UNT | HEALTH SCIENCE CENTER™

GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

PHARMACEUTICAL SCIENCES & PHARMACOTHERAPY STUDENT HANDBOOK 2019-2020

The information provided in this document serves to supplement the requirements of the Graduate School of Biomedical Sciences detailed in the UNTHSC Catalog with requirements specific to the discipline of Pharmaceutical Sciences and Pharmacotherapy.

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Pharmaceutical Sciences & Pharmacotherapy

Liang-Jun Yan, PhD, Graduate Advisor
Research and Education Building – RES-320A
817-735-2386
liang-jun.yan@unthsc.edu

Graduate Faculty: Chaturvedula; Cheng; Clay; Dong; Ellis; Emmitte; Kastellorizios; Liu; Pang, Simecka; Wang; White; Wu; Yan

The Pharmaceutical Sciences & Pharmacotherapy Graduate Discipline is an interdisciplinary discipline that offers both MS and PhD degrees. The goal of this discipline is to provide students with rigorous education and training in biomedical sciences with a specialty in Pharmaceutical Sciences and Pharmacotherapy. Students receive training through original research, formal classroom education, problem-based learning, seminars, and journal clubs. The discipline includes faculty members engaged in various aspects of basic and clinical research in Pharmaceutical Sciences and Pharmacotherapy.

The specific research interests of faculty cover a wide range of topics including, but are not limited to, redox biology, mitochondrial abnormalities, cancer stem cell biology, drug target identification, natural product discovery, design and synthesis of new drug molecules, mechanistic studies of drug action (pharmacology), drug analysis, drug formulation and drug delivery, drug metabolism, drug resistance, pharmacokinetics, pharmacodynamics, and pharmacogenomics, etc. The interdisciplinary research also includes investigation of the link between and among different categories of human diseases, such as cancer, aging-related disease, HIV, metabolic and ocular diseases. The research projects employ state-of-the-art chemical, biochemical, molecular, cellular, in vivo and clinical techniques that include computer-aided drug design, total synthesis, fermentation, chromatography, mass spectrometry, NMR, molecular cloning, gene targeting, FACS analysis, advanced fluorescence spectroscopy, optical imaging and advanced single cell technology, behavioral testing, cellular reprogramming, nanoparticle characterization, and organoid modeling, etc.

Students may enter the discipline with a variety of academic backgrounds, providing that they have fulfilled prerequisite courses. The graduate training discipline involves core courses that integrate key concepts of biochemistry, cell biology, molecular biology, genetics, physiology, pharmacology, immunology, microbiology, and cell biology, as well as advanced courses in pharmaceutical sciences and pharmacotherapy. Students participate in seminars and discussion of current research and receive extensive laboratory training. Students perform original, publishable research and present their research findings at national scientific meetings. In addition, students are required to present their research at the annual UNTHSC Research Appreciation Day (RAD) and during the department's regular Works in Progress (WIPs) presentations.

Approximately two years are required to complete the Master of Science degree, while the

Doctor of Philosophy degree is normally completed in approximately five years.

Graduates with advanced degrees typically find employment in academic and government research laboratories, as well as in the pharmaceutical/ biotechnology industry.

Pharmaceutical Sciences & Pharmacotherapy Graduate Faculty and their Research

Ayyappa Chaturvedula, PhD
Associate Professor
Pharmacotherapy
Category I

I have received a Bachelor's degree in Pharmacy from the University of Pharmaceutical Sciences, Kakatiya University, India, and a PhD in Pharmaceutical Sciences from Mercer University, Atlanta, GA. I received advanced training in Pharmacometrics as a visiting scientist in the Department of Bioengineering and Therapeutic Sciences, School of Pharmacy, University of California San Francisco, in association with the Center for Drug Development Science (CDDS). Prior to my current position, I have worked in pharmaceutical industry and academia in various positions. My research has been focused on drug delivery and pharmacokinetic-pharmacodynamic modeling since my graduate training. I have experience in developing transdermal, nasal, buccal and sublingual delivery systems using *in vitro* permeation models and utilizing pharmacokinetic models to simulate *in vivo* concentrations of drugs. I have significant experience in developing population pharmacokinetic models and applying mechanistic mathematical models to understand intracellular pharmacokinetics of metabolites.

