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Molecular, Cellular and Systemic Physiology

Graduate courses in physiology may be taken leading to the Master of Science (M.S.) or the Doctor of Philosophy (Ph.D.) degrees in Molecular, Cellular and Systemic Physiology. Graduate courses offered by the program may also contribute to graduate degrees in biological science or to a teaching specialty for the Master of Science in Education degree.

The Department of Physiology offers advanced training in mammalian physiology, aging, cancer biology, cell physiology, molecular biology, molecular endocrinology, neuro-endocrinology, neurophysiology, neuropharmacology, reproductive biology, and reproductive endocrinology, metabolism and human anatomy. Students entering the graduate training program are advised to plan the course work so as to acquire a broad knowledge of the field before emphasizing one of these sub-disciplines. The advisory system in the Department is set up to help students in planning their work. All graduate training programs in the Department are subject to approval of the graduate program committee (GPC) of the Department.

Each term the student must be engaged in a training assignment which supplements formal course work and will consist of research or teaching or both. The student is required to have participated in both types of activities, research and teaching, as a graduate student at SIUC as a condition for receiving a graduate degree.

Prerequisites for graduate training in molecular, cellular and systemic physiology include an undergraduate degree in one of the biological, physical, or behavioral sciences, preferably with one year each of physics, mathematics, and chemistry.

Financial Assistance

The Department of Physiology offers financial assistance to qualified applicants accepted by the Department. The funds which provide this assistance come from a variety of sources which include: teaching assistantships from the Department; University fellowships which are applied for directly by the student; and research assistantships from grants obtained by the graduate program faculty. Students interested in financial assistance should fill out the Financial Support Form available online and in the Department of Physiology office. Additional financial aid information may be found at the SIU Financial Aid Office web page. Financial assistance depends on availability and the student's qualifications and academic status. Continued financial support is contingent upon the student's progress toward the degree and good academic standing.

The Department may support master's students for up to 24 months and doctoral students for 48 months on department teaching assistantships. However, every effort will be made to encourage the student and their adviser to find alternative sources of funding. Continuation of support will be conditioned on satisfactory performance in areas of academics, research, and teaching. Academic performance will be based on good standing in the Graduate School (3.0 GPA) and passage of the preliminary exam by the end of the third year (Ph.D. students only). Satisfactory research performance will be based on the filing of an approved research proposal by the end of the (Ph.D. students only) calendar year and after that time by an annual memo from the student's advisory committee indicating progress in the area of research. It will be the student's responsibility to provide this documentation to the GPC. Evaluation of teaching effectiveness will be carried out by the GPC from sources possibly but not limited to the course coordinator, student evaluations and by direct observation of classes by the GPC.

A departmental stipend for graduate student research will be available to molecular, cellular and systemic physiology graduate students working in laboratories of regular physiology department faculty members provided that the student is making satisfactory progress in their research program and remains in good academic standing (as defined above).

Research Tools

Doctoral students must acquire competence in one research tool and are encouraged to attain competence with two tools. The requirements for a research tool may be satisfied by establishing proficiency in advanced statistics, computer science, electronics, advanced mathematics, electron microscopy, foreign language (with suitability of a particular language being determined by the student's committee), or some technique which is acceptable to the student's advisory committee. Courses which are normally part of a track requirement or are highly recommended for students in a particular track cannot serve as tools for students in that track. Approval of a given tool by the student's committee will be granted only if the student has demonstrated proficiency by taking a formal course and receiving a grade (preferably *B* or better) or by passing a formal examination given by an expert in that field (preferably a faculty member in the University department where the subject is normally taught).

Master of Science (M.S.) in Molecular, Cellular and Systemic Physiology

Application

The application should be submitted online through the Graduate School. All applicants must submit a brief (300-600 words) statement of goals and ambitions indicating why they wish to do graduate work and three letters of recommendation submitted by individuals who can comment on their academic abilities, character, and potential for doing research.

This program requires a nonrefundable \$65 application fee that must be submitted with the application for Admissions to Graduate Study in Molecular, Cellular and Systemic Physiology. Applicants may pay this fee by credit card.

The Graduate School requires an earned grade point average (GPA) of 2.70 or better (*A* = 4.0) on all undergraduate work. A minimum GPA of 3.00 (*A* = 4.0) in all undergraduate and graduate work is needed for serious consideration.

