College of Sciences

Purpose and Focus

Science and technology influence every aspect of our lives. We live in a period marked by astonishing changes in communications, information processing, genetic engineering, materials sciences, medicine, transportation, and our understanding of the universe. The College of Sciences offers courses that equip students to function in this dynamic age, whether as informed citizens or as practicing professionals. Course offerings cover broad areas and enhance one's general understanding of nature, mathematics and technology. Undergraduate majors are introduced to the fundamentals of the natural and mathematical sciences that serve as the foundation for a host of professional careers.

Accreditation

Northwest Commission on Colleges and Universities
American Chemical Society (B.S. in Chemistry)

Departments, Majors, and Undergraduate Degrees

College of Sciences
- Professional Development — Professional Development Degree

Department of Chemistry
- Biochemistry — Bachelor of Science
- Chemistry — Bachelor of Arts
- Chemistry — Bachelor of Science

Department of Geoscience
- Earth and Environmental Science — Bachelor of Science
- Geology — Bachelor of Science

Department of Mathematical Sciences
- Mathematical Sciences — Bachelor of Arts
- Mathematical Sciences — Bachelor of Science
- Mathematical Sciences — Bachelor of Science, Actuarial Science Concentration

Department of Physics and Astronomy
- Physics — Bachelor of Science, Physics Concentration
- Physics — Bachelor of Science, Applied Physics Concentration
- Physics — Bachelor of Science, Computational Physics Concentration

School of Life Sciences
- Biology — Bachelor of Science, Biotechnology Concentration
- Biology — Bachelor of Science, Cell and Molecular Biology Concentration
- Biology — Bachelor of Science, Comprehensive Concentration
- Biology — Bachelor of Science, Ecology and Evolutionary Biology Concentration
- Biology — Bachelor of Science, Education Concentration
- Biology — Bachelor of Science, Integrative Physiology Concentration
- Biology — Bachelor of Science, Microbiology Concentration
- Biology — Bachelor of Science, Pre-Professional Concentration

Graduate Degree Programs

Astronomy
- Master of Science in Astronomy, Doctor of Philosophy in Astronomy

Biochemistry
- Master of Science in Biochemistry

Chemistry
- Master of Science in Chemistry
- Doctor of Philosophy in Chemistry

Geoscience
- Master of Science in Geoscience
- Doctor of Philosophy in Geoscience

Life Sciences
- Master of Science in Biological Sciences
- Doctor of Philosophy in Biological Sciences

Mathematical Sciences
- Master of Science in Mathematical Sciences
- Doctor of Philosophy in Mathematical Sciences
- Dual Master of Science in Mathematical Sciences/Economics (M.S./M.A.)
- Dual Mathematical Sciences and Electrical Engineering (M.S./M.S. - EG)
- Dual Mathematical Sciences and Electrical Engineering (M.S./Ph.D. - EG)

Physics
- Master of Science in Physics
- Doctor of Philosophy in Physics

Radiochemistry
- Doctor of Philosophy in Radiochemistry

Science
- Master of Arts in Science (M.A.S.)

Water Resources Management
- Master of Science in Water Resources Management

Minors

- Actuarial Science
- Biological Sciences
- Chemistry
- Earth and Environmental Science
- Geology
- Mathematics
- Physics
- Physical Geography
- Statistics

No course in which a grade of C- or lower is earned may be applied to any minor in the College of Sciences.

Admission to the College

Students must satisfy department minimum GPA requirements before being admitted to a major within the college.

Admission Policies: See admission policies of individual departments.

Transfer Policies: The College of Sciences adheres to the University of Nevada, Las Vegas policies for transfer students found elsewhere in this catalog. The college urges all transfer students to meet an advisor without delay after admission in order to evaluate the applicability of previous course work to department majors and graduation requirements.

College Policies

Probation: A student will be placed on probation within the college for any of the following reasons:

1. The student's cumulative GPA falls below 2.00.
2. The student's semester GPA is below 2.00 for all degree courses.
3. The student receives D, F, or I grades in more than two courses in one semester.

English and math requirements should be taken during the student's first year at UNLV, but no later than the end of the second. Please see the catalog Admissions Section for current ACT/SAT placement test scores that will guide placement in the appropriate English and math class.

Requirements for Probationary Students: Once a student has been placed on probation as a major in a department of the college, the following guidelines apply:

The student must meet with an advisor to design and agree upon a probationary course of study. This course of study must include at least 15 credits that apply toward a degree in the major, with a majority of the credits coming from courses in the college, unless all requirements within the college have been completed. Specific courses will be selected in consultation with the advisor based on the student's previous progress and on established degree program requirements. Upon agreement on a course of study, the advisor will place a memorandum outlining the course of study in the student's file.

Students are expected to complete the probationary course of study within two consecutive semesters and one summer. With approval of the faculty advisor, three consecutive semesters (and the intervening summer) may be allowed if course schedules make it necessary. Students who complete the probationary course of study within the allotted time with a cumulative GPA (for the course of study only) of at least 2.00 will be removed from probation.

Students should consult the listings for individual departments within the college for any specific requirements concerning probationary status.

Suspension: A student on probation will be suspended from the college for the following reasons:

1. The student fails to maintain a GPA of at least 2.00 in a probationary course of study within the allotted time period.
2. The student's cumulative grade point balance is -15 or lower.
3. The student has received D, F, or I grades in more than 25 percent of all degree courses taken.

Readmission: A suspended student may apply for readmission to the college after a full calendar year has elapsed. The readmitted student will enter the college on probation and must follow the requirements for probationary students as outlined above. Under these rules, the student may be suspended a second and final time.

Advisement

Students interested in majoring in any curricular area of the college should consult an advisor in the appropriate department or in the office of the College of Sciences Advising Center for further information concerning scheduling of courses, and curricular revisions too recent to appear in this catalog. It is required that all incoming transfer students obtain advising from the College of Sciences Advising Center prior to the first semester of classes. Freshmen are required to obtain advising before enrolling in their first semester classes at UNLV. As well, those students with any questions regarding degree requirements and graduation applications should contact the Advising Center.

Upperclassmen are encouraged to meet with a faculty advisor regarding career information and graduate/professional schools. Information pertaining to graduate degree programs, including instructions for undergraduate enrollment in graduate courses, is found in the UNLV Graduate Catalog.

Degree Requirements

The graduation requirements outlined below apply to all majors in the College of Sciences.

1. The General Education Core requirements of the university (see Academic Policies section).
2. A total of at least 120 credits with at least 40 credits in courses numbered 300 or higher.
3. The specific requirements for the degree being sought (see departmental listings).
4. A cumulative GPA of at least 2.00 for all courses in the major field.

Health-Related Pre-Professional Students

In addition to pursuing a degree program, many students plan to seek admission to health-related professional schools that provide advanced degrees in specialties such as medicine, osteopathic medicine, veterinary medicine, dentistry, optometry, pharmacy, podiatry, or chiropractic. The College of Sciences provides a complete array of courses that are required by professional schools for admittance. Students who plan to apply to a professional school should be aware of the UNLV Pre-Professional Interview Committee. This committee consists of faculty from a variety of disciplines, including non-science areas and health care professionals from the community. The committee interviews students prior to their applications to professional schools and writes letters of recommendation. When students are ready for their pre-professional interviews (normally in the spring semester of their junior year), they should contact the Office of the Pre-Professional Advisor 702-895-3170 in order to obtain a Pre-Professional interview packet, which contains information and instructions about the interview process. Regardless of the specific major or curricular path within a major that is chosen, students will find excellent Pre-Professional training available in the college.

Certification for Teaching Science or Mathematics in Secondary Schools

Students wanting to prepare themselves to teach science or mathematics at the secondary school level should be aware of the special requirements for teacher certification. It is recommended that these students major in one of the degree programs in the College of Sciences, make their interest in teaching known to their advisor, and consult the College of Education section of this catalog to become aware of specific teacher certification requirements and the availability of the minor in Secondary Education.

ENS 100 - Humans and the Environment
Introduction to the relationship of humans and the environment. Selected aspects of current thinking and research concerning the impact of industrialization and urbanization on environmental quality, including the population explosion; the potential decline of the affluent society by the depletion of natural resources; the pollution of air, land surface, and water; and the public agencies and policies designated to solve environmental problems. 3 credit(s)

ENS 301 - Science Seminars for Teachers
Weekly seminars pertaining to newsworthy topics in the sciences. Designed for primary and secondary educators and presented by UNLV faculty and area scientists. May be taken for one or three credits; the three-credit option requires a library research paper. One credit S/F only; three credits grade only. Prerequisite(s): Bachelor's degree in education or teaching certificate. Note(s): S/F grading only. 1-3 credit(s)

Post-Baccalaureate
Professional Development Degree in Science and Education (PDDSE)

This post baccalaureate degree is intended for persons who hold at least a bachelor's degree and are eligible for or hold a teaching certificate (option A) or who hold at least a bachelor's degree in science, mathematics, or applied science and wish to qualify for a teaching certificate in science or mathematics (option B). The program is intended to deepen and/or broaden the student's background toward those ends. The program consists of a minimum of 24 credits of appropriate course work and is planned with the help of an advisor to meet the needs of individual students. The program plan must be approved by the PDDSE Program Committee consisting of the deans of the College of Sciences and the College of Education or their designees.

Admission: The applicant must possess at least a bachelor's degree in mathematics or a pure or applied science degree or at least a bachelor's degree in any field that qualifies the applicant to hold a valid teaching certificate. Applicants must have as a career objective the goal of teaching science or mathematics in the common schools.

Prerequisite Courses: MATH 126 - Precalculus I (Precalculus mathematics I or equivalent)
and either
CHEM 121 - General Chemistry I/121L (General Chemistry I or equivalent)
or
PHYS 151 - General Physics I
PHYS 151L - General Physics I
or
PHYS 180L - Physics for Scientists and Engineers Lab I
PHYS 180 - Physics for Scientists and Engineers I
Any of these courses may be taken during study for the degree but will not count in the required 24 credits.

Option A: This option is for students who hold at least a B.A./B.S. in any field and who hold or would qualify for a teaching certificate. The student must complete a program of study constructed with the aid of an advisor and approved by the PDDSE Program Committee. The course work will provide the background and competency necessary to instruct in a field or fields of specialization. Generally, this will require the student to meet a major or minor teaching certificate endorsement in mathematics or one of the sciences, or the broad field science option as specified by the Nevada Department of Education. Minimum requirements in the fields available are listed below:

	Minor	Major
Biological Sciences	24 credits	36 credits
General Science	24 credits	36 credits
Mathematics	16 credits	30 credits

The student must also complete a special methods course for the teaching area of specialization.

Option B: This option is for students who hold at least a B.A./B.S. in science, an applied science, or mathematics. The student must complete a program of study drawn up with the help of an advisor and approved by the PDDSE Program Committee. This includes course work in mathematics or science needed to fulfill requirements for a major or minor in at least one area of teaching specialization, the appropriate teaching methods course(s), and those professional education courses specified by the Nevada Department of Education as necessary for certification as a teacher.

Program Completion Requirements: Students enrolled in either Option A or Option B must complete the following program requirements.

1. A minimum of 24 credits at UNLV. With permission of the advisor, up to seven credits that were earned subsequent to the award of the bachelor's degree may be transferred from another accredited institution of higher learning. No course in which the grade was C- or lower will be accepted.
2. A minimum cumulative grade point average of 2.50 or above in courses that appear on the official program, exclusive of prerequisites.
3. Completion of:
   MATH 127 - Precalculus II (Precalculus Mathematics II) or equivalent and completion of one of the following:
   CHEM 122 - General Chemistry II/122L (General Chemistry II) or equivalent
   PHYS 152 - General Physics II
   PHYS 152L - General Physics II or equivalent
   PHYS 181 - Physics for Scientists and Engineers II
   PHYS 181L - Physics for Scientists and Engineers Lab II or equivalent
   PHYS 182 - Physics for Scientists and Engineers III
   PHYS 182L - Physics for Scientists and Engineers Lab III
   The intent is that students complete at least one year of general chemistry or one year of general or engineering physics.

College of Science Course Descriptions:
SCI 101 is a first year course (fulfills First Year Seminar requirement) designed to foster understanding of scientific methodology, discourse, and ethics, develop analytical and critical thinking skills, and to help students explore, discover, and connect with the university and its academic and scientific resources.

SCI 499 is a seminar course designed to develop and hone leadership skills for undergraduate students. Students acquire skills required for proctoring examination, tutoring of undergraduate students, teaching undergraduate students, and peer advising. Students also receive education regarding ethics that are essential for all responsibilities. Prerequisite: Sophomore standing and cumulative GPA of 3.0 or higher.

School of Life Sciences

Purpose and Focus

Biology is the study of life. The earth is filled with an enormous variety of living organisms; therefore, an understanding of the basic biological processes common to all organisms is essential to understanding the world. In recent decades, great strides have been made in understanding important biological processes, particularly those at the molecular, cellular, and ecosystem levels. An understanding of biological systems depends, in part, on the principles of physics and chemistry; thus a firm background in the physical sciences is also important in the study of biology. For many, an undergraduate major in biology serves as a basis for postgraduate study in the life sciences. School of Life Sciences graduates have gone on to advanced graduate study, leading to careers in college or university teaching, basic and applied research, and public health. Many have entered professional programs in medicine, veterinary medicine, and dentistry. Other graduates have gone directly into secondary (high school) science teaching, the biomedical industry, independent laboratory research, natural resources management, or environmental education.

Accreditation

Northwestern Commission on Colleges and Universities

Undergraduate Major

Biological Sciences

Degree Objectives/Learning Outcomes

The primary mission of the School of Life Sciences is to provide a rich, contemporary learning environment that ensures an integrated educational experience spanning the full spectrum of biology, with focused training available to advanced undergraduate students. Through these efforts, the School of Life Sciences will occupy central roles in creating scientific literacy among the diverse array of UNLV students and in addressing biological issues of local, regional, and global interest.

Students who graduate with a major in biology at UNLV will acquire:

1. Knowledge of the diversity and similarity of living organisms at organizational levels ranging from molecules to the community.
2. Knowledge of processes of inheritance and natural selection as they influence the characteristics of populations and species.
3. Knowledge of scientific methods and the relationships among theory, experiment, analysis of data, and general knowledge.
4. The ability to articulate, in verbal and written form, knowledge of biology, biological methods, and biological issues in context.

Learning Outcome

Students who graduate with a major in biology will have fulfilled their personal expectations and will indicate they have been accepted to a graduate or professional school or an entry-level career position.

Areas of Concentration

Biological Sciences majors at the university have a choice of eight areas of specialized study (concentrations) that prepare them for a variety of professional fields. In addition to attending graduate, medical, and other professional schools, Biological Sciences majors may move directly to governmental and private-sector careers in such fields as health care, laboratory sciences, environmental sciences, and teaching. All concentrations provide the necessary background for application to graduate programs and medical or health science professional schools, differing mainly in their emphasis on specialized career trajectories within the life sciences.

Biology — Biotechnology

The Biotechnology Concentration provides strong preparation for careers in biotechnology, biomedical science research, and the pharmaceutical industry as well as for transition to graduate or other advanced educational programs.

Biology — Cell and Molecular Biology

The Cell and Molecular Biology concentration provides Biological Sciences majors with the intellectual tools essential for careers in biotechnology and biomedical science research as well as for transition to graduate Ph.D. programs in Biology, and in Cell and Molecular Biomedical research.

Biology — Comprehensive

The Comprehensive concentration provides the educational background necessary for a career in modern life science, including all requirements for admission to graduate school or related postgraduate study. The Biology — Comprehensive curriculum provides a solid foundation in fundamental areas of biology while permitting wide choice in course selection, allowing majors to explore and develop areas of molecular, physiological, ecological, and evolutionary biology.

Biology — Ecology and Evolutionary Biology

This concentration is recommended for those students who desire a strong foundation in evolution and the conceptual explanatory core of biology, as well as those whose interests are at the interface between organisms and their environments — that is, ecology. Ecology and Evolutionary Biology students are well-prepared for advanced graduate education in the Biological sciences and for careers in Environmental Biology research in teaching and in natural resources assessment and management.

Biology — Education

The Education concentration is designed for students seeking exceptionally strong backgrounds for professional teaching careers that include biology as a first teaching field. Students completing the Biology — Education curriculum also enroll in course work to satisfy the Minor in Secondary Science Education in the UNLV College of Education.

Biology — Integrative Physiology

The Integrative Physiology concentration provides the biology major with the intellectual and technical tools essential for success in a broad array of life sciences careers including application to all the health care-related professional schools, graduate school or related postgraduate study as well as biomedical science research. Integrative Physiology provides an in-depth examination of how animals and/or plants work from the molecular/cellular level of organization to a systems-level understanding (cardiac, vascular, temperature regulation etc.) and up to the integration of physiology with behavior and evolutionary processes. The integrative nature of this program provides the student with a solid foundation in fundamental areas of biology yet allows a wide choice in course selection ranging from molecular, physiological, ecological, and evolutionary biology.

Biology — Microbiology
The Microbiology concentration provides the biology major with the intellectual and technical skills required for success in the broad area of microbiology, which includes clinical, environmental, ecological, evolutionary, molecular, metabolic, and physiological perspectives of microbes, including aspects of virology and immunology. The skills obtained in this concentration provide training for an array of life sciences careers, including application to all the health care-related professional schools, appropriately related graduate schools, or related postgraduate study as well as biomedical science research. The Microbiology concentration focuses on how microbes function at a variety of levels of organization, from understanding the genetics of micro-organisms, their gene regulation environmental interactions, metabolic regulation, and ecological interactions. Microbiology impacts all levels of biological organization, and as such, students majoring in Biology with a concentration in microbiology are provided with a solid foundation in the life sciences yet are exposed to an in-depth understanding of microbial processes.

Biology — Pre-Professional
The Preprofessional Biology concentration provides Biological Sciences majors with the intellectual tools essential for application to health care-related professional schools, including medical, dental, veterinary, optometric, and related programs.

Biological Sciences — Pre-Professional Biomedical Sciences (BS)

Early Admit Fast-Track Program with the University of Nevada School of Medicine
This program expedites the process of earning a medical degree. Students admitted to the program complete three years of prerequisite coursework at UNLV. Following completion of the second year, students take the MCAT and apply to the University of Nevada School of Medicine (UNSOM) through the American Medical College Application Service (AMCAS). Participation in this Early Admit Program does not guarantee acceptance following completion of the second year of undergraduate study. Students who are admitted to UNSOM matriculate following completion of the third year at UNLV. Coursework completed at UNSOM during the first two years is transferred to UNLV to complete the Bachelor of Science in Preprofessional Biomedical Sciences. The net result is reduction of the time required to earn the baccalaureate and medical degrees from 8 years to 7.

Early Admit Fast-Track Program with UNLV - School of Dental Medicine
This program expedites the process of earning a doctor of dental medicine degree. Students admitted to the program complete three years of prerequisite course work at UNLV. Following completion of the second year, students take the DAT and apply to UNLV — School of Dental Medicine (UNLV-SDM) through the Associated American Dental School Application Service (AADSAS). Participation in this early admit program does not guarantee acceptance following completion of the second year of undergraduate study. Students who are admitted to UNLV-SDM matriculate following completion of the third year at UNLV. Course work completed at UNLV-SDM during the first year is transferred to UNLV to complete the Bachelor of Science in biology — pre-professional concentration. The net result is reduction of the time required to earn the baccalaureate and DMD degrees from eight years to seven. To learn more about the specific details of this program, please contact the pre-health advisor.

Early Admit Fast-Track Program with Touro University - College of Osteopathic Medicine
This program expedites the process of earning an osteopathic medical degree. Students admitted to the program complete three years of prerequisite course work at UNLV. Following completion of the second year, students take the MCAT and apply to Touro University – College of Osteopathic Medicine (TU-COM) through the Association of American Colleges of Osteopathic Medicine Application Service (AACOMAS). Participation in this Early Admit Program does not guarantee acceptance following completion of the second year of undergraduate study. Students who are admitted to TU-COM matriculate following completion of the third year at UNLV. Course work completed at TU-COM during the first two years is transferred to UNLV to complete the Bachelor of Science in Biology — Pre-Professional Concentration. The net result is reduction of the time required to earn the baccalaureate and medical degrees from eight years to seven. To learn more about the specific details of this program please contact the pre-health advisor.

Early Admit Fast-Track Program with Touro University - Physician Assistant Studies Program
This program expedites the process of earning a Master's in Physician Assistant Studies. Students admitted to the program complete three years of prerequisite course work at UNLV. Following completion of the second year, students apply to Touro University — Physician Assistant Studies Program (TU-PASP) through the Central Application Service for Physician Assistants (CASPA). Participation in this Early Admit Program does not guarantee acceptance following completion of the second year of undergraduate study. Students who are admitted to TU-PASP matriculate following completion of the third year at UNLV. Course work completed at TU-PASP during the first two years is transferred to UNLV to complete the Bachelor of Science in Biology — Pre-Professional Concentration. The net result is reduction of the time required to earn the baccalaureate and physician assistant degrees from six to five. To learn more about the specific details of this program, please contact the pre-health advisor.

Major
Biological Sciences - Pre-Professional Biomedical Sciences (BS)
Please see the UNLV College of Sciences, Biological Science department web page at www.unlv.edu/degree/bs-biological-sci-pre-professional-studies for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science Advising at www.unlv.edu/sciences/advising.

Accreditation
Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes
All students graduating with a Bachelor of Science in Biological Sciences should be able to:
*Outcomes marked with an asterisk apply to students graduating with a minor in Biological Sciences.

1. Understand the nature of scientific knowledge.*
   - Describe the differences between opinions, facts, and scientific theories
   - Appropriately utilize the scientific method within the laboratory environment
   - Apply their understanding of the scientific method to successfully design an experiment
   - Critically analyze scientific content presented both orally and in writing
2. Understand cell structures and functions.*
   - Explain the similarities and differences between prokaryotic and eukaryotic cells
   - Explain the similarities and differences between plant and animal cells
   - Describe the structure and function(s) of common eukaryotic organelles (nucleus, ribosomes, rough and smooth endoplasmic reticulum, Golgi apparatus, vesicles, lysosomes, mitochondria, chloroplasts, peroxisomes, vacuoles, and cytoskeleton)
   - Diagram the structure of an animal cell membrane, including the phospholipid bilayer, cholesterol, proteins, and carbohydrates
   - Explain the functions of the cell membrane, including passive and active transport and communication/information processing
3. Understand the physical nature of genetic information.*
   - Describe the structure of DNA
   - Diagram the basic structure of a gene, including regulatory and coding sequences
   - Explain how genetic information is used in reproduction, including the processes of mitosis and meiosis
   - Explain how genetic information is utilized during transcription, translation, DNA replication, and cell division
   - Explain how genetic information can be changed through processes of mutation
   - Explain how epigenetic regulation of gene expression can occur
4. Understand that all organisms are genetically related, have evolved, and are evolving.*
   - Explain the relationship between genetic information, physical characteristics, and the environment
   - Provide a timeline of major evolutionary events describing the emergence of the main forms of life (prokaryotes, eukaryotes, multicellular life, fungi, plants, insects, fish, amphibians, reptiles, birds, mammals)
   - Articulate the mechanisms of evolution including mutation, selection, and speciation
   - Apply their understanding of evolutionary relationships to accurately interpret phylogenetic trees
   - Explain experimental techniques used to investigate evolution
5. Understand the metabolic complexity of cells and organisms.
   - Provide examples of diverse mechanisms used by cells/organisms to extract energy from the environment
   - Explain the reactions of energy transformation that occur in mitochondria, chloroplasts, microbes, and multicellular organisms
   - Provide examples of diverse mechanisms used by cells/organisms to synthesize biological molecules
   - Explain how cells/organisms regulate the internal environment
6. Understand the complex interplay of how organisms respond to and interact with each other and their environment.
   - Describe how interactions change as the scale of life transitions from cells to ecosystems
   - Articulate the different patterns of population growth and explain the environmental factors that underlie each pattern
   - Explain community structure and the various forms of biodiversity
   - Provide examples of the types of interactions that can occur between community members, including competition, predation, parasitism, coexistence, mutualism, and commensalism
   - Explain how communities can respond to disturbances
   - Discuss the interactions that occur between organisms and the nonliving components of their environment, including the role of biogeochemical cycling
7. Effectively communicate complex biological concepts, orally and in writing.
   - Effectively discuss individual biological concepts in short written format such as a two to four paragraph response
   - Effectively articulate the relationships between many biological concepts in an extended written format such as an eight to ten page paper
   - Effectively explain individual biological concepts in a ten to fifteen minute oral presentation
   - Effectively answer questions from the audience following an oral presentation
   - Summarize key points from a peer-reviewed journal article in a written report or during a group discussion
8. Fulfill their professional goals.
   - In addition to the outcomes listed above, concentration specific outcomes are as follows:

Biotechnology
- Understand how organisms can be genetically manipulated for the production of a useful biological commodity.

Cell and Molecular Biology
- Explain the interrelationship between chemistry and biology, including how physical and chemical laws influence the structure and function of intracellular components and macromolecules.

Comprehensive Biology
- Understand the general complexity, diversity, and interaction of living organisms at organizational levels ranging from cells to communities.

Ecology and Evolutionary Biology
- Articulate in detail the interactions organisms have with each other and with nonliving components of the environment and how organisms and environments change over time.

Education
- Accumulate the knowledge necessary to provide biology instruction to middle- and high-school students. Students in the Education concentration will also work with an advisor in the College of Education to ensure they are simultaneously fulfilling the requirements necessary for licensing in secondary science education.

Integrative Physiology
- Explain how cells and organisms acquire and process nutrients, transform energy, and maintain homeostasis in a variable environment to survive and reproduce.

Microbiology
- Explain the diversity and similarity of microbes, including their physiology, mechanisms of pathogenesis and host defenses, and unique ecology.

Pre-professional Studies

- Become competitive candidates for admission into professional schools.

University Graduation Requirements

- Please see Graduation Policies for complete information

Early Admit Fast – Track Program with the University of Nevada School of Medicine

This program expedites the process of earning a medical degree. Students admitted to the program complete three years of prerequisite coursework at UNLV. Following completion of the second year, students take the MCAT and apply to the University of Nevada School of Medicine (UNSOM) through the American Medical College Application Service (AMCAS). Participation in this Early Admit Program does not guarantee acceptance following completion of the second year of undergraduate study. Students who are admitted to UNSOM matriculate following completion of the third year at UNLV. Coursework completed at UNSOM during the first two years is transferred to UNLV to complete the Bachelor of Science in Preprofessional Biomedical Sciences. The net result is reduction of the time required to earn the baccalaureate and medical degrees from 8 years to 7.

Students desirous of entering the program must satisfy one of two admission criteria:

Traditional application route:

- Completion of high school with a 3.5 cumulative GPA
- Completion of the ACT with a minimum score of 27
- Submission of three letters of recommendation
- Submission of a resume summarizing all relevant non-curricular experience

Alternate application route:

- Completion of 30 credit hours of coursework including at least two science courses
- Maintain a 3.5 cumulative and 3.5 science GPA in above coursework
- Submission of three letters of recommendation
- Submission of a resume summarizing all relevant non-curricular experience

Students meeting either criterion may apply for the program. A joint admission committee comprised of both UNLV and UNSOM faculty will interview applicants and select students for admission into the program. Students admitted to the program engage in three years of defined curriculum required for the baccalaureate degree and application to UNSOM. The Pre-Health Advisor monitors student performance during the three years at UNLV. Students whose science or cumulative GPA falls below 3.5 are placed on academic probation. Students incurring two sequential semesters of academic probation are ejected from the program and may not petition for readmission. Students who maintain a 3.5 cumulative and science GPA are eligible to take the MCAT and apply for admission to UNSOM following completion of the second year of coursework. The application process requires completion of the AMCAS application, a MCAT score of 28 or better with no subset scores lower than 8, and an interview by the Pre-professional Evaluation Committee. Students meeting the above criteria are granted an interview by the UNSOM Committee. The committee bases its decision to admit or deny admission on academic performance, MCAT score, non-curricular qualifications, and the interview. Students who are not admitted to UNSOM through the Early Admit Program are eligible to reapply following completion of the third year of undergraduate coursework.

