The medical technology program (also called clinical laboratory science) was established at the University of Minnesota in 1922 to prepare men and women for professional work in laboratory science and advanced study. This program provides a strong foundation in the sciences together with rich experiences in the clinical laboratory. Approximately 20 percent of medical technology graduates go on to complete an advanced degree.

Clinical laboratory scientists (medical technologists) perform many and varied laboratory analyses and use critical thinking in determining the correctness of test results. They recognize the interdependency of testing information and have knowledge of physiologic and pathologic conditions affecting results in order to validate them. In many health care settings, they provide data used by physicians in determining the presence, extent, and, as far as possible, causes of disease.

Clinical laboratory scientists/medical technologists

- develop and establish procedures for collecting, processing, and analyzing biological specimens and other substances;
- perform analytical tests of body fluids, cells, and other substances.
- integrate and relate data generated by various clinical laboratories while making decisions regarding possible discrepancies;
- confirm abnormal results, verify and execute quality control procedures, and solve problems concerning the generation of laboratory data.
- make decisions concerning the results of quality control and quality assurance measures and institute proper procedures to maintain accuracy and precision.
- establish and perform preventive and corrective maintenance of equipment and instruments as well as identify appropriate sources for repairs.
- develop, evaluate, and select new techniques, instruments, and methods in terms of their usefulness and practicality within the context of a given laboratory’s personnel, equipment, space, and budgetary resources.
- demonstrate professional conduct through interpersonal skills with patients, laboratory personnel, other health care professionals, and the public.
- participate in continuing education for growth and maintenance of professional competence.
- provide leadership in educating other health personnel and the community.
- exercise principles of management, safety, and supervision.
- apply principles of educational methodology.
- apply principles of current information systems.


Tests and procedures are performed or supervised by laboratory technologists in hematology, coagulation, microbiology, immunohematology, immunology, clinical chemistry, and urinalysis. Subspecialty areas in which laboratory personnel work include such fields as molecular diagnostics, cytogentic, fertility testing, flow cytometry, tissue typing, bone and skin banks, forensics, and infection control.

As complexities of clinical laboratories increase, many medical technologists specialize in immunohematology, hematology, microbiology, chemistry, immunology, virology, coagulation, administration, computer science, education, quality assurance, and other areas. There are opportunities for graduates to work in hospital laboratories, clinics, physician offices, public health agencies, research, and industry.

As a general rule, a student who has excelled in scientific subjects in high school will succeed in medical technology.

The program is fully accredited by the National Accrediting Agency for Clinical Laboratory Sciences, 8410 West Bryn Mawr, Suite 670, Chicago, IL 60631 (773/714-8880; e-mail NAACLS@mcs.net).

Facilities

Health sciences facilities are in a complex of buildings on the East Bank of the Minneapolis campus, including the Mayo Memorial Building, Malcolm Moos Health Sciences Tower, Weaver-Densford Hall, and the Phillips-Wangensteen Building. Close to or connected with the complex are Fairview-University Medical Center, Dwan Variety Club Cardiovascular Research Center, Veterans of Foreign Wars Cancer Research Center, and Children’s Rehabilitation Center. Extensive resources and services of the Bio-Medical Library, including the Learning Resources Center, are housed in Diehl Hall.

These facilities provide learning, research, and internship sites for many students. They are excellent research centers, not only for studying diseases, healthy physiological processes, and environmental health, but also for developing new procedures and delivering expert health care. The proximity of the Academic Health Center units to each other and to the rest of the campus facilitates interdepartmental communication and underscores the interdisciplinary nature of health care. The Academic Health Center units also maintain affiliations with many hospitals and health care facilities around the Twin Cities and greater Minnesota, which afford students access to a wide spectrum of health care situations.

Clinical experiences for University of Minnesota medical technology students are available at the Veterans Affairs Medical Center, Abbott-Northwestern Hospital, and Fairview Hospital and Healthcare Services (Minneapolis); Mayo Clinic (Rochester); and the North Central Blood Services of St. Paul.

Admission

The Division of Medical Technology sets its own standards and requirements for admission. These require a strong background in the natural sciences (specifically biology, chemistry, human anatomy, and physiology), as well as in the social and behavioral sciences. The division
that, if necessary, they may complete required courses.

**Application Process**

The medical technology curriculum consists of the preprofessional program in the College of Liberal Arts (CLA) or its equivalent at another regionally accredited institution and the professional program in the Division of Medical Technology, which is part of the Department of Laboratory Medicine and Pathology of the Medical School.

