

This is the Resources and Policies; Introduction; and General Information sections of the 1997-1999 University of Minnesota Medical Technology Bulletin.

## Medical Technology

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### University of Minnesota Mission Statement

The University of Minnesota, founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation, and the world.

The University's mission, carried out on multiple campuses and throughout the state, is threefold:

- **Research and Discovery**—Generate and preserve knowledge, understanding, and creativity by conducting high-quality research, scholarship, and artistic activity that benefit students, scholars, and communities across the state, the nation, and the world.
- **Teaching and Learning**—Share that knowledge, understanding, and creativity by providing a broad range of educational programs in a strong and diverse community of learners and teachers, and prepare graduate, professional, and undergraduate students, as well as non-degree-seeking students interested in continuing education and lifelong learning, for active roles in a multiracial and multicultural world.
- **Outreach and Public Service**—Extend, apply, and exchange knowledge between the University and society by applying scholarly expertise to community problems, by helping organizations and individuals respond to their changing environments, and by making the knowledge and resources created and preserved at the University accessible to the citizens of the state, the nation, and the world.

In all of its activities, the University strives to sustain an open exchange of ideas in an environment that embodies the values of academic freedom, responsibility, integrity, and cooperation; that provides an atmosphere of mutual respect, free from racism, sexism, and other forms of prejudice and intolerance; that assists individuals, institutions, and communities in responding to a continuously changing world; that is conscious of and responsive to the needs of the many communities it is committed to serving; that creates and supports partnerships within the University, with other educational systems and institutions, and with communities to achieve common goals; and that inspires, sets high expectations for, and empowers the individuals within its community.

### Resources

This biennial bulletin focuses on undergraduate offerings in medical technology on the Twin Cities campus of the University of Minnesota.

The *Class Schedule*, distributed with registration materials before the registration period each quarter, lists course offerings with prerequisites, class hours, rooms, and instructors. It also includes registration instructions, final exam schedules, and other useful information.

Information about evening courses and summer school offerings is contained in the *University College Classes Bulletin* and *Summer Session Bulletin*, respectively.

**Bulletin Use**—The University of Minnesota will change to a semester-based academic calendar beginning academic year 1999-2000.

This bulletin is the last quarter-based bulletin that will be produced for the Division of Medical Technology. It covers academic years 1997-98 and 1998-99. Information about semester-based academic programs will be provided in the fall of 1998 in semester-transition publications.

The information in this bulletin and other University bulletins, publications, or announcements is subject to change without notice. University offices can provide current information about possible changes.

This publication is available in alternative formats upon request. Please contact the Office of Admissions, University of Minnesota, 240 Williamson Hall, 231 Pillsbury Drive S.E., Minneapolis, MN 55455 (612/625-2008; e-mail [admissions@tc.umn.edu](mailto:admissions@tc.umn.edu)).

This bulletin also is available in electronic format on the Internet and may be accessed at <http://www.umn.edu/commpub> on the World Wide Web.

## Policies

**Equal Opportunity**—The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

In adhering to this policy, the University abides by the Minnesota Human Rights Act, Minnesota Statute Ch. 363; by the Federal Civil Rights Act, 42 U.S.C. 2000e; by the requirements of Title IX of the Education Amendments of 1972; by Sections 503 and 504 of the Rehabilitation Act of 1973; by the Americans With Disabilities Act of 1990; by Executive Order 11246, as amended; by 38 U.S.C. 2012, the Vietnam Era Veterans Readjustment Assistance Act of 1972, as amended; and by other applicable statutes and regulations relating to equality of opportunity.

Inquiries regarding compliance may be directed to Stephanie Lieberman, Director, Office of Equal Opportunity and Affirmative

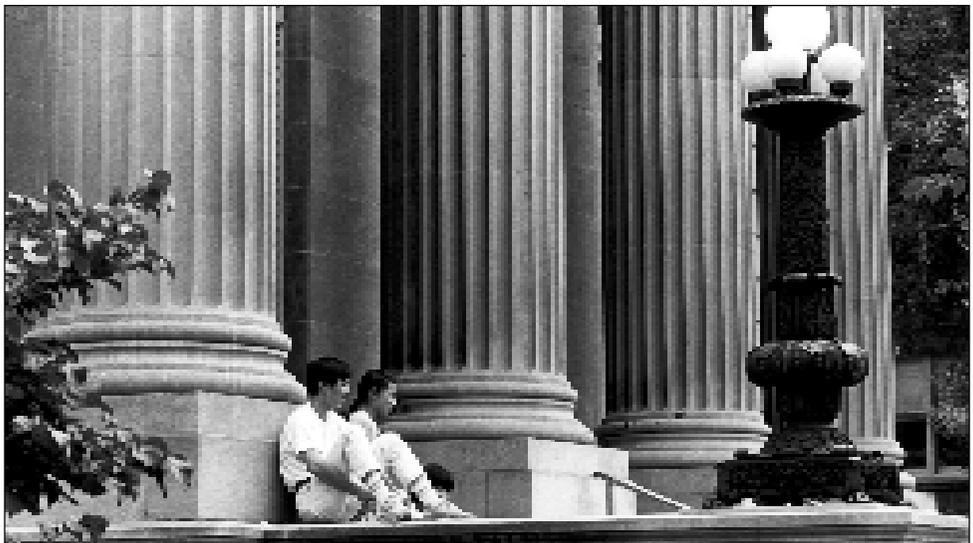
Action, University of Minnesota, 419 Morrill Hall, 100 Church Street S.E., Minneapolis, MN 55455 (612/624-9547).

**Immunization**—Students born after 1956 who take more than one University class are required under Minnesota law to submit an Immunization Record form.

The form, which is sent along with the official University admission letter, must be filled out and returned to Boynton Health Service within 45 days of the first term of enrollment in order for students to continue registering for classes at the University. Complete instructions accompany the form.

