Students in the Department of Biomedical and Health Sciences study and work at the intersection of human health, medicine, and technology. Programs offered lead to Bachelor of Science degrees in Medical Laboratory Science, Medical Radiation Sciences, and Health Sciences.

The B.S. in Medical Laboratory Science offers two concentrations: Clinical Laboratory Science or Public Health Laboratory Science.

The B.S. in Medical Radiation Science offers a clinical track in Radiation Therapy.

The B.S. in Health Sciences program offers both a four-year, residential option and a degree completion option for students who have previously earned at least one year (30 credit hours) of college credit.

All programs offer an integrated curriculum, with courses in the humanities, basic, health and medical sciences, and direct hands-on experience through clinical practica, research or field work. Students have the opportunity to interact with faculty from the department and throughout the university, including the College of Medicine. Graduates of all three programs are prepared for immediate employment in the healthcare arena, or graduate study.

Requirements for admission are the same as the general university requirements, with the addition that applicants must have taken high school biology, mathematics through trigonometry or precalculus, and chemistry; physics is highly recommended.

### MAJORS

#### BIOMEDICAL AND HEALTH SCIENCES MAJORS

Health Sciences B.S. (http://catalogue.uvm.edu/undergraduate/nursingandhealthsciences/biomedicalandhealthsciences/healthsciencebs/)

Medical Laboratory Science B.S. (http://catalogue.uvm.edu/undergraduate/nursingandhealthsciences/biomedicalandhealthsciences/medicallabsciencebs/)

Medical Radiation Sciences B.S. (http://catalogue.uvm.edu/undergraduate/nursingandhealthsciences/biomedicalandhealthsciences/medicalradsciencebs/)

### GRADUATE

Interprofessional Health Sciences Ph.D.

Medical Laboratory Science AMP

Medical Laboratory Science M.S.

See the online Graduate Catalogue (http://catalogue.uvm.edu/graduate/) for more information.

### Biomedical and Health Sciences Courses

#### BHSC 034. Human Cell Biology. 0 or 4 Credits.
Lecture and laboratory experiences about molecular and cellular structure, function and physiology using human cells as the model.

#### BHSC 054. Principles of Microbiology. 3 Credits.
Lectures dealing with the structure, physiology, and control of microorganisms, in particular those of medical importance.

#### BHSC 056. Principles of Microbiology Lab. 1 Credit.
Laboratory experiences dealing with the structure, physiology, and control of microorganisms, particularly those of medical importance. Co-requisite: BHSC 054.

#### BHSC 090. Internship. 1-3 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

#### BHSC 092. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### BHSC 096. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

#### BHSC 098. Intro to Scientific Writing. 3 Credits.
Introduction to the principles and practices of research and writing in the biomedical and health sciences. Using scientific data and literature as a foundation, students will write in multiple genres through regular assignments applicable to future course work and health science professions. Pre/Co-requisites: ENGS 001 or a TAP course or equivalent or Instructor permission; Radiation Medical Science, Medical Laboratory Sciences, and Health Sciences majors only.

#### BHSC 110. Phlebotomy. 1 Credit.
Basic techniques in blood collection in outpatient phlebotomy and advanced techniques in inpatient phlebotomy, including choice of anticoagulants, equipment, sterility, and protection from blood-borne pathogens. Prerequisite: Medical Laboratory Science and Medical Laboratory Science Post-Baccalaureate Certificate students only.

#### BHSC 140. Radiation Science. 4 Credits.
Provides a broad based understanding of the fundamentals of radiation science including the ways in which radiation is produced and utilized, the principles of radioactive decay, radiation exposure, absorbed dose, shielding and detection of radiation. Prerequisite: MATH 019 or MATH 021.
BHSC 141. Advanced Radiation Science. 3 Credits.
Lecture and laboratory experiences to enhance the understanding and application of the principles of radioactive decay, radiation exposure, absorbed dose, shielding and detection of radiation. Prerequisite: MATH 009, MATH 010, MATH 019 or MATH 021.

BHSC 175. Cross Sectional Imaging. 3 Credits.
Introduction to the radiographic anatomy and the various imaging modalities presently used to include diagnostic imaging, computed tomography (CT), magnetic resonance imaging (MRI), and nuclear medicine. Prerequisites: ANPS 020.

