MASTER OF SCIENCE

GRADUATE PROGRAM

IN

PHYSIOLOGY

AT

THE UNIVERSITY OF LOUISVILLE

HEALTH SCIENCES CENTER

Last Revised 8/8/2024

GENERAL PROCEDURES AND REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN THE DEPARTMENT OF PHYSIOLOGY

I. PROGRAM OVERVIEW AND OBJECTIVES

The Department of Physiology is located in the Health Sciences Center of the University of Louisville which provides our graduate students with an active and intellectually stimulating environment. Our Graduate Program offers a Master of Science Degree to provide several career options. The **Pre-HealthCare track** is for students who wish to enhance their credentials for admission to and performance in professional healthcare programs. The **Research track** is to: 1) develop competence in directed research for advanced technical positions in industry, government, and university medical research laboratories; 2) prepare students with a good general knowledge of human physiology to enable them to communicate physiological concepts to future students; and 3) explore the possibility of a future career as an independent scientist in medically-related research.

The typical Master of Science (M.S.) Graduate Program consists of thirty (30) semester hours typically over a twelve-month (3 semesters) period to include the following: 16 credit hours of physiology and biochemistry and at least 14 credit hours of electives.

II. ADMISSION

A. APPLICATION PROCEDURES

The University of Louisville Graduate School catalog gives a general description of admission procedures. Application information can be found on the SIGS website (www.graduate.louisville.edu). The following application items must be submitted to the Graduate School Admissions Office at the University of Louisville.

1. One official transcript of the applicant's previous work for each college or university that has been previously attended.
2. At least two letters of recommendation from people who are well acquainted with the applicant's previous academic work.
3. TOEFL Examination scores for foreign students from non-English speaking countries.
4. A non-returnable application fee to the University of Louisville.
5. Applicants must state in a letter to the Department but submitted to the Graduate School (referred to as the Personal Statement in the application materials), why they desire a M.S. degree in this Department of Physiology.

B. ADMISSION REQUIREMENTS

1. A cumulative undergraduate grade point average that is usually 2.80 or higher on a scale of 4.00 (A=4, B=3, etc.)
2. In the case of a foreign applicant from a non-English speaking country, the applicant must achieve a TOEFL Examination score of 550 (paper test) or 213 (computerized test).

III. REQUIREMENTS FOR THE MASTER'S DEGREE

A. ADVISOR SELECTION

1. FIRST SEMESTER TEMPORARY ADVISOR

   The Director of Graduate Studies will meet with the new student to discuss their academic and research interests. The Director of Graduate Studies will serve as a Temporary Advisor until a Permanent Advisor is selected.

2. During the first semester of their graduate study, **Research track** students visit research laboratories in which they have an interest. First-year students must select a principal advisor. The selection process involves approval by the student, the Principal Advisor, the Director of Graduate Studies, and the Department Chair.

3. The Director of Graduate Studies will serve as the Academic Advisor for students in the **Pre-HealthCare track**.

B. MINIMUM PROGRAM REQUIREMENTS

At least 30 semester hours beyond the Baccalaureate Degree are required for the degree of Master of Science. A maximum of 6 semester credit hours (CH) may be credited from post-baccalaureate work in other professional or graduate degree programs.

C. MINIMUM COURSE REQUIREMENTS

The typical M.S. Program must include (if not completed prior to admission to the Department) the following courses taken on a grade basis:

Fall semester:

PHZB 640 or equivalent (required)	3 CH
PHZB 641 or equivalent (required)	3 CH
BIOC 645 or equivalent (required)	4 CH
Electives	2 CH

Spring semester:

PHZB 642 or equivalent (required)	3 CH
PHZB 643 or equivalent (required)	3 CH
Electives	6 CH

Summer:

Electives	6 CH

All electives must be graduate level courses. See Appendix for suggested electives.

D. ACADEMIC PERFORMANCE

A student must have at least a 3.0 accumulated GPA to be graduated with a degree of Master of Science in Physiology. In general, a student with a GPA that is less than 3.0 at the end of the second semester will require a 2/3 majority vote of the Departmental faculty to continue in the Program. A student may not be graduated with more than 6 CH of “C” grades in their required courses.

E. FINAL EXAMINATION

The **Research track** M.S. student will take a Final Examination during the last semester of the M.S. Program. The Final Examination shall consist of an oral presentation. This exam may take the form of a presentation of the research experience or a detailed review of a selected topic.

