BIOLOGY (BIOL)

BIOL 1010 Opportunities in Biological Sciences (1 credit)
This course will provide a first-year experience for new students by introducing them to departmental faculty and areas of study within biological sciences. Students will explore their interests and opportunities available within the department and university. Graded Pass/Fail. Typically Offered: Fall.

BIOL 1020 Biology and Society (3 credits)
General Education: Scientific Ways of Knowing
Not open to majors or for minor credit in the department of Biological Sciences. Study of ecology, evolution, cells, heredity, and human body processes with a focus on connecting to issues in society. Three lectures per week. Typically Offered: Fall and Spring.

BIOL 1020L Biology and Society Lab (1 credit)
Not open to majors or for minor credit in the department of Biological Sciences. The lab follows BIOL 1020 lecture topics and offers hands-on practice and experimentation with core course concepts. It is strongly recommended that the lecture and lab be taken in the same semester. One 3-hour lab per week. Typically Offered: Fall and Spring.

BIOL 1140 Organisms and Environments (4 credits)
Topics include an overview of ecology and a detailed foundation in evolutionary processes and the diversity of life; intended for students in biology-related majors. Three lectures and one 3-hour lab per week. Typically Offered: Fall and Spring.

BIOL 1150 Cells and the Evolution of Life (3 credits)
General Education: Scientific Ways of Knowing
This course provides a detailed foundation of biomolecules, the cell, metabolism, and heredity; intended for students in biology-related majors. Three lectures per week. Typically Offered: Fall and Spring.
Prereqs: CHEM 1101 or CHEM 1111

BIOL 1150L Cells and the Evolution of Life Laboratory (1 credit)
Laboratory for introductory biology; experiments are designed to teach problem solving, scientific methods and the aspects of biology related to the cell. Typically Offered: Fall and Spring. Prereqs or
Coreqs: BIOL 1150

BIOL 1510 Intro to Health Professions (1 credit)
This course is primarily for first- and second-year students, but all students interested in healthcare careers are welcome. The primary content of this course is centered on a series of presentations by guests from a variety of health professions, ranging from occupational therapy to dentistry. Students will learn about the presenters' educational process and personal journey to become a professional in their chosen field, as well as the responsibilities, professional interactions, joys, and challenges of working in that field. Discussions and assignments are designed to broaden the perspective of the healthcare field for the student, and to begin preparing them to be successful applicants in their chosen field. This is a dynamic course, and the content varies from one year to the next due to the availability of guest speakers and number of students registered.

BIOL 2040 (s) Special Topics (1-16 credits, max 99)
Credit arranged

BIOL 2130 Structure and Function Across the Tree of Life (4 credits)
Comparative study of morphological and physiological adaptations that have evolved across the tree of life, with the focus of the course split equally between animals and plants. Three lectures and one 3-hour lab per week. Typically Offered: Spring semester.
Prereqs: BIOL 1140

BIOL 2227 Anatomy and Physiology I (4 credits)
Study of the general organization of the human body and its function, followed by more specific study of the anatomy and physiology of the integumentary, skeletal, muscular, cardiovascular, and respiratory systems. Labs include anatomical models, prosected cadavers, and physiological data collection software. Three lectures and one 3-hour lab per week. Typically Offered: Fall.
Prereqs: BIOL 1020 or BIOL 1150

BIOL 2228 Anatomy and Physiology II (4 credits)
Continuation of the study of the organization of the human body and its function, including specific study of the anatomy and physiology of the nervous, endocrine, digestive, urinary, and reproductive systems. Labs include anatomical models, prosected cadavers, and physiological data collection software. Three lectures and one 3-hour lab per week. Typically Offered: Spring.
Prereqs: BIOL 2227

BIOL 2500 General Microbiology (3 credits)
General Education: Scientific Ways of Knowing
Introduction to nature and activity of bacteria and other microorganisms; their importance in all life systems. Three hours of lecture per week. Typically Offered: Fall.
Prereqs: BIOL 1150, BIOL 1150L and either CHEM 1101 and CHEM 1101L or CHEM 1111 and CHEM 1111L