**Extracurricular Events**—No extracurricular events requiring student participation may be scheduled from the beginning of study day to the end of finals week. Exceptions to this policy may be granted by the Senate Committee on Educational Policy. The Senate advises all faculty that any exemption granted pursuant to this policy shall be honored and that students who are unable to complete course requirements during finals week shall be provided an alternative and timely opportunity to do so.

**Smoke-Free Campus Policy**—Smoking is prohibited in all facilities of the University of Minnesota, Twin Cities campus except for designated private residence hall rooms.



*University of Minnesota students enjoy Northrop Mall.*

# Introduction



## Development and Objectives

The program in medical technology (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 in science and laboratory medicine. This program provides a strong foundation in the sciences together with rich experiences in the clinical laboratory.

Clinical laboratory scientists (medical technologists) perform many and varied analyses and use critical thinking in determining the correctness of test results. They recognize the interdependency of tests 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.

*Source: National Accrediting Agency for Clinical Laboratory Sciences, Chicago, Illinois, 1995.*

Tests and procedures are performed or supervised by laboratory technologists in hematology, coagulation, microbiology, immunochemistry, immunology, clinical chemistry, and urinalysis. Subspecialty areas in which laboratorians work include such fields as molecular diagnostics, cytogenetics, 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 blood banking, 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 (312/714-8880; e-mail NAACLS@mcs.net).

## 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. Offices at 15-170 Phillips-Wangenstein Building (612/625-9490; e-mail medtech@tc.umn.edu).

### Facilities

Health sciences facilities are located 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 several facilities of the Jackson-Owre-Millard-Lyon quadrangle, 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 interdepartment 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 also available at the Veterans Affairs Medical Center and Abbott-Northwestern Hospital (Minneapolis), Mayo Clinic (Rochester), as well as the Memorial Blood Center of Minneapolis and North Central Blood Services of St. Paul.



*Medical technology students Tedla Belayneh (left) and Steven Wiesner study human blood cells in preparation for an examination.*

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

### Health Care Agency/Government

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

### Health Care Administration

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

### Management Information System

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

### Health Maintenance Organization

Laboratory supervisor→Administrator

### Consultant to Physician Office Laboratories

### Reference/Independent/ Commercial Laboratory Scientist

### Veterinary Medicine Laboratory Scientist

### Humanitarian Work

Medical missionary work	Project HOPE, others
Peace Corps	

### Education

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

### Other Professional Routes

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

### Industry (U.S. or International)

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

### Research—Basic and Applied

Research assistant	Director of research
Associate scientist/Scientist	

## General Information



## 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, anatomy, and physiology), as well as in the social and behavioral sciences. The division recommends that applicants be genuinely interested in human services and sincerely committed to promoting the public's health and general welfare.

Students generally enter the program described in this bulletin at the beginning of their junior year, after they have completed the required preprofessional courses. To discourage students from focusing too narrowly on a field of specialization and to ensure that all students receive a broad general education in the liberal arts, certain minimum requirements in several liberal arts categories have been established. To qualify for admission students are expected to complete these liberal education requirements as specified in this bulletin. In addition, students must complete specified preprofessional courses, some of which fulfill liberal education requirements.

## Planning to Transfer?

*Minnesota's public colleges and universities are working to make transfer easier. You can help if you PLAN AHEAD, ASK QUESTIONS, and USE PATHWAYS created by transfer agreements.*

## Preparing for Transfer

If you are currently enrolled in a college or university:

- Discuss your plans with your academic adviser.
- Call or visit your intended transfer program. You should obtain the following materials and information:
  - college catalog
  - transfer brochure
  - information on admissions criteria and on materials required for admission (e.g., portfolio, transcripts, test scores). Note that some majors have limited enrollments or their own special requirements such as a higher GPA
  - information on financial aid (how to apply and by what date).
- After you have reviewed these materials, make an appointment to talk with an adviser/counselor in the college or program

you want to enter. Be sure to ask about course transfer and admission criteria.

If you are not currently enrolled in a college or university, you might begin by meeting with a transfer specialist or an admission officer at your intended transfer college to plan the steps you need to take.

## Understanding How Transfer of Credit Works

- The receiving college or university decides what credits transfer and whether those credits meet its degree requirements. The accreditation of both your sending and your receiving institution can affect the transfer of the credits you earn.
- Institutions accept credits from courses and programs like those they offer. They look for similarity in course goals, content, and level. "Like" transfers to "like."
- Not everything that transfers will help you graduate. Baccalaureate degree programs usually count credits in three categories: general education, major/minor courses and prerequisites, and electives. The key question is, "Will your credits fulfill requirements of the degree or program you choose?"
- If you change your career goal or major, you might not be able to complete all degree requirements within the usual number of graduation credits.

## Applying for Transfer Admission

- Application for admission is always the first step in transferring. Fill out the application as early as you can before the deadline. Enclose the application fee.
- Request that official transcripts be sent from every institution you have attended. You might be required to provide a high school transcript or GED test scores as well.
- Recheck to be certain you supplied the college or university with all the necessary paperwork. Most colleges make no decisions until all required documents are in your file.
- If you have heard nothing from your intended college of transfer after one month, call to check on the status of your application.
- After the college notifies you that you have been accepted for admission, your transcribed credits will be evaluated for

transfer. A written evaluation should tell you which courses transfer and which do not.

How your courses specifically meet degree requirements may not be decided until you arrive for orientation or have chosen a major.

- If you have questions about your evaluation, call the Office of Admissions and ask to speak with a credit evaluator. Ask why judgments were made about specific courses. Many concerns can be cleared up if you understand why decisions were made. If not satisfied, you can appeal. See “Your Rights as a Transfer Student” below.