A positive recommendation for the Master of Science Degree shall require a majority vote of the Final Examination Committee (consisting of at least the Principal Advisor who will serve as Chair and two additional members of the Graduate Faculty). The Committee must have been approved by Director of Graduate Studies and the Department Chair (or his/her designee) prior to the Final Examination. This recommendation shall be made at least one week before graduation. In the event of an unfavorable vote of the Final Examination Committee, the student may be considered

for re-examination only by a recommendation of a 2/3 majority of the Departmental faculty.

The **Pre-HealthCare track** M.S. student will give a final presentation as part of their elective courses during their last semester. The topic will be determined by the student and the Course Director.

Course Descriptions

REQUIRED COURSES:

Fall Semester

Systemic Membrane, Nerve, and Muscle Physiology (3 cr.)

Course #: PHZB 640

Description: This course covers Cell-Membrane, Nerve, and Muscle Physiology and incorporates molecular, cellular, and systemic mechanisms to teach physiological processes. The course uses a team-taught, integrative organ-systems approach to emphasize the systemic physiological function that arises from interaction among individual cellular and organ level components. Lectures, post-lecture quizzes, interactive group exercises (GEs) and team-based learning sessions (TBLs), and examinations with multiple learning methods foster student-directed self-learning. Students are highly encouraged to take both PHZB 640 and 641 in the same semester.

Systemic BF, Heart, and Circulatory Physiology (3 cr.)

Course #: PHZB 641

Description: This course covers Body-Fluid (BF), Cardiac, and Circulatory Physiology and incorporates molecular, cellular, and systemic mechanisms to teach physiological processes. The course uses a team-taught, integrative organ-systems approach to emphasize the systemic physiological function that arises from interaction among individual cellular and organ level components. Lectures, post-lecture quizzes, interactive group exercises (GEs) and team-based learning sessions (TBLs), and examinations with multiple learning methods foster student-directed-self-learning. Students are highly encouraged to take both PHZB 640 and 641 in the same semester.

Advanced Biochemistry I (4 cr.)

Course #: BIOC 645

Description: BIOC 645 introduces students to basic principles and concepts in modern biochemistry. The first part of the 645 course concerns the chemical features of life on earth with an emphasis on protein structure and function. The second part of the course will focus on nutrition and metabolism with an emphasis on how nutrients provide the chemical building blocks and energy for living systems. Whenever possible, material covered in class will be discussed in the context of human health and disease.

ELECTIVE COURSES:

Fall Semester

Stem Cell Biology and Regenerative Medicine (2 cr.)

Course #: PHZB 604

Description: This course will provide a comprehensive overview on this intriguing and highly debated topic. The course will focus on the biology of stem cells and their role in health and disease with emphasis on development, carcinogenesis and tissue engineering. Lectures on various aspects of stem cells from renowned experts will cover both embryonic, induced pluripotent and adult stem cells. Specific lectures will include stem cell types present in the blood, liver, brain, muscle, kidney, pancreas, prostate, lung, gut, skin, and eye. Fellows/graduate students will also be educated on therapeutic cloning as well as bio-ethical issues and existing laws governing stem cell research.

Principles of Oral Presentations (2 cr.)

Course #: PHZB 607

Description: This course will provide instruction in best practices for oral-based presentations. There will be multiple oral presentation topics covered, including: Basic Presentations; Using Visual Aids, Charts and Figures; Distilling and Presenting a Clear and Understandable Hypothesis and Specific Aims; Interviews; and Scientific Poster Presentations. Students will attend lectures, participate in small group discussions and present five different types of oral-based presentations.

Research in Physiology (2 cr.)

Course #: PHZB 619

Description: There is a limited enrollment in this course for those who wish to complete physiologically relevant research with one of our faculty and/or associates.

Biomedical Applications of Physiology of the Eye (2 cr.)

Course #: PHZB 630

Description: This course uses active discovery to relate physiologic principles to function of the eye to give the role of physiology in understanding, diagnosing, and treating medical eye conditions. The material gives many examples of the relationship of eye health to other systemic physiologic systems and emphasizes the biomedical differences among symptoms, observations, and tests in clinical applications. This course discusses the basic physics behind key instruments used for

diagnostics in eye health. Students will discover the variations in supply, need, professional attributes, and personal life-styles among the various ways to practice clinical medicine and students will learn the differences in professional demands and rewards among different clinical medicine specialties.

Spring Semester

Systemic Respiratory, Renal, and Acid-Base Physiology (3 cr.)

Course #: PHZB 642

Description: This course covers Respiratory, Renal, and Acid-Base (AB) Physiology and incorporates molecular, cellular, and systemic mechanisms to teach physiological processes. The course uses a team-taught, integrative organ-systems approach to emphasize the systemic physiological function that arises from interaction among individual cellular and organ level components. Lectures, post-lecture quizzes, interactive group exercises (GEs) and team-based learning sessions (TBLs), and examinations with multiple learning methods foster student-directed-self-learning. Students are highly encouraged to take both PHZB 642 and 643 in the same semester.

