

Exercise Science

Faculty: Assistant Professors Thomas Roberge and Amanda Tepfer; Lecturer Kylie Cowens

Information

Goals:

- The goals of the Exercise Science major are to provide undergraduate students with the following:
 - A fundamental background in human physiology
 - An understanding of how exercise can impact the human body in a positive manner
 - A solid foundation in the natural sciences
 - To produce highly trained individuals to educate others on how to exercise appropriately without causing undue harm

Outcomes:

- Exercise Science students will acquire scientific literacy related to the biological and exercise sciences. This will be demonstrated through written and oral expression.
- Exercise Science students will conduct laboratory research to allow students to learn hands-on experimental methodology, approach, design, and statistical analysis.
- The Exercise Science major will give students the knowledge, skills and abilities to become gainfully employed upon graduation or secure a position at a graduate school in a related field.

Careers for this Major:

- Cardiopulmonary Rehabilitation Specialist; Exercise Technologist in cardiology suites
- Personal Trainer/Exercise leader
- Strength and Conditioning Coach for College, University and professional sports programs
- Laboratory Researcher in exercise science
- Sports Nutritionist
- Corporate Fitness Program Director
- Sports and Wellness Program Instructor and Director
- Health Promotion Specialist

B.S. in Exercise Science Curriculum Map 2016-2017 Catalog

Print PDF Curriculum Map (http://catalog.norwich.edu/residentialprogramscatalog/collegeofscienceandmathematics/exercisesci/exercisesci_1485371440164.pdf)

Freshman			
Fall	Cr.	Spring	Cr.
BI 101 Principles of Biology I (General Education Lab Science)	4	CH 101 Introduction to General Chemistry	4
EN 101 Composition and Literature I	3	EN 102 Composition and Literature II	3
MA 107 Precalculus Mathematics (General Education Math)	4	MA 232 Elementary Statistics (General Education Math)	3
PE 161 Physical Fitness & Wellness Assessment ^C	3	PE 265 Lifelong Motor Development ^C	3
PE 260 Personal and Community Health ^C	3	PE 107 Foundations of Physical Education ^C	3
Semester Total Credits	17	Semester Total Credits	16
Sophomore			
Fall	Cr.	Spring	Cr.
BI 215 Human Anatomy & Physiology I	4	BI 216 Human Anatomy & Physiology II	4
CH 102 Introduction to Organic and Biochemistry	4	BI 253 Foods and Nutrition	4
PE 261 Foundations in Health Education ^C	4	General Education Literature	3
PE 306 Outdoor Physical Education I ^C	3	PE 307 Outdoor Physical Education II ^C	3
		PY 211 Introduction to Psychology (General Education Social Science)	3
Semester Total Credits	15	Semester Total Credits	17
Junior			
Fall	Cr.	Spring	Cr.
PE 355 Coaching:Leadership in Sports (General Education Ethics) ^C	3	BI 364 Pathophysiology in Sports Medicine ^C	4
PE 365 Kinesiology ^C	4	General Education Arts & Humanities	3
PE 333 Management Sports Facilities ^C	3	General Education History	3
PS 201 General Physics I	4	PE 371 Physiology of Exercise ^C	4
		PE 432 Organization and Administration in Physical Education ^C	3
Semester Total Credits	14	Semester Total Credits	17
Senior			
Fall	Cr.	Spring	Cr.
BI 401 Senior Seminar (Capstone) ^C	3	PE 426 Internship (OR Free Elective)	12
BI 440 Reading and Research (OR Free Elective)	3-4		
PE 441 Advanced Exercise Physiology and Prescription ^C	4		
PE 450 Exercise Testing and Electrocardiography ^C	4		
Semester Total Credits	14-15	Semester Total Credits	12
Total Credits For This Major: 122-123			

c Grade of C or higher required.

- All sciences must be taken as lab sciences (4 credit courses)
- Certification in First Aid & CPR is also required for graduation

Biology Courses

BI 101 Principles of Biology I 4 Cr.

This course is the prerequisite for all biology courses and satisfies general education laboratory science requirements for both majors and non-majors. This course gives an introduction to biochemistry, cell structure, metabolism, and protein synthesis, as well as human anatomy and physiology. Dissection of living and preserved animals is required. Classroom 3 hours, laboratory 2 hours. Offered fall and spring semesters.

BI 102 Principles of Biology II 4 Cr.

This course is a prerequisite for most biology courses and satisfies general education laboratory science requirements for both majors and non-majors. This course explores genetics, evolutionary theory, diversity of life on earth, history of life on earth, and ecology. Dissection of preserved animals is required. Classroom 3 hours, laboratory 2 hours. Prerequisite: BI 101 or permission of the instructor. Offered spring semesters.