The graduate program committee of the department will normally examine the credentials, which include the application form, transcript(s), letters of recommendation, goal statement, and GRE scores, only after all materials have been received.

International students must submit English language equivalency exam test scores and obtain a score equal or greater to the department requirements to qualify for admission by the Graduate School, and must pass a Test of Spoken English prior to the awarding of teaching assistantships by the Department of Physiology.

Advisory Committee

The Director of Graduate Studies will act as an advisor to new graduate students until a research advisor is selected. The choice of a research advisor is a very important step and should be carefully considered. During the first semester, most students rotate through four research laboratories to get acquainted with faculty members and research programs before selecting an advisor who will direct the thesis research and help plan course work.

The functions of the research advisor are:

1. To provide guidance in the student's research and the use of facilities.
2. To provide mentorship in conducting, evaluating, and publishing scientific research.
3. To serve as chair of the Advisory Committee and consultant for the selection of the other members of the Advisory Committee (at least three additional members from the graduate faculty, including one from outside the Department).

Members of the Advisory Committee should provide expertise in or complementary to the research area and provide guidance in the selection of course work. The student should meet with the committee yearly or as needed to discuss research and academic progress.

Following the selection of a research advisor and the Advisory Committee, the Graduate Faculty Committee Approval Form (available online and in the department office) must be filled out with the names and signatures of committee members and filed with the department secretary. The completed form will then be forwarded to the Graduate School for final approval.

Total Hours Required

A total of 30 credit hours at the 400- and 500-level is required for the master's degree. Of the total credit hours completed, at least 21 of these must be graded (A, B, C) hours. At least 15 of the total 30 credit hours must be 500-level courses taken at SIUC. Of these 15, a minimum of 3 credit hours of PHSL 599 (thesis) is required. More than three credit hours of PHSL 599 may be taken, however only six may be counted toward the 500-level requirement.

Thesis

The thesis should represent a competent piece of original research carried out on a specific physiological problem or area under the research advisor's supervision. It should include an adequate review of the literature, a statement of the hypothesis, a set of experiments testing the hypothesis by whatever methods are appropriate, an analysis of the results, and an interpretation of the work and its significance. Upon completion of the thesis research, a final department seminar is presented followed by an oral examination. The examination will be conducted by the Advisory Committee and will cover the subject of the thesis and other matters related to the discipline.

Doctor of Philosophy (Ph.D.) in Molecular, Cellular and Systemic Physiology

The Graduate School requires a grade point average in previous graduate work of at least 3.0 and acceptance by the academic unit offering the Ph.D. in Molecular, Cellular and Systemic Physiology. There are accelerated and direct entry options.

The application should be submitted online through the Graduate School. All applicants must submit a brief (300-600 words) statement of goals and ambitions indicating why they wish to do graduate work and three letters of recommendation submitted by individuals who can comment on their academic abilities, character, and potential for doing research.

This program requires a nonrefundable \$65 application fee that must be submitted with the application for Admissions to Graduate Study in Molecular, Cellular and Systemic Physiology. Applicants may pay this fee by credit card.

The graduate program committee of the Department will examine the credentials, which include the application form, transcript(s), letters of recommendation, goal statement and GRE scores (if applicable) only after all materials have been received.

International students must submit English language equivalency exam test scores and obtain a score equal or greater to the department requirements to qualify for admission by the Graduate School, and must pass a Test of Spoken English prior to the awarding of teaching assistantships by the Department of Physiology.

Direct Entry Option into Ph.D. in Molecular, Cellular and Systemic Physiology

This option is presently available for admission to the Graduate School. Contact the Department of Physiology for further information regarding this option. In general, the Department of Physiology may accept a post-baccalaureate student directly into the Ph.D. in Molecular, Cellular and Systemic Physiology program, provided that the student has:

1. A cumulative undergraduate grade point average of 3.25 (A = 4.0).
2. Sufficient undergraduate course work in biology, chemistry, physics, and mathematics or an outstanding score on the Graduate Record Exam (GRE) on: (a) the general part or (b) the advanced part in biology, chemistry, physics, or mathematics.

A student admitted to the doctoral program under this option is subject to the admissions requirements stated above and all other requirements of the doctoral degree including: course work, retention, residency, examinations, research proposal, dissertation, and all applicable time limits. The Advisory Committee may adjust the course work and requirements of the student based on the student's background and research area. Students who have taken one or more core courses at another accredited university may be given credit toward their core requirements if such courses are deemed equivalent to our core courses by the Graduate Program Committee and department grade requirements are met.