Yi-Qiang (Eric) Cheng, PhD
Professor
Pharmaceutical Sciences, Biochemistry & Cancer Biology, Microbiology
Category III

The overall goal of my group research is to discover and develop bioactive natural products as drugs or drug leads for the treatment of human diseases. To this end, we have so far discovered a serial of potent histone deacetylase inhibitors, and a serial of potent pre-mRNA splicing inhibitors, among many other natural products from exotic bacterial species. We forged collaborations with cancer biologists to evaluate some of those small molecules in tumor xenograft models, including neuroendocrine cancer, breast cancer, colon caner, prostate cancer, glaucoma, leukemia and neuroblastoma. Our research has been generously supported by NIH grants (R03, R01, CTSA), a US Department of Defense BCRP Idea Award, a pilot grant from the Lynde and Harry Bradley Foundation, and supplemented with institutional funds. I have so far coauthored more than 50 peer-reviewed publications and several book chapters. One of our publications was recognized as "The 2013 A. E. Schwarting Award for the *Journal of Natural Products* Best Paper of the Year". I am also an inventor in several issued US and international

patents, and pending patents. Students of my group will gain broad training in microbiology, molecular biology, biochemistry and natural product chemistry.

Patrick G. Clay, PharmD

Professor

Pharmacotherapy,
Microbiology & Immunology
Category III

Dr. Clay received formal training in the field of pharmacy (BPharm, University of Louisiana-Monroe; a PharmD, an Infectious Diseases Residency and a Fellowship in Pharmacotherapy of Infectious Diseases & Clinical Research through the University of Oklahoma Health Science Center's College of Pharmacy and Medicine). He maintains national certification as a clinical trial investigator through the Association of Clinical Research Professionals and is routinely invited to speak on the scientific, clinical and technical merits of clinical research. His research pursuits remain primarily in the conduct of over 60 clinical trials involving new and experimental antiviral medications in the field of antiretrovirals (anti-HIV medicines, but has also included influenza, hepatitis) and numerous other primary care conditions (i.e. diabetes, cholesterol, hypertension and COPD) with an emphasis on pharmacokinetic and pharmacodynamic assessments as well as mechanisms by which tolerability or optimization of outcomes can be achieved.

Xiaowei Dong, PhD

Associate Professor Pharmaceutical Sciences

Category II

My research has focused on drug delivery and formulation development. Cancer definitely is one of my research areas. Finding novel delivery systems to efficiently deliver anti-cancer drugs to tumors is the goal for this research. The research on overcoming multidrug resistance in cancer, which was the area of my Ph.D. research, continues in my current lab. In addition, I obtained great experience on drug product development and manufacture. The projects I had worked on covered the development stages from pre-clinical to clinical Phase III. Thus, my research interests also include translating pharmaceutical research into commercial products. In this aspect, novel oral solid dosage forms are specially interested. In-vitro cell study and in-vivo animal study are essential, and the studies of the underlying mechanisms about why and how the novel delivery systems enhance therapeutic outcomes are emphasized in my lab. Moreover, I am actively looking for the collaboration opportunities with the groups working on drug discovery to provide the support on formulation development of novel compounds. The ultimate goal of my research is to provide more medication options for patient benefits and make best contribution on healthcare improvement.

Dorette Z. Ellis, PhD

Associate Professor

Pharmaceutical Sciences,
North Texas Eye Institute
Category III

I am interested in understanding how aqueous humor is regulated in normal and the diseased state, glaucoma. Specifically, I study signal transduction and the regulation of ion transport (sodium and potassium) in physiological and pathological states. High intraocular pressure is a risk factor for glaucoma. Intraocular pressure is regulated by the rate of secretion of aqueous humor in the ciliary processes and the rate of exit of aqueous humor through the trabecular meshwork and Schlemm's canal. The role of the trabecular meshwork and Schlemm's canal in intraocular pressure regulation is unknown. Therefore the goals of my laboratory are to determine how aqueous humor production and outflow via the trabecular meshwork and Schlemm's canal are regulated. Additionally, we will identify the molecular and cellular mechanisms by which certain ocular hypotensives lower intraocular pressure. Identification of these target sites will allow for potential therapeutic strategies for the treatment of glaucoma and ocular hypertension. Another area of interest is retinal ganglion cell survival in glaucoma; specifically, the involvement of the sigma 1 receptor in neuroprotection and its modulation of ion transport (calcium) and mitochondrial function. The elucidation of mechanism (s) involved in retinal ganglion cell survival is of great importance, as this may lead to potential targets for therapeutic strategies for the treatment of glaucoma.