BIOL 2550 General Microbiology Lab (2 credits)
Training in the handling of microscopes, basic lab equipment, and manipulation of microbes. Two 2-hour labs per week. Typically Offered: Fall and Spring. Prereqs or
Coreqs: BIOL 2500

BIOL 2990 (s) Directed Study (1-16 credits, max 99)
Credit arranged

BIOL 3000 Survey of Biochemistry (3 credits)
Cannot be taken for credit after BIOL 3800. Survey of biochemical principles and the molecular structure and function that describe the chemical basis of life. Typically Offered: Spring.
Prereqs: CHEM 1101 and CHEM 1101L or CHEM 1111 and CHEM 1111L; and CHEM 2750 or CHEM 2770

BIOL 3010 Undergraduate Research (0-4 credits, max 8)
Undergraduate research for students without senior standing. BIOL 3010 cannot be used for upper-division elective requirement credit in degrees offered by the Department of Biological Sciences.
Prereqs: Permission

BIOL 3100 Genetics (3 credits)
Genetic mechanisms in animals, plants, and microorganisms. Three hours of lecture per week. Typically Offered: Fall.
Prereqs: BIOL 1150 and BIOL 1150L or BIOL 2500

BIOL 3120 Molecular and Cellular Biology (3 credits)
Current theory and experimental basis of the structure/function of eukaryotic cells. Topics include plasma membrane, organelles, cytoskeleton and cell mobility, the nature of genes, gene expression, DNA replication and cellular reproduction, and signal transduction. Three one-hour lectures per week. Recommended: CHEM 2750 or 2770 Typically Offered: Spring.
Prereqs: BIOL 1150/BIOL 1150L and one of the following: BIOL 3100 or GENE 3140 or BIOL 2500 or BIOL 3800.

BIOL 3130 Molecular and Cellular Laboratory (1 credit)
Laboratory experiments and techniques related to molecular and cellular biology. One 3-hour lab per week. Typically Offered: Spring.
Coreqs: BIOL 3120

BIOL 3140 Ecology and Population Biology (4 credits)
Population genetics, population ecology, species interactions, community ecology, biodiversity, and data analysis. Three lectures and one 3-hour lab per week. Typically Offered: Spring.
Prereqs: BIOL 1140 and BIOL 1150, BIOL 1150L; STAT 2510 or STAT 3010; and MATH 1160 or MATH 1170

BIOL 3150 Genetics Lab (1 credit)
Laboratory on genetic mechanisms in animals, plants, and microorganisms. One 3-hour lab per week. Typically Offered: Fall.
Prereqs: BIOL 1150 or BIOL 2500
Coreqs: BIOL 3100

BIOL 3240 Comparative Vertebrate Anatomy (4 credits)
Evolution of vertebrates and their organ systems with an emphasis on structure – function relationships. Two lectures and two 3-hour labs per week. (Spring only, alt/years)
Prereqs: BIOL 1140 and BIOL 1150, BIOL 1150L and BIOL 2130; or Permission

BIOL 3400 Pathophysiology (3 credits)
This course will cover the physiological basis for altered health, the study of the structural and functional changes in the body leading to disease states. Case studies will be presented and discussed in class to apply and understand the material learned. Typically Offered: Spring.
Prereqs: BIOL 1150, BIOL 1150L, BIOL 2227
Coreqs: BIOL 2228

BIOL 3800 Biochemistry I (4 credits)
Carries one credit after BIOL 3000. Introduction to the structure and function of major molecular constituents of living systems. Emphasis on proteins, enzyme kinetics and catalysis, and carbohydrate metabolism. Three hours of lecture and one hour of interactive problem solving per week. Typically Offered: Fall.
Prereqs: CHEM 1120, CHEM 1120L and CHEM 2770

BIOL 3820 Biochemistry I Laboratory (2 credits)
Lab training in modern methods. One 3-hour lab and one 1-hour recitation per week. Typically Offered: Fall.
Coreqs: BIOL 3800 or equivalent

BIOL 3980 (s) Internship (1-3 credits, max 3)
Supervised internship in professional biological, non-university settings, integrating academic study with work experience; requires formal written plan of activities to be approved by academic advisor and department chair before engaging in the work; a final written report will be evaluated by on-campus faculty. Graded Pass/Fail.
Prereqs: Permission

BIOL 4000 (s) Seminar (1-16 credits, max 99)
May be used as a science elective after 1 required credit, up to a maximum of 4 credits. Graded Pass/Fail.