BHSC 188. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

BHSC 190. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

BHSC 192. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

BHSC 196. Intermediate Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

BHSC 198. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion. Prerequisite: Department Permission.

BHSC 242. Immunology. 3 Credits.
Deals with cells, organs, development, interactions and the functioning (infectious process, immunodeficiency, hypersensitivity reactions, transplantation and tumor immunology) of the innate and the adaptive immune system. Prerequisites: One semester of biochemistry, one semester of organic chemistry.

BHSC 244. Immunology Lab. 1 Credit.
Laboratory experience dealing with cellular and humoral immunity, B cells and T cells, autoimmunity, immunodeficiency. Laboratory covers immunological techniques and applications. Prerequisites: One semester of biochemistry, one semester of organic chemistry. Co-requisites: BHSC 242 or MMG 223.

BHSC 281. Applied Molecular Biology. 3 Credits.
Introduces students to the nucleic acid and protein-based molecular diagnostics technology through class presentation, reading, and discussions. Focuses on diagnostic applications for understanding molecular mechanisms of disease. Prerequisite: CHEM 042 or CHEM 141.

BHSC 282. Applied Molecular Biology Lab. 1 Credit.
Laboratory experiences include practical concepts of molecular applications. Introduces basic methods used in DNA and Protein technology including plasmid isolation, polymerase chain reaction, restriction enzyme use, and related assays. Prerequisite: CHEM 042 or CHEM 141. Co-requisite: BHSC 281.

BHSC 288. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

BHSC 290. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

BHSC 292. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

BHSC 296. Advanced Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles. Prerequisite: Department permission.

BHSC 297. Leadership & Mgt in Hlth Care. 3 Credits.
Familiarizes students with operational aspects of health care management, leadership and policy. Explores current techniques in process improvement, management methodologies, and healthcare policy with a special focus on disparities in health and healthcare. Prerequisites: Minimum Junior standing; College of Nursing and Health Sciences majors.

BHSC 298. Undergraduate Research. 1-18 Credits.
Individual research performed under the supervision of a faculty mentor. A written report and seminar is required. Prerequisite: Department Permission.

Health Sciences Courses

HSCI 021. Introduction to Public Health. 3 Credits.
In this introductory investigation of public health, students will explore the development and scope of the discipline of public health, and issues that have been raised with regard to the practice of public health.

HSCI 090. Internship. 1-3 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

HSCI 092. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.
HSCI 096. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

HSCI 102. Epidemics-Dyn. of Inf. Disease. 3 Credits.
Through historical and fictional epidemics and pandemics, students will explore how the changing world has impacted the development and spread of infectious disease, and make informed decisions related to infectious disease risk at the personal, clinical, and population level. Prerequisite: HSCI 021.

HSCI 103. D2: Fndns of Global Health. 3 Credits.
Explores global health and global health challenges affecting people primarily in developing or resource-constrained countries. Prerequisite: Minimum Sophomore standing. Cross-listed with: ANTH 173, HSOC 103.

HSCI 130. Health Promotion. 3 Credits.
An overview of health promotion across the lifespan, from local, national and global perspectives. Examination of the influences on health and risk, strategies to promote health, and evaluation of outcomes. Students will engage in 8-10 hours of service learning. Prerequisite: HSCI 021.

HSCI 140. Struct & Finan of US Hlthcare. 3 Credits.
Organization and financing of the U.S. health care system; discussion of current issues in health reform. Prerequisite: HSCI 021; ENGS 001 or equivalent.

HSCI 160. Health Communication. 3 Credits.
Students will work together to investigate the nature of health communication and explore the ways in which health communication is intertwined with public health and health care. Prerequisites: HSCI 021, ENGS 001 or equivalent; minimum Sophomore standing.

HSCI 190. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

HSCI 192. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

HSCI 196. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

HSCI 197. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory-level course in the discipline, for which credit is awarded. Offered at department discretion.

HSCI 198. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

HSCI 230. SU:Reading and Eval. Research. 3 Credits.
Critical reading and analysis of varied types of health literature and research. Examination of research methods and evaluation of published literature viewed through a sustainability framework. Prerequisites: STAT 111 or STAT 141; Health Sciences majors.

HSCI 240. Project Planning and Eval.. 3 Credits.
In stages, create a project proposal and evaluation plan for a health-related program. A complete proposal and evaluation plan will be required of each student as the final course outcome. Prerequisites: HSCI 130; Health Sciences major; minimum Junior standing.