### Your Rights as a Transfer Student

- A clear, understandable statement of an institution’s transfer policy.
- A fair credit review and an explanation of why credits were or were not accepted.
- A copy of the formal appeals process. Usual appeals steps are: 1) Student fills out an appeals form. Supplemental information you provide to reviewers—a syllabus, course description, or reading list—can help. 2) Department or committee will review. 3) Student receives, in writing, the outcome of the appeal. 4) Student can appeal decision to the director of the program to which you are applying.
- At your request, a review of your eligibility for financial aid or scholarships.

*For help with your transfer questions or problems, see a pre-health sciences adviser.*

### Expenses

Tuition assessed at the University generally changes annually, subject to approval by the regents. The most up-to-date information about tuition and other fees, including the student services fee, appears in the quarterly *Class Schedule*. All tuition and fee charges are subject to change.

Students should plan for additional expenses, such as charges for uniforms, special equipment (e.g., microscopes), and insurance.

### Financial Aid

The Office of Scholarships and Financial Aid (OSFA) offers students financial assistance, including financial advising.

For most financial aid programs, students should submit application materials in January or February to be eligible for aid the following fall. Most aid programs require a completed Free Application for Federal Student Aid (FAFSA), which is available from OSFA and public libraries. Most aid is awarded on the basis of financial need and the availability of funds. For more information, contact the Office of Scholarships and Financial Aid, 210 Fraser Hall, 106 Pleasant Street S.E., Minneapolis, MN 55455 (612/624-1665).

The Office of Human Resources Student Employment Center posts job vacancies and refers qualified students for interviews for a variety of on- and off-campus jobs. The center is in 170 Donhowe Building, Minneapolis campus (612/624-8070).

### Medical Technology Scholarships

The Division of Medical Technology has four scholarship programs providing \$15,000 to \$20,000 each year (usually in \$500 to \$1000 scholarships) to worthy students in the professional program. Awards are made on the basis of scholastic achievement, need, and professional promise. At least 20 medical technology students receive these scholarships each year.

### Residency and Reciprocity

**Residence**—Because the University is a state institution, Minnesota residents pay lower tuition than nonresidents and, in many programs, receive priority consideration for admission. To qualify for resident status, students must reside in Minnesota for at least one calendar year before the first day of class attendance. For more information, contact the Resident Classification and Reciprocity Office, 240 Williamson Hall, 231 Pillsbury Drive S.E., Minneapolis, MN 55455 (612/625-6330), or the residency office on your campus.

**Reciprocity**—The University has reciprocity agreements with North Dakota, South Dakota, Wisconsin, and Manitoba. If you are a resident of any of these states or this province, you may qualify for reciprocity tuition rates, which are lower than nonresident tuition rates and, in some cases, comparable to resident rates. For more information, contact the Resident Classification and Reciprocity Office, 240 Williamson Hall, 231 Pillsbury Drive

S.E., Minneapolis, MN 55455 (612/625-6330), or the residency office on your campus.

## Health Sciences Student Services

**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.

**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).

**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 weekly 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.

## Academic Policies and Regulations

**Grading**—Students have a choice of two grading systems: A-B-C-D-F (with pluses and minuses) or Satisfactory-No Credit (S-N). Each academic unit, including Medical Technology, determines which courses and what percentage of courses its students can take S-N. Some courses, usually required preprofessional and professional courses, must be taken A-F only; others, such as clinical rotations, are taken S-N. Complete grading policies and practices may be found at [http://www.umn.edu/tc/students/grades/grading\\_systems.html](http://www.umn.edu/tc/students/grades/grading_systems.html) on the World Wide Web.

**Grade Reports and Transcripts**—The academic records of medical technology students on the Twin Cities campus are maintained by the Office of the Registrar. These records show all courses for which students were registered beyond the second week of each quarter and the grades or symbols earned for those courses. Transcripts are available on request from the Office of the Registrar Service Center, University of Minnesota, 150 Williamson Hall, 231 Pillsbury Drive S.E., Minneapolis, MN 55455 (612/625-5333).

**Academic Standing**—Each academic unit, including the Division of Medical Technology, establishes its own criteria and procedures for monitoring students' academic progress and determining whether students are progressing satisfactorily toward a degree. In the medical technology program, students must maintain a 2.00 grade point average (GPA) and satisfy certain other criteria.

**Access to Student Educational Records**—In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. (Exceptions under the law include state and federal educational and financial aid institutions.) The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, electronic (e-mail) address, telephone number,

dates of enrollment and enrollment status (full time, part time, not enrolled, withdrawn and date of withdrawal), college and class, major, adviser, academic awards and honors received, and degrees earned—is considered public or directory information. Students may prevent the release of public information. To do so, they must notify the records office on their campus.

Students have the right to review their educational records. The regents' policy is available for review at 150 Williamson Hall, Minneapolis, and at records offices on other campuses of the University. Questions may be directed to the Office of the Registrar, 150 Williamson Hall (612/625-5333).

**Grievance Procedures and Appeals**—Within the professional program, a student who has a complaint or criticism about the content or conduct of a course has recourse through well-established grievance procedures. Students are expected to confer first with the course instructor. If no satisfactory solution is reached, the complaint can be presented to the program director. If these informal processes fail to reach a satisfactory resolution, the division's Student Concerns Committee hears the evidence. A final appeal is heard by faculty from allied health units within the Academic Health Center.

A medical technology adviser can help interpret college procedures or regulations and can often suggest suitable alternatives when a problem is involved.

Other sources of assistance include the Student Ombuds Service (102 Johnston Hall), a student-fee-supported service that helps students resolve problems, and the CLA Student Intermediary Board, the college's official student organization (101 Johnston Hall).

## Application Process

The curriculum in medical technology consists of the preprofessional program in the College of Liberal Arts 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 the Preprofessional Program**—A student in the preprofessional program must meet the admission criteria and is subject to the

College of Liberal Arts' academic regulations or their equivalent at another institution. For complete information, consult the *College of Liberal Arts Bulletin*.