Biological Science - Pre-Professional

Biomedical Studies Degree Requirements ..... Total: 120 Credits

General Education Requirements ..... Subtotal: 32-36 Credits

First-Year Seminar ..... Credits: 2-3

(see note 1 below)

English ..... Credits: 6

- ENG 101 - Composition I

and

- ENG 102 - Composition II

Second-Year Seminar ..... Credits: 3

Constitutions ..... Credits: 3-6

Mathematics

Distribution Requirement ..... Credits: 18

Please see Distribution Requirements for more information.

- Humanities and Fine Arts: ..... 9 Credits
  - Two courses 3 credits each from two different humanities areas ..... 6 Credits
  - One course in fine arts ..... 3 Credits
- Social Science: ..... 9 Credits
  - EPY 303 - Educational Psychology
  - and two 3 credits social science courses
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirements

Multicultural and International

Multicultural, one 3 credit course required

International, one 3 credit course required

These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students

Major Requirements - BS in Biological Science -

PreProfessional Studies ..... Subtotal: 78-85 Credits

(see note 2 below)

UNSOM Courses ..... UNLV Equivalent

Systems Physiology ..... BIOL 440 - Mammalian Physiology

Clinical Histology ..... BIOL 468 - Histology

Human Biochemistry ..... CHEM 474 - Biochemistry I

CHEM 475 ..... Biochemistry II

Clinical Gross Anatomy ..... BIOL 451 - Comparative Vertebrate Anatomy

Clinical Embryology ..... BIOL 465 - Vertebrate Embryology

Medical Neuroscience ..... BIOL 475 - Neurobiology

Nutrition ..... BIOL 449 - Comparative Nutrition

Medical Cell Biology ..... BIOL 445 - Cell Physiology

The combination of Basic Science Foundation and Principles of Biochemistry provide credit for BIOL 468 , and CHEM 475 .

General Human Anatomy provides credit for both BIOL 465 .

Infection and Immunity and Medical Microbiology and Immunology combined provide credit for BIOL 251 and BIOL 453 .

Capstone Experience may be used to fill part of the Biology-Preprofessional requirement (see note 3 below).

Biology Core Requirements ..... Credits: 19

- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

or

- BIOL 304 - Molecular Genetics

- BIOL 351 - Microbiology
- BIOL 415 - Evolution

Students with strong high school preparation in biology (honors or AP biology courses with lab or the equivalent) and who have achieved a score of 5 on the AP Biology exam may have either BIOL 196 or BIOL 197 lectures waived and the appropriate lab completed at UNLV (see the Advising Center before enrolling in classes).

Other Required Courses..... Credits: 31

- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 241L - Organic Chemistry for Life Sciences Lab I
- CHEM 242 - Organic Chemistry II
- CHEM 242L - Organic Chemistry for Life Sciences Laboratory II
- MATH 181 - Calculus I - Fulfills General Education Requirement
- STAT 391 - Applied Statistics for Biological Sciences

or

- STAT 491 - Statistics for Scientists I
- PHYS 151 - General Physics I
- PHYS 151L - General Physics I
- PHYS 152 - General Physics II
- PHYS 152L - General Physics II

At least one upper-division BIOL course from list A or E.

List A: Ecological and Evolutionary Biology:

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 305 - Introduction to Conservation Biology
- BIOL 341 - Principles of Ecology
- BIOL 412 - Molecular Evolution
- BIOL 427 - Bryology
- BIOL 441 - Field Ecology
- BIOL 444 - Principles of Plant Ecology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics
- BIOL 490 - Biogeography

List E: Organismal Biology:

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 320 - Invertebrate Zoology
- BIOL 422 - Taxonomy of Vascular Plants
- BIOL 431 - Ichthyology
- BIOL 432 - Herpetology
- BIOL 434 - Mammalogy
- BIOL 437 - Entomology

Courses completed at the University of Nevada School of Medicine provide credit for all remaining coursework required for the Biology - Preprofessional degree.

Total Credits: 120

Notes:

1. Lists of approved capstone courses may be obtained in the departmental office or the College of Sciences Advising Center.
2. At least 40 credits must be earned at the upper-division level (300 and above).
3. Lists of approved capstone courses may be obtained in the departmental office or the College of Sciences Advising Center.

Biology Major (BS)

Biology Major - Bachelor of Science (BS)

Please see the UNLV College of Sciences, Biology department web page at www.unlv.edu/lifesciences for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science Advising at www.unlv.edu/sciences/advising.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

All students graduating with a Bachelor of Science in Biological Sciences should be able to:

*Outcomes marked with an asterisk apply to students graduating with a minor in Biological Sciences.

1. Understand the nature of scientific knowledge.
   - Describe the differences between opinions, facts, and scientific theories
   - Appropriately utilize the scientific method within the laboratory environment
   - Apply their understanding of the scientific method to successfully design an experiment
   - Critically analyze scientific content presented both orally and in writing
2. Understand cell structures and functions.
   - Explain the similarities and differences between prokaryotic and eukaryotic cells
   - Explain the similarities and differences between plant and animal cells
   - Describe the structure and function(s) of common eukaryotic organelles (nucleus, ribosomes, rough and smooth endoplasmic reticulum, Golgi apparatus, vesicles, lysosomes, mitochondria, chloroplasts, peroxisomes, vacuoles, and cytoskeleton)
   - Diagram the structure of an animal cell membrane, including the phospholipid bilayer, cholesterol, proteins, and carbohydrates
   - Explain the functions of the cell membrane, including passive and active transport and communication/information processing
3. Understand the physical nature of genetic information.
   - Describe the structure of DNA
   - Diagram the basic structure of a gene, including regulatory and coding sequences
   - Explain how genetic information is used in reproduction, including the processes of mitosis and meiosis
   - Explain how genetic information is utilized during transcription, translation, DNA replication, and cell division
   - Explain how genetic information can be changed through processes of mutation
   - Explain how epigenetic regulation of gene expression can occur
4. Understand that all organisms are genetically related, have evolved, and are evolving.
   - Explain the relationship between genetic information, physical characteristics, and the environment

- Provide a timeline of major evolutionary events describing the emergence of the main forms of life (prokaryotes, eukaryotes, multicellular life, fungi, plants, insects, fish, amphibians, reptiles, birds, mammals)
- Articulate the mechanisms of evolution including mutation, selection, and speciation
- Apply their understanding of evolutionary relationships to accurately interpret phylogenetic trees
- Explain experimental techniques used to investigate evolution

5. Understand the metabolic complexity of cells and organisms.
   - Provide examples of diverse mechanisms used by cells/organisms to extract energy from the environment
   - Explain the reactions of energy transformation that occur in mitochondria, chloroplasts, microbes, and multicellular organisms
   - Provide examples of diverse mechanisms used by cells/organisms to synthesize biological molecules
   - Explain how cells/organisms regulate the internal environment
6. Understand the complex interplay of how organisms respond to and interact with each other and their environment.
   - Describe how interactions change as the scale of life transitions from cells to ecosystems
   - Articulate the different patterns of population growth and explain the environmental factors that underlie each pattern
   - Explain community structure and the various forms of biodiversity
   - Provide examples of the types of interactions that can occur between community members, including competition, predation, parasitism, coexistence, mutualism, and commensalism
   - Explain how communities can respond to disturbances
   - Discuss the interactions that occur between organisms and the nonliving components of their environment, including the role of biogeochemical cycling
7. Effectively communicate complex biological concepts, orally and in writing.
   - Effectively discuss individual biological concepts in short written format such as a two to four paragraph response
   - Effectively articulate the relationships between many biological concepts in an extended written format such as an eight to ten page paper
   - Effectively explain individual biological concepts in a ten to fifteen minute oral presentation
   - Effectively answer questions from the audience following an oral presentation
   - Summarize key points from a peer-reviewed journal article in a written report or during a group discussion
8. Fulfill their professional goals.
   - In addition to the outcomes listed above, concentration specific outcomes are as follows:

Biotechnology
- Understand how organisms can be genetically manipulated for the production of a useful biological commodity.

Cell and Molecular Biology
- Explain the interrelationship between chemistry and biology, including how physical and chemical laws influence the structure and function of intracellular components and macromolecules.

Comprehensive Biology
- Understand the general complexity, diversity, and interaction of living organisms at organizational levels ranging from cells to communities.

Ecology and Evolutionary Biology
- Articulate in detail the interactions organisms have with each other and with nonliving components of the environment and how organisms and environments change over time.

Education
- Accumulate the knowledge necessary to provide biology instruction to middle- and high-school students. Students in the Education concentration will also work with an advisor in the College of Education to ensure they are simultaneously fulfilling the requirements necessary for licensing in secondary science education.

Integrative Physiology
- Explain how cells and organisms acquire and process nutrients, transform energy, and maintain homeostasis in a variable environment to survive and reproduce.

Microbiology
- Explain the diversity and similarity of microbes, including their physiology, mechanisms of pathogenesis and host defenses, and unique ecology.

Pre-professional
- Become competitive candidates for admission into professional schools.

University Graduation Requirements
- Please see Graduation Policies for complete information

Admission Policies

Minimum GPA Requirement: 2.50

Prospective biology majors with a GPA less than 2.50, but at least 2.0, may be admitted on probationary status. A student placed on probation must meet with an advisor to design and agree upon a probationary course of study based on the student's previous progress and on established degree program requirements. This course of study must include at least 15 credits that apply toward a degree in the major, with a majority of the credits coming from courses in the college, unless all requirements within the college have been completed by the student. The advisor will place a memorandum outlining the course of study in the student's file. Students are expected to complete the probationary course of study within two consecutive semesters and one summer. Students who complete the probationary course of study within the allotted time with a cumulative GPA (for the course of study only) of at least 2.00 will be removed from probation.

Biological Sciences Major:

Course requirements: Biological Sciences majors must complete a set of required 100-level science, math, and composition classes with a satisfactory grade before they can enroll in more advanced 300- and 400-level biology classes. In the first two semesters the typical student will complete the seven biology, chemistry, math, and composition courses listed below with a C or better (C- is not sufficient) as a prerequisite for enrollment in any upper division biology course. These courses, which satisfy university and science major requirements (25 credits), are typically taken in the freshman year:

- BIOL 196 and BIOL 197
- CHEM 121 and CHEM 122
- MATH 127 or higher
- ENG 101 and ENG 102

With satisfactory completion of these classes ("C" or better in each class), students will be able to enroll in 300- and 400-level biology classes, subject to any additional prerequisites listed in the course catalog.

If a student does not earn a "C" or better the first time they take a required course, it is expected that they will repeat the course one time and utilize available resources to improve their academic performance. Continuation as a biology major requires a C or better (C- is not sufficient) in each course (or equivalent transferred from another institution).

Transfer Policies: Transfer students must have a minimum GPA of 2.50. All students are required to meet with an advisor to determine course work that can be used to satisfy degree requirements. Biology, chemistry, physics and math transfer courses will be accepted to fill specific degree requirements only with a grade of C or better.

Although rare, it is possible for superior pre-professional students to gain admission to a professional school upon completion of 94 units of undergraduate work. Such students may, under certain circumstances, be awarded a baccalaureate degree from UNLV upon successfully completing one year of full-time study with courses equivalent to the School of Life Sciences major at the professional school. To apply for a degree after one year of professional school, students must have completed 94 units at UNLV with a GPA of 3.50 and meet university and college graduation requirements. Any student contemplating such a program must obtain approval from the departmental chair and college dean in advance of departure from UNLV.

Community College Articulation: The School of Life Sciences has course articulation agreements with several community colleges both within and outside Nevada. For specific information about transfer of credits from two-year institutions, students should seek advising about specific courses of study from the department.

Department Policies

Academic Policies: In addition to the General Education Core requirements, all study courses must include a minimum of 39 credits in the Biological Sciences and satisfy the specific requirements of one of the five concentration areas offered by the department.

In accord with UNLV requirements, at least 40 credits must be earned in upper-division-level courses. This requirement may be satisfied by selecting courses within and outside the School of Life Sciences.

To graduate with a degree in the biological sciences, a GPA of at least 2.00 must be maintained for all courses in the major field (BIOL). All BIOL core courses taken (BIOL 196, 197, 300 or 304, 351, and 415) must be passed with a grade of C- or better to fulfill prerequisites for other upper-division courses and to apply to the B.S. degree in Biological Sciences.

BIOL 100, 104, 109, 113, 189, 120, 121, 122, 148, 208, 220, 223, and 224 are designed for non-biology majors and do not fulfill the School of Life Sciences curricular requirements. Although these credits will apply to the general university total credit requirement; or might be required or advised for other programs or career tracks (e.g., primary or secondary teaching), they are not recommended for Biological Sciences majors and do not fulfill any requirements for the biology major. The faculty of the School of Life Sciences urge all new majors in the department to enroll in and promptly complete fundamental course work, which will serve as a foundation for success in the study of the life sciences. By the end of the second full year of study (or its equivalent), Biological Sciences Instructors will expect that Biological Sciences majors in all concentrations will have completed: ENG 101 and 102; MATH 127, 128 or MATH 181; CHEM 121 and 122; and PHYS 151/151L and 152/152L (or the equivalent from the PHYS 180 series). BIOL course content will reflect these expectations.

Advisement

All pre-majors and majors in the School of Life Sciences are required to meet with an advisor once a year at the College Advising Center located in Paul McDermott Physical Education Building. Students who fail to meet with an advisor will not be able to register for courses in the fall semesters.

Note: Requirements for the major have been revised. The new requirements apply to biology majors in the class of Fall 2014 and later. Students in prior classes follow the requirements that were in place when they entered the program. Students needing help in bridging gaps between old and new programs should contact the School of Life Sciences office (WHI 101).

Biology

Degree Requirements..... Total: 120 Credits
General Education Requirements..... Subtotal: 33-37 Credits
First-Year Seminar..... Credits: 2-3
(see note 1 below)
English Composition ..... Credits: 6
- ENG 101 - Composition I
- ENG 102 - Composition II

Second - Year Seminar..... Credits: 3
Constitutions ..... Credits: 4-6
Mathematics
- MATH 181 - Calculus I - Fulfilled by the major requirment

Distribution Requirement..... Credits: 18
Please see Distribution Requirements for more information.
- Humanities and Fine Arts: ..... 9 Credits
  - Two courses 3 credits each from two different humanities areas..... 6 credits
  - One course in fine arts- 3 credits
- Social Science:..... 9 Credits
  - One course each from three different fields.
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirements

Multicultural and International
(see note 2 below)
Multicultural, one 3 credit course required
International, one 3 credit course required
These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students.

Major Requirements - BS in Biology

Biotechnology Concentration ..... Subtotal: 76-80 Credits

(see note 2 and 3 below)

Biology Core Requirements ..... Credits: 19

- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

or

- BIOL 304 - Molecular Genetics
- BIOL 351 - Microbiology
- BIOL 415 - Evolution

Other Required Courses..... Credits: 37

- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 241L - Organic Chemistry for Life Sciences Lab I
- CHEM 242 - Organic Chemistry II
- CHEM 242L - Organic Chemistry for Life Sciences Laboratory II
- CHEM 474 - Biochemistry I
- CHEM 475 - Biochemistry II
- MATH 181 - Calculus I
- STAT 391 - Applied Statistics for Biological Sciences

or

- STAT 491 - Statistics for Scientists I
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II

Recommended Course

- MATH 182 - Calculus II

Biology-Biotechnology Requirements..... Credits: 20-24

A minimum of five courses are required.

- BIOL 351 - Microbiology
- BIOL 405 - Molecular Biology

and a minimum of two upper-division BIOL courses from lists B and D with at least one from list A, C or E. Other course work important for biotechnology careers, such as Quality Assurance/Quality Control may be petitioned to be substituted for UNLV courses.

List A: Ecology and Evolutionary Biology

- BIOL 301 - Fossil Record
- BIOL 341 - Principles of Ecology
- BIOL 412 - Molecular Evolution
- BIOL 418 - Microbial Ecology
- BIOL 427 - Bryology
- BIOL 441 - Field Ecology
- BIOL 444 - Principles of Plant Ecology
- BIOL 471 - Aquatic Ecology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics
- BIOL 490 - Biogeography

List B: Cell and Molecular Biology

- BIOL 300 - Principles of Genetics
- BIOL 304 - Molecular Genetics
- BIOL 409 - Virology
- BIOL 412 - Molecular Evolution
- BIOL 414 - Endocrinology
- BIOL 425 - Genomics
- BIOL 445 - Cell Physiology
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 453 - Immunology
- BIOL 460 - Microbial Physiology
- BIOL 464 - Bacterial Pathogenesis
- BIOL 466 - Developmental Biology
- BIOL 470 - Topics in Applied Microbiology
- BIOL 473 - Advanced Topics in Cell and Molecular Biology
- BIOL 475 - Neurobiology
- BIOL 481 - Advanced Cell Biology
- BIOL 485 - Microbial Genetics
- BIOL 489 - Developmental Genetics

List C: Anatomical and Morphological Biology

- BIOL 348 - Introduction to Human Anatomy
- BIOL 426 - Plant Anatomy
- BIOL 455 - Comparative Vertebrate Anatomy and Biomechanics
- BIOL 465 - Vertebrate Embryology
- BIOL 468 - Histology

List D: Physiological Biology

- BIOL 414 - Endocrinology
- BIOL 417 - Biochemical Adaptations
- BIOL 440 - Mammalian Physiology
- BIOL 442 - Principles of Plant Physiology with Laboratory
- BIOL 445 - Cell Physiology
- BIOL 447 - Advanced Comparative Animal Physiology
- BIOL 448 - Mammalian Physiology Laboratory
- BIOL 449 - Comparative Nutrition
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 460 - Microbial Physiology
- BIOL 475 - Neurobiology
- BIOL 480 - Introduction to Biological Modeling

List E: Organismal Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 320 - Invertebrate Zoology
- BIOL 422 - Taxonomy of Vascular Plants
- BIOL 431 - Ichthyology
- BIOL 432 - Herpetology
- BIOL 433 - Ornithology
- BIOL 434 - Mammalogy
- BIOL 437 - Entomology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics

Electives..... Credits: 0-11

Total Credits: 120

Notes

1. It is strongly recommended that students take SCI 101 to satisfy the First Year Seminar requirement.
2. It is strongly recommended that students interested in biomedicine or attending graduate school take additional appropriate upper-division biology courses and research units to meet their elective credit requirements.
3. At least 40 credits must be earned at the upper-division level (300 and above).
4. BIOL 196 or 197 lectures may be waived. See Advising Center before enrolling.

Major Requirement - BS in Biology
Cell and Molecular Biology Concentration .....Subtotal: 76 Credits
(see notes 2-4 below)
Biology Core Requirements ..... Credits: 19
- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

or
- BIOL 304 - Molecular Genetics
- BIOL 351 - Microbiology
- BIOL 415 - Evolution

Required Courses..... Credits: 37
- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 241L - Organic Chemistry for Life Sciences Lab I
- CHEM 242 - Organic Chemistry II
- CHEM 242L - Organic Chemistry for Life Sciences Laboratory II
- CHEM 474 - Biochemistry I
- CHEM 475 - Biochemistry II
- MATH 181 - Calculus I
- STAT 391 - Applied Statistics for Biological Sciences

or
- STAT 491 - Statistics for Scientists I
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II

Other Recommended Courses
- MATH 182 - Calculus II

Biology - Cell and Molecular ..... Credits: 20
A minimum of five courses are required
Required Courses
- BIOL 405 - Molecular Biology
- BIOL 425 - Genomics
- BIOL 445 - Cell Physiology

Remaining credits selected from Lists A, B, C, D, E
List A: Ecology and Evolutionary Biology
- BIOL 300 - Principles of Genetics
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 305 - Introduction to Conservation Biology
- BIOL 341 - Principles of Ecology
- BIOL 412 - Molecular Evolution
- BIOL 418 - Microbial Ecology
- BIOL 427 - Bryology
- BIOL 441 - Field Ecology
- BIOL 444 - Principles of Plant Ecology
- BIOL 471 - Aquatic Ecology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics
- BIOL 490 - Biogeography

List B: Cell and Molecular Biology
- BIOL 300 - Principles of Genetics
- BIOL 304 - Molecular Genetics
- BIOL 409 - Virology
- BIOL 412 - Molecular Evolution
- BIOL 414 - Endocrinology
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 453 - Immunology
- BIOL 460 - Microbial Physiology
- BIOL 464 - Bacterial Pathogenesis
- BIOL 466 - Developmental Biology
- BIOL 470 - Topics in Applied Microbiology
- BIOL 473 - Advanced Topics in Cell and Molecular Biology
- BIOL 475 - Neurobiology
- BIOL 481 - Advanced Cell Biology
- BIOL 485 - Microbial Genetics
- BIOL 489 - Developmental Genetics

List C: Anatomical and Morphological Biology
- BIOL 348 - Introduction to Human Anatomy
- BIOL 426 - Plant Anatomy
- BIOL 455 - Comparative Vertebrate Anatomy and Biomechanics
- BIOL 465 - Vertebrate Embryology
- BIOL 468 - Histology

List D: Physiological Biology
- BIOL 414 - Endocrinology
- BIOL 417 - Biochemical Adaptations
- BIOL 440 - Mammalian Physiology
- BIOL 442 - Principles of Plant Physiology with Laboratory
- BIOL 445 - Cell Physiology
- BIOL 447 - Advanced Comparative Animal Physiology
- BIOL 448 - Mammalian Physiology Laboratory
- BIOL 449 - Comparative Nutrition
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 460 - Microbial Physiology
- BIOL 475 - Neurobiology
- BIOL 480 - Introduction to Biological Modeling

List E: Organismal Biology
- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 320 - Invertebrate Zoology
- BIOL 422 - Taxonomy of Vascular Plants
- BIOL 431 - Ichthyology
- BIOL 432 - Herpetology
- BIOL 433 - Ornithology
- BIOL 434 - Mammalogy
- BIOL 437 - Entomology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics

Electives.....Credits: 4-11
Total Credits: 120

Major Requirement - BS in Biology
Comprehensive Concentration.....Subtotal: 73 Credits
(see note 4 below)
- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

or
- BIOL 304 - Molecular Genetics
- BIOL 351 - Microbiology
- BIOL 415 - Evolution

Other Required Courses..... Credits: 34
- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 241L - Organic Chemistry for Life Sciences Lab I
- CHEM 242 - Organic Chemistry II
- CHEM 242L - Organic Chemistry for Life Sciences Laboratory II

- CHEM 474 - Biochemistry I
- MATH 181 - Calculus I
- STAT 391 - Applied Statistics for Biological Sciences

or

- STAT 491 - Statistics for Scientists I
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II

Recommended Courses

- CHEM 475 - Biochemistry II
- MATH 182 - Calculus II

Biology - Comprehensive Requirements ..... Credits 20
A minimum of five courses are required. A maximum of three courses from any one list (A, B, C, D or E) depending on the areas of interest, with the remaining credits selected from a least two other lists.

List A: Ecology and Evolutionary Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 305 - Introduction to Conservation Biology
- BIOL 341 - Principles of Ecology
- BIOL 412 - Molecular Evolution
- BIOL 418 - Microbial Ecology
- BIOL 427 - Bryology
- BIOL 441 - Field Ecology
- BIOL 444 - Principles of Plant Ecology
- BIOL 471 - Aquatic Ecology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics
- BIOL 490 - Biogeography

List B: Cell and Molecular Biology

- BIOL 300 - Principles of Genetics
- BIOL 304 - Molecular Genetics
- BIOL 405 - Molecular Biology
- BIOL 409 - Virology
- BIOL 412 - Molecular Evolution
- BIOL 414 - Endocrinology
- BIOL 425 - Genomics
- BIOL 445 - Cell Physiology
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 453 - Immunology
- BIOL 460 - Microbial Physiology
- BIOL 464 - Bacterial Pathogenesis
- BIOL 466 - Developmental Biology
- BIOL 470 - Topics in Applied Microbiology
- BIOL 473 - Advanced Topics in Cell and Molecular Biology
- BIOL 475 - Neurobiology
- BIOL 481 - Advanced Cell Biology
- BIOL 485 - Microbial Genetics
- BIOL 489 - Developmental Genetics

List C: Anatomical and Morphological Biology

- BIOL 348 - Introduction to Human Anatomy
- BIOL 426 - Plant Anatomy
- BIOL 455 - Comparative Vertebrate Anatomy and Biomechanics
- BIOL 465 - Vertebrate Embryology
- BIOL 468 - Histology

List D: Physiological Biology

- BIOL 414 - Endocrinology
- BIOL 417 - Biochemical Adaptations
- BIOL 442 - Principles of Plant Physiology with Laboratory
- BIOL 445 - Cell Physiology
- BIOL 447 - Advanced Comparative Animal Physiology
- BIOL 448 - Mammalian Physiology Laboratory
- BIOL 449 - Comparative Nutrition
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 460 - Microbial Physiology
- BIOL 475 - Neurobiology
- BIOL 480 - Introduction to Biological Modeling

List E: Organismal Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 320 - Invertebrate Zoology
- BIOL 422 - Taxonomy of Vascular Plants
- BIOL 431 - Ichthyology
- BIOL 432 - Herpetology
- BIOL 433 - Ornithology
- BIOL 434 - Mammalogy
- BIOL 437 - Entomology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics

Electives.....Credits: 4-14
Total Credits: 120

Major Requirements - BS in Biology
Ecology and Evolutionary
Biology Concentration.....Subtotal: 77 Credits
(see note 2-4 below)
Biology Core Requirements ..... Credits: 19

- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

or

- BIOL 304 - Molecular Genetics
- BIOL 351 - Microbiology
- BIOL 415 - Evolution

Students with strong high school preparation in biology (honors or AP biology courses with lab or the equivalent) and who have achieved a score of 5 on the AP Biology exam may have either BIOL 196 or BIOL 197 lectures waived, and the appropriate lab completed at UNLV (see the Advising Center before enrolling in classes).
Other Required Courses..... Credits: 34

- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 241L - Organic Chemistry for Life Sciences Lab I
- CHEM 242 - Organic Chemistry II
- CHEM 242L - Organic Chemistry for Life Sciences Laboratory II
- CHEM 474 - Biochemistry I
- MATH 181 - Calculus I
- STAT 391 - Applied Statistics for Biological Sciences

or

- STAT 491 - Statistics for Scientists I
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II

Recommended Courses

- MATH 182 - Calculus II
- CHEM 475 - Biochemistry II

Biology - Ecology and Evolutionary Biology
Requirements ..... Credits: 24
A minimum of six courses is required. BIOL 341, one course from List A, one from List E and one additional course from either A or E, and two courses from any two of Lists B, C and D. BIOL 441 is strongly recommended for any EEB student with an Ecological career focus.