Accelerated Entry Option into Ph.D. in Molecular, Cellular and Systemic Physiology

The Department of Physiology offers an accelerated entry option to a graduate student in the master's program who demonstrates the intellect, research aptitude, and commitment for pursuing a doctoral degree. At the end of at least one year of studies at the master's level, the student may request that their Advisory Committee review their qualifications and performance in order to establish eligibility for entry into the doctoral program under this option. The student must have a GPA of at least 3.25 ($A = 4.0$) in graduate course work and letters of reference attesting to the student's abilities and potential to perform doctoral level research. The Advisory Committee must establish that the student is prepared and able to conduct research at the doctoral level, which may be established by publications; presentations at meetings; depth of understanding; and quality of seminars, presentations, and research proposal. The Advisory Committee will make a recommendation that the student should either continue in the Master's program or advance into the doctoral program.

After the student's eligibility has been established, the research advisor and/or the Advisory Committee will prepare a written review of the student's qualifications and submit it to the Graduate Program Committee for approval. The Graduate Program Committee will then submit a recommendation to the Chair of the Department of Physiology, who will in turn submit a letter to the Graduate School requesting a waiver of a master's degree or master's equivalency and entry into the doctoral program.

The student will need to submit the following items to the Graduate School: a letter of acceptance into the doctoral program from Graduate Program Committee Chair, a Graduate School application form (indicating Ph.D. in Molecular, Cellular and Systemic Physiology), and a completed Notification of Accelerated Entry Option Students Form.

A student admitted to the doctoral program under this option is subject to all requirements of the doctoral degree including: course work, retention standards, residency, examinations, research proposal, dissertation, and all applicable time limits.

Please note that only courses taken after admission to the doctoral program will count toward residency.

Advisory Committee

The Director of Graduate Studies will act as an advisor to new graduate students until a research advisor is selected. The choice of a research advisor is a very important step and should be carefully considered. During the first semester, most students rotate through four research laboratories to get acquainted with faculty members and research programs before selecting an advisor who will direct the dissertation research and help plan course work.

The functions of the research advisor are:

1. To provide guidance in the student's research and the use of facilities.
2. To provide mentorship in conducting, evaluating, and publishing scientific research.
3. To serve as chair of the Advisory Committee and consultant for the selection of other members of the Advisory Committee (at least four additional members from the graduate faculty, including one from outside the Department).

Members of the Advisory Committee should provide expertise in or complementary to the research area and provide guidance in the selection of course work. The student should meet with the committee yearly or as needed to discuss research and academic progress.

Following the selection of a research advisor and the Advisory Committee, the Graduate Faculty Committee Approval Form (available in the department office) must be filled out with the names and signatures of committee members and filed with the department secretary. The completed form will then be forwarded to the Graduate School for final approval.

Total Hours Required

The requirements for the Ph.D. in Molecular, Cellular and Systemic Physiology are those established by the Graduate School, the Guide to Graduate Studies, and the student's advisory committee. The Graduate School requires 24 credit hours prior to candidacy and 24 hours of dissertation credit. Of the total credit hours completed, at least 10 of these must be graded (A, B, C) hours.

Preliminary Examination

Preliminary examinations for doctoral students consist of a set of written exams covering the student's research area and course work, a research proposal in the area of the dissertation research project, and an oral defense of the proposal. In most cases, the written exams are taken in early August after completion of the second year of study. After passing the written exams, the student will have one month to write the research proposal. The student's Advisory Committee will evaluate the research proposal and if it is found acceptable, the oral defense of the proposal will be scheduled with the Advisory Committee. Details of the preliminary examinations are available from the Graduate Program Committee.

Dissertation

The dissertation should represent a competent piece of original research carried out on a specific physiological problem or area under the advisor's supervision. It should include an adequate review of the literature, a statement of the hypothesis, a set of experiments testing the hypothesis by whatever methods are appropriate, an analysis of the results, and an interpretation of the work and its significance. The research should be of sufficient quality and quantity to merit publications in peer-reviewed journals. Upon completion of the dissertation research, a final department seminar is presented followed by an oral examination. The examination will be conducted by the Advisory Committee and will cover the subject of the dissertation and topics related to the discipline.