HSCI 250. Writing for Health Profess.. 3 Credits.
Review of principles of good writing with an emphasis on non-technical writing commonly used in health care organizations, and organizations that support health and health care in the U.S. and globally. Adaptation of materials for lay or low literacy audiences. Prerequisites: HSCI 160; Health Sciences major; minimum Junior standing.

HSCI 280. Capstone. 3 Credits.
The health-related capstone is a service-learning based course that provides an opportunity for students to integrate their academic learning and skills while gaining exposure to health issues and populations through a service placement with a community agency. Prerequisites: All HSCI required courses unless permission granted from instructor; Health Sciences Majors Only; Senior Standing.

HSCI 290. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

HSCI 292. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

HSCI 296. Special Topics. 1-18 Credits.
See Schedule of Course for specific titles.

HSCI 297. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory-level course in the discipline, for which credit is awarded. Offered at department discretion.

HSCI 298. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

Medical Laboratory Science Courses

MLS 090. Internship. 1-3 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.
MLS 092. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

MLS 096. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

MLS 190. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

MLS 191. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

MLS 196. Intermediate Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

MLS 197. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

MLS 198. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

MLS 220. Clinical Practicum: Chemistry. 3 Credits.
Experiences in an approved clinical laboratory education site in the area of clinical chemistry. Prerequisite: Medical Laboratory Science Seniors only.

MLS 221. Clinical Chemistry I. 4 Credits.
Lectures and laboratory experiences introduce basic principles in clinical quantitative analysis and laboratory instrumentation; test results are correlated with clinical case studies. Prerequisites: ANPS 019, ANPS 020, CHEM 032; CHEM 042 or CHEM 141.

MLS 222. Clinical Chemistry II. 3 Credits.
Advanced instruction in body chemistry and pathophysiology of disease with emphasis on diagnostic lab techniques in chemistry. Prerequisites: MLS 221, PATH 101.

MLS 230. Clinical Practicum: Hematology. 3 Credits.
Experiences in approved clinical laboratory education site in the area of clinical hematology. Prerequisite: Medical Laboratory Science Seniors only.

MLS 231. Hematology. 3-4 Credits.
Advanced theory and analysis of blood cell physiology and related pathology. Concepts of hemostasis and clinical assessment methods. Prerequisites: One semester of organic chemistry, one semester of biochemistry.

MLS 250. Clin Practicum: Microbiology. 3 Credits.
Experiences in an approved clinical laboratory education site in the area of clinical microbiology. Prerequisite: Medical Laboratory Science Seniors only.

MLS 255. Clinical Microbiology II. 3 Credits.
Comprehensive study of non-bacterial pathogenic microorganisms and their disease states in humans. Includes medical mycology, parasitology and virology. Prerequisites: MMG 065 or MMG 101.

MLS 260. Clin Practicum: Immunohematolog. 3 Credits.
Experiences in an approved clinical laboratory education site in the area of clinical Immunohematology. Prerequisite: Medical Laboratory Science Seniors only.

MLS 262. Immunohematology. 4 Credits.
Advanced theory and experience related to human blood groups and transfusion practice. Prerequisite: MLRS 242 or MMG 223.

MLS 272. MDS Practicum. 16 Credits.
Practical experiences in molecular diagnostic applications at various locations which include FAHC Laboratories, State of Vermont Health Department Laboratory and other UVM affiliate sites. Medical Laboratory Science Seniors only.

MLS 282. Public Health Lab Practicum. 12 Credits.
Public health laboratory experiences under the direction of public health scientists, performing methods for screening and diagnostic purposes as well as good public health practice. MLS Seniors.

MLS 290. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

MLS 291. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

MLS 292. Topics in Medical Lab Science. 3 Credits.
Seminar on topics in the practice and profession of Medical Laboratory Science. Online course. MLS majors only.

MLS 296. Advanced Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

MLS 297. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

MLS 298. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.
Radiation Therapy Courses  

**RADT 090. Internship. 1-3 Credits.**  
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.  

**RADT 092. Independent Study. 1-18 Credits.**  
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.  

**RADT 096. Special Topics. 1-18 Credits.**  
See Schedule of Course for specific title. Offered at department discretion.  