Qualified applicants may enter the College of Liberal Arts at the beginning of any quarter, but the medical technology sequence is based on entrance to the professional program in the fall quarter of year three or four, depending on completion of prerequisites.

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 the Professional Program**—For admission to the Division of Medical Technology, a student must have completed 90 quarter credits, including required courses. The major criterion for admission is satisfactory academic performance as judged by the student's grade point average (GPA) in prerequisite courses. Students are usually admitted once a year for the fall quarter. 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 Request for Change of College Within the University form with the Office of Admissions by May 30. Those who have sufficient credits but have course deficiencies should consult with advisers in the Medical Technology Office regarding their status.

Students from other regionally accredited colleges and universities may transfer to the University of Minnesota to complete the program in medical technology. 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 a science curriculum and have completed prerequisites may finish the program in 15 months, as space is available, in affiliated laboratories. Students transferring from other colleges may obtain an Application for Admission at <http://www.admissions.tc.umn.edu> on the World Wide Web or from the Office of

Admissions, 240 Williamson Hall, 231 Pillsbury Drive S.E., Minneapolis, MN 55455 (612/625-2008). These applications must be filed with the Office of Admissions by May 30. It is strongly advised that transfer students ascertain their status by writing to the Director, Division of Medical Technology, University of Minnesota, Box 609 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455, so that, if necessary, they may complete required courses during the summer.

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.

**English Proficiency**—If English is not your native language, you are required to take the Test of English as a Foreign Language (TOEFL) or the Michigan English Language Assessment Battery (MELAB). To register for the TOEFL, contact the agency that handles TOEFL registration in your country or write to the Educational Testing Service (Box 899, Princeton, NJ 08540 USA) at least 10 weeks before any scheduled test date. If you are already in the Twin Cities area, you may register for the MELAB with the Minnesota English Center, 320 16th Ave. S.E., University of Minnesota, 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 (313) 764-2416. The minimum scores required are 550 for the TOEFL or 80 for the MELAB.

**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 the student.

## Registration Procedures and Advisers

Students admitted to the professional program receive instructions and information about registration procedures from the Medical Technology Office before the fall quarter registration period.

All students, whether in the preprofessional curriculum in the College of Liberal Arts or in the professional curriculum in the Division of Medical Technology, are expected to plan their class schedule each quarter with a Medical Technology Office adviser.

## 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.

### Satisfactory 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.

A student not achieving satisfactory progress may be placed on scholastic probation upon recommendation of the Student Concerns Committee. This committee is composed of Division of Medical Technology faculty and student representatives, as appropriate.

A student's work is considered unsatisfactory when she or he earns less than a C grade average (2.00 grade points for each credit) for any course in a given year or quarter. In addition, a student must earn a minimum grade of C in selected courses to enroll in related clinical rotations.

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

### Graduation

The minimum requirements for graduation are completion of the curriculum requirements and

a total of 180 credits with a minimum grade point average of 2.00.

Upon satisfactory completion of the prescribed course of study, the bachelor of science degree will be conferred by the Board of Regents. Students completing professional program courses with a GPA of at least 3.00 may graduate "with distinction," and those with a GPA of 3.60 or higher may graduate "with high distinction."

Application for a degree must be filed with Office of the Registrar Service Center (150 Williamson Hall) two quarters before graduation. Students completing the related clinical courses any time before March will be eligible to participate in fall graduation ceremonies.

### Certification and Placement

Graduates from the Division of Medical Technology of the University of Minnesota 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 advisers in the Medical Technology Office. Notices of employment opportunities in the field are received from all parts of the United States and are posted in this office as an aid to students.

### Student Organizations

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.

Students in the undergraduate program in medical technology 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. For more information, see the introduction to this bulletin.

## Curriculum and Courses

This is the Curriculum and Courses section of the 1997-1999  
University of Minnesota Medical Technology Bulletin.



## Liberal Education Requirements

*Effective for all freshmen with fewer than 39 credits enrolling from fall 1994 to summer session II 1996. Beginning fall 1996, the liberal education requirements apply to all students entering a baccalaureate degree program, regardless of prior credits.*

A liberal education introduces you to the modes of inquiry and subject matter of the major branches of knowledge, including the factual information and theoretical or artistic constructs that form their foundations; the “ways of knowing”—the kinds of questions asked and how insight, knowledge, and data are acquired and used; the changes over time of their central ideas or expressive forms; and the interrelationships among them and with human society in general. To these ends, study by all undergraduate students on the Twin Cities campus is guided by a common framework.

### The Diversified Core Curriculum

**Physical and Biological Sciences.** Comprehension of physical and biological principles; understanding of and ability to use the methods of scientific inquiry—the ways in which scientists investigate physical and biological phenomena; and appreciation of the importance of science and the value of a scientific perspective.

*Requirement:* A minimum of three courses totaling at least 12 credits, including one course with a laboratory or field experience in the physical sciences and one course with a laboratory or field experience in the biological sciences.

**History and Social Sciences.** Knowledge of how historians and social scientists describe and analyze human experiences and behavior; study of the interrelationships among individuals, institutions, structures, events, and ideas; understanding of the roles individuals play in their historical, cultural, social, economic, and political worlds.

*Requirement:* A minimum of three courses totaling at least 12 credits, including one course with historical perspective.

**Arts and Humanities.** Understanding of approaches to the human condition through works of art, literature, and philosophy; knowledge of how artists create and humanistic scholars think; ability to make aesthetic judgments.

*Requirement:* A minimum of three courses totaling at least 12 credits including courses in two of the following: literature, philosophical perspective, and visual or performing arts.

**Mathematical Thinking.** Acquisition of mathematical modes of thinking; ability to evaluate arguments, detect fallacious reasoning, and evaluate complex reasoning chains; appreciation of the breadth of applications of mathematics and its foundations.