Certificate in Anatomy

The anatomy certificate is a graduate (post-baccalaureate) certificate program that provides students an opportunity to become proficient in anatomy teaching. This will allow them to compete more effectively for jobs in this field. The student must be currently enrolled in a graduate degree program at SIUC or an individual holding a bachelor's degree and admitted to the Graduate School (non-declared), preferably in an existing anatomically based graduate, masters, or Ph.D. program (e.g. Physiology, Biological Sciences, Anthropology, or Zoology). However, others will be evaluated on a case-by-case basis. Additional prerequisites, such as embryology, basic vertebrate anatomy, etc. are preferred but other courses may qualify. Students lacking such prerequisites may be encouraged to obtain them prior to admission into the anatomy certificate program. The Director of the Anatomy Certificate Program will review all applications. In addition to coursework in anatomy, students in the anatomy certificate program will obtain experience teaching gross anatomy to undergraduates and/or graduates at the PHSL 301 and PHSL 401 A/B level. Minimum of 17-18 graduate credit hours are required for fulfillment of the certificate requirements. They are:

- Advanced Human Anatomy, (PHSL 401A, PHSL 401B, 10 CH)
- Mammalian Histology, (PHSL 409, 4 CH)
- Either Advanced Neuroanatomy with Lab (PHSL 503, 3 CH) or Advance Human Embryology (PHSL 503, 3 CH).

Where appropriate, these courses may also count for credit toward the master's or Ph.D. degree. The Director of the Anatomy Certificate Program and the student's advisory committee will make recommendations for other coursework and oversee the student's progress. Students supported by graduate assistantships will have the same teaching obligations as all other departmentally supported students.

For more information, contact:

Director of Graduate Studies
Department of Physiology, School of Medicine
Southern Illinois University

Molecular, Cellular and Systemic Physiology Courses

PHSL401A - Advanced Human Anatomy with Laboratory A-B sequence. Laboratory dissection of the human body with lectures as needed. Primarily for students majoring in physiology, biological sciences, anthropology or pre-medical fields. Prerequisite: PHSL 301. Enrollment by consent of instructor. Lab fee: \$20. Credit Hours: 5

PHSL401B - Advanced Human Anatomy with Laboratory A-B sequence. Laboratory dissection of the human body with lectures as needed. Primarily for students majoring in physiology, biological sciences, anthropology or pre-medical fields. Prerequisite: PHSL 301. Enrollment by consent of instructor. Lab fee: \$20. Credit Hours: 5

PHSL409 - Mammalian Histology This course is intended to provide life sciences students with an introduction and understanding of mammalian tissues with a strong emphasis on human anatomy. The course utilizes self-directed and problem-based learning strategies employing on-line resources including virtual microscopy. By completing this course, successful students should 1) be familiar with the organization, structure, and appearance of mammalian tissues; 2) be able to recognize and identify tissues from all major mammalian organs; and 3) be able to describe the relationship between tissue conformation and organ function. Prerequisites: BIOL 211 and PHSL 301 with grades of C or better. Credit Hours: 4

PHSL420A - Principles of Pharmacology Examines basic principles of pharmacology (pharmacokinetics) and the action of various classes of drugs on living organisms. Drug classes covered include those affecting most organ systems of the human body, such as the nervous, cardiovascular, gastrointestinal and renal systems as well as drugs used for antibiotic and cancer chemotherapy. Three lectures per week. Prerequisites: PHSL 310 or PHSL 410A,B, CHEM 340 and CHEM 341 (or equivalent) with grades of C or better. Credit Hours: 3

PHSL420B - Principles of Pharmacology Examines basic principles of pharmacology (pharmacokinetics) and the action of various classes of drugs on living organisms. Drug classes covered include those affecting most organ systems of the human body, such as the nervous, cardiovascular, gastrointestinal and renal systems as well as drugs used for antibiotic and cancer chemotherapy. Three lectures per week. Prerequisites: PHSL 310 or PHSL 410A,B, CHEM 340 and CHEM 341 (or equivalent) with grades of C or better. Credit Hours: 3

PHSL426 - Comparative Endocrinology (Same as ANS 426, ZOOL 426) Comparison of mechanisms influencing hormone release, hormone biosynthesis, and the effects of hormones on target tissues, including mechanisms of transport, receptor kinetics, and signal transduction. Prerequisites: PHSL 310 or ANS 331 or ZOOL 220 with a grade of C. Laboratory/Field Trip fee: \$15. Credit Hours: 3