List A: Ecology and Evolutionary Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 305 - Introduction to Conservation Biology
- BIOL 341 - Principles of Ecology
- BIOL 412 - Molecular Evolution
- BIOL 418 - Microbial Ecology
- BIOL 427 - Bryology
- BIOL 441 - Field Ecology
- BIOL 444 - Principles of Plant Ecology
- BIOL 471 - Aquatic Ecology
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics
- BIOL 490 - Biogeography

List B: Cell and Molecular Biology

- BIOL 300 - Principles of Genetics
- BIOL 304 - Molecular Genetics
- BIOL 405 - Molecular Biology
- BIOL 409 - Virology
- BIOL 412 - Molecular Evolution
- BIOL 414 - Endocrinology
- BIOL 425 - Genomics
- BIOL 445 - Cell Physiology
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 453 - Immunology
- BIOL 460 - Microbial Physiology
- BIOL 464 - Bacterial Pathogenesis
- BIOL 466 - Developmental Biology
- BIOL 470 - Topics in Applied Microbiology
- BIOL 473 - Advanced Topics in Cell and Molecular Biology
- BIOL 475 - Neurobiology
- BIOL 481 - Advanced Cell Biology
- BIOL 485 - Microbial Genetics
- BIOL 489 - Developmental Genetics

List C: Anatomical and Morphological Biology

- BIOL 348 - Introduction to Human Anatomy
- BIOL 426 - Plant Anatomy
- BIOL 455 - Comparative Vertebrate Anatomy and Biomechanics
- BIOL 465 - Vertebrate Embryology
- BIOL 468 - Histology

List D: Physiological Biology

- BIOL 414 - Endocrinology
- BIOL 417 - Biochemical Adaptations
- BIOL 440 - Mammalian Physiology
- BIOL 442 - Principles of Plant Physiology with Laboratory
- BIOL 445 - Cell Physiology
- BIOL 447 - Advanced Comparative Animal Physiology
- BIOL 448 - Mammalian Physiology Laboratory
- BIOL 449 - Comparative Nutrition
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 460 - Microbial Physiology
- BIOL 475 - Neurobiology
- BIOL 480 - Introduction to Biological Modeling

List E: Organismal Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 320 - Invertebrate Zoology
- BIOL 422 - Taxonomy of Vascular Plants
- BIOL 431 - Ichthyology
- BIOL 432 - Herpetology
- BIOL 433 - Ornithology
- BIOL 434 - Mammalogy
- BIOL 437 - Entomology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics

Electives..... Credits: 0-10
Total Credits: 120

Major Requirement - BS in Biology
Education Concentration .....Subtotal: 73 Credits
(see notes 2-4 below)
Biology Core Requirements ..... Credits: 19

- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

or

- BIOL 304 - Molecular Genetics
- BIOL 351 - Microbiology
- BIOL 415 - Evolution

Other Required Courses..... Credits: 34

- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 241L - Organic Chemistry for Life Sciences Lab I
- CHEM 242 - Organic Chemistry II
- CHEM 242L - Organic Chemistry for Life Sciences Laboratory II
- CHEM 474 - Biochemistry I
- MATH 181 - Calculus I
- STAT 391 - Applied Statistics for Biological Sciences

or

- STAT 491 - Statistics for Scientists I
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II

Recommended Courses

- CHEM 475 - Biochemistry II
- MATH 182 - Calculus II

Biology - Education Requirements ..... Credits: 20
A minimum of five courses are required, taken from Lists A, B, C, D, or E. One course must deal with Botany (BIOL 305, BIOL 422, BIOL 426, BIOL 442, BIOL 444). Students must meet with an Advisor in the Education Department in order to determine what requirements are for both a minor in Education and middle/high school certification.

List A: Ecology and Evolutionary Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 305 - Introduction to Conservation Biology
- BIOL 341 - Principles of Ecology
- BIOL 412 - Molecular Evolution
- BIOL 418 - Microbial Ecology
- BIOL 427 - Bryology
- BIOL 441 - Field Ecology
- BIOL 444 - Principles of Plant Ecology

- BIOL 471 - Aquatic Ecology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics
- BIOL 490 - Biogeography

List B: Cell and Molecular Biology

- BIOL 300 - Principles of Genetics
- BIOL 304 - Molecular Genetics
- BIOL 405 - Molecular Biology
- BIOL 409 - Virology
- BIOL 412 - Molecular Evolution
- BIOL 414 - Endocrinology
- BIOL 425 - Genomics
- BIOL 445 - Cell Physiology
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 453 - Immunology
- BIOL 460 - Microbial Physiology
- BIOL 464 - Bacterial Pathogenesis
- BIOL 466 - Developmental Biology
- BIOL 470 - Topics in Applied Microbiology
- BIOL 473 - Advanced Topics in Cell and Molecular Biology
- BIOL 475 - Neurobiology
- BIOL 481 - Advanced Cell Biology
- BIOL 485 - Microbial Genetics
- BIOL 489 - Developmental Genetics

List C: Anatomical and Morphological Biology

- BIOL 348 - Introduction to Human Anatomy
- BIOL 426 - Plant Anatomy
- BIOL 455 - Comparative Vertebrate Anatomy and Biomechanics
- BIOL 465 - Vertebrate Embryology
- BIOL 468 - Histology

List D: Physiological Biology

- BIOL 414 - Endocrinology
- BIOL 417 - Biochemical Adaptations
- BIOL 440 - Mammalian Physiology
- BIOL 442 - Principles of Plant Physiology with Laboratory
- BIOL 445 - Cell Physiology
- BIOL 447 - Advanced Comparative Animal Physiology
- BIOL 448 - Mammalian Physiology Laboratory
- BIOL 449 - Comparative Nutrition
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 460 - Microbial Physiology
- BIOL 475 - Neurobiology
- BIOL 480 - Introduction to Biological Modeling

List E: Organismal Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 320 - Invertebrate Zoology
- BIOL 422 - Taxonomy of Vascular Plants
- BIOL 431 - Ichthyology
- BIOL 432 - Herpetology
- BIOL 433 - Ornithology
- BIOL 434 - Mammalogy
- BIOL 437 - Entomology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics

Electives..... Credits: 14
Total Credits: 120

Major Requirement - BS in Pre-Professional Concentration ..... Subtotal: 76-80 Credits

Biology Core Requirements ..... Credits: 19

- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

or

- BIOL 304 - Molecular Genetics
- BIOL 351 - Microbiology
- BIOL 415 - Evolution

Students with strong high school preparation in biology (honors or AP biology courses with lab or the equivalent) and who have achieved a score of 5 on the AP Biology exam may have either BIOL 196 or BIOL 197 lectures waived and the appropriate lab completed at UNLV (see the Advising Center before enrolling in classes).

Other Required Courses..... Credits: 37

- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 241L - Organic Chemistry for Life Sciences Lab I
- CHEM 242 - Organic Chemistry II
- CHEM 242L - Organic Chemistry for Life Sciences Laboratory II
- CHEM 474 - Biochemistry I
- CHEM 475 - Biochemistry II
- MATH 181 - Calculus I
- STAT 391 - Applied Statistics for Biological Sciences

or

- STAT 491 - Statistics for Scientists I
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II

Recommended Course

- MATH 182 - Calculus II

Biology - Pre-Professional Requirements..... Credits: 20-24

A minimum of five BIOL Courses are required with at least one each from Lists B, C, and D, and one from List A or E.

List A: Ecology and Evolutionary Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 305 - Introduction to Conservation Biology
- BIOL 341 - Principles of Ecology
- BIOL 412 - Molecular Evolution
- BIOL 418 - Microbial Ecology
- BIOL 427 - Bryology
- BIOL 441 - Field Ecology
- BIOL 444 - Principles of Plant Ecology
- BIOL 471 - Aquatic Ecology
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics
- BIOL 490 - Biogeography

List B: Cell and Molecular Biology

- BIOL 300 - Principles of Genetics
- BIOL 304 - Molecular Genetics
- BIOL 405 - Molecular Biology
- BIOL 409 - Virology
- BIOL 412 - Molecular Evolution
- BIOL 414 - Endocrinology
- BIOL 425 - Genomics
- BIOL 445 - Cell Physiology
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 453 - Immunology

- BIOL 460 - Microbial Physiology
- BIOL 464 - Bacterial Pathogenesis
- BIOL 466 - Developmental Biology
- BIOL 470 - Topics in Applied Microbiology
- BIOL 473 - Advanced Topics in Cell and Molecular Biology
- BIOL 475 - Neurobiology
- BIOL 481 - Advanced Cell Biology
- BIOL 485 - Microbial Genetics
- BIOL 489 - Developmental Genetics

List C: Anatomical and Morphological Biology

- BIOL 348 - Introduction to Human Anatomy
- BIOL 426 - Plant Anatomy
- BIOL 455 - Comparative Vertebrate Anatomy and Biomechanics
- BIOL 465 - Vertebrate Embryology
- BIOL 468 - Histology

List D: Physiological Biology

- BIOL 414 - Endocrinology
- BIOL 417 - Biochemical Adaptations
- BIOL 440 - Mammalian Physiology
- BIOL 442 - Principles of Plant Physiology with Laboratory
- BIOL 445 - Cell Physiology
- BIOL 447 - Advanced Comparative Animal Physiology
- BIOL 448 - Mammalian Physiology Laboratory
- BIOL 449 - Comparative Nutrition
- BIOL 452 - Comparative Behavioral Endocrinology
- BIOL 460 - Microbial Physiology
- BIOL 475 - Neurobiology
- BIOL 480 - Introduction to Biological Modeling

List E: Organismal Biology

- BIOL 301 - Fossil Record
- BIOL 302 - Evolutionary Survey of Vascular Plants
- BIOL 320 - Invertebrate Zoology
- BIOL 422 - Taxonomy of Vascular Plants
- BIOL 431 - Ichthyology
- BIOL 432 - Herpetology
- BIOL 433 - Ornithology
- BIOL 434 - Mammalogy
- BIOL 437 - Entomology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 486 - Animal Behavior
- BIOL 487 - Principles of Systematics

Electives.....Credits: 0-11
Total Credits: 120

Minor

Biology Minor

Courses Include .....Total Credits: 24
The Biological Sciences Minor is appropriate for all students with interests in the life sciences and especially for those who seek careers that may be enhanced by a background in biology. These include, but are not limited to, biochemistry, chemistry, geology, psychology, anthropology, and sociology. To minor in Biological Sciences, students must complete the biological sciences core;
BIOL 189 - Fundamentals of Life Science
BIOL 196 - Principles of Modern Biology I
BIOL 197 - Principles of Modern Biology II
and 12 upper-division credits. A genetics course, either BIOL 300 - Principles of Genetics or BIOL 304 - Molecular Genetics and BIOL 415 - Evolution are recommended. No more than three credits of independent study (BIOL 492, 493, 494, 496,) may be applied toward the minor. A Biological Sciences Minor will be awarded only if the overall Biology GPA is 2.00 or above. At least nine credits must be earned at UNLV.

School of Life Sciences

BIOL 100 - General Biology for Non-Majors
Introduction to biology of the human species. For non-majors; emphasizing those aspects of structure, function, ecology, and evolution which provide a biological perspective for problems facing modern society. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Satisfies the General Education Core requirement for a laboratory science course. 4 credit(s)

BIOL 103 - Biology Laboratory
Laboratory portion of either BIOL 100 or BIOL 189, for students who have had course work without a laboratory at a previous institution. Prerequisite(s): Credits for the lecture portion of either majors or non majors entry-level course and consent of instructor. Note(s): For transfer students only. 1 credit(s)

BIOL 104 - Introduction to Human Ecology
Focusing on natural processes that determine where organisms occur and how they change through time, this course for non-science majors will provide introductions to ecology, biogeography, and evolution. The principles learned will be used to understand interrelationships between humans and other organisms and address global issues such as emergent diseases, invasive species, changing landscapes, and wildlife conservation. 3 credit(s)

BIOL 111 - Water, People and the Environment
An introduction to the study of water resources on a local, regional and global scale for non-science students. Special emphasis will be given to how people and societies develop water resources and the environmental consequences of that development. The course will include lectures, readings, videos, class discussions, and local field trips. 3 credit(s)

BIOL 113 - Life in the Ocean
Introduction to the environments and inhabitants of the sea. 3 credit(s)

BIOL 120 - Plants and People
Introduction for non-biology majors to the social, cultural, and economic role of useful and harmful plants and plant products in modern society. Consideration given to the origin, history, and human value of selected plants, especially those used for food, medicine, and industrial raw materials, or religious purposes. 3 credit(s)

BIOL 121 - Human Nutrition
(Same as NUTR 121). Description of the nature and role of carbohydrates, lipids, proteins, water, vitamins, and minerals in the human body. Energy relations and various controversies in nutrition examined, as well as the relationships among nutrition, health, and disease. 3 credit(s)

BIOL 122 - Desert Plants
Study of typical desert plant communities, along with the identification of more common species. Additional topics include morphological and physiological adaptations to aridity; and the nature, origin, and occurrence of arid environments. Lab/Lecture/Studio Hours Two hours lecture and three hours laboratory. Note(s): Satisfies the General Education Core requirement for a laboratory science course. 3 credit(s)

BIOL 123 - Human Nutrition Laboratory
Laboratory exercises are employed to examine the nature and role of nutrients in the human body and energy relationships. Contemporary controversies in nutrition examined in relation to nutrition, health and disease. Corequisite(s): BIOL 121. Prerequisite(s): ENG 101. 1 credit(s)

BIOL 148 - Natural History of the Desert Southwest
Introduction for biology non-majors to the desert environments of the American Southwest. Includes the study of climate, geology, plants, animals, and man in desert regions. Includes field trips. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Satisfies the General Education Core requirement for a laboratory science course. 4 credit(s)

BIOL 189 - Fundamentals of Life Science
Survey of contemporary biology; includes structure, function, interactions and evolutionary origins of living systems. For Biological Sciences majors and others who require biology as part of their professional career preparation. Note(s): Satisfies General Education Core requirements for laboratory sciences. Aligned with State of Nevada life science content standards for K-8 certification. 4 credit(s)

BIOL 196 - Principles of Modern Biology I
Structural and chemical nature of cells, complex organisms and cellular environments. Transmission and molecular genetics, cell communication, reproduction and energetics. For Biological Sciences majors and others pursuing advanced study in biology. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Satisfies the General Education Core requirement for a laboratory science course. 4 credit(s)

BIOL 197 - Principles of Modern Biology II
Whole-organism biology in an evolutionary context; biodiversity, structure, function and reproduction of prokaryotic and eukaryotic organisms. Evolutionary and ecological pattern and process. For Biological Sciences majors and others pursuing advanced study in biology. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Satisfies the General Education Core requirement for a laboratory science course. 4 credit(s)

BIOL 208 - Introduction to Human Genetics
For non-majors. Aspects of human inheritance and evolution considered. Prerequisite(s): BIOL 100 or BIOL 189. 3 credit(s)

BIOL 220 - Introduction to Ecological Principles
Introduction for environmental science students to the major ecological principles at work in the environment. Focuses not only on these principles but also on understanding the processes that underlie them. Prerequisite(s): ENS 100 for Environmental Studies majors, and BIOL 197 for BIOL majors. 3 credit(s)

BIOL 223 - Human Anatomy and Physiology I
Review of the basic organization of human cells and tissues and the structure and function of the skeletal, muscular, nervous, and sensory systems. Prerequisite(s): BIOL 189. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

BIOL 224 - Human Anatomy and Physiology II
Structure and function of the human digestive, circulatory, urogenital, and endocrine systems. Prerequisite(s): BIOL 189, BIOL 223. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

BIOL 251 - General Microbiology
Survey of general microbiology including microbiological prokaryotic cell structure and function with an emphasis on microorganisms that associate with humans. Prerequisite(s): BIOL 189, CHEM 110 or CHEM 121. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Credit not allowed in both BIOL 251 and BIOL 351. 4 credit(s)

BIOL 300 - Principles of Genetics
Study of the transmission of traits from one generation to the next, the structure and function of genes, and the variation of genes between and within populations. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

BIOL 301 - Fossil Record
History and evolution of life as recorded in the fossil record. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 100, ENG 102, and MATH 127 or higher. 3 credit(s)

BIOL 302 - Evolutionary Survey of Vascular Plants
Evolutionary survey of vascular plants: their classification, appearance in geologic time, comparative life cycles and morphological characteristics. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

BIOL 304 - Molecular Genetics
Comprehensive survey course designed to cover the basic principles that deal with the physical and chemical nature of genes. Specific topics include the structure/function of genes, genome organization, DNA replication and recombination, protein synthesis, regulation of gene expression, chromatin structure, epigenetic effects, and genetic engineering. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Note(s): Required concurrent registration in Molecular Genetics Discussion, BIOL 304D. 4 credit(s)

BIOL 305 - Introduction to Conservation Biology
Fundamental issues in conservation biology including biodiversity, invasive and endangered species, reserve design, and environmental legislation to provide a scientific examination of the biological underpinnings of conservation issues. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. 3 credit(s)

BIOL 320 - Invertebrate Zoology
Discussion of the taxonomy, morphology, and physiology of the phyla and classes of invertebrate animals, including some ecological and phylogenetic relationships. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Two hours lecture and three hours laboratory. 4 credit(s)

BIOL 341 - Principles of Ecology
Fundamentals of ecology and levels of population, community, and ecosystem. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture. 3 credit(s)

BIOL 345 - Urban Horticulture
New field of urban horticulture, which deals with how plants respond to urban stresses. Includes readings on and discussion of the following topics: plant sciences and development, horticultural practices, and stress physiology. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. 3 credit(s)

BIOL 348 - Introduction to Human Anatomy
Consideration of human anatomical systems - structure, composition, gross function, development and origins. Fundamental principles of anatomy including gross, microscopic, developmental and evolutionary aspects. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Two 75 minute lectures per week. 3 credit(s)

BIOL 351 - Microbiology
Microbial systems provides in-depth coverage of prokaryotic cell structure, function, genetics, diversity, ecology, and pathogenesis, with an emphasis on microbial metabolism, bacterial genetics and molecular mechanisms. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher.. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Credit not allowed in both BIOL 251 and BIOL 351. 4 credit(s)

BIOL 360 - Introduction to Biomathematics I
Introduction to the interdisciplinary field of biomathematics; mathematical models of biological systems; applied numerical methods and computer software for solving mathematical models. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 181 or higher. Note(s): Same as MATH 360. 3 credit(s)

BIOL 361 - Introduction to Biomathematics II
A continuation to the study of biomathematics; part two will consider more advanced mathematical models of biological processes associated with advection, diffusion and pattern formation; computational methods for solving partial differential equations. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 360 or BIOL 360. Note(s): Same as MATH 361. 3 credit(s)

BIOL 402 - Great Biological Discoveries
Students will read original research articles and critically examine 25 of the most important biological discoveries of all time. Students will learn the basic skills of a structured approach to critically examine data, develop hypotheses, challenge the interpretation of results, identify valid conclusions, and discuss the significance of conclusions and research. The course will help students understand the origins of different biological fields and develop a "big picture" view of science. Prerequisites Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121,CHEM 122 ,ENG 101, ENG 102 , and MATH 127 or higher, and a 300- or 400-level BIOL class. 3 credit(s)

BIOL 405 - Molecular Biology
Introductory molecular biology. Study of genes and their activities at the molecular level, including transcription, translation, DNA replication, and recombination. Concepts of molecular biology presented along with experimental strategies and data the led to those concepts. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and BIOL 300 or CHEM 474. Note(s): This course is crosslisted with BIOL 607. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 409 - Virology
Systematic examination of animal, plant, and bacterial viruses including their structure and genome organization, their reproduction and assembly, and their effects on host organisms. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and BIOL 351. 3 credit(s)

BIOL 412 - Molecular Evolution
Molecular evolution of genes and genomes. Origin of life from the prebiotic soup through the RNA world to current DNA replication systems. Determination of the universal tree of life by inferring molecular phylogenies of genes and proteins. Emphasis on evolution by duplication, recombination, and transposition. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. BIOL 300 or BIOL 304, BIOL 415. 3 credit(s)

BIOL 413 - Introduction to Scientific Writing
This course introduces students to scientific writing for those intending to publish manuscripts, technical reports, or academic papers in the sciences. Writing techniques, published literature, and student writing examples are presented and evaluated. Students will improve their writing skills and learn to critique published writing samples. Prerequisites Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102 , and MATH 127 or higher and one upper division course from any of the following; BIOL, CHEM, GEOL, PHYS, MATH, and permission of instructor. 2 credit(s)

BIOL 414 - Endocrinology
(Same as CHEM 478.) Survey of the structure and function of vertebrate endocrine systems, with emphasis on the biochemical basis of hormone action and the role of cell communication in endocrine physiology. Prerequisite(s): BIOL 196, CHEM 474 recommended. 3 credit(s)

BIOL 415 - Evolution
Introduction to evolutionary biology, focusing on the processes that have been (and are currently) responsible for the generation and maintenance of biological diversity. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122 ,ENG 101, ENG 102, and MATH 127 or higher, and BIOL 300, BIOL 304. 3 credit(s)

BIOL 416 - Bioinformatics
This class covers basic principles in bioinformatics, as well as Perl programming, algorithms, databases, and use of many bioinformatics resources. In class "laboratory" exercises reinforce these topics with hands-on activities and individual/group learning exercises. The class emphasizes a conceptual and practical understanding of bioinformatics applied to biological systems at the molecular, cellular, and organismal level. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and at least one 300-level or 400-level BIOL class; or by consent of the instructor. 3 credit(s)

BIOL 417 - Biochemical Adaptations
Exploration of biochemical and molecular characteristics that appear to be adaptive for organisms in their respective environments. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122 ,ENG 101, ENG 102, and MATH 127 or higher and BIOL 445. Lab/Lecture/Studio Hours Three hour lecture. 3 credit(s)

BIOL 418 - Microbial Ecology
Study of microbes as individuals, populations, and communities in freshwater, marine, and terrestrial environments. Topics such as nutrient cycling, biodegradation, and biotechnology discussed from an ecological standpoint. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and BIOL 351 or consent of instructor. Lab/Lecture/Studio Hours Three hours lecture. Note(s): This course is crosslisted with BIOL 618. Credit at the 600-leval requires additional work. 3 credit(s)

BIOL 422 - Taxonomy of Vascular Plants
Study of the evolutionary relationships of the principal orders, families and genera; systems of classification; collection and identification of local flora. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Two hours lecture and six hours laboratory. 4 credit(s)

BIOL 425 - Genomics
Study of the sequencing, assembling and annotating of genomes. Examination of new approaches that integrate genetics, molecular biology, and computer sciences to answer biological questions in novel ways. Applications of genomics, proteomic and bioinformatic technologies in medical researches. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and BIOL 300 and BIOL 405. Note(s): This course is crosslisted with BIOL 625. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 426 - Plant Anatomy
Study of the basic structure of plant organs and tissues, particularly with regard to relationships between structure and function. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Two hours lecture and four hours laboratory. Note(s): This course is crosslisted with BIOL 626. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 427 - Bryology
Biology of mosses, including taxonomy, morphology, reproduction, speciation, desiccation tolerance, resource transfer, spore biology, and biology of the ecologically important soil crusts. Arid environments highlighted. Lab focuses on local identification and includes field trips. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. 3 credit(s)

BIOL 431 - Ichthyology
Study of biology of fishes, including morphology, physiology, ecology, and evolution. Emphasis on local fish, field work with state and federal agency biologists. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture, three hours laboratory, some overnight or weekend field trips. 4 credit(s)

BIOL 432 - Herpetology
Introduction to various aspects of the ecology, behavior, and evolution of recent amphibians and non-avian reptiles. In the laboratory students will learn diagnostic characteristics, some functional attributes, and aspects of the natural history of recent amphibians and non-avian reptiles, particularly of species from southwestern North America. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): This course is crosslisted with BIOL 632. Credit at the 600-level requires additional work. 4 credit(s)

BIOL 433 - Ornithology
Principles of avian biology and evolution. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Laboratory sessions involve bird identification and include field trips. Two hours lecture and six hours laboratory. Note(s): This course is crosslisted with BIOL 633. Credit at the 600-level requires additional work. 4 credit(s)

BIOL 434 - Mammalogy
Study of mammalian biology, evolution, and ecology, with attention to issues in mammal conservation biology. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory with possible weekend and overnight field trips. 4 credit(s)

BIOL 437 - Entomology
Introduction to the principles of insect classification and biology. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

BIOL 438 - Soil Plant Water Relations in Arid Environments
The class will cover soil plant water relationships relevant to arid environments under limited water resources. Topics that will be discussed in detail include; the hydrologic cycle, water properties, soil physical and Chemical properties, environmental demand, plant stress associated with drought and salinity, water quality and irrigation management as it relates to plant growth and productivity. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours The class will be taught in a lecture/lab format. Note(s): This ourse is crosslisted with BIOL 638. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 440 - Mammalian Physiology
Principles of mammalian physiology, normal functioning of mammalian body as a whole, and interrelationships of organs and organ systems. Emphasis on physiological processes and their interrelationships. Corequisite(s): CHEM 242 and CHEM 242L. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and CHEM 241 and CHEM 241L. 3 credit(s)

BIOL 441 - Field Ecology
Introduction to ecological research. Weekly field projects emphasize population biology, interactions among species, and ecosystem processes. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and BIOL 220 or BIOL 341 or consent of instructor. Lab/Lecture/Studio Hours Six hours of combined lecture and field or laboratory work. Note(s): This course is crosslisted with BIOL 641. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 442 - Principles of Plant Physiology with Laboratory
Introduction to the basic physiological processes in plants: metabolism, nutrition, growth, and development. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and BIOL 220 or BIOL 341 or consent of instructor. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): This course is crosslisted with BIOL 642. Credit at the 600-level requires additional work. 4 credit(s)

BIOL 444 - Principles of Plant Ecology
Introduction to the ecology of wild plants, particularly structure, ecology of populations, interactions of plants with their environment and other organisms, and survey of the major global vegetation types. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 341 or consent of instructor. Note(s): This course is crosslisted with BIOL 644. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 445 - Cell Physiology
Cell physiology provides an understanding of the basic processes of eukaryotic cells and their relationship to cellular ultrastructure. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Note(s): This course is crosslisted with BIOL 645. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 447 - Advanced Comparative Animal Physiology
Comparative physiology provides a detailed understanding of the diverse array of physiological systems evolved to allow animals to function in various environments. The comparative approach is used to understand physiological adaptations to various environments and the evolution of physiological systems. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and CHEM 241 and CHEM 241L. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 3 credit(s)

BIOL 448 - Mammalian Physiology Laboratory
Practical experience with physiological techniques. Emphasis on the integration of tissue, organ, and organ system physiological functions. Corequisite(s): BIOL 440 or BIOL 447. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121 ,CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. 1 or 2 credit(s)

BIOL 449 - Comparative Nutrition
Explore the diversity and complexity of systems that have evolved to adequately support energy requiring processes for life. Topics range from the evolution of digestive systems in a wide array of organisms (single celled, plants and animals) to the development of, for example, simple, complex, and ruminant digestive systems. Methods of acquiring, processing and utilizing nutrients for growth, maintenance and metabolism, including performance are also discussed. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. 3 credit(s)

BIOL 451 - Comparative Vertebrate Anatomy
The companion laboratory course of BIOL 455. Hands-on dissection of specimens representing major vertebrate groups. Numerous demonstration specimens sample the diversity of fishes, amphibians, and amniotes. Review of fossil vertebrates with emphasis on phylogenetic relationships. Corequisite(s): BIOL 455. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Three hours lecture and six hours laboratory. Note(s): This course is crosslisted with BIOL 651. Credit at the 600-level requires additional work. 2 credit(s)

BIOL 452 - Comparative Behavioral Endocrinology
Explores the relationships between hormones, brain and behavior in invertebrate and vertebrate animals. Discussion of the effects of hormones on development and behavior, how behavior and the nervous system influence endocrine physiology and how hormones influence the timing of physiological and behavioral events. Prerequisite(s): BIOL 414 or BIOL 486. 3 credit(s)