Kyle A. Emmitte, PhD

Professor & Chair

Pharmaceutical Sciences,
Pharmacology & Neuroscience
Category III

Dr. Emmitte's primary research interests include the design and optimization of biologically active small molecules to serve as *in vivo* probes and drug discovery leads. He has more than thirteen years of experience in the fields of medicinal chemistry and drug discovery, having previously held positions in the pharmaceutical industry and academia. Dr. Emmitte's recent research has primarily focused on the design and discovery of novel small molecule negative allosteric modulators (NAMs) of the metabotropic glutamate receptor (mGlu) family of receptors as novel approaches to the treatment of a variety of CNS disorders. Previously, he also worked on projects directed toward the design of novel ATP competitive kinase inhibitors for the treatment of cancer. Dr. Emmitte's research is collaborative by nature and engages the areas of medicinal chemistry, molecular pharmacology, *in vivo* biology, and DMPK. To date, he has authored over 45 peer-reviewed publications and is an inventor on 21 filed patent applications and has 11 issued U.S. patents.

Jin Liu, PhD

Assistant Professor

Pharmaceutical Sciences

Category III

I am interested in understanding protein allosteric mechanisms and developing new therapeutic strategies for cancer and neurological diseases using computational chemistry and computational biology approaches. Allostery, as the communication of distinct sites in proteins, is an intrinsic property of many proteins for cell signaling. Allosteric drug design, targeting sites other than active sites, emerges as a novel way to design drugs for a wide range of diseases, offering distinct advantages over conventional drugs, such as increased selectivity, self-limiting activity, and fewer side effects. However, the complication of allosteric mechanism and the lack of strategies to identify allosteric sites remain big challenges to design allosteric drugs. Recently, I have developed novel computational methods to successfully identify allosteric sites, and forged collaborations with cancer biologists to develop allosteric drugs. My current and future research interests include developing allosteric drugs for cancer and neurological disorders, exploring mechanisms of neurotransmitter release machinery, and constructing novel 3D allosteric network for next-generation drug design.

Iok-Hou Pang, Ph.D.

Professor

Pharmaceutical Sciences,
North Texas Eye Institute
Category III

Dr. Pang has considerable experience in glaucoma research and ocular pharmacology. He has been involved in glaucoma drug discovery since 1990, and dedicated in evaluation and discovery of new potential therapeutic targets and agents for the disease. His current research interests mainly focus on the understanding of glaucoma etiology, pathology, and pharmacology, especially on glaucoma neuroprotection. He is working to delineate essential molecular and cellular mechanisms, as well as characterize receptors and signal transduction pathways related to the abnormal changes in glaucoma. His laboratory is using rodents and primary cultures of retinal cells, neurons as well as glias, as study models to clarify biological events leading to glaucomatous optic neuropathy and retinopathy as well as its prevention and protection. He has edited one book, coauthored more than 90 peer-reviewed publications and book chapters. He is a member of numerous professional organizations, including the American Association of Pharmaceutical Scientists, Association for Research in Vision and Ophthalmology, International Society for Eye Research, and Society for Neuroscience. He has served on editorial boards and as reviewer for many journals. He is an inventor in 18 issued US & international patents and numerous pending patents.

Michail Kastellorizios, PhD

Assistant Professor

Pharmaceutical Sciences

Category II

Dr. Kastellorizios' research focuses on drug delivery technologies including nanomedicine, medical devices, and regulatory science.
Our primary research focus is the translation of anticancer medicines from preclinical development to the clinic. We are developing novel nanoparticle characterization methods designed to be of clinical relevance by testing them against solid tumor biopsies. In particular, we are developing a method for personalized treatment of metastatic breast cancer, and we are studying breast cancer health disparities in African American women as they apply to nanotherapy outcomes.
Our work on regulatory science includes the development of novel quality assurance testing methods for nanoparticle drug products. We apply the principles of Physical Pharmacy and Physical Chemistry to characterize nanoparticle formulations based on their unique interfacial properties.In addition, we provide formulation development and characterization expertise to other researchers that work on new drug candidates, generic drug formulations, and medical devices. These smaller projects are utilized to train Dr. Kastellorizios' lab members in the science of and application of Pharmaceutical Technology.