**Admission to Preprofessional Program**—Students in the preprofessional program must meet the admission criteria and are subject to CLA’s academic regulations or their equivalent at another institution. For complete information, see the CLA section of this catalog.

Qualifying applicants may enter CLA at the beginning of any semester, but the medical technology sequence is based on entrance to the professional program in the fall semester of year three or four, depending on prerequisite completion.

Admission to the preprofessional program does not assure admission to the professional program.

It is recommended that prospective students take mathematics, physics, chemistry, and biology in high school.

**Admission to Professional Program**—For admission to the Division of Medical Technology, a student must have completed 60 semester credits, including required courses. The major criterion for admission is satisfactory academic performance as judged by the student’s GPA in prerequisite courses. Students are usually admitted once each year for the fall semester. Admission to the professional program is competitive because of the limited number of students who can be accommodated in the teaching and clinical facilities.

Students in residence at the University of Minnesota who expect to complete the requirements for admission to the professional program must file a Change of College or Status form with the Office of the Registrar, 200 Fraser Hall, by May 1. Those who have sufficient credits but have course deficiencies should consult with Division of Medical Technology advisers regarding their status.

Students from other regionally accredited colleges and universities may transfer to the University of Minnesota to complete the medical technology program.

Courses completed that are equivalent to those offered at the University of Minnesota are accepted to satisfy the requirements for admission to the Division of Medical Technology. Students who have a baccalaureate degree in science or a related field under the direction of an adviser.

**English Proficiency**—If students are not native speakers of English, they must take the Test of English as a Foreign Language (TOEFL) or the Michigan English Language Assessment Battery (MELAB). To register for the TOEFL, students should contact the agency that handles TOEFL registration in their country or write to the Educational Testing Service (Box 6151, Princeton, NJ 08541, USA) at least 10 weeks before any scheduled test date. If students are already in the Twin Cities area, they may register for the MELAB with the Minnesota Medical Technology, University of Minnesota, 320 16th Avenue S.E., Minneapolis, MN 55455, or call (612) 624-1503. To register for the MELAB outside the Twin Cities area, contact the English Language Institute, Testing and Certification Division, University of Michigan, Ann Arbor, MI 48109, USA, or call (734) 764-2416. The minimum scores required are 572 for the TOEFL (230 on the computer-based exam) or 84 for the MELAB.

Those who have completed two years of instruction at a college or university where English is the language of instruction may have the English requirement waived.

**Degrees**

**Bachelor of Science**—The Division of Medical Technology offers the bachelor of science (B.S.).

**Master of Science**—Graduate work in clinical laboratory science is available for qualified candidates who wish to prepare for a career of research, teaching, or work in industry. The master of science (M.S.) program in clinical laboratory science is offered by the Graduate School. The program is offered only under Plan A (master’s degree with thesis). Each student must complete a thesis involving independent research in one of the subareas of this field under the direction of an adviser.

Admission requirements include a bachelor’s degree from an accredited institution of higher learning with sufficient scholarly attainment in medical technology or chemistry and the biological sciences to justify graduate work in these areas.

For more information, see the Graduate School Catalog or contact Clinical Laboratory Science Graduate Program Coordinator, Box 609 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455-0374 (612/625-8952).

**Policies**

**Immunizations**—All students in the medical technology program are expected to arrange appointments at the Boynton Health Service for necessary immunizations before assignment to the clinical courses of the professional program. This procedure is required to protect students.

**Background Check**—Medical technology students are placed in a variety of clinical settings during their clinical coursework. In accord with Minnesota law, a criminal background check is required of each student before clinical courses. The Division of Medical Technology arranges this check.

**Satisfactory Academic Progress**—Students in the professional program are subject to the regulations established by the Division of Medical Technology and must maintain satisfactory academic progress.

Satisfactory performance is considered to be not only a passing level in scientific and technical skills together with theoretical knowledge, but also complete personal integrity and honesty.
Students not achieving satisfactory progress may be placed on scholastic probation upon recommendation of the Student Scholastic Standing Committee (SSSC). This committee is composed of Division of Medical Technology faculty and student representatives, as appropriate.

Students’ work is considered unsatisfactory when they earn less than a C grade average (2.0 grade points for each credit) for any course in a given year or semester. In addition, students must earn a minimum grade of C in selected courses to enroll in related clinical rotations.