PHSL430 - Cellular and Molecular Physiology This course will examine the molecular and cellular aspects of physiology in the context of human pituitary and neurological genetic disorders. Topics include experiments and model systems used to examine the regulation of gene expression, signaling pathways, protein activities, and cellular functions that underlie these disorders. Prerequisites: BIOL 306 or CHEM 350 & 351 with minimum grade of C or better. Credit Hours: 3

PHSL433 - Comparative Animal Physiology (Same as ZOOL 433) Variations of the physiological processes in animal phyla, comparison with human physiology, and review of basic physiology principles and comparative aspects of mechanism and function. Prerequisite: BIOL 211, BIOL 212 & BIOL 213 or PHSL 310 with a grade of C or better. Credit Hours: 3

PHSL440A - Biophysics Biomathematics, biomechanics and biotransport. Three lectures per week. Prerequisites: MATH 141 or 150; PHSL 310; PHYS 203 A&B and 253 A&B or PHYS 205 A&B and 255 A&B. May be taken in B,A sequence with consent of instructor. Credit Hours: 3

PHSL440B - Biophysics Bioelectrics and bio-optics applied to physiological problems. Three lectures per week. Prerequisites: MATH 141 or 150; PHSL 310; PHYS 203 A&B and 253 A&B or PHYS 205 A&B and 255 A&B. May be taken in B,A sequence with consent of instructor. Credit Hours: 3

PHSL450 - Advanced Human Sexuality (Same as WGSS 449) Advanced, comprehensive course intended to supplement and expand the critical examination of topics covered in PHSL 320, Reproduction and Sexuality. The objectives of this class are to examine the physiological and behavioral basis of human reproduction and sexuality. Examining how humans reproduce from a physiological perspective including all aberrations and clinically relevant dysfunctions, as well as, the spectrum of human sexual behaviors including typical and atypical sexual behavior, paraphilias and diversity of human relationships. Prerequisite: PHSL 320. Credit Hours: 3

PHSL460 - Electron Microscopy Lecture course designed to introduce the student to the theory and principles of electron microscopy. Two lecture hours per week. Restricted to senior standing or permission of instructor. Credit Hours: 2

PHSL462 - Biomedical Instrumentation Diagnostic and therapeutic modalities related to engineering. Cardiovascular, neural, sensory and respiratory instrumentation. Special approval needed from the instructor. Credit Hours: 3

PHSL470 - Biological Clocks Study of the temporal aspects of diverse physiological and behavioral functions which possess diurnal and sectional periodicity. Species covered will include many eukaryotic organisms including plants, but will mainly stress mammals. Oscillations in sleep-wake cycle, locomotion, reproduction, hormonal secretion and numerous other processes will be explored. In addition, the effects of biological clocks in humans and the effect of jet lag and depression will be examined. Prerequisite: PHSL 310. Credit Hours: 3

PHSL480 - Cancer Journal Club Goal of the journal club is to discuss current primary journal articles about cancer, often with an emphasis on ovarian cancer. Each semester a theme is selected to guide selection of articles. Grade is based on: 1) presentation; 2) participation; 3) short essay on each journal article that is discussed. Each student presents at least one journal article per semester and is expected to participate in the discussion of each paper that is presented. Faculty and graduate students also present articles for discussion to provide examples of how to read and discuss primary scientific literature. Student will, with instructor approval, choose either 1 cr/hr for a research paper component for which they write a 10 page research paper reviewing current literature related to the journal club's theme for the semester or a different cancer theme as determined by the instructor, or select 2 cr/hrs for journal club participation as outlined above, or 3 cr/hrs for completing both course components. Prerequisite: PHSL 310 with a B or better or concurrent enrollment. Credit Hours: 1-3

PHSL500 - Advanced Seminar in Physiology Presentation of research and current literature in physiology. Required of all graduate students in physiology. Course restricted to physiology graduate doctorate and graduate masters students only. Graded S/U. Credit Hours: 1

PHSL501 - Presentation of Physiological Data Research areas and special topics requisite for conducting scientific research will be presented. Students will learn how to organize a talk, prepare slides, communicate effectively in an oral presentation, write a research proposal, design experiments, and write a curriculum vitae. Required of all graduate students in Molecular, Cellular, and Systemic Physiology. Credit Hours: 2

