

HEALTH SCIENCES

Health Sciences Professional Programs

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Wilkes University has a long-standing tradition of educating students who become health care professionals in a variety of community settings—large and small, rural and urban. The Health Sciences Programs at Wilkes provide a particularly broad and rich range of choices for entry into the medical and allied health professions.

The University's pre-professional medical programs prepare students for careers in allopathic and osteopathic medicine, dentistry, optometry, podiatric medicine, and veterinary medicine. Pre-professional programs in allied health provide preparation for students to enter the health care professions of physical therapy, occupational therapy, clinical laboratory sciences, and physician assistant studies.

Advisement, Guidelines and Procedures for all Health Sciences Students

All Health Sciences students must declare a specific academic major and also complete a core of courses for their chosen health profession. Many pre-doctoral students major in Biology, Chemistry, Biochemistry, or Psychology. However, students who have majored in the traditional liberal arts, Math or Engineering have also been successful in gaining admission to health professions schools. Health professions schools are generally interested in students who have in-depth training in the sciences along with a broad background in the humanities and social sciences. Many students pursuing one of the allied health areas major in Biology, Psychology or one of the other traditional science or social science programs.

An important component of the University's Health Sciences Programs is its counseling and advising system. The Wilkes tradition of close student advising permits thorough understanding of the student's aspirations and goals. A faculty advisor is assigned to the student in his or her academic major. This academic advisor is the first point of contact regarding course planning and registration for the student. In addition, the student is counseled on the particulars of pre-doctoral and allied health education by the Health Sciences Director.

The Center for Health Sciences and Student Success specifically provides information about standards for admission to the various health professions. In addition, time lines for individual programs, admission services for health professions schools, test dates and study guides for professional school admission exams, admission deadlines, and catalogues and online resources from a variety of professional schools in the health sciences are available.

All students planning to pursue careers in the health sciences must declare their specific interest with the Wilkes Center for Health Sciences and Student Success. Students must complete a Health Sciences Declaration Form as soon as they determine their interest and submit a schedule of their classes each semester to the Center. The Declaration Form enables the Center for Health Sciences and Student Success to track the student and monitor his or her academic progress.

Health Sciences Pre-professional Programs

These programs prepare students for health professional programs in Allopathic Medicine, Osteopathic Medicine, Dentistry, Optometry, Podiatric Medicine, and Veterinary Medicine.

Overview

Wilkes University offers premedical programs that share a fundamental and formative premise—that unprecedented technological and scientific dynamism will characterize the context of medical careers conducted in the next thirty to fifty years. This perspective has important implications for the future health professionals' baccalaureate studies, including the need to master computer-based information access systems, to reach a level of mastery in the sciences permitting independent judgment and research, and to grow in ethical sensitivity and sophistication. Drawing on the University's strengths in science, information systems, and the humanities, Wilkes has defined an approach to health sciences pre-professional education that produces exceptionally competent and competitive candidates for admission to the nation's leading health professions institutions.

The Wilkes Health Sciences pre-professional graduate stands out because he or she is not only broadly trained but also has mastered the rapidly evolving medical information technologies. Throughout the science curriculum at Wilkes, students are exposed to and use databases that relate up-to-date information at the cutting edge of research in science fields. Interviews with professional school professors and admissions officers indicate that such information access skills are increasingly relevant and are essential for the health practitioner. As a comprehensive University, with a full range of bachelor's and master's degree programs in natural sciences, computer science, and engineering, Wilkes provides a sophisticated, research-capable science environment in which students learn how to negotiate the information-rich and highly complex world of scientific database communications.

The future health practitioner will also be called upon to assess and implement promising information emerging in the fields of molecular biology, biochemistry, cell biology, and organic chemistry. A general exposure to science at the undergraduate level, typical of universities with a liberal learning emphasis for health sciences pre-professional studies, will no longer be sufficient to prepare medical students and practitioners to be fully competent as professionals. The Wilkes science-intensive pre-professional program involves students in research projects and applications activities during their undergraduate years and helps them to gain real mastery as scientists, able to make independent judgments and to conceptualize and conduct independent research. Health care now makes obsolete the former dichotomous categorization of science and pre-professional studies, in that the superior physician will increasingly have to be a research-capable scientist. Pre-professional studies at Wilkes have adapted to this trend well in advance of programs at most other institutions.

Database information and scientific dynamism make it necessary to focus attention on the moral and ethical dimensions of pre-professional studies. Through its General Education Requirements, Wilkes provides the future health practitioner with a highly meaningful learning experience in philosophy, ethics, and social problems. These learning experiences are augmented by the robust atmosphere of intellectual discussion and debate, which has long been one of Wilkes' distinguishing institutional characteristics, as a nondenominational, non-sectarian university at which issues

of morality and ethics are taken seriously. In this way, Wilkes prepares its Health Sciences students for the real world in which they will function as broadly educated, competent professionals.

The descriptions of courses and curricula that follow put into practice what we at Wilkes believe to be a progressive program of pre-professional studies in health care careers.

Premedical Coursework and Competencies

Before applying, medical schools expect that applicants develop certain competencies through undergraduate coursework, especially in the sciences, to provide the foundation for studying medicine. Most medical schools currently require that students complete at least one year of college coursework (including both lecture and lab components) in biology, general/inorganic chemistry, organic chemistry, and physics to meet their admission requirements.

Science and medicine are changing, however, and some medical schools are changing their admission requirements and how they evaluate applicants. It has been proposed that medical schools eventually move away from course-based admission requirements toward competency-based admission requirements, in order to allow greater flexibility in the types of courses that students take to prepare for medical school.

The following section outlines many of the common course requirements for admission to medical schools. Please note that there can be important variations in admissions requirements. Students should research the requirements for the schools where they intend to apply. There are several resources for researching requirements. Students can consult the individual medical school websites for information on their admission requirements. The guide produced by the Association of American Medical Colleges, *Medical School Admissions Requirements*, provides information on admission requirements for allopathic medical schools. The American Association of Colleges of Osteopathic Medicine publishes an *Osteopathic Medical College Information Book* that provides information on admissions requirements for osteopathic medical schools. Students also may consult with an advisor at the Health Professions and Prelaw Center on premedical coursework.

Most medical schools will not require that you complete all required coursework before you submit the application for admission; most will simply require you to complete all required coursework before you matriculate to (enroll in) the school. However, before taking the MCAT exam you should be sure to complete the necessary coursework in the sciences and social sciences for building competencies in the areas covered on the exam.

You should not view your premedical coursework as simply part of a checklist of tasks to get out of the way before applying to medical school. You should view your premedical coursework as a means to build critical competencies that will be vitally important for the MCAT exam, success in medical school, and your future practice as a physician.

Your performance in premedical science courses will be viewed by admissions committees as a predictor of your ability

to cope with the rigorous demands of medical school. Simply earning passing grades in these courses is not sufficient.

Medical schools have expectations that students who are building the necessary competencies should be able to excel in their premedical science coursework, generally earning A's in most premedical science courses, with occasional B's. If you are earning C's, D's or F's you cannot be regarded as developing the necessary competencies for success and you may need to reevaluate whether medical school is the path for you.

For more information on the competencies required for success in medical school please see the report, "Scientific Foundations for Future Physicians."

For more information on requirements for Health Professions Schools, direction in appropriate coursework, and assistance in the application process, students should consult with the Director of the Center for Health Sciences and Student Success on a regular basis.

The Wilkes Health Sciences Pre-Professional Core

This core program is required of all students aspiring to enter programs in Allopathic Medicine, Osteopathic Medicine, Dentistry, Optometry, Podiatric Medicine, and Veterinary Medicine. The goals of the Pre-professional Core are to

1. Help the student develop a useful scientific foundation for their selected career choice;
2. Serve as a unique signature, which Wilkes graduates can carry forward as successful professionals; and
3. Facilitate the preparation for standardized admissions tests such as MCAT, OAT, and DAT.

A unique feature of the university's pre-professional education is the pre-professional core, a sequence of courses designed to prepare students for the challenges and rigors of a health care doctoral education. The core was developed after consulting admissions personnel from health professions schools regarding undergraduate courses required for admission. The pre-professional core not only includes the traditional requirements expected by health professional schools, but also capitalizes on the University's strengths in science and technology.

The pre-professional core includes a meaningful research or project experience, a practicum and observation, experience provided by local health professionals, knowledge and utilization of computers in health care, meaningful laboratory background with emphasis on the understanding and use of modern instrumentation, and participation in a variety of seminars and programs offered through the Center for Health Sciences and Student Success.

The Wilkes Pre-Professional Core

The Wilkes Pre-professional Core Curriculum requires the following courses:

- Two courses in Modern Biology
 - [[BIO-121]] – Principles of Modern Biology I
 - [[BIO-122]] – Principles of Modern Biology II

- Four courses in Chemistry]]
 - [[CHM-115]] – Elements and Compounds (plus [[CHM-113]] – Elements and Compounds Lab)
 - [[CHM-116]] – The Chemical Reaction (plus [[CHM-114]] – The Chemical Reaction Lab)
 - [[CHM-231]] – Organic Chemistry I (plus [[CHM-233]] – Organic Chemistry I Lab)
 - [[CHM-232]] – Organic Chemistry II (plus [[CHM-234]] – Organic Chemistry II Lab)
- Two courses in Physics
 - [[PHY-171]] – Principles of Classical and Modern Physics and
 - [[PHY-174]] – Applications of Classical and Modern Physics; **OR** (depending on a student's major)
 - [[PHY-201]] – General Physics I and
 - [[PHY-202]] – General Physics II
- Two courses in Mathematics
 - [[MTH-111]] – Calculus I
 - [[MTH-114]] – Biological Calculus **OR** (depending on a student's major)
 - [[MTH-112]] - Calculus II
- One course in Computer Sciences
 - [[CS-115]] - Computers & Applications **OR** (depending on a student's major)
 - [[CS-125]] - Computer Science I
- Two courses in Behavioral and Social Sciences
 - [[PSY-101]] – General Psychology
 - [[SOC-101]] - Introduction to Sociology
- One - two courses in English** (emphasizing writing skills)
- Research course or a Special Project*
- Volunteer/Community Service (minimum 20 hours) in each of the undergraduate years
- Shadowing & Patient Care Hours experience (20 hours) in each of the undergraduate years
- Participation in Pre-Professional programming through the Center for Health Science and Student Success.

