

PRE-HEALTH STUDIES

Pre-health studies are a roadmap through the liberal arts that begins with your admission to college, and ends with your admission to a health professional school (such as a medical school). At St. Olaf College, this route intersects with our commitment (as stated in the Mission Statement) to an education that fosters critical thinking, heightens moral sensitivity, promotes lives of unselfish service to others and challenges you to become responsible, knowledgeable citizens of the world. Pre-health studies are supported by the dedication and efforts of the faculty of the Health Professions Committee (<http://wp.stolaf.edu/pre-health/health-professions-committee>) (HPC) and the staff of The Piper Center for Vocation and Career (<http://wp.stolaf.edu/pipercenter>); the Chair of the HPC serves as the academic advisor for all pre-health students while coaches at the Piper Center support pre-health student professional development and experiential learning.

Overview of Pre-Health Studies

The following information is intended for St. Olaf students who are in the process of deciding what path their future career will take in the health professions. There are many health careers in addition to human and veterinary medicine, dentistry and nursing. Some of these areas are listed below, along with the advising specialist in that area:

Health Careers	Advising Specialist
Audiology	Jeremy Loebach (on sabbatical 2017-2018)
Genetic Counseling	Jay Demas (on sabbatical 2017-2018)
Health Administration	Ashley Hodgson
Mental Health	Donna McMillan
Nursing	Mary Beth Kuehn (nursing majors), Kevin Crisp (non-nursing majors)
Occupational Therapy	Cindy Book
Optometry	Jay Demas (on sabbatical 2017-2018)
Pharmacy	Doug Beussman
Physical Therapy	Cindy Book
Physician Assistant	Kevin Crisp
Podiatry	Kevin Crisp
Public Health	Susan Wold (Piper Center)
Speech Language Pathology	Jeremy Loebach (on sabbatical 2017-2018)
Veterinary Medicine	Diane Angell

Preparing for any health science profession requires careful planning, as prerequisites vary by field and even by school or program. More information concerning professional preparation for these areas can be found on the pre-health program (<http://wp.stolaf.edu/pre-health>) website and pre-health program Moodle (<https://moodle-2016-17.stolaf.edu/course/view.php?id=2343>) page. Students should seek advice from their academic advisor, the Piper Center staff, and the HPC as they plan and prepare for health science professions.

Pre-Nursing Students Not Majoring in Nursing

For specific details about the undergraduate nursing program at St. Olaf, please see the nursing major (<http://catalog.stolaf.edu/academic-programs/nursing>) catalog page. Students interested in pursuing a Nurse Practitioner degree or a Masters of Science in nursing who are not nursing majors most often will need to complete the following pre-requisites:

Code	Title	Credits
Two semesters of anatomy and physiology:		2.00
BIO 143	Human Anatomy and Physiology: Cells and Tissues (Not Recommended for Biology Majors)	
BIO 243	Human Anatomy and Physiology: Organs and Organ Systems	
BIO 247	Animal Physiology	
BIO 266	Comparative Vertebrate Anatomy	
BIO 231	Microbiology	1.00
NURS 110	Nutrition and Wellness	1.00
PSYCH 125	Principles of Psychology	1.00
PSYCH 241	Developmental Psychology	1.00
STAT 212	Statistics for the Sciences	1.00

Prerequisites for Pre-Medical, Pre-Dental, Pre-Physician's Assistant, and Pre-Podiatry Students

Each medical school (whether MD or DO), dental school, and physician's assistant program differs somewhat in their exact list of courses required for admission. However, St. Olaf's general education curriculum (<http://catalog.stolaf.edu/curriculum/graduate-requirements-degrees/general-education-requirements-ba>) provides you with most of the non-science prerequisites typical of these programs. The following courses are recommended for all students planning on entering medical schools (either MD or DO) or dental schools.