PHSL502 - Advanced Neuroanatomy with Lab Advanced Human Neuroanatomy with Lab (4 hours) examines the detailed structure of the human nervous system, linking structure to function at both the clinical and neurobiological level. The overall objective of the course will be a three-dimensional understanding of nervous system structure and organization, based upon anatomical connections, functions, and diseases. Graduate students will engage in literature reviews relevant to course material and submit final projects as approved by course instructors. Enrollment requires consent of the instructor. Students who have passed PHSL 402 are not eligible for enrollment. Lab fee: \$25. Credit Hours: 4

PHSL503 - Advanced Human Embryology Embryology is the branch of anatomy that looks at the developmental events that occur prior to birth. This course is designed to provide a basic foundation in human embryology to graduate students who are interested in the biomedical sciences. In this course, we will explore human development from fertilization to birth. Our major focus will be on the morphological

changes that take place during development, but we will also explore many of the underlying molecular mechanisms and relevant congenital anomalies. Students will review and discuss current literature relevant to each unit and complete final projects as approved by the course instructor. Approval of the instructor required for enrollment. Students who have passed PHSL 403 are not eligible for enrollment. Credit Hours: 3

PHSL510 - Experimental Methods in Physiology The main objectives of this course are to acquaint the student with the techniques and the equipment used in modern research laboratories and to provide instruction in the principles and practice of scientific experimentation. Restricted to Physiology (MCSP) graduate students only. Credit Hours: 3

PHSL511A - Advanced Mammalian Physiology Physical and chemical organization and function in mammals, with emphasis on the human. Physiology of blood and circulation, respiration, digestion, metabolism, excretion, endocrines, sensory organs, nervous system, muscle and reproduction. Four lectures and one seminar per week. Seminar will consist of primary literature discussion and student presentation on areas covered in lecture. Principal lecturer for each of the area topics will lead discussion and assign the primary literature. May be taken in any sequence. Restricted to consent of department. Special approval needed from the instructor. Credit Hours: 1-5

PHSL511B - Advanced Mammalian Physiology Physical and chemical organization and function in mammals, with emphasis on the human. Physiology of blood and circulation, respiration, digestion, metabolism, excretion, endocrines, sensory organs, nervous system, muscle and reproduction. Four lectures and one seminar per week. Seminar will consist of primary literature discussion and student presentation on areas covered in lecture. Principal lecturer for each of the area topics will lead discussion and assign the primary literature. May be taken in any sequence. Restricted to consent of department. Special approval needed from the instructor. Credit Hours: 1-5

PHSL512 - Teaching Methods and Strategies This online course is designed to introduce instructional theories and methods to students interested in teaching in the Life Sciences. It will provide coverage of methods of classroom instruction, management and assessment. The methodology of the course will include projects on lesson construction, online discussion boards of readings, and quizzes. Students should finish the course prepared to be competent in up-to-date methodology and strategies in critical teaching practices. Credit Hours: 2

PHSL520 - Reproductive Function and Sexual Behavior Advanced, comprehensive course examining the physiological and behavioral basis of human reproduction and sexuality. Topics include physiology and pathophysiology of the human reproductive system and normal and atypical sexual behavior. Course topics will include didactic presentations and problem-based lab discussions selected by the students selected from lecture or related topics. The class will meet three times weekly for didactic presentations and once a week for a three hour extensive discussion and presentation utilizing self-directed learning strategies and knowledge in a problem-based format, similar to that used in the medical school curricula. Special approval needed from the instructor. Credit Hours: 4

PHSL530 - Advanced Cellular and Molecular Physiology This course will examine the molecular and cellular aspects of physiology in the context of human pituitary and neurological genetic disorders using the primary literature as the source of topics for oral presentations and discussions. Topics include experiments and model systems used to examine the regulation of gene expression, signaling pathways, protein activities, and cellular functions that underlie these disorders. Special approval needed from the instructor. Credit Hours: 3

PHSL531 - Advanced Cellular Physiology Laboratory One one-hour lecture and one three-hour laboratory per week, designed to be taken concurrently with PHSL 530. Basic experimental procedures used in studies in cellular physiology. Credit Hours: 2