BI 122 Concepts in Biology 4 Cr.

A lab science course designed exclusively for non-science majors that aims to give students an appreciation of the major concepts and current topics in biology. Concepts may include cell structures, photosynthesis, cellular respiration, genetics and ecology as well as human anatomy and physiology. Current topics may include stem cell research, nutrition, diseases, steroid abuse, traumatic brain injury, global climate change, and other pertinent issues. The course meets the general education requirement for laboratory science, but cannot be counted towards a biology major or minor. Credit may not be earned for both BI 101 and BI 122. Classroom 3 hours, laboratory 2 hours. Offered spring semesters.

BI 1XL Biology Lab Elective 4 Cr.

BI 1XX Biology Elective 3 Cr.

BI 201 Comparative Vertebrate Anatomy 4 Cr.

A study of the origins, structure and functions of the organ systems of representative vertebrates. An attempt is made to correlate form and function in the evolution of the vertebrates. Classroom 3 hours, laboratory 3 hours. Prerequisites: BI 101, BI 102. Offered fall semesters of odd numbered years.

BI 202 Genetics 4 Cr.

The physical and chemical basis of inheritance, expression, and interaction of the hereditary units, linkage, and variation. The application of Mendelian principles to plants and animals. Consideration is also given to microbial and viral genetics and genetic engineering. Classroom 3 hours, laboratory 2 hours. Prerequisites: BI 101, BI 102. Offered fall semesters.

BI 203 Introduction to Scientific Method & Bioscientific Terminology 1 Cr.

An introduction to the philosophy of science, the scientific method and bioscientific terminology. Analysis of data and interpretation of scientific and science-related popular press articles is stressed. Includes exposure to various forms of scientific communication and data collection and analysis. Prepares the student for the rigors of majoring in the biological sciences. Classroom 1 hour. Prerequisites: Sophomore standing, major in Biology.

BI 215 Human Anatomy & Physiology I 4 Cr.

This is the first half of a two semester course exploring human anatomy and physiology. It covers cellular metabolism, tissues, and the following body systems: skeletal, muscle, integumentary, and nervous. Dissection of preserved animals is required. Classroom 3 hours, laboratory 2 hours. Offered fall semesters.

BI 216 Human Anatomy & Physiology II 4 Cr.

This is the second half of a two semester course exploring human anatomy and physiology. It investigates the following body systems: endocrine, digestive, respiratory, circulatory, lymphatic (including the immune response), urinary, and reproductive. Dissection of preserved animals is required. Classroom 3 hours, laboratory 2 hours. Prerequisite: BI 215 or permission of the instructor. Offered spring semesters.

BI 220 Introductory Microbiology 4 Cr.

A survey of the field of microbiology with emphasis on those microorganisms of medical significance. Fundamentals of microbial structure, physiology and control are considered along with the role of pathogenic organisms in the infectious and disease processes. Laboratory exercises are designed to provide facility in visualizing, staining, culturing, enumerating, isolating, maintaining, and identifying micro organisms. Classroom 3 hours, laboratory 2 hours. Offered spring semesters.

BI 240 Environmental and Food Microbiology 4 Cr.

A course designed to develop an awareness of the essential role of microbes in maintaining the biosphere and the quality of life of its human inhabitants. The role of microorganisms as degraders, bioremediators and recyclers of essential elements will be presented and reinforced through laboratory exercises. The dependence of humans on microorganisms for health, food transformation, pharmaceutical production and genetic engineering will be explored in lecture and lab. Controversies surrounding the use of biotechnology to produce genetically engineered foods and animals as well as agents for bioterrorism, will be discussed. Classroom 3 hours, laboratory 2 hours. Prerequisites: BI 101, BI 102 or permission of the instructor. Offered even-numbered fall semesters.

BI 253 Foods and Nutrition 4 Cr.

A course designed to provide the student with a background in organizational structure and activities that emphasize the physiological basis of nutrition with an analysis of nutritional needs at various age levels. Consideration given to the relationship of nutrition to health and fitness, principles of food selection, metabolism of nutrients, vitamins and minerals, energy balance and obesity, food safety and technology. Classroom 3 hours, Field Experience/Laboratory 2 hours. Prerequisite: BI 101. Offered spring semesters.

BI 260 Ornithology 4 Cr.

A survey of avian biology and ecology to include evolution, the anatomical and physiological adaptations for flight, migration, behavior, reproduction and identification of birds and their songs. Integrated classroom, laboratory, and field studies will emphasize Vermont birds. Dissection of the pigeon during the spring semester is an integral part of the spring course's laboratory component. The summer course features a nesting study in lieu of dissection. Classroom 3 hours, laboratory 2 hours. Offered spring semesters.