BIOL 4010 Undergraduate Research (1-4 credits, max 8)
General Education: Capstone Experience
Undergraduate research at the senior level. BIOL 4010 cannot be used for major upper-division elective requirement credit in degrees offered by the Department of Biological Sciences.
Prereqs: Senior Standing and Permission of Instructor

BIOL 4030 (s) Workshop (1-16 credits, max 99)
Credit arranged

BIOL 4040 (s) Special Topics (1-16 credits, max 99)
Credit arranged

BIOL 4070 Practicum in Biology Laboratory Teaching (2-6 credits, max 12)
General Education: Capstone Experience
Organization, preparation, and teaching of lab experiments or demonstrations under faculty supervision.
Prereqs: Any four of the following courses: BIOL 1140, BIOL 1150, BIOL 2130, BIOL 3100, BIOL 3120, or BIOL 3140; and Permission

BIOL 4080 Human Anatomy and Physiology Laboratory Pedagogy (2-4 credits, max 8)
General Education: Capstone Experience
Developing presentations, learning assessments, and grading schemas for undergraduate anatomy and physiology courses. Includes specimen preparation, data collection, and analysis. 2 credits per each 3-hour lab per week, one hour lab meeting per week. Typically Offered: Fall and Spring.
Prereqs: Instructor Permission

BIOL 4110 Senior Capstone (2 credits)
General Education: Capstone Experience
Application of biological principles and information to the analysis of societal and philosophical issues. Typically Offered: Spring.
Prereqs: BIOL 3100, BIOL 3120, and BIOL 3140 or BIOL 3800, and Senior standing

BIOL 4160 Plant Diversity and Evolution (4 credits)
Origin, evolution, and diversity of major land plant groups; emphasis on systematics, anatomy, morphology, ecological diversity, and macroevolution. Two lectures and one 3-hour lab a week; one field trip. Typically Offered: Fall.
Prereqs: BIOL 1140 and BIOL 1150, BIOL 1150L

BIOL 4190 Microbial Physiology (3 credits)
This course examines how fundamental cellular phenomena like growth, stress response, or the coordination of metabolism arise. This is critical to understand how microbes overcome physiological challenges and survive in a stressful, changing world, thereby relating physiology to evolutionary pressures and ecological interactions. In particular, we explore quantitative concepts that synthesize understanding and seek to develop predictive models of cellular behavior. Typically Offered: Fall (Even Years).
Prereqs: BIOL 2500

BIOL 4210 Advanced Evolution (3 credits)
Scientific understanding of the processes of evolution, the history of life on earth, and application of evolutionary principles across fields in biology. Typically Offered: Spring.
Prereqs: BIOL 3100 or BIOL 3140 or FOR 2100 or REM 2210 or WLF 2200.

BIOL 4250 (s) Experimental Field Ecology (3 credits, max 99)
Intensive course on diverse aspects of field ecology to be held off-campus. Various global locations (i. e. Costa Rica, Oregon coast, Hawaii) are possible. The course will be scheduled during an 8-10 day period preceding/following the Spring Term (i. e. January or May). Will involve travel and lodging costs at student expense. Typically Offered: Varies.
Prereqs: BIOL 1140, BIOL 1150, BIOL 2130, BIOL 3100, BIOL 3120, and BIOL 3140

BIOL 4260 Systems Biology (3 credits)
Joint-listed with BIOL 5260
Systems Biology will use quantitative approaches including theory and computation to understand the complex function that emerges from physiological systems. Topics will include transcriptional networks and their common motifs, robustness in chemotaxis and development, noise and variability, evolution of modularity, and optimality in metabolism. Two lectures per week. Typically Offered: Fall (Odd Years).
Prereqs: BIOL 1150, BIOL 1150L and MATH 1170 or permission of instructor Cooperative: open to WSU degree-seeking students.

