PH.D. IN BIOMEDICAL SCIENCES (PHDBS)

PHDBS 1B01. Research. (0.5-10 Credit Hours)
The course is designed to provide students with a scientific research experience. Students are expected to undertake the activities agreed upon with their thesis advisor, which may include: learning, using, and documenting the methodologies of research and scientific method, development and statement of hypotheses being tested, interpretation of results, and communication of the results and their implications.

PHDBS 2B01. Molecule to Medicine I. (3 Credit Hours)
This course will provide students with important backgrounds on a number of standard and advanced biochemical techniques utilized in basic biomedical research. Subsequently, an important section of the course will involve students working on papers from lines of investigation that have historically developed from the early findings to the molecular mechanisms to applications in medicine. The focus here will be on biochemical processes. The papers will be assigned by course faculty at the beginning of the course. Students are expected to discuss the rationale, experimental designs, results and next steps on each paper in the line.

PHDBS 2B02. Molecule to Medicine II. (3 Credit Hours)
This course will provide students with important backgrounds on a number of standard and advanced physiological and pharmacological techniques utilized in basic research in physiology & pharmacology. Subsequently, an important section of the course will involve students discussing papers from lines of investigations that have historically developed from the early findings to the molecular mechanisms to applications in medicine. The focus here will be on physiological and pharmacological research. Papers will be assigned by course faculty at the beginning of the course in conjunction with lecture materials. Students are expected to discuss the rationale, experimental designs, results, and next steps for each paper reviewed.

PHDBS 2B10. Dissertation Proposal I. (1 Credit Hour)
The primary goal of this 1-credit course is to provide students with a framework to address reviewers' critiques of their NIH F31 predoctoral fellowship proposal previously completed during the Grant Writing Skills course. Based on the PhD program curricular strategies, this grant will be developed in the Grant Writing Skills course and completed in the Dissertation Proposal I course to be submitted to the dissertation committee as the final PhD dissertation proposal for the student. Prior to entering this course, students will have already formed their dissertation committee and completed the Grant Writing Skills course. During this course, students will strengthen their proposal by addressing the reviewers' concerns/comments. A formal written rebuttal will be developed by the student. Course instructors will help students learn how to receive and respond to reviewers' feedback, strengthen hypothesis development skills, and improve scientific writing skills. The revised dissertation proposal and the reviewer rebuttal document will be submitted by the students to their dissertation committees to be evaluated.

PHDBS 2B11. Dissertation Proposal II. (1 Credit Hour)
The primary goal of this course is to provide PhD students with the framework to present and defend their dissertation proposal to the dissertation committee. Prior to starting this course, students will have already had their written dissertation proposal evaluated by their dissertation committee as part of the Dissertation Proposal I course. Course instructors will work in small groups with students to help them hone their oral scientific presentation skills. Students will practice constructing and delivering sound scientific arguments supported by both empirical evidence and scientific reasoning. The course will culminate in the oral dissertation proposal defense, which will be evaluated by the dissertation committee members.

PHDBS 2B12. Dissertation Proposal. (2 Credit Hours)
This course is designed to provide PhD students with an advanced understanding of the skills necessary to successfully address the reviewer critiques of their written dissertation proposal and to successfully present and defend their proposal in an oral format. Through individualized mentoring, students will gain the skills and insight necessary to strengthen their written dissertation proposal that will have previously been evaluated in the Grant Writing Skills I and Grant Writing Skills II courses. In addition, individualized mentoring of students will help them to develop the necessary oral presentation skills to effectively present their proposal to their Dissertation Advisory Committee.

PHDBS 2B21. Sem in Biomed Sci I: Presentation Skills. (1 Credit Hour)
The course is part of a three course series designed to provide students with a basic understanding of the components necessary to prepare and deliver an effective oral scientific presentation. Through didactic instruction, individualized mentoring, and practical experience, students will be provided insight and the tools necessary to improve their presentation skills. This offering focuses on practical skills for delivering a presentation such as public speaking tips, managing presentation anxiety, delivering technical information, and establishing credibility. Students will have the opportunity to apply their skills to a practical setting. The course must be completed prior to the final year in the program and is a pre-requisite to the Seminar in Biomedical Sciences 3 course.

PHDBS 2B22. Sem in Biomed Sci II: Presentat Design. (1 Credit Hour)
The course is part of a three course series designed to provide students with a basic understanding of the components necessary to prepare and deliver an effective oral scientific presentation. Through didactic instruction, individualized mentoring, and practical experience, students will be provided insight and the tools necessary to improve their presentation skills. This offering focuses on practical skills for designing a presentation with PowerPoint and includes learning the features of PowerPoint, designing slides, and incorporating animations and other media. Students will have the opportunity to evaluate presentation design elements. The course must be completed prior to the final year in the program and is a pre-requisite to the Seminar in Biomedical Sciences 3 course.

PHDBS 2B23. Teaching the Biomedical Sciences. (1 Credit Hour)
This course offers a culminating experience that allows for the student to demonstrate an understanding and the ability to deliver effective teaching presentations in biomedical sciences. Topics will align with students' dissertation research and areas of specialization. Through individualized mentoring and practical experiences, students will apply the knowledge and skills that they have gained to create and deliver teaching presentations in their specific areas of research. The course is limited to those students who have successfully defended their proposals in the Biomedical Sciences doctoral program.