If students receive an unsatisfactory grade in a course, remedial work in the course may be provided, if possible; if not, students must repeat the course the next time it is offered. If students receive an unsatisfactory grade in more than one course, either concurrently or in different semesters, the matter is referred to the SSSC for investigation and action. If the committee decides students should not continue in the curriculum, students are notified. Ordinarily, unsatisfactory grades in two courses are sufficient basis for dismissal.

Medical Technology Essential Functions

To successfully complete a clinical laboratory science program, medical technology students must be able to perform the following functions.

Communication skills—Must be able to communicate effectively in written and spoken English; comprehend and respond to both formal and colloquial English—person-to-person, by telephone, and in writing; appropriately assess nonverbal as well as verbal communication.

Locomotion—Must be able to move freely from one location to another in physical settings, such as the clinical laboratory, patient areas, corridors, and elevators.

Small motor skills—Must have sufficient eye-motor coordination to allow delicate manipulations of specimens, instruments, and tools. Must be able to grasp and release small objects (e.g., test tubes, microscope slides); twist and turn dials/knobs (e.g., for a microscope, balance, or spectrophotometer); manipulate other laboratory materials (e.g., reagents and pipettes).

Other physical requirements—Must be able to lift and move objects of at least 20 pounds. Must have a sense of touch and temperature discrimination.

Visual acuity—Must be able to identify and distinguish objects macroscopically and microscopically; read charts, graphs, and instrument scales.

Safety—Must be able to work safely with potential chemical, radiologic, and biologic hazards and follow prescribed guidelines for working with all potential hazards, including mechanical and electrical.

Professional skills—Must be able to follow written and verbal directions; work independently and with others and under time constraints; prioritize requests and work concurrently on at least two different tasks; maintain alertness and concentration during a normal work period.

Stability—Must possess the psychological health required for full use of abilities; recognize emergency situations and take appropriate actions.

Affective (valuing) skills—Must show respect for self and others and project an image of professionalism, including appearance, dress, and confidence.

Application skills—Must be able to apply knowledge, skills, and values learned from previous coursework and life experiences to new situations.

Certification and Placement

Division of Medical Technology graduates are eligible to take national examinations for certification as medical technologists or clinical laboratory scientists. These examinations are conducted by national certifying agencies. Many organizations/institutions require certification for employment.

Program graduates are assisted in finding employment by Division of Medical Technology advisers. Notices of employment opportunities in the field are received from all parts of the United States and are posted in this office.

Licensure

The licensed medical technologist practices in accordance with the requirements of individual state laws. In some states, a medical technologist must participate in continuing education courses for license renewal. Minnesota does not require a license to practice.

Advising

Pre-Health Sciences Advising—College of Liberal Arts Pre-Major Advising, 30 Johnston Hall, is a centralized resource offering a wide range of services to University students. Health sciences specialists offer academic advising services, such as assistance with course planning and registration, evaluation of coursework already completed, and information about admission requirements and application or testing procedures. Specialists also assist individuals in exploring various health care fields and careers.

A health sciences library is available in 30 Johnston Hall. It contains a collection of bulletins from schools throughout the country with health-related programs, videotapes from many health sciences schools, occupational files with information about health sciences professions, and general reference materials about health care fields.

For more information or to arrange an advising appointment, call (612) 624-9006.

Medical Technology Advising—The Division of Medical Technology offers centralized advising services to undergraduates currently enrolled or interested in medical technology. In addition, medical technology advisers work closely with the College of Liberal Arts pre-health science advisers. For more information, contact the medical technology office, 15-170 Phillips-Wangensteen Building (612/625-9490).

Special Learning Opportunities and Resources

Minority Program—The Academic Health Center’s Multicultural Institute is committed to the recruitment and retention of minority persons who come from groups underrepresented in the health professions. At the undergraduate level, the program provides summer enrichment programs and a minority pre-health sciences student organization. Advising and special courses are also offered through the Martin Luther King Program.

The Multicultural Institute is in 1-125 Malcolm Moos Health Sciences Tower, 515 Delaware Street S.E. (612/624-9400).
Scholarships

The Division of Medical Technology has four scholarship programs for students in the professional program. Awards are made on the basis of scholastic achievement, need, and professional promise. For more information, contact the medical technology office, 15-170 Phillips-Wangensteen Building (612/625-9490).

Career Paths

The following career paths list represents positions taken by University of Minnesota medical technology graduates. It depicts the opportunity and versatility afforded by a medical technology (laboratory science) degree for positions not only in hospital laboratories, but also in industry, research, public health, government, information systems, consulting, reference (private) laboratories, and education.