*Requirement:* A minimum of one course totaling at least four credits.

### The Designated Themes of Liberal Education

The designated themes of liberal education offer a dimension to liberal learning that complements the diversified core curriculum. Each of the themes focuses on an issue of compelling importance to the nation and the world, the understanding of which is informed by many disciplines and interdisciplinary fields of knowledge.

*Requirement:* A minimum of six courses (or five courses if one includes an approved practicum), including one course in each of the following:

**Cultural Diversity.** Understanding of the roles gender, ethnicity, and race play in structuring the human experience in and developing the social and cultural fabric of the United States.

**International Perspectives.** Comprehension of the ways in which you are part of a rapidly changing global environment dominated by the internationalization of most human endeavors.

**Environment.** Knowledge of the interaction and interdependence of the biophysical systems of the natural environment and human social and cultural systems.

**Citizenship and Public Ethics.** Reflection on and determination of a clearer sense of your present and future civic relationships and your obligations to the community.

### Writing Skills

The ability to communicate effectively is a hallmark of a liberally educated individual and a key to a successful and satisfying life. To encourage refining of writing skills, the liberal education curriculum includes both writing courses and writing across the curriculum.

*Requirement:* Writing skills requirements are being revised. Until the new requirements are in effect, all students will complete the writing requirement specified by the college awarding their baccalaureate degree.

You may satisfy the liberal education requirements with a number of courses and credits different from those of other students because some courses serve multiple goals in the curriculum; e.g., some courses will satisfy a diversified core requirement and a designated theme requirement, and other courses will satisfy the requirements for each of two themes. Thus, you may satisfy the designated theme requirements with a smaller number of courses than is stated in the requirement. Each quarter, the *Class Schedule* will publish the requirements and list all courses that satisfy them. In addition, the *Class Schedule* will list which of these courses are offered that quarter and which are tentatively scheduled for the subsequent quarters during the academic year.

### Minnesota Transfer Curriculum

If you complete the Minnesota Transfer Curriculum at any participating Minnesota college or university, you fulfill the University’s Twin Cities campus liberal education requirements. However, you will still need to complete a portion of the writing skills requirements. Contact your college advising office concerning these requirements. For more information on using transfer credits for the liberal education requirements, contact the Office of Admissions (612/625-2008).

## Curricular Requirements

### Bachelor of Science Program

To help students achieve a liberal education, the Division of Medical Technology expects each student to distribute some part of his or her coursework in areas of study outside the major.

To integrate the goals of both a liberal and professional education in a manner appropriate to a baccalaureate curriculum in medical technology, the program emphasizes vigorous training in the biological and physical sciences, with special emphasis on acquiring a knowledge of biology and chemistry that is basic to all facets of laboratory science. The program includes not only scientific information and technical skills but also the development of professional and caring attitudes and a commitment to lifelong learning.

In addition to prerequisite courses, liberal education courses are required. They do not have to be completed during the preprofessional years. Consult the *Class Schedule* for a complete listing of courses commonly used to meet liberal education requirements.

Students applying to the Division of Medical Technology who will be earning their second baccalaureate degree are not required to meet University of Minnesota liberal education requirements.

### Diversified Core

- Physical and biological sciences, 12-cr minimum, must include one laboratory course.
- History and social science, three courses, 12-cr minimum. One course must be in a historical perspective category.
- Arts and humanities, three courses, 12-cr minimum.
- Mathematical thinking, one course, 4-cr minimum.

### Designated Themes

Six courses from the following:

cultural diversity  
international relations  
citizenship and public ethics  
environment

### Writing Skills

See page 16.

**Preprofessional Program**—Students register in the College of Liberal Arts (CLA) or another comparable college for the preprofessional program. The following courses or their equivalents must be completed before admission to the professional program. (Quarter credits are indicated in parentheses.)

- CBN 3001—Elementary Anatomy (4)  
and CBN 3005—Anatomy Laboratory (1)
- Biol 1009—General Biology (5)
- Chem 1051-1052—General Principles of Inorganic Chemistry (8)
- Chem 3301-3302—Organic Chemistry (8) (lecture)
- Chem 3305-3306—Organic Chemistry Laboratory (4)
- Completion of the freshman composition requirement as defined by CLA.
- HSU 5210—Terminology of the Health Sciences (2)  
strongly recommended.
- Math 1031 or Math 1051 or Math 1251—College Algebra or Precalculus or Calculus (4) or Stat 3011—Statistical Analysis (8) (two courses from these four)
- MedT 1010—Orientation in Medical Technology (1)  
(optional, but recommended)
- Phys 1041-1042—Introductory Physics (10)
- Electives satisfying liberal education requirements to total 90 credits.

Other courses that are equivalent or more comprehensive may be substituted for the required courses. Students planning to pursue graduate programs or medical school should take three quarters of calculus and a higher-level physics. Students should also complete the freshman composition requirement in their first year.

Students who transfer into the preprofessional program are exempted from the MedT 1010 course. The credit earned in this course does not count toward a B.S. degree.

### The following program schedule is suggested for the preprofessional years (credits in parentheses):

	Fall	Winter	Spring
FIRST YEAR	Gen Chem 1051 (4) Core elective Math 1031 or 1051 or 1251 MedT 1010 (1) recommended	Engl Comp 1011 (5) Gen Chem 1052 (4) Core elective Elective	Biol 1009 (5) Core elective Core elective Elective
SECOND YEAR	Chem 3301 (4) Chem 3305 (2) HSU 5210 (2) Phys 1041 (5)	Chem 3302 (4) Chem 3306 (2) Phys 1042 (5) Core/theme electives	CBN 3001/3003 (5) (Anat) Stat 3011 (4) Core elective

Note: To complete the prerequisites in two years, elective courses must satisfy both a diversified core and a designated theme.