Yu-Chieh (Jack) Wang, PhD

Assistant Professor

Pharmaceutical Sciences,
Molecular & Medical Genetics
Category III

Dr. Wang's primary research interest includes stem cell and cancer biology aiming to understand the molecular basis for cellular pluripotency and malignancy, and to develop better therapeutic strategies for managing human diseases. The long-term goals of Dr. Wang's research are 1) to discover novel targets for manipulating cellular pluripotency in human pluripotent stem cells (e.g., iPSCs or ESCs) for regenerative medicine and other biomedical purposes, 2) to identify and functionally analyze novel biomarkers and therapeutic targets for better managing human cancer disease. Dr. Wang is a member of several professional societies including the American Association for Cancer Research (AACR), American Society of Clinical Oncology (ASCO), American Chemical Society (ACS), Society for Glycobiology (SFG), and International Society for Stem Cell Research (ISSCR). Also, he has served as an advisory board member of the GTC Stem Cell Summits and been invited as a speaker in the panel discussion on Selecting a Mentor sponsored by Elsevier B.V., the ISSCR annual meeting, the GTC Stem Cell Summit, and special seminars for several academic institutions.

Annesha White, PharmD, PhD

Associate Professor and Assistant Dean for Assessment

Pharmacotherapy

Category I

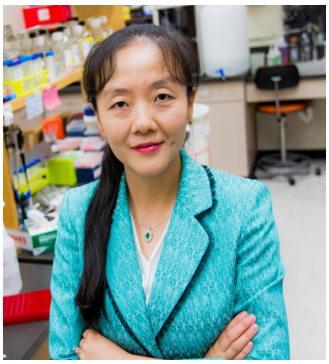
Dr. White's primary research interests include the design of studies to address issues in the health services research arena. Areas of focus include Medicare, Managed Care, Pharmacoeconomics, Comparative Effectiveness and Outcomes Research. Her research over the years has included a focus on a variety of disease states, such as heart disease, asthma, hypertension, and diabetes with the goal of providing care that is balanced in quality and cost. Dr. White's recent research has focused on accountable care organizations and health system mergers to improve patient care coordination. She also works on projects to improve care for chronic kidney disease patients, specifically targeting novel therapies to treat hyperphosphatemia. Dr. White's research involves a team approach to care examining the various aspects of the health care system and how entities can join together to enhance efforts. She has published several peer-reviewed articles, a textbook entitled Introduction to the Pharmacy Profession and serves as a referee for journals such as Medical Care and the Journal of Managed Care Pharmacy.

Hongli Wu, PhD

Associate Professor

Pharmaceutical Sciences, Pharmacology & Neuroscience

Category III

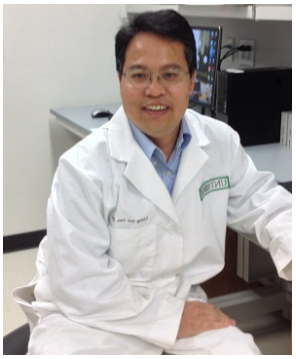


The central theme of my research is to understand the role of protein repair enzymes and evaluate their therapeutic potentials for the treatment of eye diseases and cancer. Of primary interest is the age-related macular degeneration (AMD), the most common retinal disorder that affects 25 million people worldwide, yet its pathogenesis remains poorly understood. My lab uses gene knockout and transgenic animals, and primary retinal cells as models to elucidate how altered redox signaling and disrupted redox homeostasis contribute to the pathogenesis of AMD. My research emphasizes the effects of oxidative damage and its repair on retinal proteins, in particular the thiol (SH)-containing proteins/enzymes. We also identify new therapeutic agents from natural products for AMD treatment and cancer prevention.