BIOL 453 - Immunology
Study of the immune response, cell-mediated and humoral. Topics include the diversity of antibodies and antigen receptors, evolution of immunity, cell-cell interactions, importance of major histocompatibility complex immune regulation, and immunity to microorganisms. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 414 or BIOL 486. Note(s): This course is crosslisted with BIOL 653. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 455 - Comparative Vertebrate Anatomy and Biomechanics
Examines structure-function relationships in the context of vertebrate evolution. Tissues and structures of the integumentary, skeletal, and muscular system are emphasized. Biomechanics of materials, structures, and movements are related to adaptations of vertebrates to life in their physical worlds. Corequisite(s): BIOL 451. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Note(s): This course is crosslisted with BIOL 655. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 460 - Microbial Physiology
Exploration of the major aspects of microbial physiology, including structure and growth of bacteria, generation of ATP and intermediary metabolism, synthesis of macromolecules and cellular components, and coordination of intracellular activities. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 351, CHEM 241 and CHEM 241L. Lab/Lecture/Studio Hours Three hours lecture. Note(s): This course is crosslisted with BIOL 660. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 464 - Bacterial Pathogenesis
Addresses the molecular mechanisms by which bacterial pathogens cause disease. Basic principles of bacterial pathogenesis will be considered before a survey of bacterial pathogens and their specific virulence factors is conducted. Includes aspects of bacterial genetics, physiology, immunology, and the cell biology of host-parasite interactions. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 351. Note(s): This course is crosslisted with BIOL 664. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 465 - Vertebrate Embryology
Development of vertebrates, with emphasis on amphibians, birds, and mammals. Considerations of gametogenesis, fertilization, cleavage, early morphogenesis, and organogenesis included. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Two hours lecture and six hours laboratory. Note(s): This course is crosslisted with BIOL 665. Credit at the 600-level requires additional work. 4 credit(s)

BIOL 466 - Developmental Biology
Development biology from the perspective of evolutionary biology and embryology and genetics. Elucidation of general principles about the genetic basis of morphologic changes and regulatory mechanisms, the genetics toolkit for development of model species, and the regulation and function of these genes in the complex hierarchies that govern animal development. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 300 and BIOL 405 or CHEM 474. Note(s): This course is crosslisted with BIOL 666. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 468 - Histology
Microscopic structure and function of vertebrate tissues with emphasis on mammals. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Lab/Lecture/Studio Hours Two hours lecture and six hours laboratory. Note(s): This course is crosslisted with BIOL 668. Credit at the 600-level requires additional work. 4 credit(s)

BIOL 470 - Topics in Applied Microbiology
Applications may include bioremediation, food, agriculture, pharmaceuticals, vaccine development, water treatment, or genetic engineering. Presentation and discussion of current literature. Topics published in the class schedule. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG102 , and MATH 127 or higher and, BIOL 300 and BIOL 351. Note(s): Maximum of two different topics may be selected for a total of six credits. This course is crosslisted with BIOL 670. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 471 - Aquatic Ecology
Principles of aquatic ecology including physical, chemical and biotic attributes - and their interactions - relating to both freshwater and marine systems. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 341 and CHEM 122 or consent of instructor. Lab/Lecture/Studio Hours Three hour lecture/discussion. Note(s): This course is crosslisted with BIOL 671. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 473 - Advanced Topics in Cell and Molecular Biology
Discussion of current literature on a specific topic in cell and molecular biology. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher, and BIOL 300 and consent of instructor. May be repeated to a maximum of six credits. Note(s): Topics published in the class schedule. 3 credit(s)

BIOL 475 - Neurobiology
Introduction to the neurosciences, emphasizing cellular, molecular, and physiological aspects. Establishes a foundation of cellular neurobiology and moves on to selected topics in the organization, function, and development of neural systems. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 300. 3 credit(s)

BIOL 478 - Genetics and Cell Biology of Cancer
This course examines the molecular mechanisms underlying carcinogenesis, tumorigenesis, and metastasis with a heavy emphasis placed on advanced genetic concepts that underlie basic cell biology. The class utilizes a multi-disciplinary approach to learning that includes a mixture of formal lectures, student presentations, and class discussions. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and, BIOL 300 or BIOL 304 and BIOL 445. 3 credit(s)

BIOL 480 - Introduction to Biological Modeling
Introduction to the modeling of biological systems and processes through the use of computers. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Note(s): This course is crosslisted with BIOL 680. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 481 - Advanced Cell Biology
Advanced topics in cell and molecular biology, including membrane structure and function, cytoskeleton, signal transduction, and current research methods. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG102 , and MATH 127 or higher, and CHEM 474. 3 credit(s)

BIOL 485 - Microbial Genetics
Examines genetics of prokaryotic microorganisms, including induction of mutations and selection of mutants, alternative processes of genetic exchange and gene mapping, and gene organization and regulation. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher, BIOL 300 and BIOL 351. Lab/Lecture/Studio Hours Three hours lecture. Note(s): This course is crosslisted with BIOL 685. Credit at the 600-level requires additional work.º 3 credit(s)

BIOL 486 - Animal Behavior
Evolutionary analysis of vertebrate and invertebrate behavior. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. 3 credit(s)

BIOL 487 - Principles of Systematics
Principles and applications of methods used to reconstruct history and biotic diversity among genes, species, and higher taxa. Considers several approaches to tree construction and significance of phylogenetic history within the context of evolution, biogeography, and conservation biology. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher. Note(s): Emphasis on molecular approaches to systematics. This course is crosslisted with BIOL 687. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 489 - Developmental Genetics
Topics in molecular genetics of developmental processes explored through current literature. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, BIOL 300, and BIOL 405 or CHEM 474, and MATH 127 or higher. May be repeated to a maximum of six credits. 3 credit(s)

BIOL 490 - Biogeography
Study of distributional patterns of plant and animal groups, including consideration of theories and principles, derived from a variety of disciplines, related to those patterns. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher; BIOL 300, and BIOL 405 or CHEM 474. Note(s): This course is crosslisted with BIOL 690. Credit at the 600-level requires additional work. 3 credit(s)

BIOL 492 - Undergraduate Research
Special problems in some field of the biological sciences for investigation and report. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher; Two years of biological sciences and consent of instructor. May be repeated to a maximum of eight credits. 1-3 credit(s)

BIOL 493 - Undergraduate Seminar
Preparation and presentation of seminars on topics of current interest in biology. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher; Two years of biological sciences and consent of instructor. May be repeated to a maximum of three credits. Note(s): Topic changes by semester; see class schedule. 1 credit(s)

BIOL 494 - Biology Colloquium
Analysis and critique of topics as presented by speakers drawn from the national biological research community. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher; Two years of biological sciences. May be repeated to a maximum of three credits. Note(s): S/F grading only. 1 credit(s)

BIOL 496 - Advanced Topics in Modern Biology
Advanced study in a specialized area of biology. Topics selected and published in class schedule. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher and consent of instructor. Note(s): Maximum of three different topics may be selected for a total of six credits. 1-3 credit(s)

BIOL 498 - Scientific Presentations
Seminar for undergraduate students conducting research projects on any biological discipline. Gives students advice and provides them with practical experience on giving oral and written presentations. Discussion of principles of good visual communication and demonstrations of good and poor selections. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher; and consent of instructor 1-2 credit(s)

BIOL 499 - Instruction in Biological Sciences
Significant involvement in instruction of courses in biological sciences. May include laboratory preparation, instruction, and grading. Prerequisite(s): Grade of C or better in each of the following: BIOL 196, BIOL 197, CHEM 121, CHEM 122, ENG 101, ENG 102, and MATH 127 or higher; consent of instructor. May be repeated to a maximum of two credits. Note(s): S/F grading only. 1-2 credit(s)

Chemistry

Purpose and Focus
The science of chemistry deals with the composition, analysis, structure, and properties of matter and the various transformations matter may undergo. Chemical processes are at the heart of many diverse systems that are of great interest to mankind, including biological functions, the natural and polluted environment, industrial processes, biotechnology, food and agriculture, mining technology, etc. The Bachelor of Arts degree is designed to allow a student sufficient flexibility to obtain expertise in a discipline other than chemistry so that chemical knowledge can be applied to another field. The Bachelor of Science degree is an accredited program that requires more chemistry, math, and physics than the Bachelor of Arts degree and is intended for students wishing to pursue a career in chemistry. The Bachelor of Science degree in Biochemistry is intended to provide a student with the theoretical and technical skills necessary for employment in industry or to pursue a graduate degree in biochemistry or a related field.

Accreditation
Northwest Commission on Colleges and Universities
American Chemical Society (B.S. in Chemistry)

Undergraduate Majors
Biochemistry-Bachelor of Science
Chemistry-Bachelor of Arts
Chemistry-Bachelor of Science

Areas of Concentration
Education
Environmental Chemistry

Early Admit Fast-Track Program with UNLV — School of Dental Medicine
This program expedites the process of earning a doctor of dental medicine degree. Students admitted to the program complete three years of prerequisite course work at UNLV. Following completion of the second year, students take the DAT and apply to UNLV — School of Dental Medicine (UNLV-SDM) through the Associated American Dental School Application Service (AADSAS). Participation in this early-admit program does not guarantee acceptance following completion of the second year of undergraduate study. Students who are admitted to UNLV-SDM matriculate following completion of the third year at UNLV. Course work completed at UNLV-SDM during the first year is transferred to UNLV to complete the Bachelor of Arts in Chemistry. The net result is reduction of the time required to earn the baccalaureate and DMD degrees from eight years to seven. To learn more about the specific details of this program, please contact the pre-health advisor.

Early Admit Fast-Track Program with Touro University — College of Osteopathic Medicine
This program expedites the process of earning an osteopathic medical degree. Students admitted to the program complete three years of prerequisite course work at UNLV. Following completion of the second year, students take the MCAT and apply to Touro University — College of Osteopathic Medicine (TU-COM) through the

Association of American Colleges of Osteopathic Medicine Application Service (AACOMAS). Participation in this Early Admit Program does not guarantee acceptance following completion of the second year of undergraduate study. Students who are admitted to TU-COM matriculate following completion of the third year at UNLV. Course work completed at TU-COM during the first two years is transferred to UNLV to complete the Bachelor of Arts in Chemistry. The net result is reduction of the time required to earn the baccalaureate and medical degrees from eight years to seven. To learn more about the specific details of this program, please contact the pre-health advisor.

Admission to the Major

Minimum GPA: 2.50

Admissions Policies: Students with a GPA less than 2.50, but at least 2.0, may be admitted on probationary status. Students on probation must meet with their advisor to devise a course of study that, when successfully completed, will remove the student from probationary status; the course of study must be approved by the department chair. The course of study shall consist of at least 15 units that apply toward a degree in the major; ordinarily, the course of study will be required to be completed in one calendar year (i.e., two semesters and the summer term). The advisor may request that completion time be extended by one semester for good cause (e.g., more than 15 units in the course of study, course offering schedules, etc.). Failure to satisfactorily complete the probationary course of study is grounds for suspension from the department.

Transfer Policies: Transfer students should first have their transcripts evaluated by the Office of the Registrar & Admissions, then schedule a meeting with the College of Sciences Advising Center. Based on the transcripts and catalog descriptions, equivalencies to UNLV courses will be determined and a plan for completion of the degree developed. In cases of questions regarding the transferability of a particular course, satisfactory performance (i.e., a grade of C or better) by a student in a higher numbered UNLV chemistry course for which the proposed UNLV transfer course is a prerequisite shall be accepted as proof that the student has mastery of the course content and the student shall be awarded transfer credit.

Department Policies

Academic Policies: Majors may count no more than one grade of D in chemistry courses toward meeting degree requirements. Chemistry courses taken more than eight years prior to the proposed date of graduation are subject to review by the department, and at the discretion of the department, such courses may not be allowed for application to a degree program. Students potentially affected by this policy should meet with the department chair.

Minors: No grade lower than a C (i.e., C- and below) may be applied to a chemistry minor. Credit toward the minor will not be allowed for both CHEM 220 and CHEM 241. At least nine credits must be earned at UNLV.

Nonchemistry Majors: Nonchemistry majors who seek rigorous preparation in chemistry for medical school, graduate school in other fields, or research positions should consider the sequence CHEM 121, 122, 241, 241L, 242, 242L, and possibly CHEM 421 and 474–475.

Probation: Students on probation must meet with their advisor to devise a course of study that, when successfully completed, will remove the student from probationary status; the course of study must be approved by the department chair. The course of study shall consist of at least 15 units that apply toward a degree in the major; ordinarily, the course of study will be required to be completed in one calendar year (i.e., two semesters and the summer term). The advisor may request that completion time be extended by one semester for good cause (e.g., more than 15 units in the course of study, course offering schedules, etc.). Failure to satisfactorily complete the probationary course of study is grounds for suspension from the department and the College of Sciences.

Advisement

See College of Sciences Advisement section for details.

Biochemistry Major- Bachelor of Science (BS)

Please see the UNLV College of Sciences, Chemistry department web page at www.unlv.edu/chemistry/ for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science Advising at www.unlv.edu/sciences/advising.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

Upon completion of all undergraduate programs in Chemistry and Biochemistry, students will have a broad understanding of chemistry's sub-disciplines by satisfactorily completing

- Introductory and foundational course work in chemistry, and in-depth course work in chemistry; all with laboratory emphasis. Additionally;
  - Students completing the B.S. program in Chemistry will complete intensive and comprehensive courses as identified by the American Chemical Society Guidelines for Bachelor Degree Programs including a research experience that provides for the development of the skills needed to be an effective professional chemist. The B.S. program in Chemistry is recognized by the ACS-CPT, and has enjoyed this status for over 40 years. Only about 30% of B.S. Chemistry programs in the United States have achieved this recognition.
  - Students completing the B.S. program in Biochemistry will complete most of the same intensive and comprehensive courses in Chemistry with laboratory emphasis as students in the B.S. ACS program above. Additionally, students in this program will complete four intensive and comprehensive courses in Biochemistry along with an advanced Biochemistry Lab. This program also provides for flexibility in the selection of in-depth Biology course electives to complement the rigorous chemistry foundation of the program.
  - Students completing the B.A. program in Chemistry will complete much of the in-depth course work in chemistry along with elective courses offered by departments from within the College of Sciences as well as other colleges within the university. There is greater flexibility in program design for customization of the program to individual student's career interests.

- Build and develop communication skills through writing laboratory reports, term papers, and presentation of seminars and poster seminars.
- Develop critical thinking. Critical thinking skills, development of problem solving abilities are implemented in the very first introductory courses common to all undergraduate programs offered. These skills are developed as students progress through the sequence of courses (meeting each course prerequisite in a well thought out and logical pattern) required for graduation in all of our programs.
- Develop intellectual growth by integrating into all of our courses concepts of ethics, laboratory safety and environmental stewardship applicable to the profession as well as to local, state, regional, national and international communities and society. Emphasis will be placed on the development of UULOs regarding Global/Multicultural Knowledge and Awareness, and Citizenship and Ethics.
- Graduates shall be able to demonstrate technical competency in the performance of basic laboratory operations, including solution preparation and standardization, common synthetic procedures, standard qualitative and quantitative analysis procedures, and operation of standard laboratory equipment.
- Graduates shall have an in-depth understanding of the theoretical basis of biochemistry, as well as areas of application of chemical principles.
- Graduates must be well versed in the language of biochemistry and should be capable of effectively communicating chemical knowledge in both written and oral forms.
- Graduates shall be able to function as chemical professionals in entry-level jobs or to succeed in graduate studies in biochemistry or related scientific fields.

University Graduation Requirements

- Please see Graduation Policies for complete information

Biochemistry Degree Requirements ..... Total: 120 Credits
General Education Requirements ..... Subtotal: 41-44 Credits
First-Year Seminar ..... Credits: 2-3
(See note 1 below)
English Composition ..... Credits: 6
- ENG 101 - Composition I

and
- ENG 102 - Composition II

Second-Year Seminar ..... Credits: 3
Constitutions ..... Credits: 4-6
Mathematics ..... Credits: 8
- MATH 181 - Calculus I
- MATH 182 - Calculus II

Distribution Requirements ..... Credits: 18
Please see Distribution Requirements for more information.
- Humanities and Fine Arts: 9 Credits
  - Two courses 3 credits each from two different humanities areas 6 credits
  - One course in fine arts 3 credits
- Social Science: 9 Credits
  - One course each from three different fields
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirements

Multicultural and International
Multicultural, one 3 credit course required
International, one 3 credit course required
These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students

Major Requirements - BS in Biochemistry ..... Subtotal: 83 Credits
Physics ..... Credits: 8
(see note 2)
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II

Biology ..... Credits: 22
- BIOL 196 - Principles of Modern Biology I
- BIOL 197 - Principles of Modern Biology II
- BIOL 300 - Principles of Genetics

and at least ten credits from the following list of courses:
Note: Make certain the prerequisites for each course selected are met before registration, some prerequisites may not be among those courses listed.
- BIOL 304 - Molecular Genetics
- BIOL 351 - Microbiology
- BIOL 405 - Molecular Biology
- BIOL 409 - Virology
- BIOL 412 - Molecular Evolution
- BIOL 415 - Evolution
- BIOL 417 - Biochemical Adaptations
- BIOL 425 - Genomics
- BIOL 440 - Mammalian Physiology
- BIOL 442 - Principles of Plant Physiology with Laboratory
- BIOL 445 - Cell Physiology
- BIOL 447 - Advanced Comparative Animal Physiology
- BIOL 448 - Mammalian Physiology Laboratory
- BIOL 453 - Immunology
- BIOL 460 - Microbial Physiology
- BIOL 466 - Developmental Biology
- BIOL 468 - Histology
- BIOL 470 - Topics in Applied Microbiology
- BIOL 473 - Advanced Topics in Cell and Molecular Biology
- BIOL 475 - Neurobiology
- BIOL 480 - Introduction to Biological Modeling
- BIOL 481 - Advanced Cell Biology
- BIOL 485 - Microbial Genetics

and
- CHEM 478 - Endocrinology

Chemistry Major Requirements ..... Credits: 49
- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 242 - Organic Chemistry II
- CHEM 347 - Laboratory Techniques of Organic Chemistry I
- CHEM 348 - Laboratory Techniques of Organic Chemistry II
- CHEM 355 - Quantitative Analysis
- CHEM 355L - Quantitative Analysis Laboratory
- CHEM 421 - Physical Chemistry I
- CHEM 422 - Physical Chemistry II
- CHEM 455 - Instrumental Analysis
- CHEM 455L - Instrumental Analysis Laboratory
- CHEM 472 - Biochemistry Laboratory
- CHEM 474 - Biochemistry I
- CHEM 475 - Biochemistry II
- CHEM 476 - Advanced Topics in Biochemistry

and five additional credits of upper-division chemistry.
Total Credits: 120

Notes

1. It is strongly recommended that students take SCI 101 to satisfy the First-Year Seminar requirement.
2. The sequence PHYS 180 -180L, and PHYS 182 -182L is an acceptable replacement for PHYS 151, 152; any two course combination from PHYS 180, 181, and 182 is not an acceptable replacement.
3. At least 40 credits must be earned at the upper-division level (300 and above).

Chemistry Major - Bachelor of Arts (BA)

Please see the UNLV College of Sciences, Chemistry department web page at www.unlv.edu/chemistry/ for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science Advising at www.unlv.edu/sciences/advising.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

Upon completion of all undergraduate programs in Chemistry and Biochemistry, students will have a broad understanding of chemistry's subdisciplines by satisfactorily completing

- Introductory and foundational course work in chemistry, and in-depth course work in chemistry; all with laboratory emphasis. Additionally;
  - Students completing the B.S. program in Chemistry will complete intensive and comprehensive courses as identified by the American Chemical Society Guidelines for Bachelor Degree Programs including a research experience that provides for the development of the skills needed to be an effective professional chemist. The B.S. program in Chemistry is recognized by the ACS-CPT, and has enjoyed this status for over 40 years. Only about 30% of B.S. Chemistry programs in the United States have achieved this recognition.
  - Students completing the B.S. program in Biochemistry will complete most of the same intensive and comprehensive courses in Chemistry with laboratory emphasis as students in the B.S. ACS program above. Additionally, students in this program will complete four intensive and comprehensive courses in Biochemistry along with an advanced Biochemistry Lab. This program also provides for flexibility in the selection of in-depth Biology course electives to complement the rigorous chemistry foundation of the program. Students completing the B.A. program in Chemistry will complete much of the in-depth course work in chemistry along with elective courses offered by departments from within the College of Sciences as well as other colleges within the university. There is greater flexibility in program design for customization of the program to individual student's career interests.
  - Build and develop communication skills through writing laboratory reports, term papers, and presentation of seminars and poster seminars.
  - Develop critical thinking. Critical thinking skills, development of problem solving abilities are implemented in the very first introductory courses common to all undergraduate programs offered. These skills are developed as students progress through the sequence of courses (meeting each course pre-requisite in a well thought out and logical pattern) required for graduation in all of our programs.
  - Develop intellectual growth by integrating into all of our courses concepts of ethics, laboratory safety and environmental stewardship applicable to the profession as well as to local, state, regional, national and international communities and society. Emphasis will be placed on the development of UULOs regarding Global/Multicultural Knowledge and Awareness, and Citizenship and Ethics.
  - Graduates shall be able to demonstrate technical competency in the performance of basic laboratory operations, including solution preparation and standardization, common synthetic procedures, standard qualitative and quantitative analysis procedures, and operation of standard laboratory equipment.
  - Graduate shall have an in-depth understanding of the theoretical basis of chemistry, as well as areas of application of chemical principles.

University Graduation Requirements

Please see Graduation Policies for complete information
Chemistry Degree Requirements ..... Total: 120 Credits
General Education Requirements ..... Subtotal: 33-36 Credits
First-Year Seminar ..... Credits: 2-3
(See note 1 below)
English Composition ..... Credits: 6
- ENG 101 - Composition I
- ENG 102 - Composition II

Second-Year Seminar ..... Credits: 3
Constitutions ..... Credits: 4-6
Mathematics
Fulfilled by Major Requirements
- MATH 181 - Calculus I
- MATH 182 - Calculus II

Distribution Requirements ..... Credit: 18
Please see Distribution Requirements for more information.
- Humanities and Fine Arts: 9 Credits
  - Two courses 3 credits each from two different humanities areas - 6 credits
  - One course in fine arts- 3 credits
- Social Science: 9 Credits
  - EPY 303 - Educational Psychology
  - and two 3 credits social science courses
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirements

Multicultural and International
Multicultural, one 3 credit course required
International, one 3 credit course required
These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students
Major Degree Requirements - BA in
Chemistry ..... Subtotal: 62 Credits
(See note 2 below)

Mathematics..... Credits: 8
- MATH 181 - Calculus I
- MATH 182 - Calculus II

Computer Science..... Credits: 3
- CS 117 - Programming for Scientists and Engineers

or
- CS 135 - Computer Science I

Physics..... Credits: 8
- PHYS 151 - General Physics I
- PHYS 152 - General Physics II (See note 3 below)

Chemistry Major Requirements..... Credits: 43
- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 242 - Organic Chemistry II
- CHEM 347 - Laboratory Techniques of Organic Chemistry I
- CHEM 348 - Laboratory Techniques of Organic Chemistry II
- CHEM 355 - Quantitative Analysis
- CHEM 355L - Quantitative Analysis Laboratory
- CHEM 421 - Physical Chemistry I
- CHEM 474 - Biochemistry I
- CHEM 455 - Instrumental Analysis
- CHEM 489 - Senior Poster Seminar

and nine credits (including at least two credits of advanced laboratory) selected from:
- CHEM 312 - Introduction to Radiochemistry
- CHEM 422 - Physical Chemistry II
- CHEM 423 - Physical Chemistry Laboratory
- CHEM 428 - Quantum Chemistry
- CHEM 431 - Advanced Inorganic Chemistry
- CHEM 442 - Advanced Organic Chemistry
- CHEM 447 - Advanced Synthesis Laboratory
- CHEM 455L - Instrumental Analysis Laboratory
- CHEM 472 - Biochemistry Laboratory
- CHEM 475 - Biochemistry II
- CHEM 490 - Senior Independent Study in Chemistry

or
- CHEM 492 - Advanced Topics in Chemistry

Electives Courses other than those listed above..... Credits: 25
Total Credits: 120

Notes

1. It is strongly recommended that students take SCI 101 to satisfy the First-Year Seminar requirement.
2. At least 40 credits must be earned at the upper-division level (300 and above).
3. The sequence PHYS 180 -180L, 181 -181L , and 182 -182L is an acceptable replacement for PHYS 151 ,152 ; any two course combination from PHYS 180, 181, and 182 is not an acceptable replacement.

Chemistry Major- Bachelor of Arts (BS)

Please see the UNLV College of Sciences, Chemistry department web page at www.unlv.edu/chemistry/ for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science Advising at www.unlv.edu/sciences/advising.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

Upon completion of all undergraduate programs in Chemistry and Biochemistry, students will have a broad understanding of chemistry's subdisciplines by satisfactorily completing

- Introductory and foundational course work in chemistry, and in-depth course work in chemistry; all with laboratory emphasis. Additionally;
  - Students completing the B.S. program in Chemistry will complete intensive and comprehensive courses as identified by the American Chemical Society Guidelines for Bachelor Degree Programs including a research experience that provides for the development of the skills needed to be an effective professional chemist. The B.S. program in Chemistry is recognized by the ACS-CPT, and has enjoyed this status for over 40 years. Only about 30% of B.S. Chemistry programs in the United States have achieved this recognition.
  - Students completing the B.S. program in Biochemistry will complete most of the same intensive and comprehensive courses in Chemistry with laboratory emphasis as students in the B.S. ACS program above. Additionally, students in this program will complete four intensive and comprehensive courses in Biochemistry along with an advanced Biochemistry Lab. This program also provides for flexibility in the selection of in-depth Biology course electives to complement the rigorous chemistry foundation of the program.
  - Students completing the B.A. program in Chemistry will complete much of the in-depth course work in chemistry along with elective courses offered by departments from within the College of Sciences as well as other colleges within the university. There is greater flexibility in program design for customization of the program to individual student's career interests.
  - Build and develop communication skills through writing laboratory reports, term papers, and presentation of seminars and poster seminars.
  - Develop critical thinking. Critical thinking skills, development of problem solving abilities are implemented in the very first introductory courses common to all undergraduate programs offered. These skills are developed as students progress through the sequence of courses (meeting each course pre-requisite in a well thought out and logical pattern) required for graduation in all of our programs.
  - Develop intellectual growth by integrating into all of our courses concepts of ethics, laboratory safety and environmental stewardship applicable to the profession as well as to local, state, regional, national and international communities and society. Emphasis will be placed on the development of UULOs regarding Global/Multicultural Knowledge and Awareness, and Citizenship and Ethics.
  - Graduates shall be able to demonstrate technical competency in the performance of basic laboratory operations, including solution preparation and standardization, common synthetic procedures, standard qualitative and quantitative analysis procedures, and operation of standard laboratory equipment.

- Graduates shall have an in-depth understanding of the theoretical basis of chemistry, as well as areas of application of chemical principles.
- Graduates shall be able to function as chemical professionals in entry-level jobs or to succeed in graduate studies in chemistry or related scientific fields.

University Graduation Requirements

- Please see Graduation Policies for complete information

Chemistry Degree Requirements ..... Total: 120 Credits
General Education Requirements ..... Subtotal 33-36
First-Year Seminar ..... Credits: 2-3
English Composition ..... Credits: 6

- ENG 101 - Composition I
- ENG 102 - Composition II

Second-Year Seminar ..... Credits: 3
Constitutions ..... Credits: 4-6
Mathematics
Fulfilled by Major Requirements
Distribution Requirements ..... Credits: 18
Please see Distribution Requirement for more information.

- Humanities and Fine Arts: 9 Credits
  - Two courses 3 credits each from two different humanities areas - 6 credits
  - One course in fine arts- 3 credits
- Social Science: 9 Credits
  - One course each from three different fields.
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirement.

