



Bachelor of Science in Medical Laboratory Science

Student Handbook // UPDATED MARCH 2023 //

Please note: this program is not admitting a new cohort for the 2023-24 academic year.

PROGRAM DESCRIPTION

The Medical Laboratory Science program at Colby-Sawyer college is a four-year program that leads to a Bachelor of Science degree. The program has one track, preparing students for careers as Medical Laboratory Scientists eligible to take the MLS(ASCP) exam.

PROGRAM MISSION STATEMENT

The mission of Colby-Sawyer's Medical Laboratory Science (MLS) program is to integrate the liberal education foundation with a focused preparation in practical laboratory skills that can be applied in medical, clinical and/or public health settings. Colby-Sawyer seeks to graduate professionally prepared laboratory scientists proficient in the area of clinical and medical laboratory work.

PROGRAM GOALS AND GRADUATE COMPETENCIES

Upon completion of the B.S. in Medical Laboratory Science, students will:

- Demonstrate proficiency in scientific testing in a variety of laboratory services
- Analyze data and correctly interpret results
- Identify and correct technical, equipment or other problems in laboratory procedures
- Adhere to standard operating procedures, appropriate and ethical communication practices, and required safety policies
- Apply governmental and regulatory requirements to laboratory operations
- Assume responsibility for professional development in an ever-changing clinical laboratory environment
- Evaluate and contribute to research in medical laboratory science
- Demonstrate knowledge of laboratory operations including administration, supervision and education methodologies necessary to provide professional development for members of the medical laboratory team

ACCREDITATION / APPROVAL STATUS

At the institutional level, Colby-Sawyer College is accredited by NECHE (New England Commission of Higher Education).

At the programmatic level, Colby-Sawyer is not yet accredited, as this program is new, but it has begun the application process for accreditation through NAACLS (National Accrediting Agency for Clinical Laboratory Science). Students' eligibility to take the ASCP certification exam may depend on the college achieving "serious applicant" status with NAACLS prior to their graduation. Colby-Sawyer will provide updates at <https://colby-sawyer.edu/medical-laboratory-science> and via email to students.

For reference: NAACLS, 5600 N. River Rd, Suite 720, Rosemont, IL 60018-5119 // 773.714.8880 // info@naacls.org

RESULTS

As this is a new program, only the introductory MLS 200 course was offered in 2021-22, and only the 300-level MLS courses were offered in 2022-23. There are no results of external certification outcomes, graduation rates outcomes, or placement rates outcomes to share yet.

LIST OF CLINICAL FACILITIES

[Dartmouth Hitchcock Medical Center](#)

One Medical Center Drive
Lebanon, NH 03756

Member of [Dartmouth Health](#), and the state's only academic medical center
[Ranked as New Hampshire's best hospital by U.S. News & World Report in 2021-22](#)

CLINICAL LIAISON

Shirley Collins, MT(ASCP)

Clinical Liaison

Laboratory-Safety Compliance & Education Coordinator
Department of Pathology and Laboratory Medicine
Dartmouth Hitchcock Medical Center

shirley.a.collins@hitchcock.org

603.650.7262

ADMISSION CRITERIA

The admission checklists for application, academic requirements and extracurriculars can be found at <https://colby-sawyer.edu/apply/first-year-applications>.

Essential Functions

Colby-Sawyer College seeks students who will benefit from and contribute to the educational environment of the college, which is based on a commitment to excellent instruction and personalized faculty-student relationships. The Admissions Committee selects students who demonstrate academic ability, intellectual curiosity, motivation, self-initiative and leadership potential. The college actively seeks diversity in its student body, and no person is excluded on the basis of race, color, gender, religious preference, disability, age, sexual orientation or national and ethnic origin.

The primary factor in the selection process is a careful review of the student's secondary school transcript. Most successful applicants for admission have prepared for a Colby-Sawyer education by taking a college preparatory program in secondary school including four years of English, three years of mathematics, three years of social studies, and three years of a laboratory science. The Admissions Office also places emphasis on the required essay, counselor or teacher recommendations (optional) and extracurricular activities. Standardized test results are an optional component to an application for Medical Laboratory Science.