Liang-Jun Yan, PhD

Professor

Pharmaceutical Sciences,
Pharmacology & Neuroscience
Category III



We investigate the roles of mitochondrial protein oxidation and posttranslational modifications in aging and aging-related diseases. We are particularly interested in mitochondrial protein oxidation and modifications that play beneficial roles in age-associated chronic diseases. Our current projects, utilizing mouse or rat as animal models, focus on two mitochondrial enzymes: dihydrolipoamide dehydrogenase (DLDH) in stroke protection and NADH-ubiquinone oxidoreductase (complex I) in diabetic pathogenesis. Both enzymes use NAD^+ as their cofactor which serves as an essential molecule in cellular redox sensing, stress response, energy metabolism, and mitochondrial function.

Jerry Simecka, Ph.D.

Associate Dean of Research
Executive Director of Preclinical Services
Pharmaceutical Sciences
Category III

Dr. Simecka's lab founded the Pre-Clinical Services group at the University of North Texas Health Science Center in 2008. We conduct studies utilizing established models of both acute and chronic bacterial and fungal infections in several different animal species to help researchers evaluate and develop need antimicrobial therapies. Animal models established include septicemia, lung, intestinal, urinary tract, gastric, biofilm, abscess, and skin infections from a broad range of pathogens. We also work with sponsors to develop and establish new animal models to meet their needs. In addition, pharmacokinetic studies with accompanied bioanalytical LCMS or HPLC analysis are performed in-house for submitted compounds. Overall, we support and guide the drug discovery process of the sponsor, through protocol design, implementation and analysis for compound lead selection. Importantly, there are 7 drugs/therapies that we tested and are currently used clinically, and others will be added to this list soon.

Requirements

The requirements below are in addition to the GSBS requirements listed in the GSBS Degree Programs chapter of the UNTHSC Catalog.

A student who receives a single "C" in BMSC 6201, BMSC 6202, BMSC 6203, or BMSC 6204, but maintains an overall GPA of 3.0 or better after the first semester will be allowed to enter the Pharmaceutical Sciences & Pharmacotherapy Discipline and enroll in PSPT 6100 and PSPT 6400.

I. REQUIRED COURSES

Principles of Drug Discovery and Development (PSPT 6400) – 4 SCH

An MS or PhD student who receives a "C" or "F" in the required course (PSPT 6400) will be allowed to self-remediate the course and the PhD student will still be allowed to take the oral qualifying exam in the summer of year 1 or the fall of year 2.

II. SEMINAR COURSES, JOURNAL CLUB COURSES, AND WIPs

Independent Topics in Pharmaceutical Sciences (Journal Club) (PSPT 6100 6204) – 1 SCH

All Pharmaceutical Sciences & Pharmacotherapy MS and PhD students are required to register for the journal club course (PSPT 6100, or comparable course) during every long semester beginning in the spring of year 1. Once MS students register for Thesis (BMSC 5395) or PhD students register for Doctoral Dissertation (BMSC 6395), they are no longer required to register for a journal club course. All MS and PhD students are required to present their research in Works in Progress or WIPs once per year beginning in their second year.

III. ELECTIVE (ADVANCED AND TECHNIQUE) COURSES (Must include 4-6 SCH for MS Students and 8-10 for PhD students from the following (other courses can be substituted according to the research project of the student):

Elective and advanced courses in Pharmaceutical Sciences & Pharmacotherapy:

PHAR 7375: Special Topics in Pharmacy Research (1-3 SCH) (can be re-taken)
Special Problems courses in Biomedical Sciences (1-3 SCH) (can be re-taken)
Independent or Individual Research courses (1-3 SCH) (can be re-taken)

4. SAMPLE DEGREE PLANS

I. **Master of Science Degree Plan** - The sample below does not imply that all requirements for graduation will be met with 30 SCH of course work. While it is possible to complete the requirements in this time frame, most research projects require additional semesters to complete. The typical time-to-degree for MS students is two years.