Hospital/Medical Center: Laboratory Areas

- Acute care
- Andrology/Fertility testing
- Blood bank
- Bone marrow
- Cell markers
- Chemistry
- Coagulation
- Computer science
- Components—Transfusion service
- Cytogenetics
- Cytdiagnostic urinalysis
- Cytology/Histology
- Development laboratory
- Drug analysis (toxicology)
- Endocrinology
- Flow cytometry
- Forensic science
- Genetics
- Hematology
- Immunology
- Immunopathology
- Immunophenotyping
- Infection control
- Microbiology
- Molecular diagnostics
- Mycology
- Nuclear medicine
- Out patient or clinic laboratory
- Parasitology
- Pathology—Surgical, autopsy
- Phlebotomy/Specimen processing
- Platelet studies
- Photography/Illustration (e.g., in forensic medicine)
- Quality assurance
- Serology
- Skin or bone bank
- Special stains
- STAT laboratory
- Tissue typing
- Transplant services
- Virology

Health Care Agency/Government

- Administrator for Veterans Affairs hospital
- Biometrist in a government health agency
- Crime laboratory scientist
- Department of Health—Educator
- Department of Health—Proficiency test consultant
- Employee recruiter/Placement officer
- Environmental health specialist (inspector)
- Environmental pathology technologist
- Fraud investigator
- Health management organization—Health educator
- JCAHO Survey team member/CAP inspector
- Medical examiner investigator (e.g., for coroner)
- Military service—Armed Forces, ROTC, National Guard
- NASA mission specialist
- Patient educator
- Private investigator FBI/Special agent (forensic lab)

Health Care Administration

- Clinic manager
- Coder—Abstractor (business or medical records office)
- Consultant service specialist
- Personnel director
- Emergency medical services coordinator
- Financial manager
- Group practice administrator
- Hazardous waste coordinator
- Health care administrator
- Health insurance administrator
- Health policy analyst
- Health promotion coordinator
- Hospital quality assurance coordinator
- Infection control officer
- Epidemiologist
- Laboratory supervisor
- Laboratory director
- Laboratory utilization review coordinator
- Long-term care administrator
- Mental health administrator
- Purchaser (laboratory/hospital/medical center)
- Staffing coordinator (laboratory or home care)

Management Information System

- Biometrician
- Director—Division of Biometry
- Installer/Educator
- Systems analyst
- Programmer

Health Maintenance Organization

- Laboratory supervisor or administrator
- Consultant to Physician Office Laboratories
- Reference/Independent/Commercial Laboratory Scientist
- Veterinary Medicine Laboratory Scientist

Humanitarian Work

- Medical missionary work
- Peace Corps
- Project HOPE, others

Education

- Academican
- Allied health dean/Health sciences administrator
- Education coordinator or program director
- Educator of students in clinical settings
- Faculty member in CLS/CLT/Cyto/SBB program
- Higher education administrator
- Instructor in veterinary medicine or other allied health program
- Medical community services program coordinator

Other Professional Routes

- Accounting
- Dentistry
- Health radiation science
Law (e.g., patent attorney)
Legislature—Politician, lobbyist, regulations writer
Medical Physics/Engineering
Medicine
Optometry
Public health
Veterinary medicine

Industry (U.S. or International)
Adviser to or inventor of “home” or other lab tests
Biomedical specialist—Occupational health
Cell culture consultant
Computer consultant
Director of marketing
Editor/manager—Medical publications
Food technologist—Quality assurance manager
Health care reimbursement coordinator
Health promotion and education specialist
Industrial hygiene specialist
Installation specialist
Insurance underwriter
Manager—Health claims administration
Medical claims reviewer/Auditor/Insurance processor
Medical consultant (TV/Movie industry)
Medical fee analyst—Insurance
Owner/Director of employee placement service
Product specialist
Quality control/Quality assurance monitor/Director
Research and development director
Research scientist
Risk management representative—Insurance
Salesperson
Technical representative

Research—Basic and Applied
Research assistant
Associate scientist/Scientist
Director of research

Student Organizations

Council for Health Interdisciplinary Participation—The Council for Health Interdisciplinary Participation (CHIP) is an interdisciplinary student service organization dedicated to enhancing the quality of life and education of all Academic Health Center students. Activities include noontime lectures, evening workshops, and weekend symposia in areas such as bioethics, international health, alternative health care, and women’s issues. CHIP publishes a newsletter featuring announcements of upcoming health sciences events, volunteer opportunities, and articles about topics of current interest to students. CHIP headquarters are located in an informal, comfortable lounge in 1-425 Malcolm Moos Health Sciences Tower. For more information, call (612) 625-7100.