*Pre-optometry students are also required to take [[MTH-150]] – Statistics, [[BIO-327]] – Medical Microbiology

**Students enrolled in an accelerated professional program may elect to be waived from the senior year research course or special project.

The Wilkes Pre-professional Core Curriculum recommends the following courses (based on the recommendations of a wide variety of health professional school programs):

- Three additional courses in Biology
 - [[BIO-226]] – Cellular & Molecular Biology
 - Two - BIO 300 Level Courses
- One additional course in Mathematics
 - [[MTH-150]] – Statistics

Pre-dental students are also recommended to take [[BIO-323]] – Histology

Pre-veterinary students are also recommended to take [[BIO-345]] – Genetics

Pre-requisites vary from one health professions school to another. It is the student's responsibility to meet the requirements of a particular health professions school.

All students intending to enter doctoral programs in health care must complete these pre-professional core courses. Students should work with their academic advisors and the Health

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Sciences Director to integrate this core into the recommended course sequence for their academic major as outlined in this bulletin.

Letter of Evaluation

Students applying to a health professions school may request a Letter of Evaluation from the Wilkes Health Sciences Committee. In order to receive the Letter of Evaluation from the Committee, students must have a Declaration Form on file, successfully complete the Pre-professional Core, develop knowledge of and experience in the field they wish to enter through shadowing, and gain experience in the social service field by volunteering their time with community agencies. These types of experiences are required by health professions schools. The application for the committee letter must be submitted to the Health Sciences Committee by April 1st of a student's intended year of health professional school application.

Placement of Pre-doctoral Students

Wilkes enjoys an enviable record of placement of students in health professions schools with acceptance rates of about 90%. Allopathic medical schools accepting Wilkes students include the Geisinger Commonwealth School of Medicine (previously known as The Commonwealth Medical College), George Washington, Georgetown, Harvard, John Hopkins, Drexel University, Pennsylvania State University-Hershey, Stanford, SUNY Upstate, Temple University, Thomas Jefferson University, Tulane, the University of Pennsylvania, the University of Pittsburgh, and Yale. A number of Wilkes students also enter osteopathic medical schools such as Lake Erie College of Osteopathic Medicine, the Philadelphia College of Osteopathic Medicine, Ohio University College of Osteopathic Medicine, and University of Health Sciences College of Osteopathic Medicine in Kansas City, MO.

Wilkes students have attended dental school at the University of Connecticut, Tufts University, the University of Pittsburgh the University of Buffalo School of Dental Medicine, and Temple University Kornberg School of Dentistry. Pre-optometry students have gained admission to institutions such as Illinois College of Optometry, New England College of Optometry, Ohio State University College of Optometry, and Pennsylvania College of Optometry at Salus University. Podiatric medical schools accepting Wilkes students include California College of Podiatric Medicine, New York College of Podiatric Medicine, Ohio College of Podiatric Medicine, and Temple University School of Podiatric Medicine. Wilkes students have also gained admission to veterinary schools such as the Oklahoma State University School of Veterinary Medicine, the University of Illinois School of Veterinary Medicine, University of Pennsylvania School of Veterinary Medicine, the University of Wisconsin-Madison Veterinary School, and the Virginia-Maryland Regional College of Veterinary Medicine.

Affiliated Degree Programs in Medicine

Early Assurance B.S./M.D. Program in Allopathic Medicine

Wilkes has developed special early assurance joint B.S.-M.D. degree program and established agreements with major

Pennsylvania State University College of Medicine at Hershey, which leads to a baccalaureate degree from Wilkes University and a medical degree from Pennsylvania State University College of Medicine at Hershey. Once students have been granted acceptance to Wilkes University and identified as qualified to be considered for selection for the early assurance program, they will be required to submit letters from two high school science teachers and one humanities/English teacher to the Health Sciences Committee and successfully complete three interviews. If ultimately selected for the program, students must satisfy all requirements as articulated in the specific affiliation agreement. All students in the early assurance program will spend their 7th or 8th semester in a clinical setting. Wilkes University has established special affiliations with Guthrie Health Systems (GHS), which includes the Robert Packer Medical Center in Sayre, Pennsylvania (Guthrie Scholars), for students to participate in this clinical experience.

The Premedical Scholars Program with the Pennsylvania State University College of Medicine at Hershey

The Pennsylvania State University College of Medicine at Hershey (Penn State Hershey) and Wilkes University offer a special Premedical Scholars Program for outstanding high school seniors from rural or medically underserved areas of Pennsylvania who must be interested in a career in primary care medicine. This program allows students to participate in the Guthrie Scholars Clinical Semester for their senior year clinical experience.

The program allows high school seniors to be assured admission to the Pennsylvania State University College of Medicine at Hershey as they enter Wilkes University to pursue undergraduate study. Details of this program are as follows:

- Program Admission
 - To be considered for selection to the Penn State Hershey Premedical Scholars BS/MD Program, applicants must meet the following conditions:
 - be accepted into the entering freshman class at Wilkes University by November of their senior year in high school;
 - have a high GPA;
 - rank in the top 10% of their high school graduating class;
 - have satisfactorily completed three (3) years of natural sciences, including biology, chemistry, and physics, and mathematics through trigonometry (calculus is recommended);
 - have had at least one shadowing experience (preferably with a primary care or general practice physician);
 - have a strong understanding of the medical field and what is involved in being a physician.
 - Once students have been accepted to Wilkes University, the Wilkes Center for Health Sciences and Student Success will notify students who meet minimal qualification criteria for selection to this early assurance program. To be selected, students are required to successfully complete interviews at Wilkes, at Robert Packer Medical Center of the Guthrie Health Care

System and at the Pennsylvania State University College of Medicine.

- Emphasis in recruiting will be placed on students from rural or medically underserved areas of Pennsylvania who wish to pursue a career in primary care medicine.
- Successful applicants should expect to be interviewed at Wilkes in December of their senior year of high school. Finalists from this interview will be called to subsequent interviews in February and March of their senior year of high school.
- Final selection for this program is at the discretion of the Pennsylvania State University College of Medicine at Hershey.
- Program Format:
- Four (4) years of successful undergraduate study at Wilkes University, which includes completion of an academic major and the Pre-professional Core. Students must maintain a minimum of 3.5 in biology, chemistry, and physics and an overall GPA of at least 3.5 by the end of their junior year at Wilkes. Specific criteria by year are as follows:
 - Freshman Year
 - Minimum GPA of 3.3
- Sophomore Year
 - Minimum GPA of 3.4
 - Shadowing experience with a primary care physician
 - Meet with the Associate Dean for Admissions and Student Affairs of the Pennsylvania State College of Medicine
- Junior Year
 - Minimum GPA in biology, chemistry, and physics of 3.5 and a minimum overall GPA of 3.5
 - A second shadowing experience with a primary care physician
 - A Letter of Evaluation from the Health Sciences Committee at Wilkes University
 - Completion of the MCAT; MCAT score must meet expectations of the Admissions Committee at Pennsylvania State University College of Medicine at Hershey
 - Completion of the AMCAS application
- Senior Year
 - Maintain a high level of academic achievement and complete Wilkes pre-medical core
 - Participate in Guthrie Clinical Semester
 - Meet with Associate Dean for Admissions and Student Affairs of the Pennsylvania College of Medicine in the fall of Senior year

Early Interview Assurance Program in Medicine

Wilkes has developed special Early Interview Assurance Programs and established agreements with Geisinger Commonwealth School of Medicine and Philadelphia College of Medicine (PCOM). Once students have been granted acceptance to Wilkes University and identified as qualified to be considered for selection for an early interview assurance program, they will be required to submit letters from two high school science teachers and one humanities/English teacher to the Center for Health Sciences and Student Success. Students must satisfy all requirements as articulated in the

specific affiliation agreement. Students should work with their academic advisors and the Health Sciences Director.

Geisinger Commonwealth School of Medicine at Scranton, PA

Geisinger Commonwealth School of Medicine at Scranton, PA and Wilkes University have developed a special Early Interview Assurance Program with Wilkes University. This program allows Wilkes University students that meet all of the following criteria to receive an interview for the allopathic medical degree program.

- Program Admission
 - Students should have a high GPA and high rank in their high school graduating class
 - Student must be from Lackawanna or Luzerne County.
 - Guaranteed interview will be contingent upon the following:
 - Submitting an AMCAS application to Geisinger Commonwealth in the year preceding desired entry as a first-year medical student.
 - Submitting the Geisinger Commonwealth secondary application in the year preceding desired entry as a first-year medical student.
 - Achieving a cumulative grade point average (GPA) of at least a 3.5 on a scale of 4.00 in biology, organic chemistry, inorganic chemistry, and physics (and any other required course determined by Geisinger Commonwealth) at Wilkes University.
 - Achieving a cumulative grade point average (GPA) of at least a 3.5 on a scale of 4.00 in the sciences courses at Wilkes University.
 - Achieving a cumulative GPA of at least 3.5 for all courses completed at Wilkes University.
 - Having no grade in any course below a "C" at Wilkes University.
 - Achieving a score of 509 or higher on the Medical College Admissions Test (MCAT) with a score of at least 126 in each section. Additionally, Geisinger Commonwealth will consider previous MCAT results if they are within three years of the date of application and the student has scored a 30 or higher with a score of at least 8 in each section.
 - Submitting a committee letter endorsing the candidate from the faculty at Wilkes University.

Philadelphia College of Osteopathic Medicine (PCOM) at Philadelphia, PA

- Philadelphia College of Osteopathic Medicine (PCOM) at Philadelphia, PA and Wilkes University have developed a special Early Interview Assurance Program with Wilkes University. This program allows Wilkes University

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students that meet all of the following criteria to receive an interview for the osteopathic medical degree program.