Internship training in the Department of Pathology and Laboratory Medicine at Dartmouth-Hitchcock Medical Center requires the following essential functions:

- **Physical Requirements:** bending, kneeling, lifting and carrying 16-30 lbs., reaching (above and below shoulders), sitting, standing, stopping, twisting, walking
- **Occupational Requirements:** color vision, far vision, near vision, hearing, work around others, work with others
- **Exposure to Conditions:** fumes, noise, tasks requiring routing exposure to blood and body fluids (OSHA Classification 1)

Advanced Placement

Colby-Sawyer College recognizes meritorious secondary school work by granting advanced placement and/or credit for those who have taken enriched or accelerated courses before entering college. Applicants qualify for credit by satisfactory achievement on college-approved placement examinations. Credit will be given if a score of three or higher is achieved on the College Board Advance Placement Tests; and on a case-by-case basis through the College-Level Examination Program.

Transfer of Credits

Students' work from other accredited colleges will be evaluated on a course-by-course basis. In all cases, credit will only be given for courses that have been completed with minimum grades of C (2.0/4.0) and are equivalent to courses offered at Colby-Sawyer. Grades earned in courses taken before matriculation at Colby-Sawyer will not be included when computing the cumulative grade point average for courses taken at Colby-Sawyer. A maximum of 90 credit hours will be allowed for transfer to a baccalaureate program at Colby-Sawyer College. The final 30 credit hours must be Colby-Sawyer College-sponsored whether taken on or off campus.

Credits for Experiential Learning

Prior experience in clinical labs will be reviewed on a case-by-case basis.

TUITION AND FEES

Current tuition and costs are outlined at <https://colby-sawyer.edu/financial-aid/tuition-costs>. In addition, there is a \$50 lab fee per lab course.

The 2020-21 fee to attend Colby-Sawyer, not including scholarships, awards or financial aid, was \$60,358. Academic awards and scholarships range from \$15,000 - \$28,000. Last year, 100% of incoming students received aid from Colby-Sawyer.

Withdrawals

Students may **withdraw from a course** without grade penalty between the end of the add/drop period and completion of 61% of the full fall and spring semesters. The deadline for shorter academic sessions is proportional to the length of the session. Courses will appear on the student's academic transcript with a grade of either W (Withdrawn) or WA (Administratively Withdrawn) depending on the circumstances. Grades of W and WA are not factored in the grade point average. A grade of F (Failure) will be posted to the student's transcript for any course(s) from which the student is withdrawn after the deadline to withdraw from courses, whether student or faculty member initiated.

Students who choose to **withdraw from the college** should contact the Office of Student Success and Retention to discuss options for support. It is the student's responsibility to signal their intent to withdraw by completing the Application for Withdrawal form located on myRegistrar on myColby-Sawyer.

Students who do not register by June 1 for the fall semester or by January 1 for the spring semester will be withdrawn from the college. The college reserves the right to place students on an administrative suspension for academic, behavioral, financial, social or medical reasons. Students who are suspended from the college will be administratively withdrawn. In addition, the college can also dismiss students.

Refund Policies

All requests for refunds must be submitted in writing to the Financial Services Office. If a student withdraws during the semester, the college will calculate a refund based on college policy and federal law. Please see <https://colby-sawyer.edu/tuition-refund-information> for more info.

LIST OF COURSE DESCRIPTIONS

BIO 106 The Chemical & Cellular Basis of Life (& Lab)

This course introduces students to processes that occur within organisms. Topics include basic biological chemistry, enzyme action, acid/base balance, osmosis and diffusion, cell structure and function, energy and metabolism, cell division, genetics, protein synthesis and an introduction to molecular genetics. Laboratory work is included. A \$50 lab fee is charged.

BIO 205 Human Anatomy & Physiology I (& Lab)

This is the first of a two-semester sequence in human anatomy and physiology. Students begin with a review of cellular physiology and then explore the anatomy and physiology of four important systems: integumentary, skeletal, muscular, and nervous. This course has both lecture and laboratory requirements, including dissections. A \$50 lab fee is charged.

BIO 206 Human Anatomy & Physiology II (& Lab)

This is the second of a two-semester sequence in human anatomy and physiology. The material covered in this course includes anatomy and physiology of the following systems: endocrine, cardiovascular, immune, respiratory, digestive, renal and reproductive. This course has both lecture and laboratory requirements, including dissections and/or computer simulations. A \$50 lab fee is charged.

Prerequisite: BIO 205

BIO 207 Microbiology (& Lab)

This course involves the study of the fundamental principles of microbiology and the relationship of microorganisms to disease. Microbial morphology, growth, metabolism, genetics, diversity, ecology and viruses are stressed in the lectures. Laboratory work includes the preparation of media, cultural methods, microscopic work, control of organisms by physical and cultural means, and quantitative techniques. A \$50 lab fee is charged.