Multicultural and International
(see note 1 below)
Multicultural, one 3 credit course required
International, one 3 credit course required
These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students
Major Requirements - BS in Chemistry - Subtotal: 87-90 Credits
(see note 2 below)
Mathematics ..... Credits: 15

- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 283 - Calculus III
- MATH 431 - Mathematics for Engineers and Scientists I

Statistics ..... Credits: 3-6

- STAT 152 - Introduction to Statistics

or

- STAT 411 - Statistical Methods I

and

- STAT 412 - Statistical Methods II

or

- STAT 491 - Statistics for Scientists I

and

- STAT 492 - Statistics for Scientists II

Physics ..... Credits: 12

- PHYS 180 - Physics for Scientists and Engineers I
- PHYS 180L - Physics for Scientists and Engineers Lab I
- PHYS 181 - Physics for Scientists and Engineers II
- PHYS 181L - Physics for Scientists and Engineers Lab II
- PHYS 182 - Physics for Scientists and Engineers III
- PHYS 182L - Physics for Scientists and Engineers Lab III

Chemistry Major Requirements ..... Credits: 57

- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- CHEM 241 - Organic Chemistry I
- CHEM 242 - Organic Chemistry II
- CHEM 347 - Laboratory Techniques of Organic Chemistry I
- CHEM 348 - Laboratory Techniques of Organic Chemistry II
- CHEM 355 - Quantitative Analysis
- CHEM 355L - Quantitative Analysis Laboratory
- CHEM 421 - Physical Chemistry I
- CHEM 422 - Physical Chemistry II
- CHEM 423 - Physical Chemistry Laboratory
- CHEM 428 - Quantum Chemistry
- CHEM 431 - Advanced Inorganic Chemistry
- CHEM 447 - Advanced Synthesis Laboratory
- CHEM 455 - Instrumental Analysis
- CHEM 455L - Instrumental Analysis Laboratory
- CHEM 474 - Biochemistry I
- CHEM 491 - Senior Seminar in Chemistry
- CHEM 493 - Senior Research in Chemistry I
- CHEM 494 - Senior Research in Chemistry II

and seven credits selected from:

- CHEM 312 - Introduction to Radiochemistry
- CHEM 442 - Advanced Organic Chemistry
- CHEM 472 - Biochemistry Laboratory
- CHEM 475 - Biochemistry II
- CHEM 476 - Advanced Topics in Biochemistry
- CHEM 492 - Advanced Topics in Chemistry

Total Credits: 120

Notes

1. German or Russian is strongly recommended. Up to six credits of foreign language may be used to satisfy the General Education Core Humanities requirement.
2. At least 40 credits must be earned at the upper-division level (300 and above).

Minor

Chemistry Minor

Courses Include ..... Credits: 24

- CHEM 121 - General Chemistry I

and

- CHEM 122 - General Chemistry II

plus 16 additional credits of chemistry in courses numbered 220 or higher. At least 12 credits must be upper division. Credit will not be allowed toward the total of 24 for completing both CHEM 220 and CHEM 241. See departmental policies for further details.

Chemistry

CHEM 103 - Preparatory Chemistry
For students with a deficiency in high school chemistry who wish to qualify for CHEM 121. Corequisite(s): Enrollment in MATH 96 or placement in MATH 124 or higher. Note(s): Credit not allowed in both CHEM 103 and CHEM 110. Does not satisfy the General Education Core Science requirement. 3 credit(s)

CHEM 105 - Chemistry, Man, and Society
Introduction to chemistry, intended to develop an understanding of basic principles, and an appreciation of both the benefits and risks resulting from application of these principles in science and technology. May be used in partial fulfillment of the General Education Core Science requirement. Note(s): Credit not allowed in both CHEM 105 and CHEM 110. 3 credit(s)

CHEM 106 - Beginning Chemistry Laboratory
Laboratory exercises designed to illustrate material discussed in CHEM 105. May be used in partial fulfillment of the General Education Core requirement. Note(s): Must be concurrently enrolled in CHEM 105. 1 credit(s)

CHEM 108 - Introduction to Chemistry
Survey of elementary principles of general chemistry, organic chemistry and biochemistry, and their applications to living systems. For non-science majors and students majoring in nursing and allied health. Prerequisites: High School Chemistry or Permission of Instructor. 4 credit(s)

CHEM 110 - Chemistry for the Health Sciences I
Survey of elementary principles of general chemistry and their applications to living systems. For students in programs such as nursing and allied health. Prerequisite(s): MATH 96 or placement in MATH 124 or higher. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Credit not allowed in both CHEM 103 and 110. 4 credit(s)

CHEM 111 - Chemistry for the Health Sciences II
Survey of elementary principles of organic chemistry and biochemistry. For students majoring in nursing and allied health. Prerequisite(s): CHEM 110. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Credit not allowed in both CHEM 111 and CHEM 220. 4 credit(s)

CHEM 121 - General Chemistry I
Fundamental principles of chemistry and their correlation with the properties of the elements. Corequisite(s): MATH 127 or MATH 128 or higher. Prerequisite(s): A passing score on the Chemistry Placement Exam or a grade of C or better in CHEM 103. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

CHEM 122 - General Chemistry II
Application of chemical principles to properties of inorganic substances. Includes principles and techniques of qualitative analysis, with special emphasis on applications of chemical equilibria. Prerequisite(s): CHEM 121, and MATH 127 or MATH 128 or higher. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

CHEM 123 - Qualitative Analysis Laboratory
Laboratory portion of CHEM 122. Open only to students with scores of four or five on the Chemistry Advanced Placement Test of the College Entrance Examination Board. Satisfies CHEM 121-122 for these students. Prerequisite(s): A score of four or five on the Advanced Placement Test in Chemistry. Lab/Lecture/Studio Hours One hour lecture and three hours laboratory 2 credit(s)

CHEM 190 - Freshman Independent Study in Chemistry
Introduction to research in a chemistry lab. Students work under close supervision of a faculty member to develop research skills. Prerequisite(s): CHEM 121 or a score of three or better on the AP Chemistry Exam; consent of faculty member directing the research prior to registration. May be repeated to a maximum of three credits. Lab/Lecture/Studio Hours May include library research and laboratory work. 1 credit(s)

CHEM 220 - Introductory Organic Chemistry
Introduction to the properties of organic functional groups and to elementary laboratory techniques. Prerequisite(s): CHEM 122. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Credit toward meeting chemistry program requirements not allowed in both CHEM 220 and CHEM 241. 4 credit(s)

CHEM 241 - Organic Chemistry I
Intensive introduction to the theory of carbon chemistry with particular emphasis on understanding the relationship between the structure and behavior of organic molecules. Credit toward meeting chemistry program requirements not allowed in both CHEM 220 and CHEM 241. Prerequisite(s): CHEM 122. Note(s): Students are limited to two (2) registrations for this course regardless of first registration status (grade, drop, withdraw or audit). Students can only enroll in this course through the Chemistry Department Office. 3 credit(s)

CHEM 241L - Organic Chemistry for Life Sciences Lab I
Laboratory exercises in introductory organic chemistry. Stereochemistry, separation and purification techniques, micro-scale organic reaction procedures. Corequisite(s): CHEM 241. 1 credit(s)

CHEM 242 - Organic Chemistry II
Continuation of CHEM 241 with emphasis on complex reactions and mechanisms, and introduction to advanced approaches for the synthesis of organic molecules. Credit not allowed in both CHEM 220 and CHEM 241-242. Prerequisite(s): CHEM 241. 3 credit(s)

CHEM 242L - Organic Chemistry for Life Sciences Laboratory II
Laboratory exercises in intermediate organic chemistry with continued emphasis on micro-scale organic reaction procedures. Introduction to the identification of organic compounds using chemical and instrumental means (qualitative analysis). Corequisite(s): CHEM 242. 1 credit(s)

CHEM 302 - Chemistry Demonstrations for Science Teachers
Provides an opportunity for science teachers to perform practical chemistry demonstrations and to review fundamental chemical principles. These demonstrations suitable for incorporation into the physical, biological, and earth science curricula. Prerequisite(s): Consent of instructor and either a teaching certificate or bachelor's degree. 2 credit(s)

CHEM 312 - Introduction to Radiochemistry
Introduction to the fundamental principles of radiation science for radiochemists. Introduction to radioactivity, interaction of radiation with matter, and effects of radiation on biological systems. Discussion and overview of practical applications of radiochemistry, including nuclear medicine, radiochemical techniques, nuclear chemical engineering, and radioactive waste management. Prerequisite(s): CHEM 122, PHYS 181, MATH 182. 3 credit(s)

CHEM 347 - Laboratory Techniques of Organic Chemistry I
Laboratory exercises in introductory organic chemistry for chemistry majors. Stereochemistry, separation and purification techniques, macro-scale organic reaction procedures. Corequisite(s): CHEM 241. 1 credit(s)

CHEM 348 - Laboratory Techniques of Organic Chemistry II
Laboratory exercises in intermediate organic chemistry with continued emphasis on macro-scale reaction procedures. Introduction to advanced purification, separation, qualitative analysis, and spectroscopic techniques. Corequisite(s): CHEM 242. 2 credit(s)

CHEM 355 - Quantitative Analysis
Theory and techniques of quantitative analysis, particularly gravimetric, titrimetric, complexometric, peotentiometric, and colorimetric methods. Standard chromatographic and spectroscopic techniques also covered. Emphasis upon chemical calculations and equilibrium considerations. Prerequisite(s): CHEM 220 or CHEM 241 plus either CHEM 241L or CHEM 347. Lab/Lecture/Studio Hours Three hours lecture. Note(s): Students are limited to two (2) registrations for this course regardless of first registration status (grade, drop, withdraw or audit). Students can only enroll in this course through the Chemistry Department Office. 3 credit(s)

CHEM 355L - Quantitative Analysis Laboratory
Laboratory stressing the application and techniques of quantitative analysis, particularly gravimetric, titrimetric, complexometric, potentiometric, and calorimetric methods. Standard chromatographic and spectroscopic techniques also covered. Emphasis upon chemical calculations and equilibrium considerations as applied to chemical analysis. Prerequisite(s): CHEM 220; or CHEM 241 plus either CHEM 241L or CHEM 347; and concurrent enrollment in CHEM 355. Lab/Lecture/Studio Hours Six hour laboratory. Note(s): Students must be concurrently enrolled in CHEM 355. 2 credit(s)

CHEM 402 - Scientific Software for the Microcomputer
Use of computer software for graphing, statistics, structure drawing, information retrieval, word processing, and self-paced learning. Prerequisite(s): CHEM 242. Note(s): This course is crosslisted with CHEM 602. Credit at the 600-level requires additional work. 1 credit(s)

CHEM 421 - Physical Chemistry I
Thermodynamics, solution behavior, and equilibrium. Prerequisite(s): CHEM 122 and PHYS 152 or concurrent registration in PHYS 182 and MATH 182. Note(s): This course is crosslisted with CHEM 621. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 422 - Physical Chemistry II
Kinetic theory, chemical kinetics, electrochemistry, introductory quantum chemistry, and states of matter. Prerequisite(s): CHEM 421. Note(s): This course is crosslisted with CHEM 622. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 423 - Physical Chemistry Laboratory
Introduction to basic physicochemical laboratory techniques and their use in elucidating chemical theory. Corequisite(s): CHEM 422. Prerequisite(s): CHEM 421. Note(s): CHEM 423 and CHEM 493 may not be taken concurrently. 2 credit(s)

CHEM 428 - Quantum Chemistry
Introduction to quantum mechanics and molecular orbital theory as related to bonding, spectra, and reactivity. Includes an introduction to computerized electronic structure calculations. Prerequisite(s): CHEM 422, MATH 182 and PHYS 181 or PHYS 182. Note(s): This course is crosslisted with CHEM 628. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 431 - Advanced Inorganic Chemistry
Atomic and molecular structure: acid-base theory; periodic relationships and organometallic chemistry. Corequisite(s): CHEM 422. Note(s): This course is crosslisted with CHEM 631. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 442 - Advanced Organic Chemistry
Builds on the background of the one-year organic chemistry course. Emphasizes advanced concepts of reactivity, single-step and multistep transformations, important named reactions, as well as mechanistic and functional group approaches to synthesis. Prerequisite(s): CHEM 242. 3 credit(s)

CHEM 447 - Advanced Synthesis Laboratory
Preparation, purification, and characterization of organic and inorganic compounds. Prerequisite(s): CHEM 242. Lab/Lecture/Studio Hours Six hours laboratory. 2 credit(s)

CHEM 455 - Instrumental Analysis
Fundamental laws and principles of instrumental determinations, including spectroscopy, spectrophotometry, electrochemical methods, and thermal analysis as main areas of study. Corequisite(s): CHEM 421. Prerequisite(s): CHEM 355 and CHEM 355L. Lab/Lecture/Studio Hours Three hours lecture. Note(s): This course is crosslisted with CHEM 655. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 455L - Instrumental Analysis Laboratory
Laboratory stressing the application and techniques of instrumental analysis including spectroscopy, spectrophotometry, electrochemical methods, and thermal analysis and the use of these methods in chemical analysis. Prerequisite(s): CHEM 355, CHEM 355L and concurrent enrollment in CHEM 455. Lab/Lecture/Studio Hours Two credit, six hours laboratory. 2 credit(s)

CHEM 472 - Biochemistry Laboratory
Introduction to analytical techniques of biochemistry as tools to study cellular components. Techniques may include centrifugation, spectrophotometry, chromatography, and electrophoresis. Prerequisite(s): CHEM 474, Biochemistry major. Lab/Lecture/Studio Hours Six hours laboratory. Note(s): This course is crosslisted with CHEM 672. Credit at the 600-level requires additional work. 2 credit(s)

CHEM 474 - Biochemistry I
Fundamentals of biochemistry with emphasis on the structure-function relationships of proteins, enzymes, carbohydrates, lipids and nucleic acids; bioenergetics; and intermediary metabolism and the mechanisms of its regulation. Prerequisite(s): CHEM 242. Note(s): This course is crosslisted with CHEM 674. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 475 - Biochemistry II
Continuation of CHEM 474 with emphasis on anabolic and catabolic pathways; gene replication and expression in prokaryotes and eukaryotes; recombinant DNA; and various aspects of physiological chemistry. Prerequisite(s): CHEM 474. Note(s): This course is crosslisted with CHEM 675. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 476 - Advanced Topics in Biochemistry
In-depth study of selected topics of current and general interest in biochemistry. Topics may include enzymes, nucleic acids, metabolism, molecular genetics, neurochemistry, toxicology, and human biochemistry. Prerequisite(s): CHEM 475. May be repeated (different topic). Note(s): This course is crosslisted with CHEM 676. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 478 - Endocrinology
(Same as BIOL 448.) Survey of the structure and function of vertebrate endocrine systems, with emphasis on the biochemical basis of hormone action and the role of cell communication in endocrine physiology. Prerequisite(s): CHEM 474 recommended. Note(s): This course is crosslisted with CHEM 678. Credit at the 600-level requires additional work. 3 credit(s)

CHEM 489 - Senior Poster Seminar
Topics of current research in all fields of chemistry, matters of professional concern. Includes presentation of a poster seminar on a selected topic. Prerequisite(s): CHEM 355 CHEM 355L, CHEM 402, CHEM 421. May be repeated to a maximum of two credits. 1 credit(s)

CHEM 490 - Senior Independent Study in Chemistry
Modest research projects for students working toward the Bachelor of Arts degree and demonstrating aptitude for independent work. Prerequisite(s): No more than three credits of CHEM 490 may be applied toward a chemistry degree. Consent of the faculty member directing the project must be obtained prior to registration. May be repeated once. 1-3 credit(s)

CHEM 491 - Senior Seminar in Chemistry
Includes oral presentations of topics of current research in any field of chemistry. Only required for BS Chemistry, but recommended as an elective for any student interested in graduate school. Students in other Chemistry degree programs should take CHEM 489 instead. Prerequisite(s): CHEM 355, CHEM 402, and CHEM 421. May be repeated to a maximum of two credits. 1 credit(s)

CHEM 492 - Advanced Topics in Chemistry
Selected topics from the various disciplines of chemistry not covered by any other course offerings and of current interest to students and faculty. Prerequisite(s): CHEM 242. May be repeated to a maximum of four credits. 1-2 credit(s)

CHEM 493 - Senior Research in Chemistry I
Individual laboratory projects drawn from any field of chemistry. Preliminary library work, equipment acquisition, and apparatus assembly and initiation of laboratory work as time allows. Corequisite(s): CHEM 421. Prerequisite(s): (Consent of the faculty member directing the project must be obtained prior to registration.) For students in the general B.S. in Chemistry program, Prerequisite(s): are CHEM 242, CHEM 422, CHEM 423, and CHEM 455. For students in the Biochemistry B.S. program, Prerequisite(s): are CHEM 355, CHEM 472, and CHEM 475; May be repeated to a maximum of two credits. 1 credit(s)

CHEM 494 - Senior Research in Chemistry II
Continuation of CHEM 493. Intensive experimental work. Prerequisite(s): CHEM 493. May be repeated to a maximum of four credits. 2 credit(s)

Department of Geoscience

Purpose and Focus
The Department of Geoscience offers two degree programs for majors interested in the geological sciences. These programs are designed to prepare students for specific career paths in geoscience including the pursuit of graduate degrees. In addition, the department wishes to communicate the flavor and excitement of the geological sciences to all students at the university by offering a number of introductory courses that are directed toward students of all backgrounds and goals.

Accreditation
Northwest Commission on Colleges and Universities

Undergraduate Majors
Earth and Environmental Science
Geology

Admission to the Major
Minimum GPA: 2.0

Transfer Policies: All transfer students should meet with an advisor without delay after admission in order to evaluate the applicability of previous course work to UNLV, their major, and graduation requirements.

Department Policies
Graduation Requirements: For graduation with a major or minor in geology, a minimum final grade of C (2.00) is necessary in all required geology-related courses. In addition, before enrolling in any geology course, the student must have completed each geology prerequisite for that course with a grade of C or higher.

Probation: A student will be placed on probation for any of the following reasons:
1. The student's cumulative GPA falls below 2.00.
2. The student's semester GPA is below 2.00 for all degree courses.
3. The student receives D, F, or I grades in more than two courses in one semester.
4. The student transfers into the college from another program at UNLV or from another institution with a GPA less than 2.50 but at least 2.00.

Requirements for Probationary Students: Once a student has been placed on probation as a major in the department, the following general guidelines apply:
1. The student must meet with a faculty advisor to agree upon a probationary course of study. This course of study must include at least 15 credits that apply toward a degree in the major, with a majority of the credits coming from courses in the college, unless all requirements within the college have been completed. Specific courses will be selected in consultation with the faculty advisor based on the student's previous progress and on established degree program requirements. Upon agreement on a course of study, the advisor will place a memorandum outlining the course of study in the student's file.

2. Students are expected to complete the probationary course of study within two consecutive semesters and one summer. With approval of the faculty advisor, three consecutive semesters (and the intervening summer) may be allowed if course schedules make it necessary. Students who complete the probationary course of study within the allotted time with a GPA (for the course of study only) of at least 2.50 will be removed from probation.

Advisement

Students who declare a major in geology or earth and environmental science are automatically assigned a faculty advisor. The student is required to meet with the advisor at least once a year, but the department recommends each semester.

Major

Earth and Environmental Science Major- Bachelor of Science (BS)

Please see the UNLV College of Science, Department of Geoscience web page at http://geoscience.unlv.edu for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science at www.unlv.edu/sciences/advising.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

1. Demonstrate the ability to recognize, formulate, employ, and interpret the scientific methodology
2. Demonstrate the knowledge of major rock types, geologic time, evolution, and earth history events
3. Demonstrate the knowledge in various specializations within the field of earth science to solve appropriate research or applied problems.
4. Demonstrate the ability to function independently, collaboratively, and ethically with others in the profession as colleagues and supervisors
5. Demonstrate the written and verbal communications skills required to convey contemporary theories in earth science and in how the Earth operates as a system
6. Demonstrate sufficient skills in computers and multi-media systems for the application and presentation in earth science

University Graduation Requirements

- Please see Graduation Policies for complete information

Earth and Environmental Science
Degree Requirements.....Total: 122-128 Credits
General Education Requirements..... Subtotal: 33-36 Credits
First-Year Seminar ..... Credits: 2-3
(see note 1 below)
English Composition ..... Credits: 6
- ENG 101 - Composition I
- ENG 102 - Composition II

Second-Year Seminar ..... Credits: 3
Constitutions ..... Credits: 4-6
Mathematics..... Credits: (Fulfilled by Major Requirements)
Distribution Requirement: Life and Physical Sciences and Analytical Thinking
Please see Distribution Requirements for more information.
- Humanities and Fine Arts: 9 Credits
  - Two courses 3 credits each from two different humanities areas - 6 credits
  - One course in fine arts- 3 credits
- Social Science: 9 Credits
  - One course each from three different fields.
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirement

Multicultural and International
Multicultural, one 3 credit course required
International, one 3 credit course required
These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students
Major Requirements - BS in Earth and Environmental Science - Subtotal:..... Credits: 89-92
Writing Requirement..... Credits: 3
(Select 3 credits from the following)
- ENG 407B - Fundamentals of Technical Writing
- ENG 405B - Research and Editing
- ENG 407A - Fundamentals of Business Writing
- ENG 407C - Advanced Professional Communication

Required Department Courses ..... Credits: 14-15
Any GEOL/GEOG 100 level course for no more than 4 credits
- GEOL 102 - Earth and Life Through Time
- GEOL 220 - Mineralogy
- GEOL 335 - Earth Resources and the Environment

Related Required Courses..... Credits: 12-14
- MATH 128 - Precalculus and Trigonometry

or
- MATH 126 - Precalculus I

and
- MATH 127 - Precalculus II

or
- MATH 181 - Calculus I or higher
- CHEM 121 - General Chemistry I or higher
- PHYS 151 - General Physics I
- PHYS 151L - General Physics I or higher

Geology Electives (at least 28 credits of additional Geology and Geography 200 level or above) ..... Credits: 28
Additional Electives in Geology or other topics, at least 13 credits above 300 level ..... Credits: 32
Total Credits: 122-128

Notes

1. It is strongly recommended that students take SCI 101 to satisfy the First Year Seminar requirement.
2. Students must complete 40 upper-division credits (satisfied by the degree requirements in the major).

Environmental Geology Major

Geology Major - Bachelor of Science (BS)

Please see the UNLV College of Sciences, Geoscience department web page at http://www.unlv.edu/degree/bs-geology for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science Advising at www.unlv.edu/sciences/advising.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

By the end of the Geology program students will be:

1. Identify common rock-forming minerals in hand specimen and thin section, major rock types and will be able to describe the conditions under which each of them formed. This will include being able to describe the chemical characteristics of various types of rocks, geologic influences on environmental pollutants, and the use of stable and radiogenic isotopes as environmental tracers and tools in dating rocks and water.
2. Identify the common types of invertebrate and vertebrate fossils, their approximate age, and the environments in which they lived, and have a grounding in the historical development of the field of geology.
3. Recognize, in the field, various types of geologic structures, and be able to use these to reconstruct the structural history of a region.
4. Describe the major processes that determine the characteristics of the earth's surface, and be able to examine a landscape and interpret its geomorphic history.
5. Describe the plate-tectonic history of the earth (when various supercontinents assembled and fragmented), the relationship between plate tectonic processes and mountain building, and the types of data that are used to reconstruct the position of a particular plate in the geologic past.
6. Describe the regional stratigraphic framework of the Southern Nevada region; they will also be able to go into a new region that has a well-exposed stratigraphic record, and reconstruct the sedimentological history of the region.
7. Be facile in computer applications in geology including spatial and imagery analysis applications, quantitative skills, and express themselves well in oral and written reports.
8. Apply the techniques of at least two specializations within the field of geology (e.g., geophysics, hydrogeology, GIS, geochronology, petroleum geology) to the solution of appropriate research or applied problems.
9. Able to demonstrate the ability to function independently, collaboratively, and ethically with others in the profession as colleagues and supervisors.
10. Demonstrate the ability to enter a new field area, construct a geologic map on a topographic base, interpret the geologic history of the area, and write a professional quality report on the geology of the area. This learning objective comprises the Capstone experience for this degree program and is fulfilled through the summer field geology course. It also includes the ability to recognize, formulate, employ, and interpret the scientific methodology, and employ critical thinking skills. Many other learning outcomes for this degree program are also reinforced through this capstone experience (For instance, outcomes 1-5, and 9).

University Graduation Requirements

- Please see Graduation Policies for complete information

Geology Degree Requirements.....Total: 120-125 Credits

To develop a level of geologic competency in our graduates so they are equipped to compete successfully for entry-level jobs in the geological job market and/or for admission to graduate programs offered by accredited universities and colleges. To accomplish the above:

1. The B.S. in Geology degree is intended to recognize, formulate, employ, and interpret the scientific methodology that is appropriate to geological research.
2. All students will graduate with competency in correctly identifying the properties, characteristics, and behavior of earth materials.
3. Graduating students will be proficient in the production and interpretation of geologic maps.
4. All graduates will have a working knowledge of those scientific disciplines ancillary to the science of geology: chemistry, physics, and mathematics.
5. All students will have the ability to function independently, collaboratively, and ethically with others in the profession.
6. Each graduate will demonstrate the written and verbal communications skills required to convey the results of scientific research.

General Education Requirements..... Subtotal 33-36 Credits

First-Year Seminar.....Credits: 2-3

1. It is strongly recommended that students take SCI 101 to satisfy the First Year Seminar requirement.

English Composition ..... Credits: 6

- ENG 101 - Composition I
- ENG 102 - Composition II
- ENG 101 - Composition I
- ENG 102 - Composition II

Second-Year Seminar..... Credits: 3

Constitutions .....Credits: 4-6

Mathematics

- Fulfilled by the major requirement - MATH 181 - Calculus I or higher

Distribution Requirement..... Credits: 18

Please see Distribution Requirement for more information.

- Humanities and Fine Arts: 9 Credits
  - Two courses 3 credits each from two different humanities areas - 6 credits
  - One course in fine arts- 3 credits
- Social Science: 9 Credits
  - One course each from three different fields.
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirements

Multicultural and International

(see note 2 below)

Multicultural, one 3 credit course required

International, one 3 credit course required

These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students

Major Requirements - BS in Geology - Subtotal: 61 Credits

Writing Requirement..... Credits: 3

(Select 3 credits from the following)

- ENG 405B - Research and Editing
- ENG 407A - Fundamentals of Business Writing

- ENG 407B - Fundamentals of Technical Writing
- ENG 407C - Advanced Professional Communication

Required Department Courses ..... Credits: 33-34
Any GEOL/GEOG 100 level course for no more than 4 credits
- GEOL 102 - Earth and Life Through Time
- GEOL 220 - Mineralogy
- GEOL 333 - Principles of Geomorphology
- GEOL 341 - Structural Geology
- GEOL 348 - Field Geology I
- GEOL 372 - Advanced Field Geology
- GEOL 427 - Igneous and Metamorphic Petrology/Petrography
- GEOL 462 - Principles of Stratigraphy and Sedimentation

Related Required Courses ..... Credits: 23-24
Math:
- MATH 181 - Calculus I
- MATH 182 - Calculus II

or
- STAT 152 - Introduction to Statistics

or
- STAT 491 - Statistics for Scientists I

Science:
- CHEM 121 - General Chemistry I

and
- CHEM 122 - General Chemistry II
- PHYS 151 - General Physics I

and
- PHYS 152 - General Physics II

or
- PHYS 180 - Physics for Scientists and Engineers I

and
- PHYS 180L - Physics for Scientists and Engineers Lab I

and
- PHYS 181 - Physics for Scientists and Engineers II

and
- PHYS 181L - Physics for Scientists and Engineers Lab II

or
- PHYS 182 - Physics for Scientists and Engineers III
- PHYS 182L - Physics for Scientists and Engineers Lab III

Electives..... Credits: 28
Additional Electives in Geology and other topics (at least 9 must be 300 level or above in GEOL.)
Total Credits: 120-125

Notes

1. It is strongly recommended that students take SCI 101 to satisfy the First Year Seminar requirement.
2. Students must complete 40 upper-division credits (satisfied by the degree requirements in the major).