- Program Admission
 - Students should have a high GPA and high rank in their high school graduating class
 - Guaranteed interview will be contingent upon the following:
 - The candidate must complete the undergraduate course requirements as listed in PCOM's catalog.
 - The candidate must have earned (on the 4.0 grading system) a grade point average of at least 3.75 through the end of the sophomore year at University for the 3+4 program or a grade point average of 3.25 through the end of junior year for the 4+4 program.
 - The candidate must take the Medical College Admissions Test as early as possible but no later than the fall of the senior year (based on program of interest). The candidate must earn a minimum score of the fiftieth percentile (50%) in each section of the MCAT.
 - The candidate must also submit an application to PCOM through AACOMAS no later than October 31st of the senior year and submit the PCOM Supplemental Application (with application fee) no later than November 30th of the senior year.
 - The candidate must submit a letter of recommendation from an Osteopathic Physician (D.O.).

Affiliated Accelerated Health Professions Programs

In addition to the traditional four-year premedical undergraduate programs, Wilkes University has maintained affiliations with health professions schools in osteopathic medicine, optometry, podiatric medicine and physical therapy education for many years. These accelerated programs permit students to spend three years at Wilkes in the basic sciences and liberal arts and four years at the affiliated health professions school. The University has developed these seven-year health professions programs with the following institutions:

Philadelphia College of Osteopathic Medicine (PCOM)

Pennsylvania College of Optometry at Salus University (PCO)

Temple University School of Podiatric Medicine (TUSP)

Widener University Institute for Physical Therapy Education (WU-IPTE)

These programs offer a unique opportunity for outstanding high school students, who are fairly certain of the career path they wish to pursue, to complete their pre-professional and professional education in seven years. Students should have a high GPA and high rank in their high school graduating class, and should have completed Honors or AP course work, especially in the sciences.

In order to qualify for any of these seven-year programs, students must apply and be accepted to Wilkes University by January of their senior year in high school. If minimum prerequisites are met and students are accepted to the University, they will be interviewed by representatives of the Wilkes University Health Sciences Committee for final selection.

Once students are selected for one of these affiliated programs and begin their undergraduate education, they will receive assistance from the Center for Health Sciences and Student Success in advising them through their accelerated program of study and in the application process to the health profession school. Students must complete all general education requirements, academic major requirements and requirements associated with the program of interest during their three years at Wilkes. They will also be expected to maintain a high GPA and are required to participate in shadowing experiences, volunteer activities, and seminars and programs sponsored by the Center for Health Sciences and Student Success during their three years at Wilkes.

Wilkes University students must apply for and receive a Health Sciences Committee Letter of Evaluation after their sophomore year in order to apply to any of the accelerated programs. Only students who have earned a high grade point average by the end of their sophomore year and who have fulfilled appropriate requirements of the Pre-professional Core and the General Education Curriculum will be endorsed and receive a Letter of Evaluation for the accelerated program of interest. Students whose academic credentials fall below the standards set by the Committee will be advised to complete a third year of study at Wilkes before reapplying for a Letter of Evaluation. Students must meet all admission requirements as outlined by the health professions schools with the final admission decision determined by the health professions institution.

Students will go through the formal professional school application process for their accelerated program of interest following the completion of their sophomore year. Qualified students will then be notified by their professional school of interest of the guaranteed interview date.

If accepted by the professional school, following successful completion of his/her first year of basic science education in professional school, a student is responsible for transferring the credits earned at the professional school to Wilkes and Wilkes will confer upon each student the Wilkes University baccalaureate degree.

If not accepted by professional school, students will become traditional, 4-year students at Wilkes University. Students will reapply to any programs of choice following the completion of their junior year.

Students must fulfill the course requirements as follows in addition to any additional items outlines by the individual professional institution.

Seven-Year Programs with a Major in Biology-Required Courses and Recommended Course Sequence

The Wilkes Accelerated Pre-Professional Program Core Curriculum requires the following courses:

- Seven courses in Biology
 - [[BIO-121]] – Principles of Modern Biology I
 - [[BIO-122]] – Principles of Modern Biology II
 - [[BIO-225]] – Population and Evolutionary Biology
 - [[BIO-226]] – Cellular and Molecular Biology
 - [[BIO-397]] – Professional Preparation Techniques
 - BIO Elective* – Structure/Function Course
 - BIO Elective* – Diversity/Population Course
- Four courses in Chemistry
 - [[CHM-115]] – Elements and Compounds (plus [[CHM-113]] – Elements and Compounds Lab
 - [[CHM-116]] – The Chemical Reaction (plus [[CHM-114]] – The Chemical Reaction Lab
 - [[CHM-231]] – Organic Chemistry I (plus [[CHM-233]] – Organic Chemistry I Lab
 - [[CHM-232]] – Organic Chemistry II (plus [[CHM-234]] – Organic Chemistry II Lab
- Two courses in Biochemistry
 - [[CHM-361]] – Biochemistry: Structure and Function
 - [[CHM-362]] – Biochemistry: Metabolism
- Two courses in Physics
 - [[PHY-171]] – Principles of Classical and Modern Physics
 - [[PHY-174]] – Applications of Classical and Modern Physics
- Three courses in Mathematics
 - [[MTH-111]] – Calculus I
 - [[MTH-114]] – Biological Calculus
 - [[MTH-150]] – Statistics
- One course in Computer Sciences
 - [[CS-115]] - Computers & Applications **OR** (depending on a student's major)
- Three courses in Behavioral and Social Sciences
 - [[PSY-101]] – General Psychology
 - [[SOC-101]] - Introduction to Sociology
- One course in English
 - [[ENG-101]] – Composition
- One course in FYF
 - [[FYF-101]] – First Year Foundations
- One Free Elective Course
- 15 Credits of Distribution Requirements

**Select one course from the Structural and Functional Biology category and one course from the Diversity and Population Biology category.*

Pre-Optometry Students must also take [[BIO-327]] – Medical Microbiology

Visit Center for Health Sciences & Student Success for recommended course sequence.

Transfer Doctoral Degree Programs

The transfer program is similar to the Seven-Year Affiliated Degree programs. However, instead of choosing this 3+4 track before entering Wilkes University as a freshman (as in the 3+4

programs), a student may elect this path during their tenure as an undergraduate student.

Typically, four (4) years of undergraduate study are required to qualify for the bachelor's degree. Wilkes University makes an exception to this requirement in special circumstances for doctoral students in osteopathic medicine, dentistry, optometry, podiatric medicine, and doctoral level physical therapy (DPT).

These students may, with the approval of the Wilkes University Academic Standards Committee, satisfy the requirements for the bachelor's degree by completing three years of an academic major, at least the last two of which must be at Wilkes, and by requesting credit toward the degree for their first two years of work in a professional school. Students in these programs must, however, satisfy the General Education Curriculum requirements at Wilkes University in order to be considered for a bachelor's degree from the University.

Such students must also petition the Academic Standards Committee for permission to graduate, submit official transcripts from the professional school, and pay the usual graduation fees. In all cases, the final approval for the granting of the baccalaureate degree rests with the Academic Standards Committee of Wilkes University.

Allied Health Programs

Wilkes University has developed programs that prepare students for admission to physical therapy and occupational therapy schools as well as programs in medical laboratory sciences.

With career opportunities expanding in the allied health fields known as physical therapy, occupational therapy, clinical laboratory sciences, physician assistant, and chiropractic medicine, admission to programs in these areas has become increasingly competitive. Wilkes University has defined an approach to pre-allied health education to produce competitive, noteworthy candidates for admission.

The University has structured a program of study emphasizing the basic sciences and social sciences to provide students with the appropriate background knowledge to enter occupational and physical therapy programs. The curriculum is complemented by an advising system that closely monitors the student's academic progress and their application process to a professional program.

Students interested in allied health fields must meet with their academic advisors and advisors from the Health Sciences Director early in their freshman year to work out an individualized course of study. It is important to look at professional programs in these areas because there is no set standard of prerequisites for all programs. By choosing schools to which a student may want to apply, the Health Science Director can help to make sure he or she meets the prerequisites of a particular program in order to be a viable candidate when applying to the professional school. Students may plan to apply to a pre-professional undergraduate program in physical therapy, occupational therapy, physician assistant, and chiropractic medicine after two or three years of course work at Wilkes. Student may also plan to complete an undergraduate degree at Wilkes and apply to an entry-level

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allied health master's or doctoral degree program. Career plans affect course selection and must be reviewed with academic and health sciences advisors.

Medical Laboratory Sciences (Medical Technology)

Total minimum number of credits required for a major in Medical Laboratory Science (Medical Technology) leading to the B.S. degree – 120.

The Board of Certification of Medical Technology, part of the American Society for Clinical Pathology, recommends certain requirements for a program of training leading to the B.S. degree in Medical Laboratory Science. The curriculum offered at Wilkes University follows these recommendations and is presented below.

At the completion of three years, the student may be accepted by an affiliated program of medical technology for a period of twelve months of clinical training. Following graduation from the programs, the students will receive the B.S. degree in Medical Laboratory Science from Wilkes University and will be eligible for certification as a Medical Technologist by the Board of Registry of Medical Technology or as a Clinical Laboratory Scientist by the National Certification Agency for Medical Laboratory Personnel.

Wilkes University has established formal affiliations with a variety of MLS programs including Robert Packer Hospital in Sayre, Pennsylvania, Pennsylvania Hospital in Philadelphia, Pennsylvania, PA College of Health Sciences at Lancaster General Hospital in Lancaster, Pennsylvania, and NY Presbyterian Brooklyn Methodist Hospital in Brooklyn, New York. Fulfillment of the fourth year requirement at non-affiliated NACCLS certified hospital programs may be arranged by agreement between the program and Wilkes University.

