication Skills for Biomedical Sciences I. 1 hr. CR/NC
Biomedical graduate students are trained to plan, prepare, and deliver effective scientific presentations.

661 Communication Skills for Biomedical Sciences II. 1 hr. CR/NC
Biomedical graduate students are trained to plan, prepare, and deliver effective scientific presentations.

664 Obesity and Related Diseases Journal Club. 1 hr. CR/NC
A seminar course where published articles in the field of obesity and obesity-related diseases are presented and discussed.

665 Cardiovascular Disease Research Colloquium. 1 hr. CR/NC.
A seminar-style series that will focus on recent advances in topics related to cardiovascular disease.

674 Teaching Practicum. 1 hr. CR/NC.
Students gain experience in teaching using a variety of methods in a supervised setting.

679 Special Problems. I, II, S. CR/NC
Intensive study of a selected topic or problem. Emphasizes independent study. (PR: Consent of advisor)

680 Seminar. 1 hr. I, II. CR/NC
Study and discussion of current topics related to the Biomedical Sciences.

681 Thesis. 1-6 hrs. I, II, S. CR/NC.

785 Introduction to Research. 1-6 hrs. I, II, S. CR/NC
Directed research activities requiring a completed prospectus for an advanced research project, a written report, or a research thesis. A minimum of three (3) hours required for all students. (PR: Consent of instructor)

882 Research. 1-15 hrs. I, II, S. CR/NC