Code	Title	Credits
Recommended Coursework (for MCAT preparation and medical school admissions)		
MATH 119 or MATH 120	Calculus I with Review Calculus I	1.00
Two semesters of general biology (typically BIO 150 and BIO 227)		2.00
Select one of the following:		2.00-3.00
CHEM 121 & CHEM 123 & CHEM 126	General Chemistry and Atomic and Molecular Structure and Energies and Rates of Chemical Reactions	

CHEM 125 & CHEM 126	Structural Chemistry and Equilibrium and Energies and Rates of Chemical Reactions ¹	
CH/BI 125 & CH/BI 126	Integrated Chem/Bio I: Chemical Concepts with Biological Applications and Integrated Chem/Bio II: Thermodynamics and Kinetics with Bio Relevance ¹	
CHEM 247 & CHEM 248	Organic Chemistry I and Organic Chemistry II	2.00
CHEM 379	Biochemistry I (organic chemistry is a prerequisite; required at some medical schools)	1.00
PHYS 124 & PHYS 125	Principles of Physics I and Principles of Physics II	2.00
BIO 243	Human Anatomy and Physiology: Organs and Organ Systems (one semester of physiology, human or animal)	1.00
or BIO 247	Animal Physiology	
PSYCH 125	Principles of Psychology	1.00
One sociology course (SOAN 121 is open to first-year students only)		1.00
One statistics course (typically STAT 212)		1.00

¹ MATH 119 or MATH 120 is a prerequisite for CHEM 126 and CH/BI 126

Pre-medical students should note that there is much more to being a competitive candidate for medical school than course planning. A competitive candidate to medical school might have a GPA of 3.6 or above, an MCAT score of greater than 515, significant experience with patients in a medical setting, and long-term volunteer experience (especially working with the underserved).

Pre-dental students should note that many dental schools recommend that students take a semester of introductory psychology, a semester of statistics, and coursework in studio art and English (e.g., composition) in addition to the recommended natural science and mathematics coursework above.

Prerequisites for podiatry programs are similar to those for medical school, and some podiatry schools may accept the MCAT, DAT, or GRE. A student who will use the MCAT when applying to podiatry school should take courses in psychology, sociology, and statistics in addition to the natural science and mathematics courses recommended for pre-medical students.

Prerequisites for physician's assistant programs are similar, but students should note that these programs may not require organic chemistry, biochemistry, or physics; however, these students are also recommended to take:

Code	Title	Credits
PSYCH 125 & PSYCH 241	Principles of Psychology and Developmental Psychology	2.00
Medical terminology (typically as BIO 291)		0.25

One course emphasizing speech and communication 1.00

BIO 143 & BIO 243	Human Anatomy and Physiology: Cells and Tissues and Human Anatomy and Physiology: Organs and Organ Systems	2.00
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One statistics course 1.00

Recommendations for Graduate Study

Health professionals graduate schools (such as medical schools) are looking for well-rounded individuals who are interested in a wide variety of areas and have demonstrated their interest in both medicine and people. Students should take advantage of the many opportunities to obtain patient contact and observe practitioners at work in their field of expertise. Medically related experience is essential to successful application to many health profession programs; medical schools strongly recommend potential applicants obtain medically related work or other contact with patients, and successful candidates to physician assistant programs often have as many as 1500-2000 hours of paid, hands-on work with patients before the student submits an application. The Piper Center's coaches and peer advisors can assist students in arranging internships with physicians in their hometown, with alumni, or with healthcare professionals in the Twin Cities. Internships during the Interim and summer of the student's sophomore or junior year work well. Students may also shadow healthcare professionals during the summer, or work in a hospital, clinic, or nursing home (e.g., as a CNA); note that formal registration for credit is **not** required.

Some medical schools highly value research experience, whether in the laboratory, the field, or internships (such as the Mayo Innovation Scholars Program). Students should also maintain a high level of involvement in extra-curricular activities. They should select and involve themselves in activities of genuine interest. Extensive involvement in a few activities ranging from music to athletics to clubs (such as the pre-health professionals club, AMSA, Alpha Epsilon Delta, etc.) can demonstrate and develop valued traits such as dedication, commitment, leadership, perseverance, and professionalism. However, extracurricular commitments should not be permitted to negatively influence academic performance.

Health professions schools are also interested in students who have demonstrated compassion and empathy through volunteer activities. Examples of volunteer activity include hospice programs, home health aid, crisis-line counseling, working with individuals with physical disabilities or individuals with developmental delays, working with survivors of abuse, or with disadvantaged youth. Long periods of service involvement are preferred to brief stints in many activities. Note that some medical schools require non-medical volunteer experience, and some physician assistant programs specify that volunteer activity should be unpaid and emphasize working with the underserved.