Medical Technology Student Council—Students in the professional or preprofessional program are represented on the Medical Technology Council by elected members from each class. The council promotes student-faculty relationships, sponsors social and educational activities, and considers matters affecting students in the program.

Student Membership in Professional Organizations—Medical technology undergraduates are eligible for student membership in the American Society for Clinical Laboratory Science. Medical technology students are also urged to participate in the activities of the Academic Health Center’s Council for Health Interdisciplinary Participation (CHIP) and other University student organizations.

Campus Contacts
Karen Karni or Patricia Solberg, Division of Medical Technology, University of Minnesota, Box 609 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455-0374. Offices at 15-170 Phillips-Wangensteen Building (612/625-9490; e-mail medtech@tc.umn.edu).
Medical Technology

B.S.

Admission Requirements—Prerequisite courses include composition, general biology, mathematics (college algebra or calculus), general inorganic chemistry, human anatomy, organic chemistry with laboratory, and physics. A minimum GPA of 2.50 is required for entrance to the program. Recent entering class average GPAs have been approximately 3.10.

Degree Requirements
The program requires a minimum of 120 credits of which at least 60 credits are prerequisites and liberal education courses (see “Liberal Education” in the Policies section of this catalog). Junior courses include biochemistry, physiology, microbiology, and genetics. Senior courses involve two semesters of professional coursework in hematology, coagulation/instrumentation, clinical chemistry and urinalysis, microbiology/mycology/virology/parasitology and immunohematology/immunology/molecular diagnostics. All required and recommended courses must be taken A-F.

Required Courses

Preprofessional Program
Biol 1009—General Biology
CBN 3001—Human Anatomy (with lab)
Chem 1021-1022—Chemical Principles I-II
Chem 2301-2302—Organic Chemistry I-II
Chem 2311—Organic Chemistry Lab
EngC 1011—University Writing and Critical Reading
Phys 1101—Fundamental Physics I (a higher-level course is permitted)
Two from Math 1031, 1142, 1155, 1271, 1272, Stat 3011

Professional Program
Year 3
Biol 4003—Genetics
or GCB 3022—Genetics
BioC 4001—Biochemistry
BioC 4002—Biochemistry of Physiological Processes
Phsl 3051—Human Physiology
EngC 3027—Advanced Expository Writing
VPB 2032—General Microbiology With Laboratory

Year 4
MedT 4010—Introduction to Clinical Laboratory Science
MedT 4065—Introduction to Clinical Immunohematology
MedT 4066—Introduction to Clinical Immunohematology: Laboratory
MedT 4080—Seminar: Specialty Rotations
MedT 4100—Virology, Mycology, and Parasitology for Medical Technologists
MedT 4102—Principles of Diagnostic Microbiology
MedT 4127—Introduction to Management and Education I
MedT 4128—Introduction to Management and Education II
MedT 4251—Hematology I: Basic Techniques
MedT 4252—Hematology II: Morphology and Correlation
MedT 4253—Hemostasis
MedT 4310—Clinical Chemistry I: Lecture
MedT 4311—Clinical Chemistry I: Laboratory Applications
MedT 4320—Clinical Chemistry II: Lecture
MedT 4321—Clinical Chemistry II: Laboratory Applications

Clinical Courses
MedT 4082—Applied Clinical Chemistry
MedT 4084—Applied Clinical Virology
MedT 4085—Applied Clinical Hematology
MedT 4086—Applied Clinical Immunohematology
MedT 4088—Applied Diagnostic Microbiology
MedT 4089—Specialty Rotation

Electives—Recommended courses
LaMP 4177—Pathology for Allied Health Students
MedT 1010—Orientation in Medical Technology (S-N)
MicB 4131—Immunology
Phys 1102—Fundamental Physics II
Phar 1002—Health Sciences Terminology

Final Project
After completing two semesters of professional coursework, students spend 23 weeks in the clinical laboratories of various health care institutions in the Twin Cities and Rochester, Minnesota, including six weeks in clinical chemistry, five weeks in hematology and coagulation, five weeks in microbiology, one week in virology, and one week in a specialty laboratory area such as molecular diagnostics. The senior year also includes a capstone course in management and education.