BI 275 Environmental Biology 4 Cr.

An introduction to the interaction of man and the environment with emphasis on contemporary problems and their possible solutions. Local and global forms of pollution, detrimental environmental practices, and other relationships will be explored in the classroom and the laboratory. Classroom 3 hours, laboratory 2 hours. Prerequisites: BI 101, BI 102 or permission of the instructor. Offered even-numbered spring semesters.

BI 2XL Biology Lab Elective 4 Cr.**BI 2XX Biology Elective 3 Cr.****BI 302 Embryology 4 Cr.**

A study of the fundamental principles of development through the establishment of the major organs and systems, exemplified in the laboratory by study of representative embryonic forms. May require dissection of living and preserved animals. Classroom 3 hours, laboratory 2 hours. Prerequisite: BI 101, BI 102 or permission of instructor. Offered even-numbered spring semesters.

BI 304 Physiology 4 Cr.

A study of the comparative physiology of animals. Physical and chemical principles, cell physiology, with emphasis on homeostatic mechanisms and the study of functions of organ systems. May require dissection of living animals. Classroom 3 hours, laboratory 3 hours. Prerequisites: BI 101, BI 102, and 1 year of college chemistry. Offered even-numbered spring semesters.

BI 305 Biomedical Techniques 4 Cr.

Students are familiarized with the theories and applications of the new technologies that pervade the fields of biotechnology and molecular biology. Laboratory exercises illustrate key concepts and provide hands-on experience in the use of instrumentation essential to molecular biologists. Classroom 2 hours, laboratory 4 hours. Prerequisites: BI 101, BI 102 or BI 215, BI 216, and CH 103, CH 104. Offered odd numbered fall semesters.

BI 306 Cell Biology 4 Cr.

A molecular level examination of the ultrastructure and function of the cytoplasm, intracellular components, cell membrane, extracellular structures and formation, and excretion of extracellular products. Recent developments in molecular biology will be stressed, including the implications for the biotechnology industry. The laboratory component will include state-of-the-art procedures and will emphasize hands-on experimental techniques. May require dissection of living animals. Classroom 3 hours, laboratory 3 hours. Prerequisites: BI 101, BI 102 and one year of college chemistry. Offered even-numbered fall semesters.

BI 316 Plant Taxonomy 4 Cr.

A general survey of the taxonomy and evolution of vascular plants, emphasizing herbaceous plants. Recognition of plant families, identification of species, and principles of collecting and preserving are stressed. Classroom 3 hours, laboratory 3 hours. Prerequisite: BI 102 or permission of instructor. Offered even-numbered fall semesters.

BI 325 Invertebrate Zoology 4 Cr.

A fundamental course designed to give the student a general knowledge of the structure, physiology, life histories, and ecology of the invertebrate animals. Requires dissection of living and preserved animals. Classroom 3 hours, laboratory 2 hours. Prerequisites: BI 101, BI 102. Offered even-numbered fall semesters.

BI 326 Natural History of the Vertebrates 4 Cr.

A study of the classification, identification, and ecology of the vertebrates with special emphasis on the local fauna. Collection and preservation of organisms is an integral part of the course. Classroom 3 hours, laboratory 3 hours. Prerequisites: BI 101, BI 102. Offered odd-numbered fall semesters.

BI 330 Immunology 4 Cr.

A course presenting the basic principles of immunology, including antigen-antibody characteristics, the role of the immune system in defense and disease, and the application of fundamental concepts in the development of new technologies and immunodiagnosis. Classroom 3 hours, laboratory 3 hours. Prerequisites: BI 101, BI 102 or BI 215, BI 216, and 1 year of college chemistry. Offered odd-numbered spring semesters.

BI 341 Plant Anatomy 4 Cr.

The anatomy of vascular plants analyzed from an evolutionary viewpoint. Cell structure, tissues, their distribution in roots, stems, leaves and reproductive organs, and plant development are stressed. Classroom 3 hours, laboratory 3 hours. Prerequisite: BI 102 or permission of instructor. Offered odd-numbered spring semesters.

BI 351 Dendrology and Silvics 4 Cr.

An introduction to major woody plant species in the Northeast, including taxonomic characteristics, life histories, habitat requirements, and economic importance. Classroom 3 hours, laboratory and/or field work 3 hours. Prerequisite: BI 102 or permission of instructor. Offered odd-numbered fall semesters.

BI 364 Pathophysiology in Sports Medicine 4 Cr.

The study of human pathology with primary emphasis on the pathogenesis of those pathological states most commonly encountered in sports medicine, their disruption of normal physiology and the body's mechanism for restoring the steady state (homeostasis). The biology of the disease process is examined at the molecular, cellular, tissue, organ and organ system level. Classroom 3 hours, laboratory 2 hours. Prerequisites: BI 215 & BI 216 with "C" or higher, or permission of instructor. Offered even-numbered spring semesters.