Special Internships and Opportunities

The Physician in Clinical and Hospital Health Care

The program occurs during the St. Olaf January term at the clinics and hospitals of the Fairview Health System in the Minneapolis-

St. Paul area or at the Family Health Clinic in Willmar, Minnesota. Students at the Fairview locations are assigned to a physician in a given clinical setting who serves as their primary mentor. The students shadow their primary mentor or other designated physicians through their daily activities in pertinent clinical and hospital settings. The student experience involves exposure to primary and specialty care area settings involving patients from all age groups. Students may experience emergency care and will become acquainted with many providers in discussions about the field of medicine. If appropriate and possible, students will be invited to attend lectures and grand rounds that are held during the student observation period. Students are observers only; they will not participate in the delivery of medical care unless cleared to do so in an emergency. The Fairview Clinics involved are: Burnsville Ridges, Cedar Ridge, Eden Center, Hiawatha, and Lakes Regional Medical Center. Students are responsible for their own transportation to the assigned clinic site either from their home or from campus. Contact Professor Kevin Crisp (crisp@stolaf.edu) for further information.

Mayo Innovation Scholars Program (<http://wp.stolaf.edu/pipercenter/mayo-innovation-scholars-program>)

Mayo Innovation Scholars Program offers an opportunity for selected undergraduate science and economics majors to evaluate projects submitted to the Mayo Clinic Ventures, the arm of Mayo responsible for evaluating potential business opportunities for discoveries and inventions created by Mayo Clinic physicians and researchers. This program is an initiative between a select group of Minnesota Private Colleges and the Mayo Clinic, with funding through the Medtronic Foundation. A team of four students will represent St. Olaf College each January and summer in the Mayo Innovation Scholars Program. The project team will be composed of students representing a variety of science and economics backgrounds who demonstrate strong analytical and communication skills and success as an effective team member. Kevin Crisp, Biology and Neuroscience, will serve as the faculty advisor. The team will also be mentored by an MBA graduate student. Students apply through Handshake (Piper Center (<http://wp.stolaf.edu/pipercenter>)) (<http://wp.stolaf.edu/pipercenter/handshake>).

Rockswold Health Scholars (<http://wp.stolaf.edu/pipercenter/rockswold>)

This clinical and research internship program provides current St. Olaf students an unparalleled hands-on experience at the Hennepin County Medical Center in Minneapolis, MN. HCMC is known for its dedication to providing care to vulnerable, diverse, and underserved populations regardless of their ability to pay for medical services. Students will expand their professional network and improve their knowledge regarding potential paths within the healthcare field. Selected participants live in apartments together in the spirit of support and mutuality. Students apply through Handshake (Piper Center (<http://wp.stolaf.edu/pipercenter>)) (<http://wp.stolaf.edu/pipercenter/handshake>).

Health Scholars at Mayo Clinic (<http://wp.stolaf.edu/pipercenter/health-scholars-mayo-clinic>)

St. Olaf alumni at Mayo Clinic have established a research internship program that provides current St. Olaf students an unparalleled hands-on experience at the Mayo Clinic in Rochester, MN. Health care is

undergoing transformative changes. Understanding how the health care team interacts and collaborates to serve the needs of the patient is critical in order to provide the best quality of care. Students will be exposed to how Mayo Clinic provides comprehensive integrated care through weekly seminars and exposure to healthcare innovation/administration. In addition, students will conduct directed research projects. Selected participants live in a house together in the spirit of support and mutuality. Students apply through Handshake (Piper Center (<http://wp.stolaf.edu/pipercenter>)) (<http://wp.stolaf.edu/pipercenter/handshake>).

Human Gross Anatomy (Cadaver Dissection)

For the past 22 years, the Human Gross Anatomy Independent Study course offers a unique opportunity for eight undergraduate students to dissect two human cadavers. Dissection is completed during the fall with the expectation that dissectors will also participate as teaching assistants for the lab component of the Human Anatomy and Physiology II course. Students apply through the Biology Department. Note that this course is now offered as a section of Biology 291.