**RADT 152. Prin of Radiation Therapy. 3 Credits.**  
Introduction to the practice and theory of radiation therapy through lectures and discussions. Prerequisite: MLRS 140.  

**RADT 173. Intro to Clinical Practice. 3 Credits.**  
Introduction to the clinical environment through activities which include patient care issues, treatment unit operations and manipulations and direct patient case. Includes a clinical practicum. Pre-requisite: RADT 152.  

**RADT 174. Clinical Practicum II. 2 Credits.**  
Students participate and observe in the University of Vermont Medical Center Radiation Therapy Department. Prerequisite: RADT 173.  

**RADT 176. Clinical Radiation Oncology. 3 Credits.**  
The various types of neoplasms, methods of diagnosis of treatment, and elementary pathology are presented. Radiation Therapy majors only. Prerequisites: ANPS 019 - ANPS 020 and concurrent enrollment in RADT 174.  

**RADT 190. Internship. 1-18 Credits.**  
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.  

**RADT 192. Independent Study. 1-18 Credits.**  
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.  

**RADT 196. Special Topics. 1-18 Credits.**  
See Schedule of Course for specific title. Offered at department discretion.  

**RADT 197. Teaching Assistantship. 1-3 Credits.**  
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.  

**RADT 198. Undergraduate Research. 1-18 Credits.**  
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.  

**RADT 199. Clinical Practicum. 2 Credits.**  
Radiation Therapy students actively participate in the delivery of radiation therapy at the department of Radiation Oncology at the University of Vermont Medical Center. Students will also rotate through other areas in the hospital pertinent to their profession. Prerequisite: RADT 173.  

**RADT 215. CT Procedures. 3 Credits.**  
Provides in-depth study of the concepts, use and practice of CT Procedures related to Nuclear Medicine Technology and Radiation Therapy. Prerequisites: ANPS 019, ANPS 020, BHSC 175.  

**RADT 223. Clinical Practicum III. 3 Credits.**  
A continuation of RADT 174 emphasizing increasing clinical capabilities. Prerequisite: RADT 174.  

**RADT 244. Essentials of Patient Care. 3 Credits.**  
Prepares students to work as members of the radiation therapy team in which a faculty member is the instructor of record, for which credit is awarded. Offered at department discretion.  

**RADT 270. Dosimetry Concepts. 3 Credits.**  
This course introduces students to dosimetry, treatment planning and quality assurance concepts to prepare for clinical Dosimetry rotations. Pre/Co-requisites: MLRS 140, MLRS 141, MLRS 175, MLRS 215; RADT 174, RADT 176.  

**RADT 274. Clinical Practicum IV. 11 Credits.**  
RADT students are assigned to approved clinical education sites to observe and increase their participation in the clinical environment. Evaluations based on defined clinical objectives and competencies to be completed by the clinical and University faculty. Spring. Prerequisites: Successful completion of all previous required major courses and concurrent enrollment in RADT 280.  

**RADT 275. Dosimetry. 3 Credits.**  
This course introduces students to dosimetry, treatment planning and quality assurance concepts to prepare for clinical Dosimetry rotations. Pre/Co-requisites: MLRS 140, MLRS 141, MLRS 175, MLRS 215; RADT 174, RADT 176.  

**RADT 277. Techniques Radiation Therapy. 4 Credits.**  
Helps prepare students for the American Registry of Radiologic Technologists national certification exam. Prerequisites: RADT 244, RADT 275. Co-requisites: RADT 223, RADT 277.
RADT 279. Final Clinical Pract Overview. 1 Credit.
To orient the student to a new radiation oncology department; understand basic patient flow and essential equipment. The student is also responsible for completing all necessary orientation requirements at the organization, department level, or both. This includes understanding relevant policies and procedures and SOP’s. Prerequisites: RADT 275, RADT 176, RADT 174, RADT 244; Senior standing. Co-requisites: RADT 274, RADT 280.

RADT 280. Qual Assurance&Treatment Plan. 2 Credits.
The integration of clinical oncology, radiobiology, dosimetry, and treatment planning, and how they affect patient outcomes. Prerequisites: RADT 223, RADT 277, RADT 278; Senior standing. Co-requisite: RADT 274.

RADT 290. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

RADT 292. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

RADT 296. Special Topics. 1-18 Credits.
See Schedule of Course for specific title. Offered at department discretion.

RADT 297. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

RADT 298. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.