BI 370 Introduction to Neuroscience 4 Cr.

An interdisciplinary course designed to introduce the structure and function of the mammalian nervous system. Topics include, but are not limited to, neuronal development, sensory and motor systems, chemical control of the brain and behavior, and the underlying mechanisms of neurodegenerative disease. May require dissection of living animals. Classroom 3 hours, laboratory 2 hours. Prerequisites: BI 101 and either BI 215 or PY 230. Offered fall semesters.

BI 399 Topics in Biology 4 Cr.**BI 3XL Biology Lab Elective 4 Cr.****BI 3XX Biology Elective 3 Cr.****BI 401 Senior Seminar 3 Cr.**

This is the capstone course that integrates reading, writing, speaking and critical thinking skills. It includes instruction in scientific writing, use of contemporary scientific biological literature, library research techniques, and requires a major paper considering ethics in science and research. Students will prepare research papers on current topics using primary sources and give oral presentations on their topics to the department faculty. Classroom 3 hours. Prerequisites: senior class standing or permission of the instructor. Offered fall semesters.

BI 402 Evolution 4 Cr.

This course is designed to introduce the student to Darwinian and Non-Darwinian mechanisms of evolutionary change, a history of life in the context of contemporary biology, and scientific and cultural controversies surrounding this topic. Offered Fall semesters. Classroom: 4 hours. Prerequisites - BI 101, BI 102 and BI 202 or permission of the instructor.

BI 405 Ecology 4 Cr.

The interrelationships between living organisms and their total environment are studied through a combination of lecture, laboratory and field studies. Major concepts include ecosystem structure and function, community development, species diversity, succession, interspecific and intraspecific relationships, competition, predation, behavior, population growth and regulation. Collection and preservation of plants and animals may be required. Classroom 3 hours. If taken for four credits also laboratory and/or field work 3 hours. Prerequisites: BI 101, BI 102. Offered fall semesters.

BI 415 Neuroanatomy 4 Cr.

The anatomy of the brain and nervous system, with an emphasis on human neuroanatomy. Gross and microscopic anatomy is covered, with in depth treatments of physical and functional organization, and major neural pathways. Classroom 3 hours, laboratory 2 hours. Prerequisites: BI 370.

BI 418 Medical Microbiology 4 Cr.

A study of pathogenic microorganisms including their general characteristics, physiology, pathogenesis, pathology, diagnosis, treatment, immunity, prevention, and control. Laboratory exercises are designed to familiarize students with diagnostic procedures used in the clinical microbiology laboratory. Classroom 2 hours, laboratory 4 hours. Prerequisite: BI 220 or BI 240. Offered even-numbered spring semesters.

BI 420 Diseases of the Nervous System 4 Cr.

An in-depth study of the biological basis of neurological and psychiatric disorders. Topics include, but are not limited to, developmental disorders, impairments of higher function, and the underlying mechanisms of neurodegenerative disease. Drug development and other therapeutic treatment strategies will be discussed using current scientific literature. Classroom 4 hours. Prerequisite: BI 370. Offered spring semesters.

BI 424 Woodland Ecology and Management 4 Cr.

A review of biotic and abiotic factors controlling the forest environment, methods for determining vegetation structure and succession, introduction to major forest associations in the Northeast, and consequences of various harvesting and management techniques. Classroom 3 hours, field studies 3 hours. Prerequisites: BI 351 or BI 316, or permission of instructor. Offered even-numbered spring semesters.

BI 440 Reading and Research 3,4 Cr.

Independent study under the supervision of a department faculty member. Open to junior and senior majors with permission of instructor. BI 440 may be taken no more than twice, for a maximum of 7 credits. Students requesting this course must have a 3.0 GPA in biology courses or departmental approval. An approved topic, a brief outline of the research to be conducted, and a signature from a biology mentor must be submitted to the department chair before the end of the drop-add period of the enrolled semester.

BI 450 Internship in Biology 3,4 Cr.

Internship in Biology.

BI 4XX Evolution 4 Cr.**Chemistry Courses****CH 100 Introduction to Forensic Science 4 Cr.**

An introductory survey course of Forensic Science/Criminalistics. The course will focus on scientific principles behind the recognition, collection, preservation, analysis, and interpretation of physical evidence found at a crime scene. The emphasis will be put on providing students with an understanding of the capabilities and limitations of forensic science as it is currently practiced. Lecture 3 hours, laboratory 3 hours. Recommended for students not majoring in science and engineering. Offered fall and spring semesters.