Courses

Additional Courses of Interest

BIO 143: Human Anatomy and Physiology: Cells and Tissues

The study of the anatomy and physiology of the human body is founded on a thorough understanding of the structure and function of cells and tissues. Students attend lectures plus one 3-hour lab per week. Nursing and exercise science majors may pre-register for this course. This course may not be taken after completion of CH/BI 227 or BIO 227. Offered in the fall semester. Counts toward exercise science major.

BIO 231: Microbiology

Microbiology examines the morphology, composition, metabolism, and genetics of micro organisms with emphasis on bacteria and viruses. Students examine the dynamic impact of microbes on humans, the immune response, and the role of microbes in the environment. Students attend lectures plus one three-hour laboratory per week. Offered annually.

Prerequisites: BIO 143 or BIO 150, and one Chemistry course.

BIO 243: Human Anatomy and Physiology: Organs and Organ Systems

Students journey toward greater understanding of the human body through an integrated study of the structure of the body (anatomy) and how organs such as the brain, heart, and kidney perform their remarkable functions (physiology). The course is designed primarily for students intending careers in the health sciences. Students attend lectures plus one three-hour laboratory per week. Offered each semester. Counts toward exercise science major and neuroscience concentration.

Prerequisite: BIO 143, or BIO 150 and BIO 227 or CH/BI 227.

BIO 284: Peruvian Medical Experience (abroad)

This course is a service/learning experience. Week one is spent on campus learning basic clinical techniques, examining emerging disease, and studying existing health care issues. Students spend three weeks in Cuzco, Peru, assessing patient needs in a public hospital, a homeless shelter, orphanages, and a small village. Week four involves discussion and writing reflective journals. Apply through the Office of International and Off-Campus Studies. Offered during Interim.

Prerequisites: BIO 150 or BIO 231, and BIO 291.

BIO 382: Immunology

Immunology focuses on the structure, development and function of the immune system. The course explores the molecular and cellular basis of the immune responses. The application of immunological principles to allergy, autoimmunity, AIDS, transplantation, and cancer are included. Students attend lectures plus a two-hour discussion per week. Counts toward biomolecular science concentration.

Prerequisite: BIO 227 and BIO 233, or CH/BI 227 and BIO 233.

CHEM 260: Medicinal Chemistry in Jamaica: An International Perspective (abroad)

In this course students gain an appreciation for the drug development process, including how natural products are isolated, how their structures relate to activities, and how research into the mechanism of disease leads to the targeted development of drugs. Issues relating to medicinal chemistry in a developing-world context, medicinal plants, and the chemical basis of folk medicine are discussed. Offered alternate years during Interim.

Prerequisites: CHEM 248 and CHEM 254.

ECON 245: Economics of Health Care

The health care sector in the U.S. is undergoing rapid change that affects patients, providers and payers. Managed care and managed competition are restructuring the delivery of health care services and reducing costs, while frustrating physicians and patients. The course examines the economic factors leading to the changes, current issues and controversies, and federal health policies. Students interested in nursing, medicine, and the sciences are encouraged to enroll. Offered annually. Counts toward American studies major.

Prerequisites: one of Economics 110-121 or permission of instructor.

PHIL 250: Biomedical Ethics

This course clarifies central concepts and distinctions developed in the literature of moral philosophy and applications of those concepts and distinctions to concrete moral problems that arise in the practice of medicine. Issues may include euthanasia, abortion, medical paternalism, allocation of scarce medical resources, culturally sensitive medical care, pandemics, and conflicts of loyalty in managed care. Readings are drawn from both philosophical and medical discussions. Offered annually. Counts toward neuroscience concentration.

Prerequisite: completion of BTS-T or permission of instructor.

SOAN 267: Medical Anthropology

How do people understand illness and healing? How does social inequality shape health? These are among the questions explored by medical anthropology. In this course students examine the ways people in different societies experience their bodies, by looking at AIDS in Haiti, old age in India, and childbirth in the United States. Students investigate diverse understandings of health, different means of promoting healing, and the role of power in providing medical care. Offered annually in the fall or spring semester.