Dept	***Course Number***	***Title***	***SCH***	***Semester to be Completed***
BMSC	5150	Lab Rotations	2	Fall year 1
BMSC	6200	Intro to Experimental Design & Biostatistical Methods	2	Fall year 1
BMSC	6201	Fundamentals of Biomedical Science I	2	Fall year 1
BMSC	6202	Fundamentals of Biomedical Science II	2	Fall year 1
BMSC	6203	Fundamentals of Biomedical Science III	2	Fall year 1
BMSC	6203	Fundamentals of Biomedical Science IV	2	Fall year 1
		Subtotal	***12***	
Milestones to be completed: Selection of Major Professor, Change of Discipline				
BMSC	5160	Biomedical Ethics	1	Spring year 1
BMSC	5315	Principles of Scientific Communication	2	Spring year 1
BMSC	5998	Individual Research	1-4	Spring year 1
PSPT	6100	Independent Topics in Pharmaceutical Sciences (Journal Club)	1	Spring year 1
PSPT	6400	Principles of Drug Discovery and Development	4	Spring year 1
		Subtotal	***9-12***	
Milestones to be completed: Designation of Advisory Committee, Degree Plan. The Research Proposal must be filed prior to enrollment in Thesis (BMSC 5395).				
BMSC	5395	Thesis	3-6	Summer year 1
		Advanced Courses	0-3	Summer year 1
		Subtotal	***6***	
		Total for Degree	***27-30***	

II. **Doctor of Philosophy Degree Plan** - The sample below does not imply that all requirements for graduation will be met with 90 SCH of course work. While it is possible

to complete the requirements in this time frame, most research projects require additional semesters to complete. The typical time-to-degree for PhD students is approximately five years.

Dept	***Course Number***	***Title***	***SCH***	***Semester to be Completed***
BMSC	5150	Lab Rotations	2	Fall year 1
BMSC	6200	Intro to Experimental Design & Biostatistical Methods	2	Fall year 1
BMSC	6201	Fundamentals of Biomedical Science I	2	Fall year 1
BMSC	6202	Fundamentals of Biomedical Science II	2	Fall year 1
BMSC	6203	Fundamentals of Biomedical Science III	2	Fall year 1
BMSC	6203	Fundamentals of Biomedical Science IV	2	Fall year 1
		Subtotal	***12***	
Milestones to be completed: Selection of Major Professor, Change of Discipline				
BMSC	5160	Biomedical Ethics	1	Spring year 1
BMSC	5315	Principles of Scientific Communication	2	Spring year 1
BMSC	5998	Individual Research	1-4	Spring year 1
PSPT	6100	Independent Topics in Pharmaceutical Sciences (Journal Club)	1	Spring year 1
PSPT	6400	Principles of Drug Discovery and Development	4	Spring year 1
		Subtotal	***9-12***	
Milestones to be completed: Designation of Advisory Committee, Degree Plan				
BMSC	6998	Individual Research	2-6	Summer year 1
		Advanced Courses	0-4	Summer year 1
		Subtotal	***6***	
Milestone to be completed: Oral Qualifying Examination				
BMSC	6998	Individual Research	4-10	Fall year 2
		Journal Club Course	1-4	Fall year 2
		Advanced Courses	1-4	Fall year 2
		Subtotal	***12***	
BMSC	6998	Individual Research	1-10	Spring year 2
		Advanced Courses	0-11	Spring year 2

		Subtotal	***12***	
BMSC	6998	Individual Research	0-6	Summer year 2
		Advanced Courses	6-0	Summer year 2
		Subtotal	***6***	
Milestone to be completed: A Research Proposal must be on file prior to enrollment in Doctoral Dissertation (BMSC 6395)				
BMSC	6998	Individual Research	4-5	Fall year 3
		Journal Club Course	1	Fall year 3
		Advanced Courses	2-3	Fall year 3
		Subtotal	***9***	
BMSC	6998	Individual Research	5-6	Spring year 3
		Journal Club Course	1	Spring year 3
		Advanced Courses	2-3	Spring year 3
		Subtotal	***9***	
BMSC	6998	Individual Research	2-5	Summer year 3
		Advanced Courses	1-4	Summer year 3
		Subtotal	***6***	
BMSC	6395	Doctoral Dissertation	9	Fall year 4
		Subtotal	***9***	
		Total for Degree	***93***	

ADVANCEMENT TO CANDIDACY

I. Master of Science

Advancement to Master's Candidacy is achieved after successful completion of a research proposal.

