

Description of Sport & Exercise Major

The B.S. in Sport and Exercise Science is a science-based undergraduate curriculum that explains the contribution of chemistry, nutrition, physiology, anatomy, biomechanics, motor learning and psychology to effective exercise and sport performance (see proposed curriculum plan below). Students wishing to enter the job market with a bachelor's degree are prepared for entry-level positions with community, medical, corporate, and athletic fitness programs delivered by health clubs, YMCAs, hospitals, industry, and intercollegiate or professional sports teams, and are equally prepared for employment in the sales or marketing division of exercise or medical equipment manufacturers. Students wishing to pursue further education are qualified for graduate studies leading to master's and/or doctoral degrees in clinical exercise physiology, preventative and rehabilitative exercise, biomechanics, motor control and development, sports psychology, podiatry, optometry, chiropractic medicine, physical therapy and occupational therapy. In addition to meeting the general admission requirements for the university, students considering a major in exercise science should take courses in chemistry and physics, as well as a fourth year of mathematics such as calculus or probability and statistics.

Job Outlook

The marketplace for recipients of undergraduate and graduate degrees in exercise science is excellent. Starting salaries with a bachelor's degree range from \$25,000 to \$35,000; starting salaries with a master's or doctoral degree range from \$35,000 to \$75,000. For more information on the scope of this degree and the industry in general, please refer to the following web link of the American College of Sports Medicine (ACSM): <http://www.exercisescience.mtu.edu/documents/careers011302.pdf>

Course Descriptions, Rationale, and Objectives

SPEX132 Health & Wellness (5)

The course provides students with a general overview of the physical, social, emotional, intellectual, spiritual and environmental dimensions of health and their application to personal wellness.

The study of sport and exercise science requires students to have an operating definition of health and a full understanding of the factors that foster or deter health. More over, students must be able to differentiate health from fitness and athleticism in order to develop appropriate protocols for promoting these three varying activity modes.

1. Identify the factors that positively and negatively affect health.
2. Describe the major health risks and diseases affecting contemporary society
3. Explain the principal ways to promote health through lifestyle and behavior change

SPEX211 Responding to Emergencies (5)

The course provides students with the knowledge and skills to respond to injury sustained during training and sport performance and to sustain life until medical help arrives following a sudden acute event as a result of training or performance.

The study of sport and exercise science requires students to understand the basic factors of personal safety needed for preventing injury and the ability to recognize an emergency when it occurs, and to make quick and appropriate decisions to respond to the emergency. Includes associated lab.

1. Identify the pre-training factors that foster safe and injury-free training.
2. Identify signs and symptoms of soft tissue and musculoskeletal injuries and the methods of responding and/or treating these in emergency situations.
3. Identify life-threatening circumstances and the signs and symptoms of shock and the methods of responding and/or treating these in emergency situations.

SPEX 231 Sport & Exercise Physiology (5)

The course introduces students to the acute responses and chronic adaptations of the body to the stresses of training using a mechanistic approach so that students first understand the details of how response and adaptation occur so they will be more likely to predict and control the response. Includes associated lab. Prerequisites: CHEM 101 and CHEM 102, BIOL 200 and BIOL 210.

The study of sport and exercise science requires students to have competency in basic human anatomy and physiology. Emphasis in this course utilizes this information to focus on how the body and its systems respond to the differing types of intensities of training. For students who wish to pursue further studies in this subject, a thorough mastery of this fundamental information provides the foundation for advanced study in bioenergetics, biochemistry and physiology.

1. Understand the various methods of energy production and the conditions in which each method of energy production contributes to physical activity.
2. Understand lactic acid and its role in exercise metabolism, VO_2 and factors influencing VO_2 and $VO_{2\max}$, gas exchange (oxygen and carbon dioxide) between atmospheric air and its relevance to the aerobic production of ATP
3. Understand the biological, biochemical and mechanical components involved in muscle contraction and their adaptations to different types of training

SPEX 312 Nutrition for Sport & Exercise (5)

The course addresses the nutritional requirements and practices of individuals involved in high-level human performance. Students will develop an understanding of nutrient metabolism required for training, the principles of a healthy competitive diet, the role of

ergogenic aids, and the interaction of body composition, nutrition, and performance.

Prerequisites: SPEX 231

The study of sport and exercise science requires students to understand the factors that determine the selection and metabolism of nutrients that fuel training and performance and the impact of that process on lean muscle mass, fat accumulation, performance energy, and heat diffusion.

1. Discuss the effects of carbohydrates, protein, fat, minerals, vitamins and fluids as they relate to training and performance.
2. Understand the relationship between body composition, energy demand, and diet.
3. Use computer diet software to collect, analyze, evaluate and summarize dietary information and to prepare dietary recommendations.

SPEX 313 Biomechanics & Motor Learning (5)

The course presents the mechanical principles pertinent to the understanding of human motion and the procedures for application of Newtonian mechanics to human movement analysis through creation of biomechanical models using three-dimensional and two-dimensional video and accompanying analog data. The course also presents the relationship of organismic and situational factors to the acquisition and performance of movement including generalized patterns and highly specific skills of sport. The course enables students to understand the general paradigm of how individuals learn movement skills. Includes associated lab.