## CURRICULUM AND COURSES

**Professional Program**—Students register in the Division of Medical Technology for the professional program. The following courses must be completed to satisfy requirements for graduation. (Quarter credits are indicated in parentheses.)

Biol 5003—Genetics (4)  
 MdBc 5300, 5301—Biochemistry (7)  
 MedT 5010—Introduction to Clinical Laboratory Science (2)  
 MedT 5064, 5065—Introduction to Clinical Immunohematology (5) (lecture and laboratory)  
 MedT 5077, 5078—Hematology, Hemostasis/Instrumentation (6)  
 MedT 5080—Seminar: Specialty Rotations (1)  
 MedT 5082—Applied Clinical Chemistry (4)  
 MedT 5084—Applied Clinical Virology (1)  
 MedT 5085—Applied Clinical Hematology (4)  
 MedT 5086—Applied Clinical Immunohematology (4)  
 MedT 5088—Applied Diagnostic Microbiology (4)  
 MedT 5089—Specialty Rotation (1)  
 MedT 5100—Virology/Mycology/Parasitology (3) (lecture)  
 MedT 5102—Principles of Diagnostic Microbiology (5)  
 MedT 5127—Introduction to Management and Education (1)  
 MedT 5310—Clinical Chemistry I (2)  
 MedT 5311—Clinical Chemistry I—Laboratory Applications (2)  
 MedT 5320—Clinical Chemistry II (2)  
 MedT 5321—Clinical Chemistry II—Laboratory Applications (2)  
 MedT 5330—Clinical Chemistry III (2)  
 MedT 5331—Clinical Chemistry III—Laboratory Applications (2)  
 MedT 5765—Hematology Morphology (4)  
 Phsl 3051—Human Physiology (5)  
 VPB 3103—General Microbiology (5)

### Electives

LaMP 5177—Pathology (4) strongly recommended  
 MicB 5218—Immunology (3) recommended  
 MedT 5090—Special Laboratory Methods (1-2)  
 MedT 5092—Honors Program in Laboratory Methods (5)

Other courses in communications, economics, business, and computer science are recommended but not required.

The clinical courses (MedT 5082, 5084, 5085, 5086, 5088, and 5089) consist of applying basic methods and techniques in chemistry, virology, hematology, immunohematology, microbiology, and a specialty in the clinical laboratories of the Fairview-University Medical Center and other affiliated institutions. These clinical courses are usually offered fall and winter quarters and on a space-available basis during summer terms. Assignment to these courses is made on an individual basis; GPA is a criterion.

A minimum grade of C is required in each introductory course in order to enroll in each related clinical course. The introductory and related clinical courses are:

<u>Introductory Courses</u>	<u>Related Clinical Courses</u>
MedT 5064, 5065	MedT 5086
MedT 5077, 5078, 5765	MedT 5085
MedT 5310, 5311, 5320, 5321, 5330, 5331	MedT 5082
MedT 5100, 5102	MedT 5084, 5088

Registration in University College courses concurrently with clinical courses requires the consent of the Division of Medical Technology's Student Concerns Committee. A maximum of five quarter/semester credits may be taken in University College concurrently with the clinical courses.

**The following program schedule is suggested for the professional years (credits in parentheses):**

	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>	<i>Summer Session</i>
THIRD YEAR	Biochem 5300 (4) Comp 3033 (4) Phsl 3051 (5)	Biochem 5301 (3) Biol 5003 (4) Theme elective	LaMP 5177 (4) VPB 3103 (5) (Micro) Theme elective	No courses
FOURTH YEAR	MedT 5010 (2) MedT 5077 (3) MedT 5102 (5) MedT 5310 (2) MedT 5311 (2)	MedT 5127 (1) MedT 5078 (3) MedT 5100 (3) MedT 5080 (1) MedT 5320 (2) MedT 5321 (2)	MedT 5064/5065 (5) MedT 5765 (4) MedT 5330 (2) MedT 5331 (2)	Clinical rotations (8-9) (if available)
FIFTH YEAR	Clinical rotations (8-9)	Clinical rotations (8-9) (Two quarters/18 credits of clinical courses are required)	Clinical rotations (only if needed)	

## Master of Science Program

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 degree program in clinical laboratory science is offered by the Graduate School. The program is offered only under the Graduate School 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.

### Using the Course Descriptions

The course descriptions in this bulletin are primarily for courses offered by the Division of Medical Technology and taught by members of the program faculty or cooperating faculty from other educational units of the University. Meeting hours, days, and rooms for these courses are listed in the quarterly *Class Schedule*.

For complete listings and descriptions of courses taught by other educational units of the University, see the bulletins of those units.

**Course Numbers and Symbols**—Courses primarily for freshmen and sophomores are numbered 1000 through 1998; for juniors and seniors, 3000 through 3998; for juniors, seniors, and graduate students, 5000 through 5998. Courses numbered 8000 and above are open only to graduate students. The following symbols are used throughout the descriptions:

, ..... The comma, used in prerequisite listings, means "and."

† ..... All courses preceding this symbol must be completed before credit will be granted for any quarter of the sequence.

§ ..... Credit will not be granted if credit has been received for the course listed after this symbol.

¶ ..... Concurrent registration is required (or allowed) in the course listed after this symbol.

# ..... Approval of the instructor is required for registration.

Δ ..... Approval of the department offering the course is required for registration.

□ ..... Approval of the college offering the course is required for registration.

A prerequisite course listed by number only (e.g., prereq 5246) is in the same department as the course being described.

A hyphen between course numbers (e.g., 3142-3143-3144) indicates a sequence of courses that must be taken in the order listed.

A comma between course numbers (e.g., 1234, 1235, 1236) indicates a series of courses that may be entered any quarter.

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.