Minor

Earth and Environmental Science Minor

The student and geoscience advisor must agree upon the courses chosen to satisfy the earth and environmental science minor. This list must be signed by the student and advisor and placed on permanent record in the student's file.
Courses Include ..... Credits: 23
The Earth and Environmental Science Minor is tailored for students outside the College of Sciences. It provides a good background in the topics likely to be covered in an earth science teaching position in Clark County and other areas as well as a solid background to appreciate the natural landscapes and resources in Southern Nevada and the world. Consists of the following course work:
GEOL 101 - Exploring Planet Earth
GEOL 102 - Earth and Life Through Time
and one of the following:
GEOG 103 - Physical Geography of Earth's Environment
GEOL 105 - Introduction to Geology of National Parks
GEOL 100 - Natural Disasters
Choose at least 12 credits from GEOL and GEOG courses numbered 300 or above. No more than 12 credits taken for the minor may be used to satisfy requirements in a student's major.

Geology Minor

Courses Include ..... Credits: 23
The Geology minor is tailored to the needs of students within the Colleges of Science or Engineering, or is for other majors with a scientific emphasis. Consists of required coursework including:
GEOL 101 - Exploring Planet Earth
GEOL 220 - Mineralogy
and one of the following:
GEOL 221 - Introduction to Optical Mineralogy and Petrography
or
GEOL 102 - Earth and Life Through Time
Choose at least 12 credits from GEOL and GEOG courses numbered 300 or above. No more than 12 credits taken for the minor may be used to satisfy requirements in a major.
No course in which a grade of C or lower is earned may be applied to any minor in the College of Sciences.

Physical Geography Minor

Physical Geography Minor ..... Credits: 24
The Physical Geography minor is designed for students in the Colleges of Science, Education, Liberal Arts, Engineering, and others, who desire a scientific understanding of the spatial aspects of the Earth System and analysis of spatial data. The minor emphasizes the four spheres of the Earth System: Atmosphere, Lithosphere, Hydrosphere, and Biosphere.
The minor consists of required coursework including:
- GEOG 103 - Physical Geography of Earth's Environment
- GEOG 104 - Physical Geography Laboratory
- GEOG 421 - Climatology
- GEOL 430 - Geographic Information Systems (GIS): Theory and Applications

Choose an additional 13 or more elective credits from:
- GEOL 100 - Natural Disasters
- GEOL 101 - Exploring Planet Earth
- GEOL 110 - Global Warming
- GEOL 303 - Global Environmental Change
- GEOL 333 - Principles of Geomorphology
- GEOL 335 - Earth Resources and the Environment
- GEOL 446 - Geologic Application in Remote Sensing

No more than 12 credits taken for the minor may be used to satisfy requirements in a major. At least twelve credits in GEOG and GEOL courses must be numbered 300 and above.

Geology

GEOG 103 - Physical Geography of Earth's Environment
Introduction to the processes that influence weather, rivers, oceans, climate, deserts, glaciers and their associated ecosystems. Emphasizes relationships between humans and our environment. Note(s): Satisfies the General Education Core requirement for a science course. Lecture may be combined with optional lab GEOG 104, which satisfies General Education Core requirement for a laboratory science course. 3 credit(s)

GEOG 104 - Physical Geography Laboratory
Provides an opportunity to apply concepts in physical geography, including map interpretation, computer GIS, meteorological processes, development of landforms and an understanding of the dynamics of the earth. Corequisite(s): GEOG 103. 1 credit(s)

GEOG 116 - Introduction to Oceanography
Fundamentals of oceanography will be covered including a brief history followed by the spatial aspects of geological, physical, chemical and biological oceanography. An emphasis will be placed on the role of oceans on climate change in the past, present and future, including global warming. Lab/Lecture/Studio Hours Three hour lecture. 3 credit(s)

GEOG 140 - Conversations With Earth
Discussion of current topics on Earth's origin, evolution, and habitability. Topics include: radioactive waste storage, catastrophic floods, evolution and extinction on life, climate change, global warming, volcanism, mountain building, ice ages, Nevada geology, ore deposits, and groundwater, among others. Note(s): (Same as GEOL 140.) 3 credit(s)

GEOG 421 - Climatology
Formerly Listed as GEOG 390.
Physical characteristics of the atmosphere. World climatic classification. Local atmospheric field study. Prerequisite(s): GEOG 103. Note(s): This course is crosslisted with GEOG 621. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 100 - Natural Disasters
Formerly Listed as GEOL 120.
Causes of natural disasters and their impact on people and property. Focuses on geological hazards such as earthquakes, volcanic eruptions, landslides, and floods. 3 credit(s)

GEOL 101 - Exploring Planet Earth
Basics of geology including the birth and evolution of planet Earth, geologic time, plate tectonics, earthquakes, volcanic eruptions, natural resources, and surface processes. Understanding how geology is important to your life. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): Satisfies the General Education Core requirement for a science course AND a laboratory science course. 4 credit(s)

GEOL 102 - Earth and Life Through Time
Systematic review of the history of the earth and the methods by which the details of earth history are unraveled. Prerequisite(s): GEOL 101 or equivalent. Lab/Lecture/Studio Hours Three lectures and one three-hour laboratory per week with occasional weekend field trips. Note(s): Field trips required. 4 credit(s)

GEOL 105 - Introduction to Geology of National Parks
Geology of selected national parks in North America with emphasis on surface processes including the causes and effects of Pleistocene glaciation and major tectonic events that have shaped the topography of the United States and Canada. 3 credit(s)

GEOL 110 - Global Warming
Learn the science of global warming, including natural climate variability versus human-caused climate change, and impacts on glaciers, water supplies, oceans, and species. Understand what models tell us about the future and the impact of our carbon footprints on sustainability. Note(s): Satisfies the General Education Core requirement for a science course. 3 credit(s)

GEOL 126 - Science in American Culture
Analysis of the relationship between science and American culture from colonial times to the present. Key themes include 1) evolving relationships between science, religion, and art, 2) influence of the maturation of the historical sciences on American culture in the nineteenth century, and 3) role of science in American public policy today. Lab/Lecture/Studio Hours Three hours lecture. 3 credit(s)

GEOL 130 - Water and the West
Examination of the physical processes governing the distribution and movement of water within the western United States. Consideration of the impact of water on human settlement and activities and also the impact of human activities on the natural hydrologic system. Topics include case studies from throughout the western United States. 3 credit(s)

GEOL 135 - Earth Resources and Society
Geological availability, exploitation, and use of nonrenewable resources including metallic minerals, nonmetallic minerals, and energy resources. Duplicate credit not allowed in GEOL 135 and GEOL 335. Lab/Lecture/Studio Hours Three hours lecture. 3 credit(s)

GEOL 140 - Conversations with Earth
(Same as GEOG 140.) Discussion of current topics of origin, evolution, and habitability. Topics include: radioactive waste storage, catastrophic floods, evolution and extinction of life, climate change, global warming, volcanism, mountain building, ice ages, Nevada geology, ore deposits, and groundwater, among others. 3 credit(s)

GEOL 141 - The Moon and Mars: Introduction to Planetary Geology
Geologic principles of terrestrial planets, icy satellites, comets and asteroids. Introduction for non-science majors to remote sensing, robotic spacecraft exploration, and manned missions to the Moon and Mars. 3 credit(s)

GEOL 220 - Mineralogy
Study of classification, chemistry, physical properties, and crystallography of minerals forming rocks, ore deposits and soils. Identification of hand samples. Study of associations of minerals in geologic environments. Corequisite(s): MATH 127 or MATH 128 and CHEM 121. Prerequisite(s): GEOL 100 or GEOL 101 or GEOG 103. 4 credit(s)

GEOL 221 - Introduction to Optical Mineralogy and Petrography
Optical properties of minerals in thin section. Laboratory identification of minerals based on optical properties. Study of associations of minerals in thin sections of rocks. Introduction to petrography. Prerequisite(s): GEOL 220. Lab/Lecture/Studio Hours Two hours lecture, three hours laboratory. 3 credit(s)

GEOL 301 - Fossil Record
History and evolution of life as recorded in the fossil record. Prerequisite(s): GEOL 102 or BIOL 189 or BIOL 197. 3 credit(s)

GEOL 302 - Paleontology Laboratory
Identification of the major fossil forming groups and analysis of paleontological data, with emphasis on invertebrates. Prerequisite(s): or Corequisite: GEOL 301. Note(s): Field trips required. 1 credit(s)

GEOL 303 - Global Environmental Change
Interdisciplinary introduction to the dynamics of the interactions among the lithosphere, biosphere, and atmosphere and their effects on the environment throughout geologic time. Emphasizes dimensions and consequences of both natural and human induced climate change. Prerequisite(s): Junior standing. 3 credit(s)

GEOL 333 - Principles of Geomorphology
Description and classification of landforms; evaluation of erosional and depositional processes with respect to earth materials, structure, and geologic history. Field trips required. Emphasis on fluvial, marine, eolian, and glacial origins of landforms. Prerequisite(s): GEOL 101. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

GEOL 334 - Environmental Geology
Control and use of the geological enviroment in modern society. Includes surface and sub-surface processes, mineral resources, and rock properties. Prerequisite(s): GEOL 333. 3 credit(s)

GEOL 335 - Earth Resources and the Environment
Geological availability, exploitation, and use of nonrenewable natural resources including metallic minerals, nonmetallic, energy resources. Component of the Environmental Studies Program. Duplicate credit not allowed in GEOL 135 and GEOL 335. Lab/Lecture/Studio Hours Three hours lecture. 3 credit(s)

GEOL 341 - Structural Geology
Study of structural features of the earth's crust and their development. Laboratory work involves study and preparation of geologic maps and cross sections as well as structural analysis techniques. Corequisite(s): PHYS 151 or PHYS 180 and PHYS 180L. Prerequisite(s): GEOL 220, MATH 128 or equivalent. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

GEOL 348 - Field Geology I
Basic tools and techniques of geologic mapping, map preparation, and report writing. Corequisite(s): GEOL 341. Prerequisite(s): GEOL 221. Note(s): Nine hours field. 3 credit(s)

GEOL 352 - Field Trip
Field trip to selected areas of geologic significance. Prerequisite(s): GEOL 101 or equivalent and consent of instructor. May be repeated once for credit. 1-3 credit(s)

GEOL 370 - Intermediate Field Geology
Intermediate-level techniques of geologic mapping, map preparation, and report writing. Preparation of reports includes professional maps, structure sections, and geologically reasonable interpretations. Requires three-week commitment during winter break. Prerequisite(s): GEOL 348. 3 credit(s)

GEOL 372 - Advanced Field Geology
Advanced field techniques including analysis of geologically complex areas; independent and collaborative field projects, and preparation of professional maps and reports. Oral presentation of projects. Requires three-week commitment after spring semester. Prerequisite(s): GEOL 370. 3 credit(s)

GEOL 410 - Soil Classification and Resource Management
Morphology and classification of soils based on their physical, chemical and mineralogical composition. Introduction to soil genesis, soil mapping, and the relationship of soils to the limitations and potentials of land use. Prerequisite(s): Junior standing and either GEOG 101 or GEOL 101, or consent of instructor. Lab/Lecture/Studio Hours Three lectures and one laboratory per week. Note(s): This course is crosslisted with GEOL 610. Credit at the 600-level requires additional work. 4 credit(s)

GEOL 420 - Introduction to X-ray Diffraction and X-ray Spectrometry Methods
Introduction to the principles and methods of x-ray analysis as applied to the study of minerals. Powder camera, diffractometry and spectrometry methods covered. Corequisite(s): GEOL 330. Prerequisite(s): GEOL 220. Lab/Lecture/Studio Hours Two hours lecture and six hours laboratory. Note(s): This course is crosslisted with GEOL 620. Credit at the 600-level requires additional work. 4 credit(s)

GEOL 425 - Principles of Geochemistry
Formerly Listed as GEOL 330.
Fundamental geochemical processes operating within the lithosphere, hydrosphere and atmosphere. Topics include chemical differentiation of the earth, crystal chemistry, mineral stability and phase diagrams, aqueous geochemistry, isotope geochemistry, organic chemistry. Corequisite(s): CHEM 122. Prerequisite(s): MATH 128; GEOL 220. Note(s): This course is crosslisted with GEOL 625. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 427 - Igneous and Metamorphic Petrology/Petrography
Description, classification, and interpretation of igneous and metamorphic rocks in hand specimen and thin section. Prerequisite(s): GEOL 220. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory per week. 4 credit(s)

GEOL 429 - Geochemical Thermodynamics and Kinetics
Survey of the basic principles of thermodynamics and kinetics and their application to geological processes; applications to include igneous, metamorphic, hydrothermal, diagenetic, weathering, and aqueous systems. Prerequisite(s): GEOL 425 and MATH 181. Note(s): This course is crosslisted with GEOL 629. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 430 - Geographic Information Systems (GIS): Theory and Applications
Survey of computer-based techniques in the storage, retrieval, analysis, and representation of spatially referenced data. Emphasis on the application of GIS technology to geologic problems such as natural hazard mapping, surface runoff and erosion, and environmental impact assessment. Prerequisite(s): MATH 127 or MATH 128. Lab/Lecture/Studio Hours Three hours lecture and three hours lab. Note(s): This course is crosslisted with GEOL 630. Credit at the 600-level requires additional work. 4 credit(s)

GEOL 433 - Glacial and Periglacial Geology
Origin and regimen of glaciers. Geomorphology and stratigraphic analysis of glacial and associated non-glacial deposits and environments. Prerequisite(s): GEOL 333. Note(s): This course is crosslisted with GEOL 633. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 434 - Quaternary Geology
Survey of global paleoenvironments, including geologic, climatic, and biotic changes during the Quaternary. Examination of the geological record of marine and terrestrial glaciated and nonglaciated environments. Prerequisite(s): GEOL 433. Note(s): This course is crosslisted with GEOL 634. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 436 - Quaternary Paleoecology
Examination of the fossil record of the Quaternary including vertebrate, invertebrate, and floral assemblages. Emphasis on paleoenvironmental and paleoclimatological reconstructions. Prerequisite(s): GEOL 333. Note(s): Field trips required. This course is crosslisted with GEOL 636. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 437 - Paleoclimatology
Paleoclimatic history of the Earth, with emphasis on the Neogene and Quaternary Periods. Survey of marine and terrestrial geological records of paleoclimate, including physical sedimentology, geochemistry, and pollen profiles of ice and sediment cores and speleothems. Prerequisite(s): GEOL 333. Note(s): This course is crosslisted with GEOL 637. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 440 - Volcanology
Description and classification of volcanoes, volcanic eruptions, and volcanic deposits. Emphasis on the dynamics of volcanic eruptions, pyroclastic rocks, lava flows, and volcanic hazard assessment. Prerequisite(s): GEOL 427. Note(s): This course is crosslisted with GEOL 640. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 443 - Plate Tectonics
Study of the origin, age, thermal and magnetic history; the dynamics and internal structure of lithospheric plates; the mechanisms and geometric constraints of plate motion; and a review of the motions of plates in the past. Prerequisite(s): GEOL 341. Note(s): This course is crosslisted with GEOL 643. Credit at the 600-level requires additional work 3 credit(s)

GEOL 444 - Tectonics of Orogenic Belts
Study of crustal deformation and the creation of mountain belts around the world. Emphasis on the comparative structural development of different regions around the globe within the context of plate tectonics. Prerequisite(s): GEOL 220 and GEOL 341. Note(s): This course is crosslisted with GEOL 644. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 445/445L - Geophysical Methods
Introduction to geophysical methods, including measurement techniques, rock properties, and interpretation methods using seismology, gravity, magnetics, ground penetrating radar, resistivity and well logs. Prerequisite(s): GEOL 101, MATH 182, PHYS 152 or PHYS 182. Lab/Lecture/Studio Hours Three hours lecture and three hours lab. Note(s): This course is crosslisted with GEOL 645. Credit at the 600-level requires additional work. 4 credit(s)

GEOL 446 - Geologic Application in Remote Sensing
Introduction in the acquisition, processing, and interpretation of remote sensing data. Topics covered include basic mapping concepts, the structure of remote sensing data and analysis, thermal and radar techniques, and classification schemes. Corequisite(s): PHYS 152 or PHYS 182 and PHYS 182L. Prerequisite(s): GEOL 101. Lab/Lecture/Studio Hours Laboratory computer based. Two hours lecture and three hours laboratory. Note(s): This course is crosslisted with GEOL 646. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 449 - Geochronology
Theoretical foundations and modern analytical techniques used in isotopic dating of rocks. Discussion of applications to specific geologic problems and the thermal significance of isotopic dates. Survey of new dating techniques. Prerequisite(s): GEOL 427 and CHEM 122. Note(s): This course is crosslisted with GEOL 649. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 462 - Principles of Stratigraphy and Sedimentation
Analysis and application of stratigraphic concepts, and the genesis and classification of sediments. Study of regional stratigraphic patterns and their related sedimentary environments. Prerequisite(s): GEOL 102, CHEM 121, and MATH 181. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

GEOL 471 - Petroleum Geology
Origin, migration, accumulation, and geologic distribution of petroleum. Surface, sub-surface and geophysical methods of exploration. Prerequisite(s): GEOL 341 and GEOL 462. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Note(s): This course is crosslisted with GEOL 671. Credit at the 600-level requires additional work. 4 credit(s)

GEOL 474 - Hydrogeology
Factors controlling the occurrence and distribution of water resource, its quality and quantity, methods of exploration and development. Prerequisite(s): GEOL 341, CHEM 122 and MATH 181. Note(s): This course is crosslisted with GEOL 674. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 477 - Geology of Metallic Ore Deposits
Geology of metallic ore deposits, origin, occurrence, and alteration. Application of ore deposit characteristics to exploration. Prerequisite(s): GEOL 220 and CHEM 121. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. Field trips required. Note(s) This course is crosslisted with GEOL 677. Credit at the 600-level requires additional work. 4 credit(s)

GEOL 478 - Hydrogeochemistry
Principles of aquatic geochemistry such as chemical thermodynamics, tableaux, and oxidation reduction and environmental organic geochemistry such as physicochemical properties of organic compounds and air/water/soil exchange of organic compounds for environmental studies. Concepts for practical environmental problems, geochemical modeling, and contaminant transport. Prerequisite(s): CHEM 122 and MATH 181. Note(s): This course is crosslisted with GEOL 678. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 485 - Engineering Geology
Application of physical geology to the construction industry. Consideration given to landslide problems, sites for dams, bridges, tunnels and canals; and possible control of erosion and sedimentation by rivers and oceans. Prerequisite(s): GEOL 333. Lab/Lecture/Studio Hours Two hours lecture and three hours laboratory. Note(s): This course is crosslisted with GEOL 685. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 488 - Microtechniques in Geoscience
Microanalytical techniques including transmitted and reflected light petrology and petrography, micro-imaging scanning electron microscope (SEM) and electron microprobe (EMP), chemical microanalyses (EMP), fluid inclusion microthermometry, and melt inclusion petrography. Project tailored to the interest required. Prerequisite(s): GEOL 220 / GEOL 221. Note(s): This course is crosslisted with GEOL 688. Credit at the 600-level requires additional work. 3 credit(s)

GEOL 491 - Seminar
Weekly lecture in selected fields of geoscience; topics vary by semester. May be repeated to a maximum of three credits. Prerequisite(s): Consent of instructor. 1 credit(s)

GEOL 495 - Independent Study and Research
Independent study and research projects in some field of geology. Open only to upper-division students. Proposed project for study and/or research must be submitted in writing to the department chair for approval and credit evaluation prior to registration. Prerequisite(s): Upper-division student and consent of instructor. May be repeated to a maximum of six credits. 1-3 credit(s)

GEOL 496 - Advanced Topics in Geoscience
Variety of advanced studies of current and/or topical interest in specialized areas of geoscience. Prerequisite(s): Varies depending upon the specific topic. May be repeated to a maximum of six credits. 1-3 credit(s)

GEOL 497 - Senior Thesis
Independent original research in geoscience. Requires a written thesis and an oral exam. Proposed project of study must be submitted in writing to the department chair and undergraduate coordinator at least two weeks prior to registration. 3-6 credit(s)

Mathematical Sciences

Purpose and Focus

The Department of Mathematical Sciences provides opportunities for learning and research in several fields of concentration. Mathematics provides the language and concepts in terms of which knowledge in almost all disciplines is understood and communicated, and it often provides the means and techniques for solving problems. The courses required in the programs serve several purposes which include helping students along paths leading to branches of science and technology as well as to mathematical specializations. These courses are designed to provide routes by which students may arrive at the research level in any of the special areas listed and to allow students to prepare themselves for work in industry or government or in educational institutions.

Accreditation

Northwest Commission on Colleges and Universities

Degree Objectives/Learning Outcomes

Upon completion of the bachelor's degree in mathematical sciences, students would have been trained to think analytically, would have rigorous problem-solving skills, and would have a solid background to enable them to pursue graduate studies in mathematical sciences.

Undergraduate Majors

Mathematical Sciences — Bachelor of Arts
Mathematical Sciences — Bachelor of Science

Areas of Concentration

Actuarial Sciences

Admission to the Major

Minimum GPA: 2.50 and placement into MATH 181 - Calculus I or higher.

Admissions Policies: Students must meet minimum GPA requirements.

Students with a GPA less than 2.50, but at least 2.0, may be admitted on probationary status. Students on probation must meet with an advisor to devise a course of study that, when successfully completed, will remove the student from probationary status; the course of study must be approved by the department chair. The course of study shall consist of at least 15 units that apply toward a degree in the major; ordinarily, the course of study will be required to be completed in one calendar year (i.e., two semesters and the summer term). The advisor may request that completion time be extended by one semester for good cause (e.g., more than 15 units in the course of study, course offering schedules, etc.). Failure to satisfactorily complete the probationary course of study is grounds for suspension from the department.

Advisement

Each student must meet with an academic advisor in the college's Advising Center before first declaring their major or minor in the mathematical sciences at UNLV, and is encouraged to seek advising at least once a year thereafter. Students should meet with a faculty advisor as needed.

Degree Requirements

A grade of C or higher is required in each MATH or STAT course used to satisfy degree requirements for a major in mathematical sciences. At most, six credits of independent study may be used in any undergraduate degree program in mathematical sciences. A student may not major or minor in dual areas of the mathematical sciences

Mathematical Science Major- Bachelor of Arts (BA)

Please see the UNLV College of Mathematical Science Degree web page at www.unlv.edu/math for information about department programs, faculty and facilities.

Please see advising information at the UNLV Sciences Advising Website at www.unlv.edu/sciences/advising/.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

1. Demonstrate a solid understanding of differential (1A), integral (1B) and multivariable (1C) calculus, and be able to apply these concepts to a variety of problems.
2. Demonstrate a solid understanding of vector calculus (2A), linear algebra (2B), ordinary differential equations (2C), higher level algebra (2D) and analysis (2E), and be able to apply these concepts to a variety of problems.
3. Be able to think analytically and critically and to formulate problems, solve them, and interpret their solutions.
4. Achieve an understanding of the nature of proof, in particular should demonstrate a good understanding of rigorous mathematical proof (reading and writing), and apply reasoning based on definitions, axioms, theorems and induction.
5. Communicate effectively in writing.
6. Have experience applying knowledge from one branch of mathematics to another and from mathematics to other disciplines.

University Graduation Requirements

- Please see Graduation Policies for complete information.

Mathematical Science Degree Requirements.....Total: 120 Credits (see note 1 below)
General Education Requirements.....Subtotal: 33-36 Credits
First-Year Seminar.....Credits: 2-3 (see note 2 below)
English Composition.....Credits: 6

- ENG 101 - Composition I
- ENG 102 - Composition II

Second-Year Seminar.....Credits: 3
Constitutions.....Credits: 4-6
Mathematics
Distribution Requirements.....Credits: 18
Please see Distribution Requirements for more information.

- Humanities and Fine Arts: 9 credits
  - Two 3-credit courses in the humanities and one 3-credit course in fine arts.
- Social Science: 9 credits
  - One course each from three different fields
- Life and Physical Sciences and Analytical Thinking :
  - Automatically satisfied by Major requirements

Multicultural and International
Multicultural, one 3 credit course required
International, one 3 credit course required

These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students.

Major Requirements - BA in Mathematical Science.....Subtotal: 51 Credits

Computer Programming Requirements..... Credits: 3

Select one of:

- CS 117 - Programming for Scientists and Engineers

or

- CS 135 - Computer Science I

Science Requirements..... Credits: 9

Select nine (9) credits, including a LAB course, from college-level BIOL, CHEM, GEOG, GEOL, PHYS, CEE, CS, CpE, EE, ME courses.

- MATH 181 - Calculus I - Fulfills Math General Education Requirement
- MATH 182 - Calculus II
- MATH 251 - Discrete Mathematics I
- MATH 283 - Calculus III
- MATH 330 - Linear Algebra

or

- MATH 365 - Computational Linear Algebra
- MATH 427 - Differential Equations I
- MATH 453 - Abstract Algebra I
- MATH 457 - Introduction to Real Analysis I

and 12 additional credits from 400-level MATH or STAT courses, the program of study must include two (2) one-year 400-level MATH or STAT sequences.

Electives.....Credits: 33-36

Total Credits: 120

Notes

1. Every student will be encouraged to take the GRE Advanced Test in Mathematics.
2. It is strongly recommended that students take SCI 101 to satisfy the First Year Seminar requirement.

Mathematical Science Major - Bachelor of Science (BS)

Please see the UNLV College of Sciences, Mathematical Science department web page at www.unlv.edu/math for information about department programs, faculty and facilities.

Please see advising information at the UNLV College of Science Advising at www.unlv.edu/sciences/advising.

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

1. Demonstrate a solid understanding of differential (1A), integral (1B) and multivariable (1C) calculus, and be able to apply these concepts to a variety of problems.
2. Demonstrate a solid understanding of vector calculus (2A), linear algebra (2B), ordinary differential equations (2C), higher level algebra (2D) and analysis (2E), and be able to apply these concepts to a variety of problems.
3. Be able to think analytically and critically and to formulate problems, solve them, and interpret their solutions.
4. Achieve an understanding of the nature of proof, in particular should demonstrate a good understanding of rigorous mathematical proof (reading and writing), and apply reasoning based on definitions, axioms, theorems and induction.
5. Communicate effectively in writing.
6. Have experience applying knowledge from one branch of mathematics to another and from mathematics to other disciplines.

University Graduation Requirements

Please see Graduation Policies for complete information

Mathematical Science Degree Requirements..... Total: 120 Credits (see notes 1-2 below)

General Education Requirements - Subtotal: 33-36 Credits

First-Year Seminar.....Credits: 2-3 (see note 3 below)

English Composition ..... Credits: 6

- ENG 101 - Composition I
- ENG 102 - Composition II

Second-Year Seminar..... Credits: 3

Constitutions .....Credits: 4-6

Mathematics Distribution Requirement..... Credits: 18

Please see Distribution Requirements for more information.

- Humanities and Fine Arts: 9 Credits
  - Two courses 3 credits each from two different humanities areas - 6 credits
  - One course in fine arts- 3 credits
- Social Science: 9 Credits
  - One course each from three different fields.
- Life and Physical Sciences and Analytical Thinking:
  - Automatically satisfied by Major requirements

Multicultural and International

Multicultural, one 3 credit course required

International, one 3 credit course required

These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students

Major Requirements - BS in Mathematical Science.....Subtotal: 80 Credits

Computer Programming Requirements..... Credits: 3

Select one of:

- CS 117 - Programming for Scientists and Engineers

or

- CS 135 - Computer Science I

Science Requirements..... Credits: 9

- PHYS 180 - Physics for Scientists and Engineers I
- PHYS 180L - Physics for Scientists and Engineers Lab I

and select five credits from the following:

BIOL courses numbered 189 and above; CHEM courses numbered 121 and above except CHEM 201, 203; GEOL courses numbered 220 and above; GEOG courses numbered 300 and above; PHYS courses numbered 181 and above; CEE courses numbered 241 and above; CS courses numbered 218 and above; CpE courses numbered 300 and above; EE courses numbered 220 and above; ME courses numbered 242 and above.