The study of sport and exercise science requires students to understand the mechanical and anatomical principles that govern human motion and develop the ability to link the structure of the human body with its function from a mechanical perspective. In order to do so, students must be able to describe motion with precise, well-defined mechanical and anatomical, understand and quantify linear and angular characteristics of motion.

Prerequisites: PHYS 105

1. Obtain and analyze kinematics and kinetics that occur during human movement.
2. Calculate external and internal forces and torques acting on the body by combining kinematic, kinetic, and anthropometric variables during static and dynamic human movement.
3. Use the scientific research process effectively to ask relevant questions, formulate hypotheses, collect data, present results, and evaluate the results relative to the hypotheses.

SPEX 321 Care & Prevention of Athletic Injuries (5)

The course develops the knowledge and skills necessary to prevent, evaluate, and remedy athletic injuries using short-term treatment techniques and modalities. Students become

familiar with various protective devices, preventative strategies of taping, wrapping and padding, and short-term treatment actions including massage, ice, heat, and numerous electrical and mechanical devices, all presented to prepare students for the NATA Athletic Trainer certification exam. Includes associated lab. Prerequisites: SPEX 211

The study of sport and exercise science requires students to have the knowledge to evaluate, ability to treat and the understanding of rehabilitation strategies for common injuries sustained during sport and exercise. From this perspective students can determine if certification in athletic training or graduate studies in physical therapy should be included in their career plans.

1. Identify common sport and exercise injuries.
2. Perform appropriate evaluation techniques with regard to sport and exercise injuries
3. Understand the principles of injury care and management.

SPEX 322 Principles of Resistance and Metabolic Training (5)

The course reviews and applies anatomical, biomechanical and physiological principles to develop general and sport-specific strength training programs that improve fitness and athletic performance. Includes associated lab. Prerequisites: SPEX 231 and SPEX 312

The study of sport and exercise science requires students to both understand and apply scientific constructs to the metabolic training paradigm so that training is safe and effective because it adheres to all five key elements of training: individualization, neuromuscular specificity, overload, periodization, and reversibility.

1. Understand and apply the principles associated with for stroke volume, capillary efficiency, oxygen transport, muscle specific lactate removal, maximum oxygen to muscle, lactate tolerance, energy delivery without oxygen, lactate buffering, maximum lactate production, creatine pool enhancement and recovery.
2. Understand and apply the principles associated with standard resistance training, circuit training, core training, stabilization training, and functional training for purpose of improving muscular strength, power, endurance, flexibility, speed, and agility.
3. Design a sport-specific training program to optimize athletic performance across defined macrocycle and associated mesocycles and microcycles of training.

SPEX 331 Exercise for Rehabilitation (5)

The course provides students with the basic concepts of cardiac and pulmonary rehabilitation programs and the knowledge and skills needed to design, implement and asses progress of rehabilitation programs to return individuals to a healthy state, full functional fitness or athletic performance.

The study of sport and exercise science requires students to identify individuals with impaired cardiovascular or pulmonary function and understand basic assessment, education, and behavior modification in order to prevent the onset or rehabilitate from cardiovascular disease and pulmonary disease. Includes associated lab. Prerequisites: SPEX 231

1. Know theoretical basis for disease rehabilitation and assess scientific evidence of its effectiveness.
2. Know theoretical basis for sport rehabilitation and assess scientific evidence of its effectiveness.
3. Interpret performer information to set and prioritize realist rehabilitative goals.

SPEX 411 Fitness Testing & Technology (5)

The course provides a review of the theoretical constructs of exercise physiology and the hands-on training in testing technology to enable students to competently assess levels of fitness in low-risk to high-risk individuals. The course includes use of informed consent, health and wellness screening, and protocols for body composition, resting metabolic rate, cardiovascular and muscular fitness, flexibility, aerobic capacity, anaerobic power, and numerous sport-specific fitness tests, all presented to prepare students for the ACSM Health Fitness Instructor certification exam. Includes associated lab. Prerequisites: SPEX 231 and SPEX 313

The study of sport and exercise science requires students to assess heart and lung function, muscle tone, strength, and endurance, balance, flexibility, coordination, reaction time, body composition, and other key attributes of human movement before prescribing training procedures for their improvement and to be competent in using technology for obtaining and evaluating these attributes.

1. Use computer software and device technologies appropriate for assessing fitness and motor performance.
2. Understand a range of fitness assessment protocols and sport skills tests and apply them effectively.
3. Identify individuals for whom exercise would be contraindicated.

SPEX 421 Sport & Exercise Psychology (5)

The course examines the relationship of psychology to sport and exercise. Topics include application of learning principles, social psychology, personality variables, psychological assessment, sport performance and exercise adherence. Includes associated practicum.

The study of sport and exercise science requires students to comprehend the relationships between sport and exercise participation and individual factors including personality, self-concept and self-esteem, stress, anxiety, and depression, emotional well-being, body image,

and quality of life and the relationships between sport performance and mental skills including goal setting, confidence and motivation, causal attribution, fear of failure, attentionality, visualization, aggression, and psyching or calming pre-performance states.

1. Understand the primary psychological and social-psychological theories of exercise, rehabilitation, and pre-performance behavior.
2. Understand and use normative assessment instruments.
3. Use established intervention strategies and mental skills training activities.