More information about the program is available in the *Graduate School Bulletin*. For detailed information, contact Claire Bjorklund, Graduate Programs Coordinator, Box 609 Mayo, 420 Delaware Street S.E., Minneapolis, MN 55455 (612/625-8952).

## Medical Technology Courses (MedT)

MedT 1010. Orientation in Medical Technology. (1 cr [no cr toward degree])

Orientation to the medical technology (clinical laboratory science) profession.

MedT 5010. Introduction to Clinical Laboratory Science. (2 cr; prereq regis professional MedT program)

Basic lab techniques. Centrifuges, analytical balances, photometry. Microscopy and pipetting. Calculations and quality control. Blood collection and specimen handling. Safety.

MedT 5064. Introduction to Clinical Immunohematology. (3 cr)

Lecture. Principles of blood grouping, antibody identification, compatibility testing, immunology, and serology.

MedT 5065. Introduction to Clinical Immunohematology. (2 cr)

Lab exercises illustrating basic techniques used in blood banking and immunology.

MedT 5077. Hematology I: Basic Techniques. (3 cr)

Theory and application of basic principles and techniques in clinical hematology. Lecture and lab.

MedT 5078. Hematology II: Hemostasis/Instrumentation. (3 cr; prereq 5077)

Theory and application of basic principles and techniques in hemostasis and hematology instrumentation. Lecture and lab.

MedT 5080. Seminar: Specialty Rotations. (1 cr; prereq regis professional MedT program)

Presentations describing each lab offering specialty rotations. For seniors planning their clinical rotation programs.

MedT 5082. Applied Clinical Chemistry. (4 cr; prereq 5310, 5311, 5320, 5321, 5330, 5331)

Application of basic methods and techniques in clinical chemistry in the lab.

MedT 5084. Applied Clinical Virology. (1 cr; prereq 5064, 5065, 5100, 5102)

Application of basic methods and techniques in the virology lab.

MedT 5085. Applied Clinical Hematology. (4 cr; prereq 5077, 5078, 5765)

Application of methods and techniques in clinical hematology, morphology, and hemostasis.

## CURRICULUM AND COURSES

MedT 5086. Applied Clinical Immunohematology. (4 cr; prereq 5064, 5065)  
Application of basic techniques and methods in blood banking and immunology in the clinical laboratory. Blood grouping, compatibility testing, and immunologic procedures.

MedT 5088. Applied Diagnostic Microbiology. (4 cr; prereq 5100, 5102)  
Identification of bacteria by biochemical and microscopic techniques. Assays for microbial antibiotic susceptibility. Identification of parasites and fungi.

MedT 5089. Specialty Rotation. (1 cr; prereq completion of MedT preclinical professional courses)  
One-week clinical rotation in a specialty lab such as immunophenotyping, cytogenetics, surgical pathology, molecular diagnostics, advanced virology, or advanced coagulation.

MedT 5090. Special Laboratory Methods. (1-2 cr)  
Assignment on an individual basis to one of a wide variety of special areas of experience in the clinical laboratory.

MedT 5092. Honors Program in Laboratory Methods. (5 cr)  
Individual assignment to special projects or research with more intensive treatment in one of the clinical areas of chemistry, hematology, immunohematology, or microbiology.

MedT 5100. Virology/Mycology/Parasitology for Medical Technologists. (3 cr; prereq VPB 3103 or equiv)  
Basic aspects of lab diagnosis of viral, fungal, and parasitic infections. Lecture.

MedT 5102. Principles of Diagnostic Microbiology. (5 cr; prereq VPB 3103)  
Current techniques used in the laboratory diagnosis of infectious disease; isolation and identification of bacteria and yeasts; antimicrobial susceptibility testing. Lecture and lab.

MedT 5127. Introduction to Management and Education. (1 cr)  
Basic concepts in management and education.

MedT 5310. Clinical Chemistry I. (2 cr)  
Renal structure and function and the analysis of urine and body fluids. Renal role in homeostasis and chemical methods to evaluate renal function. Quality assurance, quality control, reference ranges, method evaluation. Lecture.

MedT 5311. Clinical Chemistry I—Laboratory Applications. (2 cr)  
Basic lab techniques for analyzing urine and body fluids (physical, chemical, microscopic). Lab skills developed include performing renal function tests (e.g., creatinine, urea) and using instrumentation (e.g., spectrophotometers).

MedT 5320. Clinical Chemistry II. (2 cr)  
Electrolytes, acid-base balance, endocrinology, proteins, and carbohydrates. Emphasis on measurement methods and physiological relevance. Lecture.

MedT 5321. Clinical Chemistry II—Laboratory Applications. (2 cr)  
Analyzing electrolytes, osmolality, blood gases, hormones, and proteins. Development of lab skills and instrumentation use with emphasis on quality control and technique. Methods include nephelometry, electrophoresis, immunoassays, and colorimetric techniques.

MedT 5330. Clinical Chemistry III. (2 cr)  
Lipids, therapeutic drug monitoring, toxicology, enzymes, liver, and digestive tract. Emphasis on measurement methods and physiological relevance. Lecture.

MedT 5331. Clinical Chemistry III—Laboratory Applications. (2 cr)  
Analyzing lipids, drugs, enzymes, liver, and digestive function tests. Techniques include electrophoresis; affinity, thin-layer, and gas chromatography; immunoassays; and spectrophotometric techniques.

MedT 5765. Hematology Morphology. (4 cr)  
Morphology, development, and function of hematopoietic cells, with emphasis on examining peripheral blood and bone marrow. Correlation of hematology morphologic findings with specific physiologic or pathologic processes.

### Required Courses Offered by Other Units

CBN 3001/3003. Elementary Anatomy. (5 cr; prereq regis paramed fields, 1 qtr college biology)  
A general survey of human anatomy including histology, embryology, gross anatomy, and neuroanatomy, with some clinical and physiological correlations.