PHDBS 2B30. Grant Writing Skills. (3 Credit Hours)
Developing effective grant writing skills is essential to acquire competitive funding from federal agencies and private foundations. Writing a successful grant proposal is a long process with the right blend of art and science. It requires basic knowhow, content knowledge, writing proficiency, strong research skills, creativity, organizational ability, and a great deal of perseverance. This course will provide students with the background necessary to develop a competitive funding proposal. It will use a mix of (short) lectures, small-group workshop exercises, and writing assignments. The assignments will be mostly organized around the writing (by each student) of a single NIH F31 predoctoral fellowship application.

PHDBS 2B31. Grant Writing Skills I. (1 Credit Hour)
Developing effective grant writing skills is essential to acquire competitive funding from federal agencies and private foundations. Writing a successful grant proposal is a long process with the right blend of art and science. It requires basic knowhow, content knowledge, writing proficiency, strong research skills, creativity, organizational ability, and a great deal of perseverance. The Grant Writing Skills (GWS) courses will provide students with the information necessary to develop a competitive funding proposal. GWS I will introduce general instructions and provide personalized training in scientific background acquisition and preliminary results assembly. It will use a mix of (short) lectures, small-group workshop exercises, and reading and writing assignments.

PHDBS 2B32. Grant Writing Skills II. (2 Credit Hours)
Developing effective grant writing skills is essential to acquire competitive funding from federal agencies and private foundations. Writing a successful grant proposal is a long process with the right blend of art and science. It requires basic knowhow, content knowledge, writing proficiency, strong research skills, creativity, organizational ability, and a great deal of perseverance. The Grant Writing Skills (GWS) courses will provide students with the information necessary to develop a competitive funding proposal. As a continuation of GWS I, GWS II will provide personalized training in writing the rest of the grant components, including Specific Aims, Significance, and Approach sections. It will use a mix of (short) lectures, small-group workshop exercises, and writing assignments.

PHDBS 2B40. Data Analysis for Clinical Research. (2 Credit Hours)
This course is the second part of a two-course curriculum in the domain of biostatistics and data analysis training. It is intended for the biomedical researchers interested in the design and data analysis of clinical research. Through the course, students learn how to identify and differentiate types of clinical research designs., and gain basic skills and hands-on experiences in the data analysis of clinical research. This course covers common clinical research analysis topics, including measures of clinical outcomes, designs of observational studies and clinical trials, sample size, randomization, clinical data collection, measures of associations (risks, odds ratio, etc.), sensitivity/specificity and predictive values, ROC curve, ANOVA (Analysis of Variance) for randomized complete block design, two-way ANOVA and assumption check, non-parametric tests (Mann-Whitney, Wilcoxon signed rank, Kruskal-Wallis and McNemar tests), multiple test adjustments, multiple linear regression analysis and diagnostics, and survival analysis (Kaplan Myer curve and Log-rank test). The course agenda also includes topics on the role, content and features of clinical research databases, in particular, ClinicalTrials.gov and other major registeries, as well as strategies and digestion of query.
Prerequisites: *MBS 1B06 - Intro to Biostatistics and Data Analysis*

PHDBS 3B01. Critical Analysis of Biomedical Research. (1-4 Credit Hours)
The course offers graduate students an opportunity to advance their critical analysis skills of biomedical research topics through a structured "journal club" and "round table discussion" format. The biomedical topics will be new for each course offering, thus students may enroll in multiple offerings. The student will progress in the their participation level from novice to advanced with each subsequent enrollment. At the completion of the course, students will have provided a critical review of work related to their discipline track that can be used to support their research project, thesis, or dissertation.

PHDBS 4B01. Dissertation. (4 Credit Hours)
This course will prepare the PhD candidate for the writing, the preparation and the defense of their PhD Dissertation. The course will involve close interaction between the candidate and the dissertation advisor(s). Candidates will be assessed on the written dissertation, the public presentation and defense, and the defense of the dissertation to the PhD dissertation committee.

PHDBS 4B10. Dissertation I. (1 Credit Hour)
This course is designed to prepare a senior PhD, DO/PhD, or DPM/PhD student with the necessary and timely initiation of their final Dissertation. The focus is development of the complete Methods section, the main points of the Introduction section, and complete figures and figure legends of the data accumulated up to that point in a student's project.

PHDBS 4B20. Dissertation II. (1 Credit Hour)
This course is designed to prepare a senior PhD, DO/PhD or DPM/PhD candidate with the necessary and timely initiation of their final Dissertation. Continuing on the product of Dissertation I, this course will focus on completing the Introduction section, the Methods section, the complete set of figures of the project and relevant figure legends, and key Discussion points.

PHDBS 4B30. Dissertation III. (2 Credit Hours)
This course is designed to prepare a senior PhD, DO/PhD or DPM/PhD candidate to complete the PhD Dissertation document and prepare for the final defense. The focus of this course is the completion of the entire dissertation, preparation of defense presentation, and the defense. This course takes place in the last semester of the PhD curriculum.