BIOL 4280 Microscopic Anatomy (4 credits)
Basic principles of histology and advanced microscopic anatomy of vertebrate tissues and organs. Typically Offered: Fall (Even Years).
Prereqs: BIOL 2130 or BIOL 3120

BIOL 4320 Immunology (3 credits)
Theory and mechanisms of the cellular basis of immune response; antibody structure, function, and synthesis; cell-mediated immunity; complement; hypersensitivity; immunologic diseases; transplantation; tumor immunity. Extra oral and/or written assignments required for graduate credit. Typically Offered: Spring.
Prereqs: BIOL 3000 or BIOL 3800; and BIOL 3120

BIOL 4330 Pathogenic Microbiology (3 credits)
Epidemiology, host-parasite relationships, pathology, host response; treatment, prevention, and control of pathogenic microorganisms. Extra oral and/or written assignments required for graduate credit. Typically Offered: Fall.
Prereqs: BIOL 2500

BIOL 4440 Genomics (3 credits)
Structural, functional, and comparative genomics of animals, plants, fungi, and microbes. Case studies illustrating a genomic approach to questions of fundamental biological and societal relevance will be drawn from diverse fields such as human medicine, evolutionary biology, agriculture, and bioterrorism. Typically Offered: Spring.
Prereqs: BIOL 3100 or GENE 3140

BIOL 4460 Phylogenetics (3 credits)
Joint-listed with BIOL 5450
The inference of evolutionary trees (phylogeny) and the processes that generate biodiversity from analyses of morphological, molecular, and behavioral data; uses of phylogenies in testing evolutionary and other hypotheses at both inter and intraspecific levels. Two hours of lecture and one 3-hour lab per week. Additional project required for graduate credit. Typically Offered: Spring (Odd Years).
Prereqs: BIOL 3100 Cooperative: open to WSU degree-seeking students.

BIOL 4470 Virology (3 credits)
Joint-listed with BIOL 5470
A survey of virology, with special emphasis on the molecular basis of replication, host-pathogen interactions and diseases associated with animal viruses. Extra oral and/or written assignments required for graduate credit. Recommended preparation: BIOL 2500. Typically Offered: Fall (Odd Years).
Prereqs: BIOL 3120 or Permission

BIOL 4500 Microbiomes (3 credits)
The study of microbiomes – microbial communities that may be host-associated or not – has exploded in the past decade. It is now abundantly clear that the interactions within microbiomes and between the microbiomes and their host greatly affect function. This course covers the evolution and ecology of microbial communities and how these dynamics and the resulting functions affect the environment or host they live in. Typically Offered: Spring.
Prereqs: BIOL 2500

BIOL 4540 Biochemistry II (3 credits)
Joint-listed with BIOL 5540
Advanced protein structure and function, analyses of metabolism, nitrogen metabolism including amino acids and nucleotides, topics in secondary metabolism, and applications of biochemistry including biofuels and drug discovery. Extra oral and/or written assignments required for graduate credit. Typically Offered: Spring.
Prereqs: CHEM 3720; BIOL 3800 or CHEM 3020 or CHEM 3060; or Permission

BIOL 4560 Computer Skills for Biologists (3 credits)
Joint-listed with BIOL 5490
Exploration and analysis of biological datasets such as those in molecular evolution, systematics, and genomics. Demonstrations, exercises, and student projects to teach Unix skills, git version control, and computer programming for data exploration and analysis. Graduate credit requires a project and presentation. Typically Offered: Fall (Even Years).
Prereqs: BIOL 3100 and STAT 2510 or STAT 3010; or Permission Cooperative: open to WSU degree-seeking students.

