
EXERCISE SCIENCE

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About the Department

The Exercise Science Department provides a scientific background which fosters critical thinking related to human health and performance in the areas of nutrition, exercise physiology, biomechanics, and neuromuscular adaptation. Students will learn about the structure and function of the human body, how changes in use affect muscle properties and function, how the body responds to exercise and nutrition, and the importance of body mechanics from both a clinical and performance perspective through coursework and laboratory experiences. Students have the opportunity to collaborate and conduct research with faculty using the department's four state-of-the-art facilities. Students who complete their degree are prepared for careers in health professions, research, and the fitness industry.

Departmental Goals

Students in the Exercise Science program:

1. Acquire both breadth and depth in their understanding of the field of exercise science through classroom and laboratory exercises;
2. Read and evaluate scientific literature, and apply research findings to broader contemporary issues in human health and performance;
3. Gain the skills to responsibly (and ethically) collect, analyze, and interpret data, and draw logical conclusions;
4. Communicate effectively through discussion, written work, and oral presentation;
5. Apply academic experiences to solve real-world problems and sustain professional growth.

The sequencing of courses within the department is a well thought out progression of both knowledge and skills. First-year students often fulfill Chemistry 110, 105, or 115, Math 160, and Biology 111. These courses provide a foundation of quantitative and scientific background necessary for upper division courses within the Exercise Science major. Second year courses include Introductory Research Methods (EXSC 200), and the year-long Human Anatomy and Human Physiology sequence (EXSC 221/222). Usually, Physics 111 is fulfilled in the second year also. In the third year, students complete Biomechanics (EXSC 336), Exercise Physiology (EXSC 329), Nutrition (EXSC 301), and Neuromuscular Adaptation (EXSC 328). In the fourth year, students will complete a Senior Capstone (EXSC 450) requiring a group research project. Additionally, students will choose two Exercise Science electives from 300-400 level course offerings.

General Requirements for the Major or Minor

General university degree requirements stipulate that 1) at least four units of the major or three units of the minor be taken in residence at Puget Sound; 2) students earn a GPA of 2.0 in courses taken for the major or the minor; and 3) all courses taken for a major or minor must be taken for graded credit. Any exceptions to these stipulations are indicated in the major and minor degree requirements listed below.

Requirements for the Bachelor of Science Degree

Completion of the following 5 areas:

1. EXSC 200 Introductory Research Methods; EXSC 221 Human Physiology; and EXSC 222 Human Anatomy.

2. Biology 111; Chemistry 105 or 110 or 115; Math 160; and Physics 111.
3. EXSC 301 Nutrition and Energy Balance; EXSC 328 Neuromuscular Adaptation; EXSC 329 Exercise Physiology; and EXSC 336 Biomechanics.
4. EXSC 450 Senior Capstone
5. Two units at the 300 level or higher in Exercise Science that are not counted toward the major in another capacity.

Requirements for the Minor

A Minor in Exercise Science requires completion of five courses to include EXSC 200, 221 and 222; and two of the following 300 level courses: EXSC 301, 328, 329, or 336.

Notes

1. A grade of C or higher must be earned in BIOL 111, CHEM 105 or 110 or 115, MATH 160 and PHYS 111.
2. A grade of C or higher must be earned in each of the following prerequisite courses: EXSC 200, 221, and 222.
3. The Exercise Science Department reserves the option of either excluding courses more than 10 years old from applying to a major or minor or requiring such courses to be repeated.

Course Offerings

Unless otherwise specified, each course carries 1 unit of credit and is offered at least once each academic year. Please see "Frequency of Course Offerings" on page 18.

Exercise Science (EXSC)

200 Introductory Research Methods This course introduces students to the components of exercise science research including data collection and analysis skills. Health-related physical fitness is evaluated by students conducting fitness tests on one another. Students apply statistical procedures to these datasets to explore and answer questions pertaining to physical fitness measurement and evaluation. Lab writing skills are also developed in preparation for subsequent courses in the major. Additional topics include ethics pertaining to conducting human research, experimental design, and exploration of student interest within the major. *Prerequisite: MATH 160 with a grade of C or higher. Offered every semester.*

221 Human Physiology This course studies the functions of the different human systems including endocrine, muscular, nervous, circulatory, respiratory, and others. *Prerequisite: BIOL 111, CHEM 105 or 110 or 115, and EXSC 222, all with grades of C or higher, or permission of instructor. Offered spring semester.*

222 Human Anatomy This course presents a systemic approach to studying the structure of the human body, including the skeletal, muscular, integumentary, nervous, cardiovascular, respiratory, digestive, urinary, and endocrine systems. Laboratory sessions reinforce content learned in lecture, including manipulation of anatomical models complemented by observation of dissected human cadavers. Descriptions of important structure-function relationships are also integrated throughout the course. *Prerequisite: BIOL 111 with a grade of C or higher, or permission of instructor. Offered fall semester.*

280 Directed Research Variable credit up to 1.00 unit. This course provides a laboratory research experience for sophomores under the direction of a faculty member. Students may initiate a project or join a research project in the mentor's lab. Student and mentor fill out a

department contract. A written research paper and a reflective summary of the research experience must be submitted for a final grade. *Prerequisite: Permission of the instructor. May be repeated for credit up to 1.00 unit. Cannot be audited.*