BIO 223 Genetics (& Lab)

Both classical and modern topics are covered as students learn about the nature of the gene, gene action and its control, transmission of inherited characteristics and behavior of genes in populations. The course also focuses on recent developments in genetic research and technology. A \$50 lab fee is charged.

Prerequisite: BIO 106

BIO 304 Biochemistry (& Lab)

Topics include the structure and function of proteins, carbohydrates, lipids and nucleic acids. Enzyme kinetics, regulation and mechanisms are emphasized. Thermodynamics and phosphate compounds are studied. Students examine important metabolic pathways, including glycolysis, the citric acid cycle, electron transport and oxidative phosphorylation, beta oxidation, fatty acid biosynthesis and the urea cycle. Standard laboratory techniques of the biochemist are introduced. A \$50 lab fee is charged.

Prerequisite: CHE 307 or permission of instructor

BIO 322 Immunology (2 credits)

This course explores classical and modern immunological applications in the field of immunology. Students will establish a foundational knowledge of the non-specific and specific immune mechanisms. The class investigates the complex communication between immune system components. Pathologies associated with immunodeficiency, autoimmunity, hypersensitivity and organ transplants are considered, as well as the biotechnical impact of our understanding of the immune system.

Prerequisite: BIO 106

CHE 101 Principles of Chemistry I (& Lab)

Topics covered in this course include basic properties of matter, stoichiometry, the interactions of light and matter, an introduction to quantum theory, the electronic structure of the atom, chemical periodicity, thermochemistry, bonding theories and the properties of gases. The laboratory exercises introduce students to various quantitative methods of analysis, including gravimetric analysis, titrations and visible spectroscopy. A \$50 lab fee is charged.

Prerequisite: Successful completion (B- or better) of two years of high school algebra or MAT 206

CHE 102 Principles of Chemistry II (& Lab)

This course builds upon the principles developed in CHE 101. Topics include properties of liquids, solids and solutions; kinetics; chemical equilibria; acid/base chemistry; solubility equilibria; electrochemistry; thermodynamics; and an introduction to organic chemistry. The laboratory provides additional experience with instrumental and non-instrumental methods of analysis, synthesis and purification, and solution equilibria. A \$50 lab fee is charged.

Prerequisite: CHE 101

CHE 307 Organic Chemistry I (& Lab)

Topics covered in the first semester of organic chemistry include the structure of organic compounds, organic nomenclature, stereochemistry and an introduction to organic reaction mechanisms, including radical halogenation, nucleophilic substitution and elimination. Laboratory work emphasizes the mastery of basic techniques of organic chemistry, including recrystallization, extraction, distillation and the determination of physical properties. A \$50 lab fee is charged.

Prerequisite: CHE 102

MAT 220 Introduction to Statistics

This course provides an overview of the field of statistics including gathering and analyzing numerical information. Students study the concepts of sampling, experimentation and measurement and examine statistical methods to study them. Students study confidence

intervals and hypothesis testing, including t-tests, F-tests, Chi-Square tests, regressions and analysis of variance. The use of statistical software and/or graphing calculators is included.

MLS 200 Introduction to Medical Lab Science & Phlebotomy (& Lab)

This laboratory-based course introduces students to the career and practice of medical laboratory science. Topics include safety, quality assurance, phlebotomy, specimen processing, microscopy and basic concepts in the clinical practices of immunology, chemistry, hematology and microbiology. Laboratories cover introductory techniques in blood and body fluid analysis with a focus on point-of-care testing (POCT). This course is required for MLS majors but is also appropriate for biology majors, chemistry minors and others interested in a healthcare application of basic science.

Prerequisites: BIO 106 and CHE 101, or NUR 203

MLS 220 Body Fluids / Urinalysis (& Lab) (2 credits)

This course covers the biology, collection, processing and analysis of non-blood body fluids: urine, cerebrospinal fluid and others. Normal and disease-state processes will be discussed, with an emphasis on how different patient states impact test results. The lab component consists of performing, analyzing and interpreting tests using various body fluids.

Prerequisite: MLS 200

MLS 300 Hematology I (& Lab)

The hematology section of the medical laboratory analyzes whole-blood samples. This course focuses on normal red and white blood cell physiology as well as abnormal and disease-state conditions indicated by changes in red blood cells. The lab component includes microscopic identification of cell types as well as testing processes, interpretation and results analysis for red blood cell tests.

Prerequisites: MLS 200, BIO 205, BIO 206

MLS 310 Serology (2 credits)

Serological testing examines the immunological proteins present in blood plasma to help diagnose disease. Building on information learned in BIO 322 Immunology, this course covers current methods of serological tests, the associated immunological disease states and how to analyze and interpret test results.