BIOL 4600 Advanced Field Botany (3 credits)
Joint-listed with BIOL 5600
Hands-on training in field botany as applied to evolutionary, ecological, and floristic studies; two-week field course in the Inland Northwest. Additional projects/assignments required for graduate credit. Typically Offered: Summer.
Prereqs: Instructor Permission

BIOL 4610 Neurobiology (3 credits)
Joint-listed with BIOL 5650
Study of the nervous system, with an emphasis on mechanisms of neuronal signaling, the function of sensory and motorsystems, and neural development. Recommended: PHYS 1111, PHYS 1112, and CHEM 2750 or CHEM 2770. Typically Offered: Fall (Even Years).
Prereqs: BIOL 2130, BIOL 3100, BIOL 3120, GENE 3140, BIOL 3000, or BIOL 3800 Cooperative: open to WSU degree-seeking students.

BIOL 4660 Biodiversity (3 credits)
Joint-listed with BIOL 5660
This course focuses on the units of biodiversity (from genes to ecosystems), their structure in space (biogeography) and time (phylogenetics), and their importance to ecosystem health and human well-being. Topics include how biodiversity is defined and measured, the origin and distribution of biodiversity, how biodiversity varies in space and time, and how its loss impacts human societies. It will provide students with a strong ecological and evolutionary basis to understand the natural causes and consequences of current global environmental changes. The 5000-level version of the course will include additional readings and assignments. Typically Offered: Spring (Even Years).
Prereqs: BIOL 1140 and junior standing or permission

BIOL 4740 Developmental Biology (3 credits)
Joint-listed with BIOL 5730
Embryology of model organisms, mechanisms of developmental processes, reproductive biology, stem cells, growth, and tissue regeneration. Additional projects/assignments required for graduate credit. Typically Offered: Fall.
Prereqs: BIOL 3100 or BIOL 3120

BIOL 4780 Animal Behavior (3 credits)
Evolution, causation, development, and function of behavior in vertebrates and invertebrates. Typically Offered: Spring.
Prereqs: BIOL 1140 and BIOL 1150, BIOL 1150L

BIOL 4820 Protein Structure and Function (3 credits)
Joint-listed with BIOL 5820
Detailed analysis of protein structure and function including enzyme activity, binding, folding and stability, and techniques for structure determination. Additional projects/assignments required for graduate credit. Typically Offered: Fall.
Prereqs: BIOL 3800

BIOL 4830 Mammalogy (3 credits)
Evolution, systematics, distribution, and biology of mammals. Two lectures and one 3-hour lab per week; one field trip. Typically Offered: Fall.
Prereqs: BIOL 1140 and BIOL 1150, BIOL 1150L

BIOL 4840 Invertebrate Zoology (4 credits, max 4)
Evolution, systematics, and ecology of invertebrate animals. Course organized around three main fundamental themes: (1) form and function; (2) development and life history; and (3) diversity and evolutionary history. Focus on non-insect invertebrates. Three lectures and one 3-hour lab a week. Field trips. Typically Offered: Spring (Odd Years).
Prereqs: BIOL 1140

BIOL 4850 Prokaryotic Molecular Biology (3 credits)
Joint-listed with BIOL 5850
Current theory and experimental basis for prokaryotic DNA, RNA, and protein synthesis, gene regulation, and cell wall metabolism. Extra oral and/or written assignments required for graduate credit. Typically Offered: Spring.
Prereqs: BIOL 2500 and BIOL 3800

BIOL 4870 Cellular and Molecular Basis of Disease (3 credits)
Joint-listed with BIOL 5870
Basic principles of cell biology explored in the context of human diseases. Emphasis on molecular mechanisms of cancer, Alzheimer's disease, and prion diseases. Extra oral and/or written assignments required for graduate credit. Typically Offered: Fall.
Prereqs: BIOL 3800; and BIOL 3100 or GENE 3140

BIOL 4890 Herpetology (4 credits)
Evolution, systematics, physiology, and ecology of reptiles and amphibians. Three lectures and one 3-hour lab per week; field trip. Typically Offered: Fall.
Prereqs: BIOL 1140 and BIOL 1150, BIOL 1150L