Medical Laboratory Science Major (Medical Technology)- Required Courses and Recommended Course Sequence

First Semester

[[BIO-121]] Principles of Modern Biology I	4
[[CHM-115]] Elements and Compounds	3
[[CHM-113]] Elements and Compounds Lab	1
[[FYF-101]] First-Year Foundations	3
[[MTH-111]] Calculus I	4
	15

Second Semester

[[BIO-122]] Principles of Modern Bio II	4
[[CHM-116]] The Chemical Reaction	3

[[CHM-114]] The Chemical Reaction Lab	1
[[ENG-101]] Composition	4
Distribution Requirement	3
	15

Third Semester

[[BIO-225]] Population and Evolutionary Biology	4
[[CHM-231]] Organic Chemistry I	3
[[CHM-233]] Organic Chemistry Lab	1
Computer Science Elective	3
Distribution Requirement	3
	14

Fourth Semester

[[BIO-226]] Cellular and Molecular Biology	4
[[CHM-232]] Organic Chemistry II	3
[[CHM-234]] Organic Chemistry II Lab	1
[[MTH-150]] Elementary Statistics	3
Distribution Requirement	3
	14

Fifth Semester

[[BIO-327]] Medical Microbiology	4
[[CHM-361]] Biochemistry: Structure & Function	3
Distribution Requirements/ Free Electives	9
	16

Sixth Semester

[[BIO-326]] Immunology and Immunochemistry	4
[[BIO-397]] Professional Prep. Techniques	2
[[PHY-174]] Appls. of Classical and Modern Physics	4
Distribution Requirements/ Free Electives	6
	16

Seventh and Eighth Semesters

CLINICAL LABORATORY SCIENCES PROFESSIONAL STUDY YEAR

The 30 credits supplied by the twelve months of clinical training are divided into the following courses:

[[BIO-371]] Clinical Microbiology	7
[[BIO-372]] Clinical Chemistry	8
[[BIO-373]] Clinical Hematology & Coagulation	5
[[BIO-374]] Clinical Immunohematology	4
[[BIO-375]] Clinical Immunology & Serology	3
[[BIO-376]] Clinical Seminar	3
	30

Occupational Therapy

Occupational therapists work with members of the community who encounter difficulties with tasks of living. These difficulties may be from developmental deficits, the aging process, physical illness or injury, economic stress, cultural differences, or psychological problems. Occupational therapists provide services along with other health professionals in a number of different settings ranging from hospitals and clinics to schools to reach a wide population of all ages.

The Wilkes Pre-Occupational Therapy Core

In addition to completing an academic major, each student must also complete the Wilkes University Pre-Occupational Therapy Core. The Pre-Occupational Therapy Core provides a base from which students can structure their classes. The Pre-Occupational Therapy Core includes a sequence of courses identified by the American Association of Occupational Therapy Schools as common prerequisites at most occupational therapy schools. It must be emphasized that there are no universal prerequisite courses for all existing occupational therapy programs.

American Occupational Therapy Association: www.aota.org

The Wilkes Pre-Occupational Therapy

The Wilkes Pre-Occupational Therapy Core Curriculum requires the following courses:

- Two courses in Biology
 - [[BIO-115]] – Anatomy & Physiology I
 - [[BIO-116]] – Anatomy & Physiology II
- One course in Physics
 - [[PHY-171]] – Principles: Classic/Modern Physics

OR

- [[PHY-174]] – Application: Classic/Modern Physics
- One course in Chemistry
 - [[CHM-113]] / [[CHM-115]] – Elements and Compounds with Lab
- One course in Mathematics
 - [[MTH-100]] – Pre-calculus
 - **OR**
 - [[MTH-101]] – Solving problems Using Math

- One course in English
 - ENG Elective
- Four courses in Psychology
 - [[PSY-101]] – General Psychology
 - [[PSY-200]] – Research and Design Statistics I
 - [[PSY-221]] – Developmental Psychology
 - [[PSY-222]] – Adolescent Psychology
- One course in Sociology
 - [[SOC-101]] – Introduction to Sociology
- One course in Computer Science
 - [[CS-115]] – Computers & Applications
- Cooperative Education or Internship

The Wilkes Pre-Occupational Therapy Core Curriculum recommends the following courses (based on the recommendations of a wide variety of Occupational Therapy programs):

- Two additional courses in Biology
 - [[BIO-121]] – Principles of Modern Biology I
 - [[BIO-122]] – Principles of Modern Biology II
- One additional course in Sociology
 - [[SOC-251]] – Sociology of Minorities
- One additional course in Psychology
 - PSY Elective
- One Medical Terminology Course
 - Visit Center for Health Sciences & Student Success for more information

Pre-requisites vary from one Occupational Therapy program to another. It is the student's responsibility to meet the requirements of a particular Occupational Therapy program.

Minimum 100 hours through work or volunteer experiences in a clinical setting (observation hour requirements vary by Occupational Therapy program)

Physical Therapy

Physical Therapy is a profession concerned with restoration of physical function and the prevention of disability following disease, injury, or loss of body parts. The goal of physical therapy is to help the patient reach maximum potential and to a place in society while learning to live within the limits of his or her capabilities.

Physical therapists are qualified to utilize such physical agents as therapeutic heat, light, electricity, water, exercise, or massage in treating patients. Treatment may consist of teaching the patient an exercise regimen to increase muscle power or to improve coordination, or teaching the patient to walk with prostheses, braces, or other ambulatory aids. Appropriate psychological and sociological principles are applied in motivating and instructing the patient, his or her family, and others. Physical therapists may delegate selected forms of treatment to supportive personnel with assumption of the responsibilities for the care of the patient and the continuing supervision of the supportive personnel.

Career opportunities exist for physical therapists in hospitals, rehabilitation centers, pediatric facilities, private practice, research, industry, sports medicine, school systems, nursing homes, and other health care settings.

The Wilkes Pre-Physical Therapy Core

In addition to completing an academic major, each student must also complete the Wilkes University Pre-Physical Therapy Core, which provides a base from which students can structure their classes. The Pre-Physical Therapy Core includes a sequence of courses that are common prerequisites at most physical therapy schools. It must be emphasized that there are no universal prerequisite course for all physical therapy programs. Therefore, students must consult with each school to which they seek admission to ascertain that particular school's prerequisites: www.apta.org.

The Wilkes Pre-Physical Therapy Core Curriculum requires the following courses:

- Five-six courses in Biology
 - [[BIO-115]] – Anatomy & Physiology I
 - [[BIO-116]] – Anatomy & Physiology II
 - [[BIO-121]] – Principles of Modern Biology I
 - [[BIO-122]] – Principles of Modern Biology II
 - One 300 Level Biology Course (although two 300 level courses are highly recommended)
- Two courses in Chemistry with laboratory
 - [[CHM 113]] / [[CHM-115]] – Elements and Compounds with Lab
 - [[CHM 114]] / [[CHM-116]] – The Chemical Reaction with Lab
- One course in Physics (although both courses are highly recommended)
 - [[PHY-171]] – Principles of Classical and Modern Physics
 - [[PHY-174]] – Applications of Classical and Modern Physics
- Two courses in Psychology
 - [[PSY-101]] – General Psychology
 - [[PSY-221]] – Developmental Psychology
- Two courses in English
 - [[ENG-101]] – Composition
 - ENG Elective
- One course in Sociology
 - [[SOC-101]] – Intro to Sociology
- One course in Mathematics
 - [[MTH-150]] – Statistics

The Wilkes Pre-Physical Therapy Core Curriculum recommends the following courses (based on the recommendations of a wide variety of Physical Therapy programs):

- Two additional courses in Biology
 - [[BIO-314]] – Comparative Vertebrate Anatomy
 - [[BIO-321]] – Mammalian Physiology
- One additional course in Psychology
 - PSY Elective
- One Medical Terminology Course
 - Visit Center for Health Sciences & Student Success for more information

Pre-requisites vary from one Physical Therapy program to another. It is the student's responsibility to meet the requirements of a particular Physical Therapy program.

Affiliated Accelerated Program with Widener University: Doctor of Physical Therapy Degree

The Affiliated Physical Therapy Program provides students the opportunity to move on from Wilkes University to the Doctor of Physical Therapy Program at Widener University to earn a joint 3+3 B.S.-D.P.T. degree. Students must submit an official transcript to Wilkes University after completing their first year in the physical therapy program in order to receive a Wilkes Baccalaureate degree. Selected students able to meet or exceed established criteria will be eligible for a guaranteed place in the Widener Physical Therapy Program. Students will also be given the opportunity to earn a joint 4+3 B.S.-D.P.T. degree.

Students should consult the previous section of this bulletin for prerequisite courses required by Widener University's Doctor of Physical Therapy Program.

- Program Admission:
 - Apply and be accepted to Wilkes University by January of senior year in high school.
 - Students should have a high GPA and high rank in their high school graduating class
- Guaranteed interview will be contingent upon the following:
 - Complete prerequisites and maintain a cumulative grade point average of 3.0 in the undergraduate program and achieve a minimum cumulative grade point average of 3.3 by the end of the fall of the junior year. The student must have at least a 3.3 cumulative grade point average in order to matriculate into graduate courses in the physical therapy program.
 - Computer literacy, either by demonstration or successful completion of a computer course or challenge examination;
 - Graduate Record Exam General Test scores of 50th percentile or better on the combined verbal and quantitative sections.
 - Evidence of volunteer service in Physical Therapy
 - three favorable letters of recommendation: one from the Wilkes University Health Sciences Committee; one from a licensed physical therapist; and one from an individual chosen by the student;
 - The selection process will include interviews with the Wilkes University Health Sciences Committee and the Widener University Department of Physical Therapy.

The selection process will include interviews with the Wilkes University Health Sciences Committee and the Widener University Department of Physical Therapy.

Physician Assistant

The average PA program takes 26.5 months to complete. The first year is generally composed of classroom studies – the essential medical sciences such as microbiology, anatomy, and physiology – followed by a year of clinical rotations in private practice and institutional settings.

A candidate must have completed a Bachelor's degree from an accredited undergraduate college or university. Undergraduate credits must include pre-professional courses.

A candidate must have three letters of evaluation. One is from the Health Sciences Committee, one is from a professor and one is from a Physician Assistant.