301 Nutrition and Energy Balance This course provides students with the basic concepts of nutrition and exercise as they relate to health and the prevention of disease. The functions of the six essential nutrients are explored in detail with attention to their roles in metabolism, optimal health, and chronic diseases. The energy values of food and physical activity are quantified while undertaking an in-depth case study and written analysis of personal dietary intake and physical activity. Students read scientific literature, develop informed opinions, and debate controversial issues such as organically grown and genetically modified foods, and dietary supplements. Other potential topics include nutrition and dieting fads, advertising, weight control and obesity epidemic, sport nutrition, menu planning, and nutritional needs throughout the life cycle. *Prerequisite: BIOL 101 or 111 with a grade of C or higher.*

322 Human Dissection Anatomy 0.25 units. This course provides students with hands-on laboratory experience in human cadaver dissection by expanding on content learned previously in Human Anatomy. With weekly direction from the instructor, students work in teams in the laboratory to dissect several regions of a human cadaver, which may include the muscles, nerves, and vessels of the limbs, thorax, and/or abdomen. Students may also focus on specialized areas of interest, such as a joint capsule, hand, or internal organ. Students will learn and practice proper safety practices, dissection technique, and cadaver care. *Prerequisite: EXSC 222 and permission of instructor. May be repeated for credit. Offered spring semester.*

327 Evaluation of Sports Injuries Variable credit up to 1.00 unit. This introductory course explores the management of conditions limiting the functional capabilities of the physically active individual whose activities may range from occupational tasks to recreational sports. Information dealing with the prevention, recognition and management of these injuries or conditions is presented. Practical application of taping and bandaging techniques is also included. *May be repeated for credit up to 1.00 unit. Cannot be audited. Offered occasionally.*

328 Neuromuscular Adaptation This course explores the structural, cellular, and molecular changes that occur in skeletal muscle in response to changes in activity, injury, or experimental manipulation. A survey of the nervous system and sensorimotor control set the stage for an exploration of topics such as neuromuscular activation and neuromotor control, neuromuscular fatigue, endurance and strength training adaptations of the nervous system, and the neuromuscular responses to increased and decreased activity. *Prerequisite: EXSC 221 or 222, or permission of instructor. NRSC 201 is recommended.*

329 Exercise Physiology This course explores the body's acute responses and long-term adaptations to various modes and intensities of exercise. Students focus on understanding how the body's metabolic, cardiovascular, respiratory, muscular, and endocrine systems respond to the physiological stress of exercise and training. Laboratory topics include assessment of metabolic rate, body composition, cardiorespiratory fitness, ventilatory threshold, and anaerobic power. The impact of physical activity on select clinical populations is also considered. *Prerequisite: EXSC 200, 221, and 222, each with a grade of C or higher, or permission of instructor.*

330 Sport Nutrition and Ergogenic Aids This seminar reviews the requirements for energy macronutrients (carbohydrates, proteins, and

lipids), micronutrients (vitamins and minerals), and fluid intake as well as basic principles of digestion and absorption. The regulations on the sale of dietary supplements in the US are discussed and debated. The specific ergogenic aids covered in the course are determined by the interests of the students in consultation with the instructor. Groups of two or three students work together to locate, select, and lead discussion/presentations of primary research studies that address their topics of interest. Each student also designs a diet plan for a specific athlete and presents the plan to the class. *Prerequisite: EXSC 301, 329, or permission of instructor. Offered occasionally.*

331 Scientific Writing This class is a writing-intensive experience that will expose students to several different types of written assignments commonly completed in the scientific community. The writing includes an application for approval from the Institutional Review Board, a grant proposal, an article written from provided data, and a poster presentation. Both peers and faculty review the written submissions. Each student will present their results in a poster format. *Prerequisite: At least two of the following: EXSC 301, 328, 329, 336, or concurrent enrollment; junior or senior standing or permission of instructor. Offered occasionally.*

336 Biomechanics This course involves the study of human movement using both a qualitative and quantitative approach. The anatomical structures involved in simple and complex movements will be explored. The principles of mechanics are then applied to the study of human motion to provide an understanding of the internal and external forces acting on the body during human movement. Students will be exposed to a variety of biomechanical instruments and use them to describe and evaluate human movement. *Prerequisite: EXSC 200, EXSC 222, and PHYS 111, all with a grade of C or higher, or permission of instructor. Cannot be audited. Offered spring semester.*

380 Directed Research Variable credit up to 1.00 unit. This course provides a laboratory research experience for juniors under the direction of a faculty member. Students may initiate a project or join a research project in the mentor's lab. Student and mentor fill out a department contract. A written research paper, a reflective summary of the research experience, and an oral or poster presentation must be submitted for a final grade. *Prerequisite: Permission of the instructor. May be repeated for credit up to 1.00 unit. Cannot be audited.*