CH 101 Introduction to General Chemistry 4 Cr.

CH 101 is the first of a two semester course series in chemistry covering topics in General, Organic and Biochemistry (GOB). It is a fundamental course in general chemistry, introducing students to the principles of chemical structure and reactivity. Topics include accuracy and precision in measurement, atomic and molecular structure, chemical bonding and reactions, and chemical equilibrium. The laboratory element complements the lecture material with emphasis placed on collaborative problem solving. Prerequisite: Math placement score of 001 or higher. Not more than one of CH 101 or CH 103 may count as degree credit. Lecture 3 hours, laboratory 3 hours. Offered spring semesters.

CH 102 Introduction to Organic and Biochemistry 4 Cr.

CH 102 is the second part of a two semester course series in chemistry covering topics in General, Organic and Biochemistry (GOB). This course introduces students to the nomenclature, structure and reactivity of organic compounds and the structure and function of the major classes of biological compounds and their role in metabolic pathways. Laboratory exercises compliment the lecture material. Prerequisites: CH 101 or CH 103. Not more than one of CH 102 or CH 104 may count as degree credit. CH 102 may not be taken for credit after successful completion of CH 205. Lecture 3 hours, laboratory 3 hours. Offered fall semesters.

CH 103 General Chemistry I 4 Cr.

Introduction to chemical characteristics and behavior, stressing atomic structure, stoichiometry, chemical equilibrium and kinetics, and descriptive chemistry of important elements. Laboratory includes qualitative and quantitative exercises, and syntheses. Lecture 3 hours, laboratory 3 hours. Credit will not be granted for more than one of the following sequences: CH 103 - CH 104, CH 101 - CH 102, or CH 103 - CH 102. Prerequisites: One year of high school chemistry and a score of 2 or higher on the Norwich University Mathematics Placement Test or a "C" or higher in MA 103. Offered fall semesters.

CH 104 General Chemistry II 4 Cr.

Continuation of the study of chemical characteristics and behavior, stressing atomic structure, stoichiometry, chemical equilibrium and kinetics, and descriptive chemistry of important elements. Laboratory includes qualitative and quantitative exercises, and syntheses. Lecture 3 hours, laboratory 3 hours. Credit will not be granted for more than one of the following sequences: CH 103 - CH 104, CH 101 - CH 102, or CH 103 - CH 102. Prerequisites: CH 103. Offered spring semesters.

CH 1XL Chemistry Lab Elective 4 Cr.**CH 1XX Chemistry Elective 3 Cr.****CH 204 Quantitative Analysis 4 Cr.**

A course on the general principles and laboratory practices of quantitative analysis, applied principally in colorimetric and volumetric determinations. Studies of theory and practical procedures associated with gravimetric analysis, potentiometric titrations, and use of pH-meters. Lecture 3 hours, laboratory 4 hours. Prerequisites: CH 103, CH 104. Offered fall semesters of even numbered years.

CH 205 Survey of Organic Chemistry 4 Cr.

An Introduction to the chemistry of carbon-containing compounds and the instrumentation of organic chemistry. An introduction to the chemistry of carbon-containing compounds and the instrumentation of organic chemistry. Laboratory work involves elementary manipulation of organic laboratory equipment, preparation and identification of typical organic compounds, and the characteristics of the major functional groups. Lecture 3 hours, laboratory 2 hours. Prerequisites: CH 104. Offered spring semesters of even numbered years.

CH 214 Communication in Chemistry 1 Cr.

This course illustrates the organization of the chemical literature, the efficient search of the literature and a formal introduction to scientific writing. Offered fall semesters.

CH 225 Organic Chemistry I 4 Cr.

An introduction to the study of carbon compounds; preparation and identification of typical compounds. Lecture 3 hours, laboratory 3 hours. Prerequisites: CH 104 or by petition. Offered fall semesters.

CH 226 Organic Chemistry II 4 Cr.

A continuation of the study of carbon compounds; preparation and identification of typical compounds. Lecture 3 hours, laboratory 3 hours. Prerequisite: CH 225. Offered spring semesters.

CH 2XX Chemistry Elective 3 Cr.**CH 314 Instrumental Methods 3 Cr.**

A course on the Theory of Modern Instrumental Methods. Lecture 3 hours. Prerequisites: CH 204. Offered spring semesters of odd numbered years.

CH 315 Analysis Laboratory 1 Cr.

A course that provides upper class laboratory experience in chemical methods of measurement and analysis. Laboratory 3 hours. Prerequisite: CH 204. Offered spring semesters of odd numbered years.

CH 324 Biochemistry I 4 Cr.