BIOL 4990 (s) Directed Study (1-16 credits, max 99)
Credit arranged

BIOL 5000 Master's Research and Thesis (1-16 credits, max 99)
Credit arranged

BIOL 5010 (s) Seminar (1-16 credits, max 99)
Credit arranged

BIOL 5020 (s) Directed Study (1-16 credits, max 99)
Credit arranged

BIOL 5030 (s) Workshop (1-16 credits, max 99)
Credit arranged

BIOL 5040 (s) Special Topics (1-16 credits, max 99)
Credit arranged

BIOL 5050 Colloquium (1 credit)
Oral presentation required for credit. Graded Pass/Fail.
Prereqs: Permission

BIOL 5080 Topics in Neuroscience (1 credit, max 99)
Seminars and discussion of current topics in neuroscience.
Prereqs: Graduate standing

BIOL 5210 Graduate Teaching Practicum (3 credits)
Organization, preparation, and teaching of lab experiments or demonstrations under faculty supervision. Graded Pass/Fail.
Prereqs: Graduate standing and Permission

BIOL 5220 Molecular Evolution (3 credits)
Understanding evolutionary processes and patterns at the molecular level, techniques for using genetic and genomic data to understand evolutionary history of organisms, 3 lectures per week. Typically Offered: Fall.
Prereqs: Undergraduates require permission of instructor Cooperative: open to WSU degree-seeking students.

BIOL 5240 Research & Curriculum Progress (1 credit, max 99)
Required of all graduate students one semester per year. The grade is based on preparation of an oral and written presentation of research goals and coursework for the completion of the degree. A letter grade is assigned by committee members at the time of the student's graduate committee meeting. Recommended preparation: undergraduate degree in microbiology, biochemistry, or related topic.
Prereqs: Permission

BIOL 5260 Systems Biology (3 credits)
Joint-listed with BIOL 4260
Systems Biology will use quantitative approaches including theory and computation to understand the complex function that emerges from physiological systems. Topics will include transcriptional networks and their common motifs, robustness in chemotaxis and development, noise and variability, evolution of modularity, and optimality in metabolism. Two lectures per week. Typically Offered: Fall (Odd Years). Cooperative: open to WSU degree-seeking students.

BIOL 5360 Phylogenetics Reading Group (1 credit, max 99)
Review recent articles in phylogenetics and systematics journals. Students choose, critically review, and discuss the articles to develop critical-thinking skills and confidence in their knowledge of the literature. Graded Pass/Fail. Cooperative: open to WSU degree-seeking students.

BIOL 5450 Phylogenetics (3 credits)
Joint-listed with BIOL 4460
The inference of evolutionary trees (phylogeny) and the processes that generate biodiversity from analyses of morphological, molecular, and behavioral data; uses of phylogenies in testing evolutionary and other hypotheses at both inter and intraspecific levels. Two hours of lecture and one 3-hour lab per week. Additional project required for graduate credit. Typically Offered: Spring (Odd Years). Cooperative: open to WSU degree-seeking students.

BIOL 5470 Virology (3 credits)
Joint-listed with BIOL 4470
A survey of virology, with special emphasis on the molecular basis of replication, host-pathogen interactions and diseases associated with animal viruses. Extra oral and/or written assignments required for graduate credit. Recommended preparation: BIOL 2500. Typically Offered: Fall (Odd Years).

BIOL 5480 Evolutionary Ecology (3 credits, max 3)
This course develops the theoretical underpinnings for the field of evolutionary ecology and illustrates how this conceptual basis is used to address major questions of social and economic importance such as the spread of invasive species and the evolution of infectious disease. Typically Offered: Spring. Cooperative: open to WSU degree-seeking students.

BIOL 5490 Computer Skills for Biologists (3 credits)
Joint-listed with BIOL 4560
Exploration and analysis of biological datasets such as those in molecular evolution, systematics, and genomics. Demonstrations, exercises, and student projects to teach Unix skills, git version control, and computer programming for data exploration and analysis. Graduate credit requires a project and presentation. Typically Offered: Fall (Even Years). Cooperative: open to WSU degree-seeking students.

BIOL 5510 Seminar on Reproductive Biology (1 credit, max 5)
Current topics in reproductive biology. Typically Offered: Spring.
Prereqs: Graduate standing Cooperative: open to WSU degree-seeking students.