424 Recent Advances in Cellular and Molecular Mechanisms of Neuroplasticity This course explores the cellular and molecular mechanisms related to neuroplasticity. Topics such as Alzheimer's, stroke, Parkinson's, muscular dystrophy, cerebral palsy, multiple sclerosis, aging, spinal cord injury, and others will be discussed. Up-to-date molecular and cellular findings from the topics listed above and their effects on our understanding of neuroplasticity and/or neurorehabilitation will be explored. *Prerequisite: EXSC 221 or 222, or permission of instructor. NRSC 201 is recommended. Offered occasionally.*

430 Special Topics in Exercise Science This course is structured to the expertise and research interests of the professor. Each topic is unique and encompasses a current issue in the field of exercise science. *Prerequisite: At least two of the following: EXSC 301, 328, 329, 336, or concurrent enrollment; junior or senior standing or permission of instructor. May be repeated for credit. Offered occasionally.*

439 Designing Interdisciplinary Exercise Prescriptions This course will focus on designing programs intended to improve performance or quality of life with special populations. Students engage in a semester-long project designing a complete program for a specific client. The student may choose an elite athlete or disease model intended to improve

performance or health. A background in nutrition, exercise physiology, biomechanics and neuroscience will help lay the foundation for a well rounded program intended to address all aspects of the individual. Diet, agility, balance, strength, aerobic, anaerobic training, as well as the combination of training effects will be explored. Contraindications to exercise will also be examined as they relate to health. *Prerequisite: At least two of the following: EXSC 301, 328, 329, 336, or concurrent enrollment; junior or senior standing or permission of instructor. Offered occasionally.*

440 Biomechanics of Sports Injuries This course is designed to study the mechanical bases of musculoskeletal injury, to better understand the mechanisms that seem to cause injury, the effect injury has on the musculoskeletal structures, and hopefully, to study how injury may be prevented. Many different types of injury will be discussed with the students responsible for leading these discussions. Students will write a review article on an injury condition and present their findings to the class. *Prerequisite: EXSC 336. Offered occasionally.*

450 Senior Capstone Students work in small collaborations to identify a relevant scientific question, research the literature, and design and complete a research thesis written in the format of a journal style manuscript. The specific topic(s) of the course vary by semester based upon the research expertise of the faculty instructor assigned to the course, and may include topics in either biomechanics, neuromuscular adaptation, exercise physiology, or nutrition. Lecture sessions focus on primary research within the expertise of the faculty instructor and students participate by leading and taking part in lectures and discussions. Laboratory experiences include reviewing techniques from prerequisite courses and acquiring new skills required to propose and conduct original research, and present results in oral and written formats. *Prerequisite: EXSC 301, 328, 329, and 336 and permission of instructor.*

480 Directed Research Variable credit up to 1.00 unit. This course provides a laboratory research experience for seniors under the direction of a faculty member. Students may initiate a project or join a research project in the mentor's lab. Student and mentor fill out a department contract. A written research paper, a reflective summary of the research experience, and an oral or poster presentation must be submitted for a final grade. *Prerequisite: Permission of the instructor. May be repeated for credit up to 1.00 unit. Cannot be audited.*

490 Senior Research Thesis Experimental research is performed under the guidance and in the area of expertise of a faculty member that may include specialized topics in kinesiology/biomechanics, exercise physiology, nutrition and physical activity. Students must write a proposal that is approved by the department and the Institutional Review Board, carry out the research, write the thesis, and orally defend it at a research symposium. Application details can be obtained from the faculty research advisor or department chair. *Prerequisite: Junior or senior standing, 2.5 GPA, and permission of instructor. Cannot be taken Credit/No Credit.*

495/496 Independent Study Variable credit up to 1.00 unit. Research under the close supervision of a faculty member on a topic agreed upon. Application and proposal to be submitted to the department chair and research advisor. Recommended for majors prior to the senior research semester. *Prerequisite: Junior or senior standing, 2.5 GPA, and permission of instructor. May be repeated for credit up to 2.00 units.*

497 Internship Among the requirements in this seminar is the completion of 120 hours of field experience at a site prearranged in consultation with the internship coordinator in Career and Employment Services. The seminar provides students the context to reflect on concrete experiences at the site and link them to study in their disciplines as well as

the political, psychological, social, economic and intellectual forces that shape views on work and its meaning. The aim is to integrate the liberal arts with issues and themes surrounding the pursuit of a good and productive life. In certain pre-approved instances, an individualized learning plan with a faculty sponsor may substitute for the seminar. *Prerequisite: Junior or senior standing, 2.5 GPA, ability to complete 120 hours at internship site, approval of the CES internship coordinator, and completion of learning agreement. May be repeated for credit.*

498 Internship Seminar Among the requirements in this seminar is the completion of 120 hours of field experience at a site prearranged in consultation with the internship coordinator in Career and Employment Services. The seminar provides students the context to reflect on concrete experiences at the site and link them to study in their disciplines as well as the political, psychological, social, economic and intellectual forces that shape views on work and its meaning. The aim is to integrate the liberal arts with issues and themes surrounding the pursuit of a good and productive life. In certain pre-approved instances, an individualized learning plan with a faculty sponsor may substitute for the seminar. *May be repeated for credit. Cannot be audited. Cannot be taken Credit/No Credit.*