Required Department Courses ..... Credits: 39

- MATH 181 - Calculus I - fulfills Mathematics General Education Requirement
- MATH 182 - Calculus II

- MATH 251 - Discrete Mathematics I
- MATH 283 - Calculus III
- MATH 330 - Linear Algebra

or

- MATH 365 - Computational Linear Algebra
- MATH 427 - Differential Equations I
- MATH 453 - Abstract Algebra I
- MATH 457 - Introduction to Real Analysis I

and 12 additional credits from 400-level MATH or STAT courses, the program of study must include two one-year 400-level MATH or STAT sequences.

Science and Engineering Electives..... Credits: 29
Electives.....Credits: 4-7
Total Credits: 120

Notes

1. Of the 120 credits required for graduation, 80 or more must be in courses offered by the College of Sciences and the College of Engineering.
2. Every student will be encouraged to take the GRE Advanced Test in Mathematics
3. It is strongly recommended that students take SCI 101 to satisfy the First Year Seminar requirement.

Major Requirements - BS in Mathematics Actuarial Science Concentration.....Subtotal: 63 Credits (see note 2 below)

Computer Programming Requirements..... Credits: 3
Select one of:

- CS 117 - Programming for Scientists and Engineers

or

- CS 135 - Computer Science I

Science Requirements..... Credits: 9
Select nine (9) credits, including a LAB course, from BIOL courses numbered 189 and above; CHEM courses numbered 121 and above except CHEM 201, 203; GEOL courses numbered 220 and above; GEOG courses numbered 300 and above: PHYS courses numbered 180 and above; CEE courses numbered 300 and above; CS courses numbered 218 and above; all CpE courses; EE courses numbered 220 and above; all ME courses.

Required Department Courses ..... Credits: 42

- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 283 - Calculus III
- MATH 320 - Mathematics of Interest
- MATH 330 - Linear Algebra

or

- MATH 365 - Computational Linear Algebra
- MATH 463 - Advanced Matrix Theory and Applications

or

- MATH 466 - Numerical Methods I
- MATH 427 - Differential Equations I
- MATH 471 - Actuarial Mathematics I
- MATH 472 - Actuarial Mathematics II
- STAT 411 - Statistical Methods I
- STAT 412 - Statistical Methods II
- STAT 467 - Introduction to Mathematical Statistics
- STAT 488 - Senior Research Project in Statistics

Economics and Finance Requirements

- ECON 102 - Principles of Microeconomics
- ECON 103 - Principles of Macroeconomics
- FIN 321 - Corporate Risk Management

Sciences and Engineering Electives ..... Credits: 6
Electives.....Credits: 15-18
Total Credits: 120

Minor

Actuarial Science Minor

A minor in the Department of Mathematical Sciences includes at least 20 credits as follows:

Required Courses

No course in which a grade of C- or lower is earned may be applied to any minor in the College of Science.

- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 320 - Mathematics of Interest
- MATH 330 - Linear Algebra

or

- MATH 365 - Computational Linear Algebra
- MATH 471 - Actuarial Mathematics I
- MATH 473 - Risk Theory

Mathematics Minor

A minor in the Department of Mathematical Sciences includes at least 20 credits as follows:

Required Courses

No course in which a grade of C- or lower is earned may be applied to any minor in the College of Science.

- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 251 - Discrete Mathematics I

or

- MATH 283 - Calculus III
- MATH 330 - Linear Algebra

or

- MATH 365 - Computational Linear Algebra

9 additional upper division credits in MATH or STAT

Statistics Minor

A minor in the Department of Mathematical Sciences includes at least 20 credits as follows:

Required Courses

No course in which a grade of C- or lower is earned may be applied to any minor in the College of Science.

- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 330 - Linear Algebra

or

- MATH 365 - Computational Linear Algebra
- STAT 391 - Applied Statistics for Biological Sciences

or

- STAT 411 - Statistical Methods I

or

- STAT 463 - Applied Statistics for Engineers

or

- STAT 491 - Statistics for Scientists I
- STAT 413 - Statistical Experimental Design

and

- STAT 493 - Applied Regression Analysis

Mathematics

MATH 95 - Elementary Algebra
Elementary algebraic topics for students whose mathematical background or placement score indicates that preparation for Intermediate Algebra is desirable. Credit for this course does not count toward the total needed for graduation. Prerequisite(s): Arithmetic skills required. 3 credit(s)

MATH 96 - Intermediate Algebra
Polynomial and rational expressions, linear equations, linear and absolute value inequalities, applications, exponents and radicals, quadratic equations, relations, and their graphs, systems of equations. Credit for this course does not count toward the total needed for graduation. Prerequisite(s): Three years of high school mathematics, including one year of algebra, and a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test.) 3 credit(s)

MATH 115 - Humane Mathematics
Study of some elementary and elegant examples displaying mathematics as a medium for artistic expression and aesthetic appreciation. Intended for students with limited mathematical background, but not preparation for college algebra or the precalculus mathematics sequence. Does not satisfy the general education core mathematics requirement. Prerequisite(s): One year of high school algebra and a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test). 3 credit(s)

MATH 120 - Fundamentals of College Mathematics
Real numbers; consumer mathematics; variation; functions, relations, and graphs; geometry of measurement; probability and statistics; sets and logic. Broad in scope course, emphasizes applications. Prerequisite(s): Three years of high school mathematics at the level of algebra and above and a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test), or C or better in MATH 96 or equivalent. 3 credit(s)

MATH 121 - Mathematical Topics and Applications Provided in a Real World Context
Introduction to mathematical concepts such as: logic and analytic thinking, related rates, functions and relations, graphs and representations, properties of numbers, set theory, and consumer mathematics. Students will be exposed to topics within the context of practical applications. Technology will be incorporated. Prerequisite(s): Approval of Department Chair. Note(s): S/F grading only. 3 credit(s)

MATH 122 - Number Concepts for Elementary School Teachers
Mathematics needed by those teaching the new-content curriculum at the elementary school level, emphasis on number concepts. MATH 122 does not satisfy the general education core mathematics requirement. Prerequisite(s): C or better in MATH 96 or a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test). 3 credit(s)

MATH 123 - Statistical and Geometrical Concepts for Elementary School Teachers
Mathematics needed by those teaching the new-content curriculum at the elementary school level, emphasizing concepts in statistics and geometry. Prerequisite(s): C or better in MATH 122. 3 credit(s)

MATH 124 - College Algebra
Equations and inequalities; relations and functions; linear, quadratic, polynomial, exponential, and logarithm functions; systems of linear equations and inequalities; matrices; sequences and series; binomial theorem. Prerequisite(s): Three years of high school mathematics at the level of algebra and above, and a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test) or MATH 96 or equivalent. Note(s): Duplicate credits cannot be earned for MATH 124 and MATH 126 or 128. 3 credit(s)

MATH 126 - Precalculus I
Topics include fundamentals of algebra, functions and graphs, polynomial, rational, exponential, and logarithmic functions, and systems of linear equations.Prerequisite(s): Three years of high school mathematics at the level of algebra and above and a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test) or C or better in MATH 96 or equivalent. Note(s): Duplicate credits cannot be earned for MATH 126 and MATH 124 or MATH 128. 3 credit(s)

MATH 127 - Precalculus II
Topics include circular functions, trigonometric identities and equations, conic sections, complex numbers, and discrete algebra. Prerequisite(s): Three years of high school mathematics at the level of algebra and above, and a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test) or C or better in MATH 126 or equivalent. Note(s): Duplicate credits cannot be earned for MATH 127 and MATH 128. 3 credit(s)

MATH 128 - Precalculus and Trigonometry
(Formerly listed as MATH 127) Relations, functions, and their graphs; polynomial, rational, exponential, logarithm, and trigonometric functions; analytic trigonometry; systems of equations and inequalities; conics; mathematical induction; sequences and series. A combination of MATH 126 and MATH 127. Prerequisite(s): Four years of high school mathematics at the level of algebra and above, and a satisfactory score on a placement exam (ACT, SAT, or Math Placement Test) or C or better in MATH 96 or equivalent. Note(s): Duplicate credits cannot be earned for MATH 128 and MATH 124, MATH 126, and MATH 127. 5 credit(s)

MATH 132 - Finite Mathematics
Logic, sets, probability, matrices, and linear programming, and their application to the analysis of business and social science problems. Prerequisite(s): C or better in MATH 124 or C or better in MATH 126 or equivalent. 3 credit(s)

MATH 170 - Mathematics of Finance
Mathematical study of interest, annuities, sinking funds, depreciation, amortization, and other topics related to business problems. Prerequisite(s): C or better in MATH 124 or equivalent. 3 credit(s)

MATH 176 - Introductory Calculus for Business and Social Sciences
Techniques of calculus, with applications to the analysis of business and social science problems. Topics include functions of one and several variables, differentiation and partial differentiation, integration, and optimization. Prerequisite(s): C or better in either MATH 124 or MATH 126 or equivalent. Note(s): Duplicate credits cannot be earned for MATH 176 and MATH 181. 3 credit(s)

MATH 181 - Calculus I
Differentiation and integration of algebraic and transcendental functions, with applications. Prerequisite(s): C or better in MATH 128 or equivalent. Note(s): Duplicate credits cannot be earned for MATH 176 and MATH 181. 4 credit(s)

MATH 182 - Calculus II
Further applications and techniques of integration including integration by parts, sequences and series, polynomial approximations. Prerequisite(s): C or better in MATH 181. 4 credit(s)

MATH 213 - Introduction to Problem Solving Techniques
Analyzing and solving standard and non-standard problems using a variety of different problem-solving techniques, tools, and technology. Emphasizes different approaches to solving problems and complete oral and/or written explanations of how to solve the problems. Prerequisite(s): C or better in MATH 122 or equivalent. 3 credit(s)

MATH 214 - Geometry for Middle School Teachers
Study of one- two- and three-dimensional geometry, including figures, properties, and transformations, using classical and analytical methods. Emphasis on developing an appreciation for the widespread use of geometry and using geometry to solve problems. Prerequisite(s): C or better in MATH 123 or equivalent. 3 credit(s)

MATH 251 - Discrete Mathematics I
Topics include set operations, Cartesian product relations and functions, equivalence relation, graphs and digraphs, propositional calculus, truth tables, mathematical induction, elementary combinatorics with applications. Corequisite(s): C or better in MATH 182. 3 credit(s)

MATH 271 - Elementary Probability
Review of sets, counting, finite and countable probability spaces, random variables and distribution functions, statistical quantities, limit theorems, applications. Prerequisite(s): C or better in MATH 182 3 credit(s)

MATH 283 - Calculus III
Vectors; differentiation and integration of vector valued functions; multivariable calculus; partial derivatives; multiple integrals and applications; line, surface and volume integrals; theorem; divergence theorem; and theorem. Prerequisite(s): C or better in MATH 182. 4 credit(s)

MATH 313 - Probability and Combinatorics for Teachers
Topics include sets, functions, relations, propositional logic, induction, elementary combinatorics, and elementary graph theory. Prerequisite(s): C or better in MATH 182 or C or better in both MATH 181 and MATH 213.. 3 credit(s)

MATH 314 - History of Mathematics
Evolution of mathematics from ancient numeral systems to twentieth-century mathematics. Effects of culture on mathematics and impact of mathematics on cultures also considered. Prerequisite(s): C or better in either MATH 313 or MATH 330 or MATH 365. 3 credit(s)

MATH 320 - Mathematics of Interest
Introduction to the mathematical theory underlying the measurement of interest, accumulated and present values, annuities, amortization, sinking funds, bonds, and securities. Prerequisite(s): C or better in either MATH 182, MATH 330 or MATH 365. 3 credit(s)

MATH 330 - Linear Algebra
Introduction to linear algebra, including matrices, determinants, vector spaces, linear transformations, eigenvalues and eigenvectors. Prerequisite(s): C or better in MATH 182. Note(s): Duplicate credits cannot be earned for MATH 330 and MATH 365. 3 credit(s)

MATH 351 - Discrete Mathematics II
Infinite sets, diagonal argument, first order logic, formal and informal proofs, combinatorics, Boolean algebra, lattices, and graphs. Prerequisite(s): C or better in MATH 251. 3 credit(s)

MATH 360 - Introduction to Biomathematics I
Introduction to the interdisciplinary field of biomathematics; mathematical models of biological systems; applied numerical methods and computer software for solving mathematical models. Prerequisite(s): BIOL 197, and C or better in MATH 181. Note(s): Duplicate credits cannot be earned for MATH 360 and BIOL 360. 3 credit(s)

MATH 361 - Introduction to Biomathematics II
A continuation to the study of biomathematics; part two will consider more advanced mathematical models of biological processes associated with advection, diffusion and pattern formation; computational methods for solving partial differential equations. Prerequisite(s): C or better in either BIOL 360 or MATH 360. Note(s): Duplicate credits cannot be earned for BIOL 361 and BIOL 361. 3 credit(s)

MATH 365 - Computational Linear Algebra
Matrices, linear systems of equations, linear programming, least-squares approximations, determinants, eigenvalues and eigenvectors, matrix inversion, elimination, iteration and other algorithms, precision and error analysis, of computational cost of algorithms. Emphasizes the practical methods using computer algorithms. Prerequisite(s): C or better in MATH 182; CS 117 or CS 135. Note(s): Duplicate credits cannot be earned for MATH 330 and MATH 365. 3 credit(s)

MATH 415 - Graph Theory
This course examines basic concepts and applications of graph theory. Topics include subgraphs, connectivity, trees, cycles, vertex and edge coloring, planar graphs and their colorings, Eulerian graphs, Hamiltonian graphs, matching and factorization, and the applications of graphs as models. Emphasis will be on proofs and proof techniques. Prerequisite(s): C or better in MATH 251 and MATH 330 or consent of instructor. 3 credit(s)

MATH 427 - Differential Equations I
Theory and solution techniques for solving ordinary differential equations with constant and variable coefficients, systems of linear differential equations, Laplace transform, difference equations and numerical methods. Fourier Series; stability theory and autonomous systems. Prerequisite(s): C or better in MATH 283 and C or better in either MATH 330 or MATH 365. Note(s): Duplicate credits cannot be earned in any two of MATH 427 and MATH 431. 3 credit(s)

MATH 428 - Differential Equations II
Theory and solution techniques for solving ordinary differential equations with constant and variable coefficients, systems of linear differential equations, Laplace transform, difference equations and numerical methods. Fourier Series; stability theory and autonomous systems. Prerequisite(s): C or better in MATH 427. Note(s): Duplicate credits cannot be earned in any two of MATH 427-428 and MATH 431-432. 3 credit(s)

MATH 431 - Mathematics for Engineers and Scientists I
First order linear and non-linear differential equations, second and higher order differential equations with constant coefficients, Laplace transforms and applications, Gaussian elimination and eigenvalue problems, solutions of systems of differential equations. Prerequisite(s): C or better in MATH 283. Note(s): Duplicate credits cannot be earned in any two of MATH 427-428 and MATH 431-432. 3 credit(s)

MATH 432 - Mathematics for Engineers and Scientists II
Topics include complex functions, analytic functions, Cauchy-Riemann equations, conformal mappings, linear fractional transformations, complex integration, integral theorem and formula, power series, Laurent series, and calculus of residues. Prerequisite(s): C or better in MATH 431 Note(s): Duplicate credit cannot be earned in any two of MATH 432 and MATH 459. 3 credit(s)

MATH 451 - Foundations of Mathematics I
Introduction to logic, set algebra and Boolean algebra, with applications to the theory of computing machines. Prerequisite(s): C or better in MATH 251. Note(s): This course is crosslisted with MAT 651. Credit at the 600-level requires additional work. 3 credit(s)

MATH 452 - Foundations of Mathematics II
Formalization, proofs, and models of quantificational logic; axiomatics; application to mathematical theories, including set theory. Prerequisite(s): C or better in MATH 451. Note(s): This course is crosslisted with MAT 652. Credit at the 600-level requires additional work. 3 credit(s)

MATH 453 - Abstract Algebra I
Sets, functions, groups, quotient groups, homomorphism theorems, Abelian groups, rings, polynomial rings, division rings, Euclidean domains, fields and vector spaces. Prerequisite(s): C or better in MATH 251 and C or better in either MATH 330 or MATH 365. Note(s): This course is crosslisted with MAT 653. Credit at the 600-level requires additional work. 3 credit(s)

MATH 454 - Abstract Algebra II
Sets, functions, groups, quotient groups, homomorphism theorems, Abelian groups, rings, polynomial rings, division rings, Euclidean domains, fields and vector spaces. Prerequisite(s): C or better in MATH 453. Note(s): This course is crosslisted with MAT 654. Credit at the 600-level requires additional work. 3 credit(s)

MATH 455 - Elementary Theory of Numbers I
Topics include divisibility, arithmetic functions, congruences, quadratic residues, primitive roots, Diophantine equations, continued fractions, algebraic numbers, and partitions. Prerequisite(s): C or better in both MATH 251 and MATH 330. Note(s): This course is crosslisted with MAT 655. Credit at the 600-level requires additional work. 3 credit(s)

MATH 456 - Elementary Theory of Numbers II
Topics include divisibility, arithmetic functions, congruences, quadratic residues, primitive roots, Diophantine equations, continued fractions, algebraic numbers, and partitions. Prerequisite(s): C or better in MATH 455 . Note)s): This course is crosslisted with MAT 656. Credit at the 600-level requires additional work. 3 credit(s)

MATH 457 - Introduction to Real Analysis I
Topics include finite and infinite sets, axiomatic study of real numbers, topology of Cartesian spaces, sequences of functions, continuous functions, differentiation of functions of one variable. Prerequisite(s): C or better in both MATH 251 and MATH 283 and C or better in either MATH 330 or MATH 365. Note(s): This course is crosslisted with MAT 657. Credit at the 600-level requires additional work. 3 credit(s)

MATH 458 - Introduction to Real Analysis II
Topics include uniform continuity and fixed point theorems, sequences of continuous functions, approximation theorems, Riemann-Stieltjes integral, uniform convergence and infinite integrals, series of functions, differentiation in Rn. Prerequisite(s): C or better in MATH 457. Note(s): This course is crosslisted with MAT 658. Credit at the 600-level requires additional work. 3 credit(s)

MATH 459 - Elementary Complex Analysis
Complex numbers, analytic functions, contour integration, conformal mapping, applications. Prerequisite(s): C or better in both MATH 251 and MATH 283. Note(s): Duplicate credit cannot be earned in MATH 459 and MATH 432. 3 credit(s)

MATH 461 - Probability Theory
Fundamental concepts of probability; random variables, binomial, Poisson, normal, chi-square, T, F and other distributions; transformations of random variables; conditional and marginal distributions; central limit theorem and concepts associated with the field of statistics. Prerequisite(s): C or better in both MATH 271 and MATH 283. Note(s): This course is crosslisted with MAT 661. Credit at the 600-level requires additional work. 3 credit(s)

MATH 462 - Stochastic Processes
Markov chains and jump processes, elements of queuing theory, stationary stochastic processes, the Wiener process and stochastic differential equations. Prerequisite(s): C or better in MATH 461. 3 credit(s)

MATH 463 - Advanced Matrix Theory and Applications
Rigorous mathematical treatment of orthogonal matrices, Gram-Schmidt method, Q-R factorization, least-squares fits, eigenvalues and eigenvectors, linear difference equations, systems of linear differential equations, unitary similarities, theorem, discrete Markov processes, power method, quadratic forms, singular value decompositions, pseudo-inverse, systems of linear inequalities, and simplex method. Prerequisite(s): C or better in either MATH 330 or MATH 365. Note(s) This course is crosslisted with MAT 663. Credit at the 600-level requires additional work. 3 credit(s)

MATH 466 - Numerical Methods I
Introduction to numerical mathematics and scientific computing. Topics including methods of error estimation, interpolation theory, numerical integration, and solutions of linear and non-linear equations. Emphasizes hands-on computer work based on these techniques. Prerequisite(s): C or better in MATH 182 and CS 202 or equivalent, and C or better in either MATH 330 or MATH 365. 3 credit(s)

MATH 467 - Numerical Methods II
Intermediate treatment of methods in computational linear algebra, numerical solutions of ordinary and partial differential equations, algorithmic design and analysis, and topics selected by the instructor. Prerequisite(s): C or better in MATH 466 and C or better in either MATH 427 or MATH 431. 3 credit(s)

MATH 468 - Applied Finite Element Analysis
Introduction to finite element method with computer applications to engineering continuum problems such as thermodynamics, solid/fluid mechanics. Topics include variational formulation of boundary value problems, natural and essential boundary conditions, discretization of domain based on rectangular, triangular, tethedral and other elements, with linear, quadratic and higher order polynomial approximations. Prerequisite(s): C or better in MATH 431. Note(s): This course is crosslisted with MAT 668. Credit at the 600-level requires additional work. 3 credit(s)

MATH 469 - Combinatorics I
Graph models, covering circuits, graph colorings, trees and searching, general counting methods for arrangements and selections, generating functions, recurrence relations, and inclusion-exclusion. Prerequisite(s): C or better in MATH 251 or equivalent. Note(s): This course is crosslisted with MAT 669. Credit at the 600-level requires additional work. 3 credit(s)

MATH 470 - Combinatorics II
Advanced topics in combinatorics. Topics to be selected by the instructor. Prerequisite(s): C or better in MATH 469. Note(s): This course is crosslisted with MAT 670. Credit at the 600-level requires additional work. 3 credit(s)

MATH 471 - Actuarial Mathematics I
Rigorous mathematical treatment of the following topics: survival distributions, life tables, life insurance, life annuities, net premiums, reserves. Prerequisite(s): C or better in both MATH 320 and STAT 411 or equivalent. 3 credit(s)

MATH 472 - Actuarial Mathematics II
Rigorous mathematical treatment of the following topics: multiple life functions, multiple decrement models, valuation theory for pension plans, insurance models, nonforfeiture benefits, dividends. Prerequisite(s): C or better in MATH 471. 3 credit(s)

MATH 473 - Risk Theory
Rigorous mathematical treatment of the following topics: insurance, individual risk models for short term, collective risk models, applications of risk theory. Prerequisite(s): C or better in STAT 411. 3 credit(s)

MATH 480 - College Geometry
Study of advanced geometrical topics using the methods of proof of elementary geometry. Prerequisite(s): C or better in MATH 181. Note(s): This course is crosslisted with MAT 680. Credit at the 600-level requires additional work. 3 credit(s)

MATH 483 - General Topology I
Topological spaces, nets and filters, compactness, continuous functions, product and quotient spaces, introduction to algebraic topology. Prerequisite(s): C or better in MATH 251 and C or better in either MATH 330 or MATH 365. Note(s): This course is crosslisted with MAT 683. Credit at the 600-level requires additional work. 3 credit(s)

MATH 484 - General Topology II
Topological spaces, nets and filters, compactness, continuous functions, product and quotient spaces, introduction to algebraic topology. Prerequisite(s): C or better in MATH 483. Note(s): This course is crosslisted with MAT 684. Credit at the 600-level requires additional work. 3 credit(s)

MATH 488 - Partial Differential Equations
Method of separation of variables, Fourier series, divergence theorem and identities, equations of mathematical physics, initial and initial boundary value problems, well-posedness, heat conduction in a thin rod, vibrations of a string, equation, solution of the Dirichlet problem for a disc and for a rectangle.Prerequisite(s): C or better in either MATH 427 or MATH 431. 3 credit(s)

MATH 489 - Advanced Mathematical Topics
Undergraduate-level course in advanced topics of mathematics, depending upon the interest of faculty and students. Prerequisite(s): C or better in MATH 283. May be repeated to a maximum of six credits. Note(s): This course is crosslisted with MAT 689. Credit at the 600-level requires additional work. 3 credit(s)

MATH 491 - Problem Solving Workshop
Intended for undergraduate students who enjoy solving mathematical olympiad style problems. Typically, such problems are rather challenging and require considerable mathematical ingenuity, but only a modest background. The main objective of the course is to hone problem solving skills and to prepare them for mathematical contests. Students in the course are expected to participate in the local and national mathematical competitions. Prerequisite(s): C or better in MATH 251 and consent of instructor. May be repeated to a maximum of six credits. Note(s): S/F grading only. 1-3 credit(s)

MATH 499 - Independent Study
Library research and reports on topics of mathematical interest. Prerequisite(s): C or better in MATH 283. May be repeated for credit with consent of Mathematical Sciences Department. Except under special circumstances, total credits limited to six. 1-3 credit(s)

STAT 152 - Introduction to Statistics
Basic statistical methods, with emphasis on application, descriptive statistics, graphic presentation, point and interval estimation, hypothesis testing, regression, experimental design. Prerequisite(s): C or better in MATH 126 or equivalent. 3 credit(s)

STAT 391 - Applied Statistics for Biological Sciences
Elements of probability, types of biological data, sampling, graphical display of data, commonly used distributions, sampling distributions, point estimations, interval estimation, testing of hypothesis, nonparametric tests, categorical data analysis, introduction to regression and design of experiments. Prerequisite(s): C or better in MATH 127 or equivalent. 3 credit(s)

STAT 411 - Statistical Methods I
Collection and representation of information; elements of probability; Bernoulli trials, hypergeometric, binomial, Poisson and normal distributions; statistical sampling, estimation; testing hypotheses; parametric procedures for one-sample and two-sample problems. 3 credit(s). Prerequisite(s): C or better in MATH 182. Note(s): Duplicate credits cannot be earned for STAT 411 and 491

STAT 412 - Statistical Methods II
Regression analysis; importance and essentials of statistically designed experiments, completely randomized design, randomized block design, factorial design, statistical quality control. Prerequisite(s): C or better in STAT 411. 3 credit(s)

STAT 413 - Statistical Experimental Design
Fundamental principles of analysis of variance; one-way, two-way, and higher order designs; nested designs; randomized blocks; split plot designs; Latin squares; multiple comparisons; and analysis of covariance. Prerequisite(s): C or better in STAT 411. 3 credit(s)

STAT 463 - Applied Statistics for Engineers
Elementary probability, commonly used discrete and continuous probability distributions, estimation and hypothesis testing, categorical data testing, regression, model building, analysis of variance, product and system reliability and engineering applications, and quality control. Prerequisite(s): C or better in MATH 283. 3 credit(s)

STAT 467 - Introduction to Mathematical Statistics
Introduction to statistical inference, distributions of random variables, common discrete and continuous probability models, transformations limiting distributions, sufficiency, completeness, unbiasedness, the information inequality, unbiased estimation, the methods of moments, maximum likelihood estimation, Bayesian estimation, confidence intervals, hypothesis testing, uniformly most powerful tests, likelihood ratio tests and related procedures, linear models, and non-parametric models. Prerequisite(s): C or better in STAT 411. Note(s): This course is crosslisted with STA 667. Credit at the 600-level requires additional work. 3 credit(s)

STAT 469 - Environmental Statistics I: Univariate Methods
Principles of environmental sampling, testing for outliers, tests for normality, transformations for normality, sample size determinations, analysis of censored data, estimation of background contaminations, tolerance and confidence limits, calibration problem, quality control charts for data quality assessment of environmental data, statistical issues in environmental remediation, and probability of hot spot detection. Usage of statistical software packages. Prerequisite(s): C or better in STAT 411. Note(s): This course is crosslisted with STA 669. Credit at the 600-level requires additional work. 3 credit(s)

STAT 488 - Senior Research Project in Statistics
Special problem in an area of statistics for investigation and report. Prerequisite(s): C or better in STAT 411. 3 credit(s)

STAT 489 - Advanced Statistics Topics
Undergraduate course in advanced topics in statistics, depending upon the interest of faculty and students. Prerequisite(s): C or better in STAT 411. May be repeated to a maximum of six credits. 3 credit(s)

STAT 491 - Statistics for Scientists I
Frequency distributions, descriptive statistics, elementary probability; Bernoulli, binomial, and normal distributions; statistical sampling, estimation, and hypothesis testing. Less mathematical treatment than STAT 411. Prerequisite(s): C or better in either MATH 127 or MATH 128 or equivalent. Note(s): Duplicate credits cannot be earned for STAT 411 and 491. STAT 491 cannot count as credit for a 400 level requirement in the Department of Mathematical Science, or as part of a sequence. This course is crosslisted with STA 691. Credit at the 600-level requires additional work. 3 credit(s)

STAT 492 - Statistics for Scientists II
Chi-square tests for goodness-of-fit and independence, simple and multiple linear regression, designing an experiment (analysis of variance), multiple comparisons. Less mathematical treatment than STAT 412. Prerequisite(s): C or better in STAT 152 and consent of instructor or C or better in STAT 411, STAT 467 or STAT 491. Note(s): Stat 492 cannot count as credit for a 400 level requirement in the Department of Mathematical Sciences, or as part of a sequence. This course is crosslisted with STA 692. Credit at the 600-level requires additional work. 3 credit(s)

STAT 493 - Applied Regression Analysis
Line fitting; multiple linear and curvilinear regression models; variable selection techniques and examination of residuals, estimation, testing, and prediction; simple, multiple, and partial correlation. Prerequisite(s): C or better in STAT 152 and consent of instructor or C or better in STAT 411, STAT 467 or STAT 491. 3 credit(s)

STAT 495 - Nonparametric Statistics
Survey of nonparametric procedures with emphasis on application; binomial, Mann-Whitney, Wilcoxon, Kruskal-Wallis, Friedman, Kolmogorov-Smironov, and chi-square tests; measures of association; regression. Comparisons with parametric techniques. Prerequisite(s): C or better in STAT 152 and consent of instructor or C or better in STAT 411 or STAT 467 or STAT 491. Note(s): This course is crosslisted with STA 695. Credit at the 600-level requires additional work. 3 credit(s)

STAT 499 - Independent Study
Library research and reports on topics of statistical interest. Prerequisite(s): C or better in STAT 411. May be repeated for credit with consent of the Mathematical Sciences Department. Except under special circumstances, total credits limited to six. 1-3 credit(s)

Physics and Astronomy

Purpose and Focus

The Bachelor of Science in Physics provides students with preparation for governmental or industrial positions or for graduate studies in physics or related areas.