Minimum 500 hours through work or volunteer experiences in a clinical setting. Students must consult with each school to which they seek admission to ascertain that particular school's prerequisites: American Academy of Physician Assistants: www.aapa.org

The Wilkes Pre-Physician Assistant Core

The Wilkes Pre-Physician Assistant Core Curriculum requires the following courses:

- Six-seven courses in Biology to include the following:
 - [[BIO-113]] – Microbiology
 - [[BIO-115]] – Anatomy & Physiology I
 - [[BIO-116]] – Anatomy & Physiology II
 - [[BIO-121]] – Principles of Modern Biology I
 - [[BIO-122]] – Principles of Modern Biology II
 - One 300 Level Biology Course (although two 300 level courses are highly recommended)
- Four courses in Chemistry with laboratory
 - [[CHM-113]] / [[CHM-115]] – Elements and Compounds with Lab
 - [[CHM-114]] / [[CHM-116]] – The Chemical Reaction with Lab
 - [[CHM-231]] / [[CHM-233]] – Organic Chemistry I with Lab
 - [[CHM-232]] / [[CHM-234]] – Organic Chemistry II with Lab
- One course in Physics (although both courses are highly recommended)
 - [[PHY-171]] – Principles of Classical and Modern Physics
 - [[PHY-174]] – Applications of Classical and Modern Physics
- Two courses in English
 - [[ENG-101]] – Composition
 - ENG Elective
- Three-four courses in Psychology
 - [[PSY-101]] – General Psychology
 - [[PSY-221]] – Developmental Psychology
- One 300 Level Psychology Course (although both courses are highly recommended)
- One course in Sociology
 - [[SOC-101]] – Intro to Sociology
- Two courses in Mathematics
 - [[MTH-111]] – Calculus 1
 - [[MTH-150]] – Statistics

The Wilkes Pre-Physician Assistant Core Curriculum recommends the following courses (based on the recommendations of a wide variety of Physician Assistant programs):

- Two additional courses in Biology
 - [[BIO-226]] – Cellular & Molecular Biology
 - [[BIO-345]] - Genetics
- One additional course in Mathematics
 - [[MTH-114]] – Biological Calculus
- One Medical Terminology Course
 - Visit Center for Health Sciences & Student Success for more information

Pre-requisites vary from one Physician Assistant program to another. It is the student's responsibility to meet the requirements of a particular Physician Assistant program.

BIO. BIOLOGY

BIO-105. THE BIOLOGICAL WORLD

Credits: 3

This course presents concepts and modern ideas pertaining to the natural world and the life sciences. Each semester, a selected topic will be addressed and explored from an investigative set of perspectives. While the scientific method will be emphasized in each offering, the range of topics, identified as a subtitle in the course offering data, will include, for example, 1) Genetics, Evolution, and Ecology: Implications for a Changing Society, 2) Human Biology, 3) Contemporary Issues in the Life Sciences, and others. This course is intended for students who are not majoring in science, engineering, pre-pharmacy, and nursing, or pursuing B.S. programs in mathematics or computer science. Fall semesters: Human Biology—two hours of lecture and two hours of laboratory per week. Dissections of specimens may be required in the laboratory component. Spring semesters: Contemporary Issues in the Life Sciences—three hours of lecture each week.

[Click here for course fee.](#)

BIO-113. MICROBIOLOGY

Credits: 4

This course presents the basic principles of bacteriology and the relationship of micro-organisms to disease and its prevention, control, and treatment. It considers the effects of microbes within the body and the body's reaction to them. Lecture, three hours per week; laboratory, three hours per week. Offered every spring semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-115]] or permission of the instructor.

BIO-115. ANATOMY & PHYSIOLOGY I

Credits: 4

Terms Offered: Fall

This course provides a general study of the human body, its structure and normal function. It provides an appreciation of the complex nature of the human body with relation to the promotion of a healthy organism. Dissections of specimens are required in the laboratory portion of these courses. Lecture, three hours per week; laboratory, three hours per week.

[Click here for course fee.](#)

Health Sciences

BIO-116. ANATOMY & PHYSIOLOGY II

Credits: 4

Terms Offered: Spring

This course is a continuation of [[BIO-115]] and provides a general study of the human body, its structure and normal function. It provides an appreciation of the complex nature of the human body with relation to the promotion of a healthy organism. Dissections of specimens are required in the laboratory portion of these courses. Lecture, three hours per week; laboratory, three hours per week.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-115]] or permission of instructor.

BIO-121. PRINCIPLES OF MODERN BIOLOGY I

Credits: 4

Terms Offered: Fall

An introduction to concepts of modern biology for students majoring in biology and other sciences. Topics covered include the origin of life, basic biochemistry, cell structure and function, energetics, reproduction and heredity, molecular genetics, and evolution. Four hours of lecture and three hours of laboratory per week. Offered every fall semester. Required of all Biology majors.

[Click here for course fee.](#)

Co-Requisites

[[CHM-115]]

BIO-122. PRINCIPLES OF MODERN BIOLOGY II

Credits: 4

Terms Offered: Spring

An introduction to biological diversity and mammalian structure and function for science majors, usually taken as a continuation of [[BIO-121]]. Topics include organismal classification, a survey of biological diversity (including characteristics, ecology, phylogenetic relationships, and economic and biomedical uses) of microbes, plants, and animals, and an overview of the mammalian body addressing the form and function of key organ systems. Dissections of specimens are required in the laboratory portion of this course. Four hours of lecture and three hours of laboratory per week. Offered every spring semester. Required of all Biology majors.

[Click here for course fee.](#)

BIO-198. TOPICS

Credits: 1-3

A study of topics of special interest not extensively treated in regularly offered courses.

[Click here for course fee.](#)

Pre-Requisites

Will vary according to the specific topics course.

BIO-225. POPULATION AND EVOLUTIONARY BIOLOGY

Credits: 4

Terms Offered: Fall

This course emphasizes the patterns and processes of evolutionary change in living systems in an ecological context. It reviews the basic characteristics and dynamics of populations and the relevance of population ecology and population genetics to the evolution of species. Human evolutions, sociobiology, and other controversial issues are also covered. Laboratory exercises emphasize an experimental approach to more in-depth study of specific topics covered in lecture. Four hours of lecture and three hours of laboratory per week. Offered every fall semester. Required of all Biology majors.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]] and [[BIO-122]].

BIO-226. CELLULAR AND MOLECULAR BIOLOGY

Credits: 4

Terms Offered: Spring

Fees:

Cell structure in relation to function. Biochemistry and physiology of animal, plant, and bacterial cells and their viruses are presented in a molecular biology context. Cell division and development are examined. Four hours of lecture and three hours of laboratory per week. Offered every spring semester. Required of all Biology majors.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]] and [[BIO-122]].

BIO-254. SUPERLAB

Credits: 3

Superlab is a research-oriented course in which students carry out laboratory and field-based investigations into research areas such as ecotoxicology, plant physiology, ecology, phylogenetics, molecular biology, and cancer biology. In this course, students have one hour of classroom instruction per week during the regular semester followed by ten days (over a period of two weeks) of intensive laboratory work after the end of the semester. During that second phase of the course, students design and implement experiments and carry out research discussed during the first phase with the aid of their instructors. Offered each year.

Pre-Requisites

[[BIO-225]], [[BIO-226]] or [[BIO-226]] as co-requisite.

BIO-298. TOPICS

Credits: 1-3

A study of topics of special interest not extensively treated in regularly offered courses.

[Click here for course fee.](#)

Pre-Requisites

Will vary according to the specific topics course.

BIO-306. INVERTEBRATE BIOLOGY**Credits:** 4

This course is a study of the major invertebrate phyla with respect to their taxonomy, evolution, morphology, physiology, and ecology. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]] - [[BIO-122]], [[BIO-225]] - [[BIO-226]], or permission of the instructor.

BIO-311. COMPARATIVE PHYSIOLOGY**Credits:** 4

Comparative Physiology encompasses the study of organ functions and organ system functions in different animal groups. Emphasis is on the systemic physiology of vertebrate animals. Three hours of lecture and three hours of laboratory per week. Offered every spring semester. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-312. PARASITOLOGY**Credits:** 4

Parasitology is the study of organisms that live on or within other organisms and the relationship of these organisms to their hosts. This course deals with the common parasites that infect humans and other animals. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-314. COMPARATIVE VERTEBRATE ANATOMY**Credits:** 4

This course deals with the evolution and anatomy of the organ systems of vertebrates. Lectures survey the comparative anatomy of the vertebrate classes. Laboratory dissections include the lamprey, shark, mud puppy, and cat in detail. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]].

BIO-321. MAMMALIAN PHYSIOLOGY**Credits:** 4

This course examines the function of mammalian systems with regard to homeostasis, metabolism, growth and reproduction. Normal physiological processes as well as some pathophysiological situations are covered. While the emphasis is on human physiology, other mammalian systems are discussed to demonstrate physiological adaptability to various environmental situations. Laboratory exercises include physiological experimentation in living systems and in computer simulations. Three hours of lecture and three hours of laboratory per week. Offered in alternate years. This course satisfies the requirement for a course with an emphasis in quantitative biology.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-226]], or permission of the instructor.

BIO-323. FUNCTIONAL HISTOLOGY**Credits:** 4

This course emphasizes the microscopic examination of mammalian tissues from morphological and physiological perspectives. Reference is made to organ embryogenesis to support the understanding of organ form and function. Tissue preparation for histological examination is included. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-324. MOLECULAR BIOLOGY**Credits:** 4**Terms Offered:** Spring

This course introduces students to modern concepts and techniques in molecular biology through a genuine research experience in using cell and molecular biology to learn about a fundamental problem in biology. Rather than following a set series of lectures, we study a problem and see where it leads us. We use the information given in lectures and reading assignments to solve research problems and, in the process, learn a lot of molecular biology. Offered every spring.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]].

Health Sciences

BIO-325. ENDOCRINOLOGY

Credits: 4

This course focuses on the structure, biochemistry, and function of mammalian hormones and endocrine glands.

Avian, amphibian, and invertebrate hormones are also discussed, where relevant. Clinical pathologies resulting from excess or insufficient hormones are discussed, as this is essential to mastering an understanding of Endocrinology. Laboratory exercises include experimentation in living systems and computer simulations. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of instructor.