A course on the chemical phenomena and energy effects in life processes. Topics include structure and function of biomolecules, metabolism (catabolism and anabolism), photosynthesis and recombinant DNA technologies. Lecture 3 hours, laboratory 3 hours. Prerequisites: BI 101, CH 226. Offered fall semesters.

CH 325 Biochemistry II 4 Cr.

A continuation of the study of the chemical phenomena and energy effects in life processes. Topics include structure and function of biomolecules, metabolism (catabolism and anabolism), photosynthesis and recombinant DNA technologies. Lecture 3 hours, laboratory 3 hours. Prerequisite: CH 324. Offered even numbered spring semesters.

CH 327 Physical Chemistry I 3 Cr.

A course on the physical properties and structure of matter; general principles and theories of chemical interaction. Major areas studied are chemical applications of thermodynamics; phase equilibria; electrochemistry; reaction kinetics; description of electronic structure of atoms and molecules. Lecture 3 hours. Prerequisites: CH 104; MA 122 (required) college physics (recommended). Offered even numbered fall semesters.

CH 328 Physical Chemistry II 3 Cr.

A continuation of the study of the physical properties and structure of matter; general principles and theories of chemical interaction. Major areas studied are chemical applications of thermodynamics; phase equilibria; electrochemistry; reaction kinetics; description of electronic structure of atoms and molecules. Lecture 3 hours. Prerequisite: CH 327. Offered odd numbered spring semesters.

CH 337 Physical Chemistry Laboratory I 1 Cr.

Laboratory investigations with written formal reports on the physical properties and chemical behavior of substances. Laboratory 3 hours. Prerequisite or co-requisite: CH 327. Offered fall semesters of even numbered years.

CH 338 Physical Chemistry Laboratory II 1 Cr.

Laboratory investigations with written formal reports on the physical properties and chemical behavior of substances. Laboratory 3 hours. Prerequisite or co-requisite: CH 328. Offered spring semesters of odd numbered years.

CH 413 Chemistry Seminar 1 Cr.

Part of a capstone experience that provides individual assignments, written reports, oral reports, and class discussions on chemical topics of current interest. Reading, writing, speaking and critical thinking skills are emphasized. Lecture 1 hour. Prerequisites: Junior 2 Chemistry and Biochemistry majors only.

CH 421 Chemical Synthesis and Examination I 3 Cr.

A capstone experience in which organic, inorganic and compounds of biological interest are synthesized and examined with respect to purity and properties. The objectives are to develop an integrated perspective on the general field of chemistry and to develop proficiency in practical laboratory procedures and in reporting results. Laboratory and occasional lectures 8 hours. Prerequisites: open to senior CH and BCH students. Offered fall semesters.

CH 422 Chemical Synthesis and Examination II 3 Cr.

A capstone experience in which organic, inorganic and compounds of biological interest are synthesized and examined with respect to purity and properties. The objectives are to develop an integrated perspective on the general field of chemistry and to develop proficiency in practical laboratory procedures and in reporting results. Laboratory and occasional lectures 8 hours. Prerequisites: open to senior CH and BCH students. Offered spring semesters.

CH 425 Thesis 1-3 Cr.

This course allows the student to conduct research on a project approved by the faculty of the chemistry and biochemistry programs. The student can be expected to perform the necessary experiments, organize and interpret the data and to communicate the results of the project with a comprehensive report. Prerequisites: CH 226 and permission of the department. The student may re-enroll in CH 425 for up to 6 credits.

CH 438 Advanced Inorganic Chemistry 3 Cr.

A course on the chemistry of the elements: properties, characteristics, and behavior. Lecture 3 hours. Prerequisites: CH 327 - CH 328. Offered spring semesters of even numbered years.

CH 439 Advanced Organic Chemistry 3 Cr.

An advanced and thorough development of topics introduced in CH 226. Lecture 3 hours. Prerequisites: CH 226. Offered on occasion.

CH 450 Topics in Chemistry 3 Cr.

A course in which a selected limited topic in advanced chemistry is covered in depth. Offered on occasion. Prerequisite: permission of the instructor.

Physical Education Courses**PE 107 Foundations of Physical Education 3 Cr.**

A course designed to provide students with an introduction to the professional aspects of the physical education profession. Includes historical and philosophical implications with emphasis on modern trends in program design. Acquaints students with professional organizations and reviews career possibilities in the field.

PE 161 Physical Fitness & Wellness Assessment 3 Cr.

Introduces the student to the theory and practice of teaching physical fitness activities. A personalized assessment is conducted of health-related fitness and wellness components. Based on the evaluation results and individual interests, an exercise program is designed by each participant, which she/he is expected to revise and update during her/his professional preparation at Norwich University. Individualized exercise program prescriptions may include aerobics, cycling, jogging, lap swimming, walking, yoga, or weight training. Professional ethics, client privacy, and liability issues are stressed throughout the program.