Degree Objectives/Learning Outcomes

At the completion of the physics degree programs, students should have developed rigorous communication, analytical, computing, problem solving, and team-work skills.

Accreditation

Northwest Commission on Colleges and Universities.

Undergraduate Major

Physics - Bachelor of Science
Physics - Bachelor of Science, Applied Physics Concentration
Physics - Bachelor of Science, Computational Concentration

Admission to the Major

Admission Policies: Minimum GPA: 2.50
Students unable to meet the 2.50 GPA requirement with a GPA 2.0 or higher may be admitted under contract on a probationary basis. A probationary student must plan a prescribed course of study in physics in consultation with a faculty advisor assigned by the Department of Physics and Astronomy. Only after the course of study is signed by the advisor, may the Department Chair allow the student to register for courses. The student must maintain a GPA of at least 2.50 in the courses taken while on probation. Otherwise, the student will be dropped from the physics program. When the student's overall GPA rises to 2.50, the student is taken off probation.

Transfer Policies: A student transferring from another college or university who declares a major in Physics must meet university GPA requirements.

Department Policies

Academic Policies: For all majors in the programs offered by the Department of Physics and Astronomy, a grade of C or higher is required in each of the Physics Core Requirements. In addition, before enrolling in any major requirement courses, the student must have completed all course prerequisites with a grade of C or higher.

A probationary student must plan a prescribed course of study in physics in consultation with the faculty advisor assigned by the Department of Physics and Astronomy. Only after the course of study is signed by the advisor, may the Department Chair allow the student to register for courses. The student must maintain a GPA of at least 2.50 in the courses taken while on probation. Otherwise, the student will be dropped from the physics program. When the overall GPA rises to 2.50, the student is taken off probation. Refer to the College of Sciences section for further requirements.

Advisement

It is required that all incoming freshmen and transfer students obtain advising from the College of Sciences Advising Center and meet with the Chair of the Department of Physics and Astronomy prior to the first semester of classes. As well, those students with any questions regarding degree requirements and graduation applications should contact the Advising Center. All students majoring in Physics, will also be assigned a faculty advisor in the Department of Physics and Astronomy. Students must meet with their advisor in the Department of Physics and Astronomy at least once a semester.

Physics Major - Bachelor of Science (BS)

Please see the UNLV Department of Physics web page at www.physics.unlv.edu/ for information about department programs, faculty and facilities.

Please see advising information at the College of Science Student Advising Center sci.advising@unlv.edu

Accreditation

Institution - Northwest Commission on Colleges and Universities www.nwccu.org

Learning Outcomes

1. Understanding of classical mechanics
2. Understanding of electricity and magnetism
3. Understanding of thermodynamics
4. Understanding of modern physics and quantum mechanics
5. Ability to perform modern laboratory experiments
6. Ability to perform an independent physics research project and give a public talk on this project
7. Ability to communicate scientific subject matter
8. Understanding and ability to communicate the importance of physics to society
9. Ability to solve critical and fundamental problems in undergraduate physics
10. Ability and confidence to think independently

University Graduation Requirements

- Please see Graduation Policies for complete information

Physics Degree Requirements ..... Total: 120 Credits
General Education Requirements ..... Subtotal: 33-36 Credits
First Year Seminar ..... Credits: 2-3
(see note 1 below)
English Composition ..... Credits: 6

- ENG 101 - Composition I
- ENG 102 - Composition II

Second Year Seminar ..... Credits: 3
Constitutions ..... Credits: 4-6
Mathematics

- MATH 181 - Calculus I - Fulfilled by the major requirement

Distribution Requirement ..... Credits: 18
Please see Distribution Requirements for more information.

- Humanities and Fine Arts: 9 credits
  - Two 3-credit courses in the humanities and one 3-credit course in fine arts.
- Social Science:
  - One course each from three different fields
- Life and Physical Sciences and Analytical Thinking - 9 credits
  - Automatically satisfied by Major requirements.

Multicultural and International
Multicultural, one 3 credit course required
International, one 3 credit course required
These courses may overlap with general education and major requirements. A single course may not meet the multicultural and international requirements simultaneously. For the list of approved multicultural and international courses, go to: http://facultysenate.unlv.edu/students.

Major Requirements - BS in Physics.....Subtotal: 77 Credits
Physics Core Requirements..... Credits: 48
- PHYS 180 - Physics for Scientists and Engineers I
- PHYS 180L - Physics for Scientists and Engineers Lab I
- PHYS 181 - Physics for Scientists and Engineers II
- PHYS 181L - Physics for Scientists and Engineers Lab II
- PHYS 182 - Physics for Scientists and Engineers III
- PHYS 182L - Physics for Scientists and Engineers Lab III
- PHYS 411 - Modern Physics I
- PHYS 413 - Intermediate Laboratory I
- PHYS 414 - Intermediate Laboratory II
- PHYS 421 - Electricity and Magnetism I
- PHYS 422 - Electricity and Magnetism II
- PHYS 423 - Mechanics I
- PHYS 424 - Mechanics II
- PHYS 467 - Thermodynamics
- PHYS 481 - Quantum Mechanics I
- PHYS 493 - Special Problems

Six additional credits of upper-division physics courses.
Related Core Requirements..... Credits: 36
- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 283 - Calculus III

Sixteen additional credits of science, mathematics, computer science, or engineering courses with at least six of them in upper-division courses (300 or higher).
Electives.....Credits: 0-3
Total Credits 120

Major Degree Requirements - BS in Physics -
Applied Physics Concentration..... Subtotal: 73-75 Credits
Physics Core Requirements Credits 33
- PHYS 180 - Physics for Scientists and Engineers I
- PHYS 180L - Physics for Scientists and Engineers Lab I
- PHYS 181 - Physics for Scientists and Engineers II
- PHYS 181L - Physics for Scientists and Engineers Lab II
- PHYS 182 - Physics for Scientists and Engineers III
- PHYS 182L - Physics for Scientists and Engineers Lab III
- PHYS 411 - Modern Physics I
- PHYS 413 - Intermediate Laboratory I
- PHYS 421 - Electricity and Magnetism I
- PHYS 423 - Mechanics I
- PHYS 493 - Special Problems (3 credits)

Six additional credits of upper-divisions physics courses
(see note 2 below)
Related Core Requirements Credits 39
- CHEM 121 - General Chemistry I
- CHEM 122 - General Chemistry II
- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 283 - Calculus III

Nineteen additional credits of science, mathematics, computer science, or engineering courses with at least six of them in upper-division courses (300 or higher).
Electives.....Credits: 9-14
Total Credits: 120

Major Degree Requirements - BS in Physics - Computational Physics Concentration .Subtotal: 77 Credits
Physics Core Requirements Credits 39
- PHYS 180 - Physics for Scientists and Engineers I
- PHYS 180L - Physics for Scientists and Engineers Lab I
- PHYS 181 - Physics for Scientists and Engineers II
- PHYS 181L - Physics for Scientists and Engineers Lab II
- PHYS 182 - Physics for Scientists and Engineers III
- PHYS 182L - Physics for Scientists and Engineers Lab III
- PHYS 300 - Introduction to Physics and Scientific Computing
- PHYS 404 - Computational Techniques in Physics
- PHYS 411 - Modern Physics I
- PHYS 413 - Intermediate Laboratory I
- PHYS 421 - Electricity and Magnetism I
- PHYS 423 - Mechanics I
- PHYS 467 - Thermodynamics
- PHYS 481 - Quantum Mechanics I
- PHYS 493 - Special Problems

Related Core Requirements Credits 38
- MATH 181 - Calculus I
- MATH 182 - Calculus II
- MATH 283 - Calculus III
- CS 135 - Computer Science I
- CS 202 - Computer Science II
- MATH 365 - Computational Linear Algebra

Seventeen (17) additional credits of science, mathematics, computer science, or engineering courses.
Electives.....Credits: 7-10
Total Credits: 120

Notes
1. It is strongly recommended that students take SCI 101 to satisfy the First Year Seminar requirement.
2. The Department of Physics and Astronomy recommends that students take PHYS 422 and PHYS 424 for the six additional credits of upper-division physics courses needed in the Physics Core Requirements.

Minor
Physics Minor
Requirements .....Total Credits: 27
PHYS 180 - Physics for Scientists and Engineers I
PHYS 180L - Physics for Scientists and Engineers Lab I
PHYS 181 - Physics for Scientists and Engineers II
PHYS 181L - Physics for Scientists and Engineers Lab II
PHYS 182 - Physics for Scientists and Engineers III
PHYS 182L - Physics for Scientists and Engineers Lab III
PHYS 411 - Modern Physics I
PHYS 413 - Intermediate Laboratory I
Nine additional credits (three courses) of upper-division physics course work.

No course in which a grade of C- or lower is earned may be applied to any minor in the College of Sciences.

Astronomy

AST 100C - Topics in Astronomy: White Dwarfs, Neutron Stars, and Black Holes
Traces the history of a star's evolution from its birth in interstellar gas and dust to its end as a placid white dwarf, fiery nova or supernova, or mysterious black hole. Emphasis upon the archetypical Crab Nebula and its rotating neutron star. Prerequisite(s): Consent of instructor. Note(s): Recommended for non-science majors. 1 credit(s)

AST 103 - Introductory Astronomy: The Solar System
Beginning level survey that discusses the nearby objects of our solar system, the formation and evolution of planetary bodies and the exploration of space. A minimum of mathematics is required. Note(s): Recommended for non-science majors. 3 credit(s)

AST 104 - Introductory Astronomy: Stars and Galaxies
Survey course at the beginning level which discusses stellar systems and galaxies. Topics include stellar evolution, formation of galaxies, and cosmology. A minimum of mathematics is required. Note(s): Recommended for non-science majors. 3 credit(s)

AST 105 - Introductory Astronomy Laboratory
Laboratory exercises in astronomy presented in the tradition of the amateur astronomer. Instruction includes observation of celestial objects as well as laboratory exercises to investigate the physical nature of astronomical objects. Instruction on the use of telescopes and the process of the scientific method presented. Prerequisite(s): AST 103 or AST 104, or concurrent registration in one of these courses. Note(s): Recommended for non-science majors. 1 credit(s)

AST 190 - Projects in Observational Astronomy
Project-oriented course to develop skills in observational astronomy. The material and experience gained quite helpful to those people interested in education or in astronomy. The use of high quality equipment such as cameras, photometers, telescopes, and heliostats emphasized. Prerequisite(s): AST 105. Note(s): Laboratory course recommended for non-science majors. 3 credit(s)

AST 301 - Introduction to Astrophysics
Introduction to modern astrophysics. Discussion of matter and electromagnetic radiation, the physical processes in stars, galaxies, active galactic nuclei, and the large-scale structure of the Universe. Emphasis on applying physical principles and problem-solving techniques to astronomical situations. Prerequisite(s): PHYS 180. 3 credit(s)

AST 470 - Special Topics in Astrophysics
Advanced astrophysics. Material alternates among three topics: solar system astrophysics, stellar structure and evolution, and galactic dynamics. Emphasis on current areas of interest. Prerequisite(s): PHYS 180, PHYS 181, PHYS 182, and PHYS 411. 3 credit(s)

PHYS 108 - Physics For A Better Environment
This is a survey course on energy issues, including the challenges facing us today. Simple physics will be introduced to analyze production and consumption of energy and their impact on the environment. The level is set for beginning students in any field. 3 credit(s)

PHYS 108L - Physics for a Better Environment Laboratory
Laboratory exercises on energy issues, including the challenges facing us today. Simple physics experiments will be used to analyze the work-energy relationship, energy conservation, and environment related energy problems. Prerequisite(s): PHYS 108, or concurrent registration in PHYS 108. 1 credit(s)

PHYS 109 - The Physics of Climate Change
This is a survey course on climate change. Simple physics will be introduced to analyze the absorption and emission of light by the atmosphere and the effect of various gases on these processes. The level is set for beginning students in any field. 3 credit(s)

PHYS 120 - Introduction to Einstein's Spacetime
Algebra-based exploration of Einstein's theory of Special Relativity covering time dilation, length contraction, the addition of velocities, the Lorenz transformation, the Twin Paradox, Minkowski space-time diagrams, and other topics time permitting. Beauty and consistency of Special Relativity emphasized. 3 credit(s)

PHYS 151 - General Physics I
General physics intended primarily for students in liberal arts, medicine, and the biological sciences. Lecture and laboratory exercises in mechanics, heat, electricity, magnetism, optics, and modern physics. Prerequisite(s): MATH 128 or equivalent, or placement test. PHYS 151/ PHYS 151L is prerequisite for /152L PHYS 152 / PHYS 152L. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

PHYS 151L - General Physics I
General physics intended primarily for students in liberal arts, medicine, and the biological sciences. Lecture and laboratory exercises in mechanics, heat, electricity, magnetism, optics, and modern physics. Prerequisite(s): MATH 128 or equivalent, or placement test. PHYS 151 /151L is prerequisite for PHYS 152 / PHYS 152L. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 0 credit(s)

PHYS 152 - General Physics II
General physics intended primarily for students in liberal arts, medicine, and the biological sciences. Lecture and laboratory exercises in mechanics, heat, electricity, magnetism, optics, and modern physics. Prerequisite(s): MATH 128 or equivalent, or placement test. PHYS 151 / PHYS 151L is prerequisite for PHYS 152/ PHYS 152L. Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 4 credit(s)

PHYS 152L - General Physics II
General physics intended primarily for students in liberal arts, medicine, and the biological sciences. Lecture and laboratory exercises in mechanics, heat, electricity, magnetism, optics, and modern physics. Prerequisite(s): MATH 128 or equivalent, or placement test. PHYS 151 / PHYS 151L is prerequisite for PHYS 152 /152L . Lab/Lecture/Studio Hours Three hours lecture and three hours laboratory. 0 credit(s)

PHYS 180 - Physics for Scientists and Engineers I
Lecture in Newtonian mechanics. Rectilinear motion, particle dynamics, work and energy, momentum and collisions, rotational mechanics, oscillations, wave motion, and gravitation. Prerequisite(s): MATH 181. 3 credit(s)

PHYS 180L - Physics for Scientists and Engineers Lab I
Laboratory exercises in Newtonian mechanics. Rectilinear motion, particle dynamics, work and energy, momentum and collisions, rotational mechanics, oscillations, wave motion, and gravitation. Corequisite(s): PHYS 180. 1 credit(s)

PHYS 181 - Physics for Scientists and Engineers II
Lecture in electromagnetism. Coulomb's law, electric and magnetic fields, Gauss' law, potential, capacitance, current and resistance, electromotive force, inductance, motion of charged particles, introduction to Maxwell's equations, and electromagnetic waves. Prerequisite(s): PHYS 180 and MATH 182. 3 credit(s)

PHYS 181L - Physics for Scientists and Engineers Lab II
Laboratory exercises in electromagnetism, Coulomb's law, electric and magnetic fields, Gauss' law, potential, capacitance, current and resistance, electromotive force, inductance, motion of charged particles, introduction to Maxwell's equations, and electromagnetic waves. Corequisite(s): PHYS 181. 1 credit(s)

PHYS 182 - Physics for Scientists and Engineers III
Lecture in fluid mechanics, thermodynamics, and optics. Sound, temperature and thermometry, heat, gases, intermolecular forces, kinetic theory, entropy, nature of light, geometrical optics, physical optics including diffraction and interference, introduction to modern developments. Prerequisite(s): PHYS 180 and MATH 182. 3 credit(s)

PHYS 182L - Physics for Scientists and Engineers Lab III
Laboratory exercises in fluid mechanics, thermodynamics, and optics. Sound, temperature and thermometry, heat, gases, intermolecular forces, kinetic theory, entropy, nature of light, geometrical optics, physical optics including diffraction and interference, introduction to modern developments. Corequisite(s): PHYS 182. 1 credit(s)

PHYS 191 - Directed Study
Individual projects under the direction of a faculty member. Prerequisite(s): Three credits of physics. Note(s): Department approval must be obtained prior to registration. 1-3 credit(s)

PHYS 250 - Special Relativity
In-depth introduction to the space time of special relativity with emphasis on coherence brought about by the union of three-dimensional Euclidean space time to form a four-dimensional space. Prerequisite(s): PHYS 180 or consent of instructor. 3 credit(s)

PHYS 300 - Introduction to Physics and Scientific Computing
Basic concepts and methods in solving scientific problems in physics and other disciplines computationally. Emphasis on problems not commonly solvable by analytical means. Hands-on experience with real-life problems in physics and scientific computing. Prerequisite(s): PHYS 152, PHYS 152L or PHYS 180, PHYS 180L. 3 credit(s)

PHYS 350 - Introduction to General Relativity
Physics in and around black holes is used as a vehicle for learning about the implications of general relativity. Prerequisite(s): PHYS 250 or consent of instructor. 3 credit(s)

PHYS 404 - Computational Techniques in Physics
Application of numerical methods to simulation of physical systems, including topics in classical mechanics, electrostatics, quantum mechanics, scattering, nonlinear dynamics and chaos. Prerequisite(s): PHYS 181, PHYS 182 and experience with high-level programming language. Note(s): This course is crosslisted with PHYS 604. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 411 - Modern Physics I
Those aspects of quantum and statistical mechanics and relativity necessary to describe the changes in the physicist's world view wrought by revolutionary theories early in the last century. Prerequisite(s): PHYS 181, PHYS 181L, PHYS 182, PHYS 182L. 3 credit(s)

PHYS 412 - Modern Physics II
Continuation of the survey of twentieth-century developments in physics. Topics include simple molecular quantum mechanics, quantum statistics, solids, superfluids and superconductors, nuclear processes and models, and elementary particle physics. Prerequisite(s): PHYS 411. 3 credit(s)

PHYS 413 - Intermediate Laboratory I
Experimental investigation of a variety of phenomena involving the properties of electrons and their interactions with fields and matter, including selected quantum and wave mechanical effects. Experiments designed to reinforce theory learned in previous courses and to develop laboratory techniques. Corequisite(s): PHYS 411. 3 credit(s)

PHYS 414 - Intermediate Laboratory II
Further experimental investigations of phenomena in classical and modern physics. Emphasis on problem solving, experimental technique, data analysis, and independent work. Students encouraged to alter or extend the experiments and engage in projects. Prerequisite(s): PHYS 413. Note(s): This course is crosslisted with PHYS 614. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 421 - Electricity and Magnetism I
Electrostatics, magnetic fields, and electromagnetism. Maxwell's equations, theory of metallic conduction, motion of charged particles, radiation. Prerequisite(s): PHYS 181, PHYS 421 is prerequisite for PHYS 422. 3 credit(s)

PHYS 422 - Electricity and Magnetism II
Electrostatics, magnetic fields, and electromagnetism. Equations, theory of metallic conduction, motion of charged particles, radiation. Prerequisite(s): PHYS 181, PHYS 421 is prerequisite for PHYS 422. Note(s): This course is crosslisted with PHYS 622. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 423 - Mechanics I
Newtonian mechanics. Mathematical formulation of the dynamics of a particle and systems of particles, including applications to atomic physics. Mechanics of continuous media using Fourier series. Introduction to generalized coordinates and the methods of Lagrange and Hamilton. Prerequisite(s): PHYS 180. PHYS 423 is prerequisite for PHYS 424. 3 credit(s)

PHYS 424 - Mechanics II
Newtonian mechanics. Mathematical formulation of the dynamics of a particle and systems of particles, including applications to atomic physics. Mechanics of continuous media using Fourier series. Introduction to generalized coordinates and the methods of Lagrange and Hamilton. Prerequisite(s): PHYS 180. PHYS 423 is prerequisite for PHYS 424. Note(s): This course is crosslisted with PHYS 624. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 426 - Physics of Solids
Structure of crystalline solids. Mechanical, thermal, and electric properties of conducting and non-conducting solids. Prerequisite(s): PHYS 411. Note(s): This course is crosslisted with PHYS 626. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 431 - Nuclear and Elementary Particle Physics
Survey of basic nuclear concepts and structure. Interactions between nuclear radiations and matter, nuclear reactions and decay, nuclear force, sub-atomic structure and models, symmetries and conservation laws. Prerequisite(s): PHYS 411. Note(s): This course is crosslisted with PHYS 631. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 441 - Mathematical Physics
Application of selected mathematical techniques to problems in physics. Prerequisite(s): PHYS 181. Note(s): This course is crosslisted with PHYS 641. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 442 - Mathematical Physics II
Application of selected mathematical techniques to problems in physics. Prerequisite(s): PHYS 181, PHYS 441. Note(s): This course is crosslisted with PHYS 642. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 451 - Modern Scientific Instrumentation
Electronics for scientists, including circuit design and construction using analog and digital integrated circuits. Introduction to machining, glassblowing, and fabrication techniques. Prerequisite(s): PHYS 181, PHYS 181L, PHYS 182, PHYS 182L, PHYS 422. Note(s): This course is crosslisted with PHYS 651. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 461 - Light and Physical Optics
Survey of geometric optics and optical instruments. Selected topics in physical optics including interference, diffraction and polarization, with applications; the nature of light. Prerequisite(s): PHYS 182. Note(s): This course is crosslisted with PHYS 661. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 462 - Modern Optics and Photonics
Laser principles and applications. Non-linear optics, image formation, optical transfer function, and Fourier optics. Introduction to quantum optics. Prerequisite(s): PHYS 461. Note(s): This course is crosslisted with PHYS 662. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 467 - Thermodynamics
Fundamentals of thermodynamics, including equations of state, laws of thermodynamics, and entropy. Principles and methods of temperature measurement, calorimetry and heat transfer. Prerequisite(s): PHYS 182. Note(s): This course is crosslisted with PHYS 667. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 468 - Statistical Mechanics
Principles and applications of statistical mechanics. Quantum statistics of ideal gas and simple solids. Transport theory, irreversible processes and fluctuations. Prerequisite(s): PHYS 467. Note(s) This course is crosslisted with PHYS 668. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 481 - Quantum Mechanics I
Introduction to the Schroedinger Equation and the interpretation of its solutions, the uncertainty principles, one-dimensional problems, harmonic oscillator, angular momentum, the hydrogen atom. Prerequisite(s): PHYS 422 and PHYS 424. Note(s): This course is crosslisted with PHYS 681. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 482 - Quantum Mechanics II
Introduction to the matrix formulation of quantum mechanics, spin, coupling of angular momenta and applications. Time dependent perturbation theory and approximation methods and techniques discussed. Prerequisite(s): PHYS 481. Note(s): This course is crosslisted with PHYS 682. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 483 - Special Topics in Physics
Special topics in physics such as, but not limited to, relativity, plasma physics, hydrodynamics, and particle physics. Prerequisite(s): PHYS 182. May be repeated to a maximum of six credits. Note(s): This course is crosslisted with PHYS 683. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 485 - Condensed Matter Physics
Properties of condensed matters and their applications in materials science. Structures of classical and quantum liquids. Correlations in lower dimensional systems. Localization and magnetism. Superconductivity and superfluidity. Polymers and liquid crystals. Prerequisite(s): PHYS 481. Note(s): This course is crosslisted with PHYS 685. Credit at the 600-level requires additional work. 3 credit(s)

PHYS 491 - Independent Study
Independent study of a topic in physics not specifically included in the regular course offerings. Grade depends on requirements outlined in a written contract between student and instructor agreed upon prior to beginning the course. Prerequisite(s): PHYS 180, PHYS 180L, PHYS 181, PHYS 181L, PHYS 182, PHYS 182L and consent of instructor. 1-3 credit(s)

PHYS 493 - Special Problems
Laboratory or research work on a project that demonstrates the student's ability to apply his or her knowledge of physics. A 30-minute talk on the project required. Prerequisite(s): Nine credits of upper-division physics courses and consent of instructor. 1-3 credit(s)

SCI 101 - Introduction to the University for Science Majors
SCI 101 is a first year course (fulfills First Year Seminar requirement) designed to foster understanding of scientific methodology, discourse, and ethics, develop analytical and critical thinking skills, and to help students explore, discover, and connect with the university and its academic and scientific resources. Note(s): Fulfills First Year Seminar requirement. 2 credit(s)

SCI 111 - A Preview of Dentistry
Introduces students to the dental profession. Presentations by professionals in various fields expose students to all available options within the profession. Information regarding preparatory coursework and timelines that ensure maximal competitiveness during the application cycle is presented. Students may interact with admissions officials and administrators from the UNLV-SDM. Note(s): S/F grading only. 1 credit(s)

SCI 150 - Modern Biology for Wildland Fire Personnel I
This course is for federal wildland fire personnel. It covers the structural and chemical nature of cells, complex organisms and cellular environments, genetics, reproduction and energetics. There is no laboratory component. This course satisfies the General Education Core requirement for science, but is not for credit toward a science degree. Prerequisite(s): Permission of instructor. 3 credit(s)

SCI 410L - Standardized Test Lab
Laboratory review of basic sciences for standardized tests required for application to Health Science Professional School. Prerequisite(s): BIOL 196, 197, CHEM 121, 122, 241, 242, PHYS 151, 152. Three credit laboratory course. Note(s): Practice examinations administered on Saturday's. 3 credit(s)

SCI 499 - Training in Science Leadership
Seminar course designed to develop and hone leadership skills. Students acquire skills required for proctoring examinations, tutoring of undergraduate students, teaching undergraduate students, and supervising student evaluation of teaching. Prerequisite(s): Sophomore or higher standing, cumulative GPA of 3.00 or higher. Note(s): Students receive education regarding ethics that are essential for responsibilities. 3 credit(s)