The research proposal is a detailed outline of the thesis project. It must include a summary of the proposed project, the hypothesis and aims to be investigated, significance and innovation of the project, research design and methodology to be used, a review of the salient literature that supports or opposes the hypothesis, and potential limitations. To take advantage of the advisory committee's expertise and advice, and to clearly define the project and the committee's expectations, it is imperative that the student meets with his/her advisory committee before preparing the research proposal. **The research proposal should be provided to the advisory committee no later than 14 days prior to the defense.** The formal presentation and defense of the research proposal will only be to the members of the student's advisory committee. The research proposal must be approved by the advisory committee and the Dean prior to registering for Thesis (BMSC 5395). It is expected that M.S. students will complete their Research Proposal in the Fall of year 2. Research Proposal Guidelines and the Research Proposal approval forms are available on the GSBS Forms and Guidelines website.

Research Proposal Guidelines and the Research Proposal approval forms are available on the GSBS Forms and Guidelines website.

II. Doctor of Philosophy

Advancement to Doctoral Candidacy is a two-step process. The first step of this process is successful completion of the Oral Qualifying Examination, a common rite of passage in most doctoral programs regardless of the field of study. The second step of this process is the preparation and defense of a research proposal. Below are details of the Pharmaceutical Sciences & Pharmacotherapy Discipline for advancing to candidacy.

A. Oral Qualifying Examination

The qualifying examination ensures that the doctoral student has mastered information needed to succeed as a PhD in the fields of Pharmaceutical Sciences & Pharmacotherapy. The graduate advisor will distribute a list of key topics to the student prior to the qualifying examination. The student is expected to become knowledgeable in each of these topics through their previous course work, reading of textbooks and scientific literature, and discussion with faculty members.

The qualifying examination is administered by a committee comprised of members of the Pharmaceutical Sciences & Pharmacotherapy graduate faculty and the student's university member. The committee is established by the

Pharmaceutical Sciences & Pharmacotherapy Graduate Advisor. The Graduate Advisor will chair the committee, unless he/she is the major professor for the student taking the oral qualifying exam. In such a case, an alternate chair will be appointed by the graduate advisor. The student's major professor may attend the qualifying examination but may not ask questions, be present during the voting, or cast a vote. The qualifying examination will be administered in the summer of the first year. The student will be given a list of questions covering topics from core and required advanced courses. The student will be given 1 hour of preparation time to review the questions and select a specified number of questions upon which he/she will be examined. The student will address the selected topics as well as any questions from the committee that may arise from the question and answer session.

Successful completion of the oral qualifying exam will be determined by the committee. If unsuccessful on the first attempt, a student may be allowed to retake the examination. The second examination should be completed within twelve weeks of the original examination, unless otherwise specified by the examination committee. If unsuccessful on the second attempt, the student will be required to transfer to the MS degree program to complete the requirements for the MS degree.
It is the responsibility of the student to obtain signatures from the examination committee, university member, graduate advisor, and department chairman upon completion of the exam. The appropriate form may be obtained from the GSBS Forms and Guidelines website.

B. Research Proposal

The research proposal is a detailed outline of the dissertation project. It must include a summary of the proposed project, the hypothesis and aims to be investigated, significance and innovation of the project, research design and methodology to be used, a review of the salient literature that supports or opposes the hypothesis, and potential limitations. To take advantage of the advisory committee's expertise and advice, and to clearly define the project and the committee's expectations, it is imperative that the student meets with his/her advisory committee before preparing the research proposal. **The research proposal should be provided to the advisory committee no later than 14 days prior to the defense.** The formal presentation and defense of the research proposal will only be to the members of the student's advisory committee. The research proposal must be approved by the advisory committee and the Dean prior to registering for Dissertation (BMSC 6395). It is expected that PhD students will complete their Research Proposal no later than the summer of year 2. Research Proposal Guidelines and the Research Proposal approval forms are available on the GSBS Forms and Guidelines website.

Once a doctoral student has successfully advanced to candidacy, he/she may use "PhD Candidate" or "Doctoral Candidate" as a title on any general business correspondence such as business cards, e-mail messages, etc. In addition, the minimum number of credit hours required for full-time enrollment drops from 12 SCH to 9 SCH in long semesters.