BioL 1009. General Biology. (5 cr)  
Introduction to the principles of biology. The cell, metabolism, heredity, reproduction, ecology, and evolution.

BioL 5003. Genetics. (4 cr, \$GCB 3022, \$GCB 5022; prereq 5001 or BioC 3021 or BioC 5331)  
Introduction to the nature of genetic information and its transmission from parents to offspring, expression in cells and organisms, and course in populations.

Chem 1051-1052. Chemical Principles I-II. (4 cr per qtr; primarily for science or engineering majors; prereq 1001 or passing placement examination; 3 lect, 1 lab discussion, one 3-hr lab per wk)  
Atomic theory; periodic properties of elements; chemical thermodynamics; development of structural concepts; geometry of molecules; bonding theory; behavior of gaseous and liquid states; solid state and materials; chemistry; dynamics; equilibrium; behavior of solutions; acids and bases; descriptive chemistry of elements and compounds.

Chem 3301-3302. Elementary Organic Chemistry I-II. (4 cr per qtr; prereq 1052 or equiv)  
Important classes of organic compounds, their constitutions, configurations, and conformations; relationship between molecular structure and chemical reactivity. Reactions of organic compounds, nucleophilic substitution and addition; electrophilic substitution and addition; elimination reactions; molecular arrangements; oxidation and reduction.

Chem 3305. Elementary Organic Chemistry Laboratory I. (2 cr; prereq 3301 or ¶3301)  
Lab techniques used in preparing, purifying, and characterizing typical organic substances.

Chem 3306. Elementary Organic Chemistry Laboratory II. (2 cr; prereq 3302 or ¶3302)  
Continuation of Chem 3305.

LaMP 5177. Pathology for Allied Health Students. (4 cr)  
General and systems pathology. Strongly recommended.

Math 1031. College Algebra and Probability. (4 cr, §1051, §1111, §1151, §1201; prereq 3 yrs high school math, placement exam or GC 0631 with a grade of C or better)

Algebra and analytic geometry explored in greater depth than is usually done in three years of high school mathematics. Additional topics from combinations, permutations, and probability. A suitable prerequisite for 1131 or 1142, but not for 1251.

Math 1051. Precalculus I. (4 cr, §1008, §1031, §1111, §1151, §1201; prereq 3 yrs high school mathematics, placement exam or GC 0631 with a grade of C or better) Algebra, analytic geometry, and trigonometry beyond the usual coverage found in a three-year high school mathematics program. First of two courses (see 1151). Prepares students for the full calculus sequence. Not an acceptable prerequisite for 1131.

Math 1251-1252. One-Variable Differential and Integral Calculus I-II. (4 cr each, §1211-1221, §1411H-1421H, §1451H-1452H; prereq 4 yrs high school mathematics including trigonometry or grade of C or better in 1151 or equiv; grade of C or better in 1251 required for 1252) Calculus of functions of one-variable and related geometry and applications.

MdBc 5300. Biochemistry. (4 cr; prereq organic chemistry, physics) Biochemical principles. Includes proteins, enzymes, biological energy metabolism, glycolysis, citric acid cycle, pentose phosphate pathway, gluconeogenesis, glycogen metabolism, fatty acid metabolism, amino acid metabolism, biological membranes. DNA, RNA, the genetic code, control of gene expression.

MdBc 5301. Biochemistry. (3 cr; prereq BioC 3021 or MdBc 5300) Biochemical principles. Includes protein synthesis, body fluids, hemoglobin, respiration, kidney function, acid base balance, endocrinology, nutrition, and vitamins.

PhsI 3051. Human Physiology. (5 cr) The study of normal function (processes) in humans.

Phys 1041-1042. Introductory Physics. (5 cr per qtr; prereq high school algebra and plane geometry; 4 lect, 1 rec, 2 lab hrs per wk) Lectures, recitation, and lab sessions. Primarily for students interested in topics useful in technical areas. Fundamental principles of physics in context of the everyday world. Use of kinematics, dynamics, and conservation principles with quantitative and qualitative problem-solving techniques to understand phenomena of mechanics, electromagnetism, and the structure of matter.

Stat 3011. Statistical Analysis. (4 cr per qtr; prereq college algebra) Descriptive statistics; elementary probability; estimation; one- and two-sample tests; correlation; introduction to regression; ANOVA; randomized blocks; multiple comparisons; factorial experiments; multiple regression; goodness of fit; nonparametric methods; contingency tables; selected topics.

VPB 3103. General Microbiology. (5 cr) Basic techniques in microbiology, including microscopy, culture techniques, and microbial structure and growth; application of microbiological techniques to a wide variety of disciplines, including food microbiology, environmental microbiology, and infectious disease. Lecture and lab.

## Graduate Courses in Medical Technology (MedT) or Clinical Laboratory Science (CLS)

- CLS 5120. Seminar: Medical Technology. (1-3 cr)  
CLS 5125. Practicum: Teaching. (max 3 cr)  
CLS 5128. Elements of Laboratory Administration. (3 cr)  
CLS 5130. Practicum in Laboratory Administration. (3 cr)  
CLS 5133. Medical Mycology. (4 cr)  
CLS 5135. Advanced Clinical Microbiology. (5 cr)  
CLS 5140. Techniques for Teaching. (3 cr)  
CLS 5145. Development of Medical Technology. (3 cr)  
CLS 5155. Advanced Clinical Hematology. (5 cr)  
CLS 5165. Advanced Clinical Immunohematology. (5 cr)  
CLS 5173. Analytic Techniques in Laboratory Medicine.  
CLS 5175. Advanced Clinical Chemistry. (5 cr)  
CLS 5179. Chemistry Seminar. (1 cr)  
CLS 8176. Advanced Topics in Clinical Chemistry. (Cr ar)  
CLS 8230. Advanced Medical Bacteriology. (Cr ar)