BIO-326. IMMUNOLOGY AND IMMUNOCHEMISTRY

Credits: 4

This course is concerned with the biological mechanisms and chemistry of reactants and mediators associated with natural and acquired states of immunity, tissue and blood serum responses to infection and immunization. Related pathophysiological alternations of hypersensitivity phenomena in vertebrate animals and man are also discussed. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-327. MEDICAL MICROBIOLOGY

Credits: 4

Medical Microbiology provides a professional level introduction to microbiology that is focused on application of microbiology to the study of infectious disease etiology and epidemiology.

The laboratory covers techniques used in isolation and identification of micro-organisms. Three hours of lecture and three hours of laboratory per week. Cross-listed with [[PHA-327]].

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[CHM-231]]- [[CHM-232]].

BIO-328. DEVELOPMENTAL BIOLOGY

Credits: 4

A course dealing with the principles of animal development from descriptive, experimental, and evolutionary perspectives. Laboratory work includes both descriptive and experimental embryology, including molecular techniques. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-329. VIROLOGY

Credits: 3

Virology provides an introduction to the biology of animal viruses. Description of viral molecular architecture and genome organization is followed by a survey of strategies employed for multiplication and regulation of gene expression. Pathogenesis of viral infections is considered from perspectives of viral reproduction strategies and host defense.

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]], [[CHM-233]]- [[CHM-234]].

BIO-330. INTRODUCTION TO BIOINFORMATICS APPLICATIONS

Credits: 3

Terms Offered: Fall

An introduction to the ways computers are used to make sense of biological information, especially the data generated by the human genome project. Topics covered include databases and data mining, pair-wise, and multiple sequence alignment, molecular phylogeny, finding genes in raw DNA sequences, predicting protein and RNA secondary and tertiary structures, generating and analyzing transcriptomic data, rational drug design, metabolic simulation and artificial intelligence. Offered online every fall, with one assignment each week. This course satisfies the requirement for a course with an emphasis in quantitative biology.

Pre-Requisites

[[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]], [[MTH-150]], or permission of the instructor.

BIO-338. BIOLOGY OF CANCER

Credits: 3

This lecture course is designed to explore the various concepts and mechanisms associated with the origins, elaborations, and future developments in cellular transformation and carcinogenesis. Emphasis is placed on the molecular biology and physiology of these processes; therefore, a solid background in basic biology is required. Oncogenes, tumor suppressor genes, and the disruption of homeostasis are covered in detail, while the medical phenomena typically receive a more general level of coverage.

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-226]], [[CHM-231]]- [[CHM-232]].

BIO-340. CONSERVATION BIOLOGY

Credits: 3

This course covers the major topics of conservation biology including an introduction to biodiversity, threats to biodiversity, and solutions to diminish extinctions and population declines. Lecture: three hours per week. Offered each year.

Pre-Requisites

[[BIO-225]]- [[BIO-226]] or permission of the instructor.

BIO-341. FRESHWATER ECOSYSTEMS**Credits:** 3

A study of the biological and ecological aspects of streams, lakes, and wetlands from a watershed perspective. An initial introduction to physical, chemical, and geological principles of limnology is followed by a focus on freshwater biology. Laboratories include field-based watershed investigations and lake management assessments using geographic information systems techniques. Two hours of lecture and three hours of laboratory per week. Offered in alternate years. Cross-listed with [[EES-341]].

[Click here for course fee.](#)

Pre-Requisites

[[GEO-211]] or [[EES-240]] or [[BIO-121]]- [[BIO-122]] or consent of the instructor.

BIO-342. THE ARCHOSAURS: BIRDS, DINOSAURS, AND CROCODYLIANS**Credits:** 4

An examination of the biology of the Archosaurs. Major topics include evolutionary history, morphology, physiology, behavior, ecology, and conservation of archosaurs. Laboratory is largely field-based with an emphasis on identifying local fauna and population estimation methods. Laboratory also includes dissection, histology, and a field trip to a museum. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]] or permission of the instructor.

BIO-343. MARINE ECOLOGY**Credits:** 3

An examination of the biology of marine life within the context of modern ecological principles. The structure and physiology of marine organisms are studied from the perspectives of adaptation to the ocean as habitat, biological productivity, and interspecific relationships. Emphasis is placed on life in intertidal zones, estuaries, surface waters, and the deep sea. Two hours of lecture and three hours of laboratory per week. Offered in alternate years. Cross-listed with [[EES-343]].

[Click here for course fee.](#)

Pre-Requisites

[[EES-230]] and [[BIO-121]]- [[BIO-122]]. Students must have formal course experiences in oceanography and biology at the science major level or have completed their sophomore year as a biology major.

BIO-344. ECOLOGY**Credits:** 4

An examination of contemporary ecological thinking as it pertains to the interrelationships of organisms and their environments. Interactions at the population and community level are emphasized. Three hours of lecture and three hours of laboratory per week. Offered in alternate years. Cross-listed with [[EES-344]]. This course satisfies the requirement for a course with an emphasis in quantitative biology.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]] or permission of the instructor

BIO-345. GENETICS**Credits:** 4

This course presents a detailed treatment of genetics beyond the introductory level in the areas of both transmission and molecular genetics. It includes discussion of the role of genetics in such areas as developmental medicine. Three hours of lecture and three hours of lab per week. Offered every fall semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-346. ANIMAL BEHAVIOR**Credits:** 4

A course emphasizing behavior as the response of animals to physical and social environmental change. It covers the processes that determine when changes in behavior occur and what form the changes take. Laboratories, using local fauna, demonstrate principles discussed in lecture. Three hours of lecture and three hours of laboratory per week. Offered in alternate years. This course satisfies the requirement for a course with an emphasis in quantitative biology.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-347. BIostatISTICS AND EXPERIMENTAL DESIGN**Credits:** 4

This course reviews the statistical paradigms and techniques involved in analyzing biological phenomena. Frequentist and Bayesian methods are employed when appropriate with an emphasis on applied statistics and experimental design. Laboratory exercises include designing, analyzing, and communicating experiments. Computation and computer coding is employed in laboratory exercises. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]], [[MTH-150]], or permission of the instructor.

BIO-348. FIELD ZOOLOGY**Credits:** 3

The goals of this summer course are to introduce field methods of zoology and increase familiarity with Pennsylvania's animals. Taxa covered include turtles, snakes, birds, fish, arthropods, and mammals. Topics covered include conservation issues, population estimation, and sampling methods. Time distributed between lecture, lab, and fieldwork. Offered annually.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]] or permission of the instructor.

Health Sciences

BIO-352. PATHOPHYSIOLOGY

Credits: 4

Pathophysiology provides a series of lectures, exercises, and problem-solving sessions integrating the concepts of functional anatomy with human disease. Problem-based learning is encouraged by reviewing illustrative clinical cases and using interactive audio-visual media. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]] or permission of the instructor.

BIO-361. PLANT FORM AND FUNCTION

Credits: 4

An introduction to the morphology, anatomy, cytology, and physiology of vascular plants. Structural and functional aspects of plants are interpreted in relation to each other and within ecological and evolutionary contexts. Offered in a workshop format of two three-hour sessions per week. Offered every other fall semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-362. PLANT DIVERSITY

Credits: 4

A comprehensive survey of algae, bryophytes, and vascular plants emphasizing their structure, reproductive biology, natural history, evolution, and importance to humans. Offered in a workshop format of two three-hour sessions per week. Offered every other fall semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-363. HEMP BIOLOGY AND ANALYSIS

Credits: 4

This course is an introduction to hemp biology and analysis. Topics include an overview of hemp, hemp phylogeny, subspecies, plant structure, development, reproduction, water uptake, transport, uses for hemp, hemp pathogens and pests, and ways to improve hemp production using biotechnology.

[Click here for course fee.](#)

Pre-Requisites

Sophomore or pharmacy P-1 standing or instructor permission.

BIO-366. FIELD BOTANY

Credits: 3

A specialized summertime field course that emphasizes a taxonomic, phylogenetic, and ecological survey of vascular plants indigenous to Northeastern Pennsylvania. Course includes field trips to a diverse array of habitats in Northeastern Pennsylvania. Cross-listed with [[EES-366]]. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]] or permission of the instructor.

BIO-368. MEDICAL BOTANY

Credits: 3

A specialized summertime course that provides a scientifically based overview of the ways in which plants affect human health. Topics include cultural and historical perspectives of plants and medicine, plants that cause human ailments, plants used to treat human ailments, and psychoactive plants. Two hours of lecture per day for five weeks. Offered in alternate years.

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]], [[CHM-231]]- [[CHM-232]], or permission of the instructor.

BIO-369. PLANT PHYSIOLOGY

Credits: 4

This course introduces students to modern concepts and techniques in plant physiology through a genuine research experience using the techniques of plant physiology to learn about a problem in plant biology. Rather than following a set series of lectures, we study a problem and see where it leads us. We use the information given in lectures and reading assignments to solve research problems and, in the process, learn a lot of plant physiology. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]], or permission of the instructor.

BIO-391. SENIOR RESEARCH I

Credits: 1

Terms Offered: Fall

The student pursues independent research as a member of a team of senior biology majors. Each team is responsible for the identification of an original research problem, a thorough literature review of the problem, a detailed prospectus prepared in the format of a grant proposal, and formal oral presentations. Senior research is required of all biology majors seeking a four-year degree in Biology. Open only to senior Biology majors.

[Click here for course fee.](#)

Pre-Requisites

Biology major senior standing

BIO-392. SENIOR RESEARCH II**Credits:** 2**Terms Offered:** Spring

A continuation of [[BIO-391]]. The student pursues independent research as a member of a team of senior biology majors. Each team is responsible for the execution of their research project, a formal oral presentation, a poster, and a final manuscript prepared in standard journal format. Senior research is required of all biology majors seeking a four-year degree in Biology. Open only to senior Biology majors, or with permission of instructor.

[Click here for course fee.](#)

Pre-Requisites

Biology major senior standing, or with permission of instructor.

BIO-394. BIOLOGICAL FIELD STUDY**Credits:** 1-3**Pre-Requisites**

[[BIO-121]]- [[BIO-122]] or permission of the instructor.

BIO-395. INDEPENDENT RESEARCH**Credits:** 1-3

This course involves independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper at a level significantly beyond a term paper is required; it must also be presented orally at an appropriate off-campus science meeting.