PHSL533 - Advanced Comparative Physiology Advanced concepts and techniques used in current studies in comparative physiology. Three lectures and one discussion period per week. Credit Hours: 4

PHSL540 - Advanced Biophysics Survey of recent biophysical research with emphasis on historical development of current advances. Three lectures per week. Prerequisite: PHSL 440 or its equivalent. Credit Hours: 3

PHSL570A - Advanced Physiological Topics-Biological Structure Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570B - Advanced Physiological Topics-Cardiovascular Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570C - Advanced Physiological Topics-Respiratory Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570D - Advanced Physiological Topics-Nerve-Muscle Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570E - Advanced Physiological Topics-Metabolism Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570F - Advanced Physiological Topics-Gastrointestinal Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570G - Advanced Physiological Topics-Neurophysiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570H - Advanced Physiological Topics-Radiation Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570I - Advanced Physiological Topics-Environmental Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570J - Advanced Physiological Topics-Biomathematics Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570K - Advanced Physiological Topics-Biomedical Computing Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570L - Advanced Physiological Topics-Endocrinology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570M - Advanced Physiological Topics-Animal Care Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570N - Advanced Physiological Topics-Biophysics Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570O - Advanced Physiological Topics-Pharmacology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570P - Advanced Physiological Topics-Special Topics Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570Q - Advanced Physiological Topics-Reproductive Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL570R - Advanced Physiological Topics-Renal Physiology Studies of current research and literature in various topic areas of physiology. One or more of the following list of topic sections will be offered each semester, so that each section will be available once every two or three years. Credit Hours: 3

PHSL571 - Research and Problems in Biological Transmission Electron Microscopy (TEM)
Laboratory course designed to provide experience in techniques for biological electron microscopy. Student, with the aid of the instructor, designs and carries out a project in transmission electron microscopy. Two three-hour laboratories per week. Prerequisite: PHSL 460 or special permission of instructor. Credit Hours: 3

PHSL573 - Neuroanatomy A detailed survey of human neuroanatomy. The course will include radiographic, cross-sectional and developmental anatomy of the nervous system. Dissection of the human brain will occur in general laboratory sessions. Three lectures per week. Credit Hours: 3

PHSL574 - Neuropharmacology (Same as PHRM 574) A detailed examination of the biochemical aspects of neuropharmacology with emphasis on neurotransmitters - their synthesis, storage, release and metabolism in the central and peripheral nervous system. Considerable emphasis is placed on major health research developments (both past and present) that influence how one studies the action of drugs on the nervous system. Prerequisites: PHSL 410A/B, and CHEM 350. Credit Hours: 3

PHSL575 - Neuroendocrinology Designed to investigate and discuss the current research and historical aspects of the field of neuroendocrinology. In addition, designed to have students examine and evaluate current literature in the field and through discussion have them present their analysis of the research. One hour of lecture, one hour of discussion of textual material, one hour of multiple reports on library research. Prerequisite: PHSL 410A, B or equivalent, or an undergraduate/graduate endocrinology course, or consent of instructor. Credit Hours: 3

PHSL581A - Multimedia in Medical Education Students will participate in the daily discussions of a medical education multimedia corporation. Emphasis will be on process and instructional design. Students will be supervised by team members in the production of commercial educational packages. Skills to be acquired include the ability to digitize images and sound, and to create a Power Point presentation on a topic of the student's choice. Credit Hours: 3

PHSL581B - Advanced Multimedia in Medical Education Intended to be a "hands on" course which contributes significantly to the development of multimedia teaching materials for medical education. Students will be assigned to a project as part of a development team. Under supervision of the team leader, they will assist in software design, material preparation and assembly. Prerequisite: PHSL 581A. Credit Hours: 6

PHSL582 - Clinical Application/Radiology The study of human anatomy through imaging techniques such as standard x-rays, computer assisted tomography (CT) and magnetic resonance imaging (MRI). The course will include individualized work with clinical specialists in a hospital setting for 1/2 day per

week with times to be arranged. Restricted to graduate status, acceptance into anatomy certificate program. Graded S/U. Credit Hours: 3

PHSL590 - Readings or Research in Current Physiological Topics By special arrangement with the instructor with whom the student wishes to work. Graded S/U only. Credit Hours: 1-4

PHSL598 - Research The credit hours selected for this course registration will be determined by the major professor of the student. In a typical semester no more than six hours will be taken by a student except under special circumstances. Graded S/U only. Special approval needed from the instructor. Credit Hours: 1-12