PE 199 Phys Ed Topics; 4 Cr.**PE 1XX Physical Education Elective 3 Cr.****PE 223 Motor Skills Development I 3 Cr.**

This course teaches students to apply principles of best practice to the development and delivery of appropriate instructional programs in individual and elementary activities currently being taught in the public schools (e.g. dance, throwing, catching, kicking, and gymnastics). Strong consideration is given to the development of personal performance and skill acquisition in order to more effectively lead practical lessons in school. Students must demonstrate an understanding of, and competence in motor skill acquisition. Offered fall semester. 4 hour lab.

PE 224 Motor Skills Development II 3 Cr.

This course teaches students to apply principles of best practice to the development and delivery of appropriate instructional programs in team, dual, and secondary activities currently being taught in the public schools (e.g. basketball, volleyball, soccer, racquet sports) as well as non-traditional activities (e.g. Indiaka, Takraw, pateka, tchoukball). Consideration is given to the development of personal performance and skill acquisition in order to effectively lead practical lessons in school. Students must demonstrate an understanding of, and competence in motor skill acquisition and physical education pedagogy in the context of public school instruction programs. Offered spring semester. 4 hour lab.

PE 243 Instructional Design in Physical Education 3 Cr.

This course is targeted for students who plan to teach school physical education. Planning and Instructional Design is the introductory course in a sequence of professional teaching skills courses. The emphasis of the course is to identify and develop the beginning teaching skills and planning that are necessary for effective instruction in physical education and other sport settings. Classroom 3 hours. Prerequisites: PE 107 and PE 223 or PE 224. Offered Spring semester.

PE 260 Personal and Community Health 3 Cr.

A course that emphasizes principles, problems, and procedures concerned with the improvement of individual and community health. Consideration is given to the nature of communicable diseases and the preventative measures used in schools and community. Health information protection and client privacy are stressed as an integral part of the community health care provider's professional ethics.

PE 261 Foundations in Health Education 4 Cr.

This course will teach historical development, professional standards, philosophy and program planning, including current best practices in the development, implementation and evaluation of health education programs. It will focus on developing personal and social health skills, including decision making, interpersonal communication, goal setting and self management skills. In addition, this course will integrate teaching students media literacy, personal advocacy, and how to access valid health information, products and services and how to teach this to prospective students. Lecture 3 hours: Field Experience 2 hours. Prerequisite: PE 260. Offered even-numbered fall semesters.

PE 265 Lifelong Motor Development 3 Cr.

This course studies the sequential, continuous age-related process whereby movement behavior changes. The class will cover information processing theories, theories of motor learning, effects of practice regimens and feedback and biological changes experienced over a lifetime, which affect motor skill acquisition. Understanding lifespan motor development is important for educators at all levels, special education teachers, physical educators, coaches, and adult fitness leaders.

PE 2XX Physical Education Elective 3 Cr.**PE 306 Outdoor Physical Education I 3 Cr.**

This course provides students with a comprehensive background in warm weather Outdoor Physical Education. Skills in trip planning, risk management, equipment selection concerning use and care, and group leadership techniques will be covered. This class will prepare students to recognize the assumption of risk, attractive nuisances, negligence, and the standard of care when facilitating an Outdoor Physical Education program. Students will study and practice principles and protocols for administering safe, high-quality outdoor education experiences in activities such as, canoeing, mountain biking, hiking & backpacking, and adventure. Also covered will be topics in animal and wilderness conservation, nutrition, compass use and navigation, and environmental ethics. 3 classroom/field experience hours. Prerequisites: PE 107, PE 161, or permission of instructor. Offered fall semester.

PE 307 Outdoor Physical Education II 3 Cr.

This course provides students with a comprehensive background in cold weather Outdoor Physical Education. Students will be actively engaged in winter activities. This class will prepare students to conduct classes in outdoor education during the winter in activities such as, snowshoeing, cross-country skiing, and ice skating. Also presented will be, but not limited to, topics in animal and wilderness conservation, nutrition, mountain and cold weather illness and injuries, and snow science, such as avalanche assessment and ice assessment. An emphasis will be placed on preparing individuals to be active in cold weather under winter conditions. 3 classroom/field experience hours. Prerequisites: PE 107, PE 161, or permission by instructor. Offered spring semester.

PE 333 Management Sports Facilities 3 Cr.

This course is designed to help prepare students for careers associated with sport facility management. A detailed examination of facility utilization, including safety and security, scheduling, maintenance, and emergencies and emergency response will be applied to a variety of facilities. Additionally the administration of a facility with special attention to preventative supervision, risk management, facility assessment and design, project planning, and staffing will be examined. Facilities covered will include but not be limited to parks, recreation centers, gymnasiums, aquatic facilities, fitness centers, sports arenas, tennis courts, and golf courses. 3 lecture hours. Prerequisites: PE 107 or PE 161. Offered even year fall semesters.