Requirements:

Written approval of the department chairperson is required. Candidates for Independent Research must have a minimum GPA of 3.00 and be of upper class standing.

BIO-396. INDEPENDENT RESEARCH**Credits:** 1-3

This course involves independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper at a level significantly beyond a term paper is required; it must also be presented orally at an appropriate off-campus science meeting.

Requirements:

Written approval of the department chairperson is required. Candidates for Independent Research must have a minimum GPA of 3.00 and be of upper class standing.

BIO-397. PROFESSIONAL PREPARATION TECHNIQUES**Credits:** 2

Professional Preparation Techniques introduces Biology majors to Biology as a profession. Students learn how to read, write, and analyze research papers and how to make oral presentations and posters using electronic and paper-based supplements. Career development issues, including effective presentation of credentials, are also addressed. Offered every fall and every spring semester.

Pre-Requisites

Junior-level standing, or permission of the instructor.

BIO-398. TOPICS**Credits:** 1-3

A study of topics of special interest not extensively treated in regularly offered courses.

[Click here for course fee.](#)

Pre-Requisites

Will vary according to the specific topics course.

BIO-399. COOPERATIVE EDUCATION**Credits:** 1-6

Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experience, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures. Requirements: Sophomore standing, 2.0 minimum cumulative GPA, consent of the academic advisor, and approval of placement by the department chairperson.

CHM. CHEMISTRY**CHM-105. CHEMISTRY AND MODERN SOCIETY****Credits:** 3

This course will emphasize consumer applications of chemistry with some emphasis on environmental consequences of the use of various forms of energy (nuclear, coal, petroleum, natural gas) and everyday chemicals (foods, drugs, agricultural chemicals, and chemicals used in pest control).

CHM-111. FUNDAMENTALS OF CHEMISTRY**Credits:** 4

Designed for students who do not intend to major in science or engineering, this one-semester course presents principles of chemistry. Topics include atomic structure, chemical bonding, gas laws, solutions, acid/base chemistry and an introduction to organic and biochemistry. A laboratory component is required as part of this course, in which students will develop basic principles of laboratory technique. Students may not receive credit for both CHM 111 and CHM 113/115. Three hours of class, one hour of problem session, and two hours of lab per week.

[Click here for course fee.](#)

Pre-Requisites

Departmental placement criteria are met.

CHM-113. ELEMENTS AND COMPOUNDS LAB**Credits:** 1

This is the first chemistry laboratory course in the two-semester general chemistry sequence. Experiments are performed to reinforce the concepts learned in CHM-115. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

Departmental placement criteria are met

Co-Requisites

[[CHM-115]]

Health Sciences

CHM-114. THE CHEMICAL REACTION LAB

Credits: 1

This is the second chemistry laboratory course in the two-semester general chemistry sequence. Experiments are performed to reinforce the concepts learned in CHM-116. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-113]] with a grade of 2.0 or better and [[CHM-115]] with a grade of 2.0 or better

Co-Requisites

[[CHM-116]]

CHM-115. ELEMENTS AND COMPOUNDS

Credits: 3

Emphasis is placed on the periodic table and stoichiometry, including chemical properties, physical states, and structure. Three hours of class and a one-hour problem session per week.

Corequisite: [[CHM-113]].

Pre-Requisites

Departmental placement criteria are met.

CHM-116. THE CHEMICAL REACTION

Credits: 3

A detailed study of chemical equilibria in aqueous solution. Three hours of class and a one-hour problem session per week.

Pre-Requisites

[[CHM-113]] with a grade of 2.0 or better and [[CHM-115]] with a grade of 2.0 or better

Co-Requisites

[[CHM-114]]

CHM-117. INTRODUCTORY CHEMISTRY LAB FOR ENGINEERS

Credits: 1

This is a one-semester introductory chemistry laboratory course for engineering students. Experiments are performed to reinforce the concepts learned in [[CHM-118]]. One three-hour lab per week.

[Click here for course fee.](#)

Pre-Requisites

Departmental placement criteria are met.

Co-Requisites

[[CHM-118]]

CHM-118. CHEMISTRY FOR ENGINEERS

Credits: 3

This course covers the foundations of chemistry, matter and measurements, periodicity, atomic and molecular structure, stoichiometry, states of matter, phase changes, kinetics, equilibrium, thermochemistry and electrochemistry. Four hours of lecture per week.

Pre-Requisites

Departmental placement criteria are met

Co-Requisites

[[CHM-117]]

CHM-190. FRESHMEN SEMINAR

Credits: 1

Terms Offered: Spring

Students will be introduced to important skills and content area in our major programs. Students will gain familiarity with the various subdisciplines of chemistry, tools & technologies utilized by chemists, potential career pathways and applications of chemistry in everyday settings. Students will also discuss chemistry and its subdisciplines in the news and modern society.

Pre-Requisites

Successful completion of [[CHM-115]] / [[CHM-113]] with grades of 2.00 or higher or instructor permission.

Co-Requisites

[[CHM-116]] / [[CHM-114]] or instructor permission.

CHM-231. ORGANIC CHEMISTRY I

Credits: 3

Terms Offered: Summer

An introduction to the chemistry of carbon compounds, this course develops the interconnected relationship between bonding, structure, properties and reactivity in organic compounds. Instrumental methods will be presented as a means to determine structure. Three hours of class and a one-hour problem session per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-233]]

CHM-232. ORGANIC CHEMISTRY II

Credits: 3

This course continues [[CHM-231]], with emphasis on organic synthesis. Three hours of class and a one-hour problem session per week.

Pre-Requisites

[[CHM-231]] with a grade of 2.0 or better and [[CHM-233]] with a grade of 2.0 or better

Co-Requisites

[[CHM-234]]

CHM-233. ORGANIC CHEMISTRY I LAB**Credits:** 1

After an introduction to standard organic reaction, purification, physical characterization, and spectroscopic techniques, students will investigate concepts discussed in [[CHM-231]]. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-231]]

CHM-234. ORGANIC CHEMISTRY II LAB**Credits:** 1

Weekly labs that parallel the lecture topics in [[CHM-232]] and emphasize organic synthesis and characterization, including multistep synthesis. Three hours per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-231]] with a grade of 2.0 or better and [[CHM-233]] with a grade of 2.0 or better

Co-Requisites

[[CHM-232]]

CHM-235. ESSENTIALS OF ORGANIC CHEMISTRY**Credits:** 3

A one semester course covering the fundamentals of carbon chemistry. Nomenclature, stereochemistry, functional groups, spectroscopy, and reactions and mechanisms of alcohols, ethers, amines, alkyl halides, carbonyl compounds, and benzene are covered. Four hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better.

Co-Requisites

[[CHM-237]]

CHM-237. ESSENTIALS OF ORGANIC CHEMISTRY LAB**Credits:** 1

A one semester fundamental organic chemistry laboratory course that introduces organic reactions, purification, physical characterization and spectroscopic techniques.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better.

Co-Requisites

[[CHM-235]]

CHM-246. ANALYTICAL CHEMISTRY LAB**Credits:** 1

Weekly labs that parallel the lecture topics in [[CHM-248]]. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-248]]

CHM-248. ANALYTICAL CHEMISTRY**Credits:** 3

A course in the application of the principles of chemical equilibria to obtain the qualitative and quantitative information about the composition and structure of matter. An introduction to the importance of sampling is included along with methods for the statistical treatment of data. The course focuses primarily on the analyses of elemental and ionic species using electrochemical, spectroscopic, and chromatographic techniques. Three hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-246]]

CHM-256. POLYMER CHEMISTRY**Credits:** 3

This course covers topics in polymer composition and structure, polymerization mechanisms, stereochemistry of polymerization and reaction of polymers. Three hours of lecture per week.

Pre-Requisites

[[CHM-117]] with a grade of 2.0 or better and [[CHM-118]] with a grade of 2.0 or better

CHM-258. POLYMER CHEMISTRY LABORATORY**Credits:** 1

Experiments are conducted to emphasize the concepts learned in the Polymer Chemistry lecture course, [[CHM-256]].

Students will collect and process experimental data and develop laboratory skills. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-117]], [[CHM-118]]

Co-Requisites

[[CHM-256]]

CHM-261. PLANT SAMPLE PREPARATION FOR CHEMICAL ANALYSIS

Credits: 2

This is course in plant preparation for analytical chemical analysis, covering plant dehydration, digestion, and extraction of pertinent organic and inorganic chemical analytes for analysis on modern chemical instrumentation. One (1.0) hour per week of lecture/discussion and three (3.0) hours per week of laboratory.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-231]] or instructor permission.

Co-Requisites

[[CHM-231]] or instructor permission.

CHM-291. ETHICAL RESPONSIBILITIES IN MODERN SCIENCE

Credits: 1

Terms Offered: Spring

Students will become familiar with ethical issues facing modern scientists, their role in maintaining an ethical environment, and learn to behave in an ethical fashion when conducting research as an undergraduate and moving forward. Students will also evaluate the role of scientists in society, and their responsibility to ensure the proper dissemination of scientific knowledge. Topics include: what is misconduct, roles in a lab setting and how they affect power dynamics, scientific communication, data ownership, human subjects and the IRB, and the societal responsibilities of scientists. Assignments will be tailored to the major program (including: biochemistry, cannabis chemistry, and other specific chemistry tracks) of the registered students.

Pre-Requisites

30 (or more) credits completed

CHM-322. INORGANIC CHEMISTRY

Credits: 3

[[CHM-322]] presents a survey of current topics in Inorganic Chemistry. The first half of the course offers a survey of main group chemistry, including individual group trends. The second half of the course covers Crystal Field Theory, Ligand Field Theory, reaction mechanisms, and organometallic compounds. Three hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better & [[CHM-116]] with a grade of 2.0 or better

CHM-323. ADVANCED INORGANIC CHEMISTRY LAB

Credits: 1

Advanced Inorganic Chemistry Laboratory is the complimentary laboratory to CHM-322 Inorganic Chemistry. Students will build upon the foundational concepts first explored in CHM-322. An emphasis will be placed on the synthesis and characterization of transition metal complexes. Coordination chemistry reactions and mechanisms will be introduced as well as the chemistry of lanthanides. Students will gain experience in the handling of air-sensitive materials. Laboratory, three hours per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-322]]

CHM-341. INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

Credits: 3

A course in the fundamental principles that provide the basis for the design and fabrication of chemical instrumentation. The underlying physical basis for each method is introduced through an exploration of the capabilities, limitations, and applications of a wide range of separations, spectroscopic, and electrochemical methods. Three hours of lecture per week.