PHSL599 - Thesis Research Research for thesis for Master's degree. Credit Hours: 1-6

PHSL600 - Dissertation Research Research for dissertation for Ph.D. degree. Credit Hours: 1-32

PHSL601 - Continuing Enrollment For those graduate students who have not finished their degree programs and who are in the process of working on their dissertation, thesis, or research paper. The student must have completed a minimum of 24 hours of dissertation research, or the minimum thesis, or research hours before being eligible to register for this course. Concurrent enrollment in any other course is not permitted. Graded S/U or DEF only. Credit Hours: 1

PHSL699 - Postdoctoral Research Must be a Postdoctoral Fellow. Concurrent enrollment in any other course is not permitted. Credit Hours: 1

Molecular, Cellular and Systemic Physiology Faculty

Arbogast, Lydia A., Professor, Physiology, Ph.D., Indiana University, 1988; 1996. Molecular aspects of reproductive neuroendocrinology.

Bany, Brent M., Associate Professor, Physiology, Ph.D., Western University (Canada), 1997; 2003. Uterine biology with a focus on the establishment and progression through early pregnancy in rodents and humans.

Cheatwood, Joseph, Associate Professor, Anatomy, Ph.D., University of Florida, 2004; 2009. Mechanisms of neuroprotection and recovery of function following central nervous system injury.

Ellsworth, Buffy S., Associate Professor, Physiology, Ph.D., Colorado State University, 2002; 2007. Pituitary gland development, molecular biology, regulation of gene expression.

Jensik, Philip, Assistant Professor, Physiology Molecular, Cellular, and Systemic Physiology Ph.D., Southern Illinois University Carbondale, 2009; 2016. Neurodevelopment and Neurodegenerative Disorders, Functional Genetics, Neurobehavioral Measures.

Nordman, Jacob C., Assistant Professor, Physiology, Behavioral Neuroscience Ph.D., George Mason University, 2014; 2021. Stress, Synaptic and Intrinsic Plasticity, Brain Circuits, Aggression, Maladaptive Behavior.

Pond, Amber, Assistant Professor, Anatomy, Ph.D., Mississippi University, 1995. Ion Channel Biochemistry.

Sarko, Diana K., Assistant Professor, Anatomy, Ph.D., University of Florida, Neuroscience, 2006. Systems Neuroscience, Neuroanatomy, Neurophysiology.

Zheng, Zhengui (Patrick), Associate Professor, Physiology, Ph.D., Shanghai University of Traditional Chinese Medicine, 1997; 2014. Steroid hormone-regulated sexual dimorphic development of external genitalia, brain, and limbs and the genetic impact of environmental chemicals on sexual dimorphic organ development.

Emeriti Faculty

Bartke, Andrzej, Professor, Emeritus, Ph.D., University of Kansas, 1965; 1984.

Browning, Ronald A., Professor, Emeritus, Ph.D., University of Illinois Medical Center, Chicago, 1971; 1973.

Clough, Richard, W., Professor, Ph.D. University of Nebraska, 1983; 1987.
Collard, Michael W., Associate Professor, Emeritus, Ph.D., Washington State University, 1987; 1993.
Coulson, L. Richard, Professor, Emeritus, Ph.D., University of Toronto, Canada, 1971; 1978.
Cox, Thomas C., Professor, Emeritus, Ph.D., Arizona State University, 1979; 1982.
Ellert, Martha, Associate Professor, Emerita, Ph.D., University of Miami, 1967; 1975.
Falvo, Richard E., Professor, Emeritus, Ph.D., University of Wyoming, 1970; 1973.
Ferraro, James S., Associate Professor, Ph.D., The Chicago Medical School, 1984; 1987.
Hales, Dale Buchanan, Professor, Emeritus, Ph.D., University of Colorado Health Sciences Center, 1983; 2009.
Huggenvik, Jodi I., Associate Professor, Emerita, Ph.D., Washington State University, 1985; 1993.
Hunter, William S., Associate Professor, Emeritus, Ph.D., Michigan State University, 1971; 1975.
Murphy, Laura, Professor, Emerita, Ph.D., Medical College of Georgia, 1984; 1987.
Narayan, Prema, Associate Professor, Emerita, Ph.D., University of Minnesota, 1984; 2005.

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