Systemic Endocrine, Reproductive, and Gastrointestinal Physiology (3 cr.)

Course #: PHZB 643

Description: This course covers Endocrine, Reproductive, and Gastrointestinal (GI) Physiology and incorporates molecular, cellular, and systemic mechanisms to teach physiological processes. The course uses a team-taught, integrative organ-systems approach to emphasize the systemic physiological function that arises from interaction among individual cellular and organ level components. Lectures, post-lecture quizzes, interactive group exercises (GEs) and team-based learning sessions (TBLs), and examinations with multiple learning methods foster student-directed-self-learning. Students are highly encouraged to take both 642 & 643 in the same semester.

ELECTIVE COURSES:

Spring Semester

Physiology of the Metabolic Syndrome (2 cr.)

Course #: PHZB 608

Description: This course will provide students with the basic physiological and biochemical concepts necessary to understand the factors involved in the development of the Metabolic Syndrome. Students will 1) learn the

risk factors for metabolic syndrome; 2) learn the diseases and medical complications associated with metabolic syndrome; 3) understand the role of insulin resistance, obesity, hypertension and atherosclerosis in the onset of metabolic syndrome; and 4) survey the current and future approaches to diagnosis and treatment of the metabolic syndrome.

Advanced Cardiovascular Physiology (2 cr.)

Course #: PHZB 611 (Prerequisite: PHZB-605)

Description: PHY 611 utilizes lectures on the physiological and biochemical processes in the heart, blood vessels and blood elements to provide more detailed mechanisms from molecular to systematic levels and normal to pathological states.

Research in Physiology (2-6 cr.)

Course #: PHZB 619

Description: There is a limited enrollment in this course for those who wish to complete physiologically relevant research with one of our faculty and/or associates. The number of credits will depend upon the level of commitment by the student in agreement with a faculty mentor and the Director of Graduate Education for Physiology.

Physiological Adaptations to Exercise, Immobility, and Inactivity (2 cr.)

Course #: PHZB 621

Description: This is an elective course that examines the physiological aspects of exercise, immobility (due to disease or injury) and physical inactivity. The course expands the knowledge you have already gained about muscle, neural, cardiovascular, respiratory, and endocrine physiology to how the body responds, adjusts, and adapts to exercise, immobility, and physical inactivity. Comparison of the physiological adaptations to endurance training, immobilization and inactivity in every system will be emphasized.

Biomedical Applications of Physiology of the Eye (2 cr.)

Course #: PHZB 630

Description: This course uses active discovery to relate physiologic principles to function of the eye to give the role of physiology in understanding, diagnosing, and treating medical eye conditions. The material gives many examples of the relationship of eye health to other systemic physiologic systems and emphasizes the biomedical differences among symptoms, observations, and tests in clinical applications. This course discusses the basic physics behind key instruments used for

diagnostics in eye health. Students will discover the variations in supply, need, professional attributes, and personal life-styles among the various ways to practice clinical medicine and students will learn the differences in professional demands and rewards among different clinical medicine specialties.

Summer Semester

Cardio-Pulmonary Clinical Physiology (3 cr.)

Course #: PHZB 644 (Prerequisites: PHZB 641 and PHZB 642)

Description: This 3-credit hour course uses clinical situations to examine and reinforce mechanisms important to understanding systemic physiology related to 1) Heart Electrical function, 2) Myocardial Blood Flow, and 3) Pulmonary compliance and breathing. This course utilizes a combination of faculty-lead teaching techniques that include team-based learning (TBL), problem-based learning (PBL), and in-class exercises. All course materials have been prepared by the supervising faculty and will be available

Gastrointestinal-Renal-Endocrine Clinical Physiology (3 cr.)

Course #: PHZB 645 (Prerequisites: PHZB 642 and PHZB 643)

Description: This 3-credit hour course uses clinical situations to examine and reinforce mechanisms important to understanding systemic physiology related to 1) gastrointestinal blood flow and acid production, 2) renal control of arterial blood pressure, and 3) control of endocrine functions. This course utilizes a combination of faculty-lead teaching techniques that include team-based learning (TBL), problem-based learning (PBL), and in-class exercises. All course materials have been prepared by the supervising faculty and will be available to students as needed.

Research in Physiology (6 cr.)

Course #: PHZB 619

Description: There is a limited enrollment in this course for those who wish to complete physiologically relevant research with one of our faculty and/or associates.