Pre-Requisites

[[CHM-246]] with a grade of 2.0 or better, [[CHM-248]] with a grade of 2.0 or better, [[MTH-112]], [[PHY-202]]

Co-Requisites

[[CHM-343]]

CHM-343. INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS LAB

Credits: 1

Weekly lab that corresponds to the lecture topics in [[CHM-341]]. One three-hour laboratory per week.

[Click here for course fee.](#)

Co-Requisites

[[CHM-341]]

CHM-346. ADVANCED SEPARATIONS CHEMISTRY

Credits: 2

Terms Offered: Spring

An analytical chemistry laboratory course in separations chemistry. The course will cover chromatography, including GC-MS, LC, and LC-MS with a focus on their application to cannabis and natural products analysis. The course will also cover the operation and maintenance of the modern chemical chromatography instrumentation. Meets for two-laboratory sessions per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-341]] , [[CHM-343]] and [[CHM-261]] or instructor permission.

CHM-351. PHYSICAL CHEMISTRY: QUANTUM AND SPECTROSCOPY**Credits:** 3

This course emphasizes the molecular approach to physical chemistry. It begins discussing the principles of quantum mechanics and their applications in chemistry, leading to atomic and molecular structure, and chemical bonding. These concepts are then used in the development of atomic and molecular spectroscopy. Photochemistry is introduced. Three hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better, [[CHM-116]] with a grade of 2.0 or better, [[MTH-212]] and [[PHY-202]]

CHM-352. PHYSICAL CHEMISTRY: KINETICS AND THERMODYNAMICS**Credits:** 3

Statistical mechanics is used to formulate thermodynamics in terms of atomic and molecular properties, allowing a molecular interpretation of the laws of thermodynamics. Three hours of lecture a week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better, [[CHM-116]] with a grade of 2.0 or better, [[MTH-212]], and [[PHY-202]]

CHM-353. PHYSICAL CHEMISTRY: QUANTUM AND SPECTROSCOPY LAB**Credits:** 1

Laboratory experiments are performed in order to reinforce concepts in [[CHM-351]]. Bench as well as computational experiments will explore the photoelectric effect, resonance states of a particle in a one-dimensional box, applications of molecular orbital theory, and molecular spectroscopy. Three hours per week.

[Click here for course fee.](#)

Co-Requisites

[[CHM-351]]

CHM-354. PHYSICAL CHEMISTRY: KINETICS AND THERMODYNAMICS LAB**Credits:** 1

Laboratory experiments are performed in order to reinforce concepts in [[CHM-352]]. Bench as well as computational experiments explore calorimetry, phase equilibria, colligative properties, kinetics, and applications of the Monte Carlo method to chemical kinetics. One three-hour lab per week.

Co-Requisites

[[CHM-352]]

CHM-355. PHYSICAL CHEMISTRY FOR LIFE SCIENCES**Credits:** 4

An introduction to traditional physical chemistry topics, including additional topics related to life sciences. Laws of thermodynamics, equilibria, kinetics, and spectroscopy will be discussed in terms of their application to life sciences. Four hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better, [[CHM-116]] with a grade of 2.0 or better, and [[PHY-202]]

Co-Requisites

[[CHM-357]]

CHM-357. PHYSICAL CHEMISTRY FOR LIFE SCIENCES LAB**Credits:** 1

The laboratory experiments emphasize concepts presented in [[CHM-355]]. Course includes experimental work, analysis of a research article, and computer simulations relevant to life sciences. One three-hour laboratory pre week.

Co-Requisites

[[CHM-355]]

CHM-361. BIOCHEMISTRY: STRUCTURE AND FUNCTION**Credits:** 3

This course presents a study of the physical and chemical properties of proteins, nucleic acid, fatty acids, and carbohydrates, emphasizing the relationship between the chemical structure and the biological function. The course includes the physical methods of biochemistry, enzyme kinetics, bioenergetics, and nucleic acid transcription and translation. Three hours of lecture per week.

Pre-Requisites

[[CHM-232]] with a grade of 2.0 or better

CHM-362. BIOCHEMISTRY: METABOLISM**Credits:** 3

This course presents a study of the catabolism and anabolism of carbohydrates, fatty acids, and amino acids. The course emphasizes the regulation and integration of major metabolic pathways, including glycolysis, the Krebs cycle, electron transport, gluconeogenesis, pentose phosphate pathway, fatty acid metabolism, and amino acid metabolism. Three hours of lecture per week.

Pre-Requisites

[[CHM-232]] with a grade of 2.0 or better

Health Sciences

CHM-363. BIOCHEMISTRY LABORATORY

Credits: 1

Laboratory experiments, which emphasize biochemical techniques used in isolation and characterization of macromolecules. Included in the course are various chromatographic techniques, electrophoresis, spectrophotometry, and classic biochemical methods. Laboratory, three hours a week.

[Click here for course fee.](#)

Pre-Requisites

Prerequisite or Corequisite: [[CHM-361]] or permission of instructor.

CHM-365. MEDICAL BIOCHEMISTRY

Credits: 4

Introduction to basic biochemistry concepts, focusing on the structure and function of vitamins, proteins, and lipids, as well as bioenergetics and major catabolic pathways. The catabolism of carbohydrates, fats and amino acids, including reactions and regulation, will be discussed. Common metabolic pathways of drugs, enzyme induction and metabolism down regulation will also be presented. Four hours of lecture per week. Cross-listed with [[PHA-365]] and [[BEGR-465]].

Pre-Requisites

[[CHM-232]] or [[CHM-235]] with a grade of 2.0 or better, or permission of the instructor

CHM-370. CHM 371, CHM 372 INTEGRATED LABORATORIES I, II, III

Credits: 1-2 each

Laboratory experiments related to the five major areas of chemistry. Labs will be chosen in order that students might demonstrate proficiency in each of the required areas. Labs will include synthesis, isolation, and characterization of chemical compounds, spectroscopy, kinetics, calorimetry, chromatography, electrophoresis, and other chemical and biochemical methods. Three hours of laboratory per week per credit hour.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-232]] with a grade of 2.0 or better, [[CHM-234]] with a grade of 2.0 or better and [[CHM-341]] with a grade of 2.0 or better

CHM-377. INTRODUCTION TO TOXICOLOGY

Credits: 3

Terms Offered: Fall

An introduction to toxicology, including its history, types of poisons, their mode of operation and the biochemistry of detoxification. Environmental problems caused by toxic contaminants will be discussed.

This course is offered in the fall semester of even numbered years.

Pre-Requisites

[[CHM-232]] , [[CHM-234]] and [[BIO-226]] or instructor permission.

CHM-379. MEDICINAL CHEMISTRY

Credits: 3

Terms Offered: Fall

The course provides an introduction to drugs, their action and discovery. Topics covered include drug structure & solubility, structure-activity & quantitative structure relationships, drugs from natural sources, the role of biological membranes in drug delivery, the role of receptors & messengers, enzymes, and an introduction to drug and analogue synthesis.

This course is offered in the fall semester of odd numbered years.

Pre-Requisites

[[CHM-232]] , [[CHM-234]] and [[BIO-226]] or instructor permission.

CHM-380. NMR SPECTROSCOPY

Credits: 3

This course explores the capabilities of the Chemistry Department's NMR spectrometer, and provides a groundwork in NMR theory beyond the level covered in the sophomore organic course. Topics covered include hardware, data processing, chemical shifts and coupling, one- and two-dimensional pulse sequences, dynamic NMR, the NOE effect, and gradient methods. Offered in alternate years.

CHM-390. JUNIOR SEMINAR

Credits: 1

CHM-390 is a one-hour course offered during the spring semester. It is designed to prepare chemistry and biochemistry majors for their careers after graduation and for their capstone research projects, undertaken in the fourth year. The course will cover topics such as résumé preparation, communication of scientific information, internships, job searches, and preparation for graduate school. Students will prepare a topical literature review on their chosen project in conjunction with their selection of a research advisor.

Pre-Requisites

45 hours of service to the Chemistry Department. Requirements: Junior standing and declared major in Chemistry or Biochemistry.

CHM-391. SENIOR RESEARCH I**Credits:** 2

Students will plan and execute a chemistry research project under the direction of a faculty member. It is expected that this will be a laboratory research project. Students will also learn how to search the chemical literature. Students are required to attend weekly Department seminars and present at least one seminar. Requirements: Senior standing in a Chemistry curriculum.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-352]] with a grade of 2.0 or better or [[CHM-355]] with a grade of 2.0 or better

CHM-392. SENIOR RESEARCH II**Credits:** 2

Students will carry out a chemistry research project under the direction of a faculty member. It is expected that the project will be a laboratory research project. The project must culminate in a written report and the results must be presented at a Department poster event. Students are also required to attend any seminars hosted by the Department. Six hours of laboratory / research work per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-391]] with a grade of 2.0 or better

CHM-395. INDEPENDENT RESEARCH**Credits:** 1-3

Independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper is required.

Requirements: permission of the instructor.

[Click here for course fee.](#)

CHM-396. INDEPENDENT RESEARCH**Credits:** 1-3

Independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper is required.

Requirements: permission of the instructor.

[Click here for course fee.](#)

CHM-398. TOPICS**Credits:** 1-3

A study of topics of special interest, such as advanced physical chemistry, advanced analytical chemistry, advanced organic chemistry, surface and colloid chemistry, nuclear chemistry, chemical kinetics, polymer chemistry, or spectroscopy.

Pre-Requisites

Will vary according to the specific topics course.

CHM-399. COOPERATIVE EDUCATION**Credits:** 1-6

Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experience, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures. Requirements: Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson. Students without the indicated prerequisites for 200 and 300-level chemistry courses may enroll after written permission of the instructor has been approved by the department chair.