BIOL 5520 Professional Development for Biologists (3 credits)
Oral and written presentation skills for communicating scientific information, including grant writing and data presentation for manuscripts and seminars.
Prereqs: Graduate standing

BIOL 5530 Ethical Issues in Biological Research (1 credit)
Practical ethical issues for biologists.
Prereqs: Graduate standing

BIOL 5540 Biochemistry II (3 credits)
Joint-listed with BIOL 4540
Advanced protein structure and function, analyses of metabolism, nitrogen metabolism including amino acids and nucleotides, topics in secondary metabolism, and applications of biochemistry including biofuels and drug discovery. Extra oral and/or written assignments required for graduate credit. Typically Offered: Spring.

BIOL 5600 Advanced Field Botany (3 credits)
Joint-listed with BIOL 4600
Hands-on training in field botany as applied to evolutionary, ecological, and floristic studies; two-week field course in the Inland Northwest. Additional projects/assignments required for graduate credit. Typically Offered: Summer.

BIOL 5630 Mathematical Genetics (3 credits)
Cross-listed with MATH 5630
Investigation of aspects of evolutionary biology with an emphasis on stochastic models and statistical methods; topics include: diffusion methods in molecular evolution, gene genealogies and the coalescent, inferring coalescent times from DNA sequences, population subdivision and F statistics, likelihood methods for phylogenic inference, statistical hypothesis testing, the parametric bootstrap.
Prereqs: MATH 1160 or MATH 1170 and STAT 2510 or STAT 3010
Cooperative: open to WSU degree-seeking students.

BIOL 5650 Neurobiology (3 credits)
Joint-listed with BIOL 4610
Study of the nervous system, with an emphasis on mechanisms of neuronal signaling, the function of sensory and motorsystems, and neural development. Recommended: PHYS 1111, PHYS 1112, and CHEM 2750 or CHEM 2770. Typically Offered: Fall (Even Years). Cooperative: open to WSU degree-seeking students.

BIOL 5660 Biodiversity (3 credits)
Joint-listed with BIOL 4660
This course focuses on the units of biodiversity (from genes to ecosystems), their structure in space (biogeography) and time (phylogenetics), and their importance to ecosystem health and human well-being. Topics include how biodiversity is defined and measured, the origin and distribution of biodiversity, how biodiversity varies in space and time, and how its loss impacts human societies. It will provide students with a strong ecological and evolutionary basis to understand the natural causes and consequences of current global environmental changes. The 5000-level version of the course will include additional readings and assignments. Typically Offered: Spring (Even Years).

BIOL 5730 Developmental Biology (3 credits)
Joint-listed with BIOL 4740
Embryology of model organisms, mechanisms of developmental processes, reproductive biology, stem cells, growth, and tissue regeneration. Additional projects/assignments required for graduate credit. Typically Offered: Fall.

BIOL 5820 Protein Structure and Function (3 credits)
Joint-listed with BIOL 4820
Detailed analysis of protein structure and function including enzyme activity, binding, folding and stability, and techniques for structure determination. Additional projects/assignments required for graduate credit. Typically Offered: Fall.

BIOL 5850 Prokaryotic Molecular Biology (3 credits)
Joint-listed with BIOL 4850
Current theory and experimental basis for prokaryotic DNA, RNA, and protein synthesis, gene regulation, and cell wall metabolism. Extra oral and/or written assignments required for graduate credit. Typically Offered: Spring.

BIOL 5870 Cellular and Molecular Basis of Disease (3 credits)
Joint-listed with BIOL 4870
Basic principles of cell biology explored in the context of human diseases. Emphasis on molecular mechanisms of cancer, Alzheimer's disease, and prion diseases. Extra oral and/or written assignments required for graduate credit. Typically Offered: Fall.

BIOL 5980 (s) Internship (1-16 credits, max 99)
Credit arranged

BIOL 5990 (s) Non-thesis Master's Research (1-16 credits, max 99)
Credit arranged

BIOL 6000 Doctoral Research and Dissertation (1-45 credits, max 99)
Credit arranged