PE 341 Instructional Strategies for Physical Education in Elementary School 4 Cr.

A course that provides classroom and laboratory experience designed to acquaint the student with basic materials, methods, and principles necessary to meet the educational needs of the elementary school child. Emphasis on curriculum development with consideration given to concepts of movement education and perceptual motor development. Application of movement theory to specific sports skills and activities. Health information protection and student privacy issues are included throughout the course of instruction. Classroom 2 hours, laboratory 3 hours on site at Barre Town Middle, Elementary School.

PE 342 Instructional Strategies for Physical Education in Middle-Secondary School 4 Cr.

A course that places emphasis on ethics, principles, procedures, and techniques related to teaching health and physical education in the elementary and secondary schools. Methods of organization, types of programs, and content and materials of health and physical education courses. Laboratory experience provided in traditional and new media, self and peer evaluation, and micro teaching. Health information protection and student privacy issues are reinforced throughout this course. Classroom 2 hours, laboratory 3 hours on site at U-32 Jr. - Sr. High School.

PE 355 Coaching:Leadership in Sports 3 Cr.

A course with a strong focus on the philosophy, ethics, principles, and techniques of coaching individual and team sports. Identifying and addressing the ethical dilemmas pervading our sport organizations today will be emphasized. This course provides an emphasis on the organization of interscholastic athletics in relation to the achievement of education objectives, and satisfies the university's General Education Ethics requirement. In addition, students will be prepared for the National Federation of State High School coaching certification. 3 lecture hours.

PE 365 Kinesiology 4 Cr.

A review of the structure and function of the skeletal and muscular systems with special emphasis on an analysis of human motion as related to human performance. Classroom 3 hours, laboratory 2 hours. Prerequisite: BI 215, BI 216 or permission of the instructor.

PE 371 Physiology of Exercise 4 Cr.

A review of physiological principles of muscular activity with emphasis on the integration of body systems in the performance of exercise and various athletic activities. Classroom 3 hours, laboratory 2 hours. Prerequisite: BI 215, BI 216 or permission of the instructor.

PE 373 Activities and Programs for the Disabled and Aging 3 Cr.

A study of activities and programs focused on meeting the needs of special population groups and the aging. Consideration given to teaching methodology and program planning for individuals and groups. Health information protection and client privacy is stressed as it relates to professional ethics and liability.

PE 399 Topics: 3 Cr.**PE 406 Readings in Physical Education 3 Cr.**

This course examines the current literature on issues facing future professional educators of an ethical, legal or pedagogical nature. Students are expected to think, read, write and speak critically about these professional issues in the physical education discipline. The submission of a professional portfolio is required. Seminar 3 hours.

PE 426 Internship 6,12 Cr.

A course designed to provide the Physical Education students with an intern-type experience in a professional setting appropriate to their career goals. Prerequisite: satisfactory completion of all courses in the major through the sixth semester. Cross listed as PE/SM. A student may not receive credit for both.

PE 432 Organization and Administration in Physical Education 3 Cr.

A course that emphasizes the study of administrative principles, functional organization, and supervision in relation to the total physical education program in grades K-12 and to managing sports facilities and sports programs. Major topics include personnel, curriculum, legal liability, intramurals, evaluation, budgeting and risk management.

PE 441 Advanced Exercise Physiology and Prescription 4 Cr.

This course prepares and qualifies students to work as personal trainers and fitness specialists in corporate fitness and health club facilities. The course bridges the gap between exercise physiology and the practical application skills of personal training. Advanced exercise physiology knowledge is presented to assure new knowledge and exercise techniques are acquired. Students will learn how to design and implement exercise prescriptions for multiple populations and as well as successful goal attainment. Students will be prepared to sit for certification examinations. Three lecture hours per week and two hour laboratory component. Prerequisites: PE 365, PE 371, or permission of instructor. Offered Fall semesters.

PE 450 Exercise Testing and Electrocardiography 4 Cr.

This course focuses on the theory and methods of administering exercise stress tests using different modes of exercise and consideration of different populations. Further analysis of information gained from exercise testing, studying deviations from normal, and applications of exercise test information in adult fitness and cardiac rehabilitation programs will be highlighted. Emphasis will be placed on the recognition and interpretation of normal and abnormal resting and exercise ECG monitoring. Three lecture hours per week and two hour laboratory component. Prerequisites: BI 215, BI 216 and PE 371 or permission of instructor. Offered fall semester.

PE 499 TEST COURSE 12 Cr.