Prerequisite: BIO 322

MLS 320 Hematology II / Coagulation (& Lab)

This course builds on learning from MLS 3XX Hematology I by discussing abnormal and disease-state conditions indicated by changes in white blood cells. It continues with an in-depth study of the physiology of the coagulation process and associated conditions and disease states that may affect the blood's ability to clot. Labs include testing processes, interpretation and results analysis for white blood cell tests, as well as standard tests used to measure blood clotting.

Prerequisite: MLS 300

MLS 340 Immunohematology (& Lab)

Immunohematology, also called transfusion medicine, involves the study of blood antigens and antibodies and how they impact the practice of blood transfusions. This course covers the human genetics of blood groups, donor/patient compatibility, pathologies associated with transfusion medicine and the theory behind routine procedures. Labs include practice with patient antibody identification, compatibility testing and maintenance of a safe, high-quality testing environment.

Prerequisites: MLS 200, BIO 205, BIO 206, BIO 322

MLS 360 Clinical Microbiology (& Lab)

Building on learning from BIO 323 Advanced Microbiology, this course covers how microbes impact human health and the responsibility of the microbiology section of the medical laboratory in identifying the culprits of human infection. Characteristics of pathogenic organisms, isolation techniques, identification testing types and treatment considerations will all be discussed. In the lab, students practice pathogen identification methods based on colony morphology, microscopy and biochemical and molecular characteristics.

Prerequisites: MLS 200, BIO 205, BIO 206, BIO 207

MLS 380 Clinical Chemistry (& Lab)

Molecules dissolved in blood plasma or serum, also called analytes, are critical in diagnosing a patient's disease state. This course focuses on the pathologies that lead to clinical chemistry testing, the theory behind how sophisticated analyzers perform these types of tests and the process for critically interpreting and troubleshooting analyzer data. Lab work includes the operation, maintenance and quality assurance of clinical chemistry analyzers.

Prerequisites: MLS 200, MLS 310, BIO 205, BIO 206, BIO 304

MLS 420 Medical Laboratory Science Case Studies (Capstone) (2 credits)

This course builds on the learning gained during MLS 485 Medical Laboratory Science Internship through a series of seminars on current topics in medical laboratory science. Students will also partner with faculty or lab mentors to conduct and publicly present a research project on a topic of concern in medical laboratory practice.

Prerequisites: MLS 481, MLS 482, MLS 483, MLS 484

MLS 440 Laboratory Operations & Technical Writing (2 credits)

This course covers the basic principles of medical laboratory management. Topics will include personnel and financial management, regulation and accreditation, information management, quality assurance, quality control and continuing education.

Prerequisites: MLS 481, MLS 482, MLS 483, MLS 484

MLS 460 ASCP Board Preparation (2 credits)

This course provides structured review to assist students in preparing to take the ASCP MLS certification exam.

Prerequisites: MLS 481, MLS 482, MLS 483, MLS 484

MLS 481 Clinical Immunohematology Internship (3 credits)

This clinical rotation at an affiliated hospital lab provides supervised training in the methodology, clinical interpretation, quality assurance/improvement and daily operations in the immunohematology section of the laboratory. Students are required to begin their clinical internship prior to the start of the fall semester of senior year.

Prerequisites: A grade of C or higher in MLS 200, MLS 340, BIO 322, plus MLS Program Director approval

MLS 482 Clinical Chemistry Internship (3 credits)

This clinical rotation at an affiliated hospital lab provides supervised training in the methodology, clinical interpretation, quality assurance/improvement and daily operations in the following sections of the laboratory: clinical chemistry and immunology. Students are required to begin their clinical internship prior to the start of the fall semester of senior year.

Prerequisites: A grade of C or higher in MLS 200, MLS 310, MLS 380, BIO 322, plus MLS Program Director approval

MLS 483 Clinical Hematology Internship (3 credits)

This clinical rotation at an affiliated hospital lab provides supervised training in the methodology, clinical interpretation, quality assurance/improvement and daily operations in the following sections of the laboratory: hematology, hemostasis, and urine and body fluid analysis. Students are required to begin their clinical internship prior to the start of the fall semester of senior year.

Prerequisites: A grade of C or higher in MLS 200, MLS 220, MLS 300, MLS 320, plus MLS Program Director approval

MLS 484 Clinical Microbiology Internship (3 credits)

This clinical rotation at an affiliated hospital lab provides supervised training in the methodology, clinical interpretation, quality assurance/improvement and daily operations in the microbiology section of the laboratory. Students are required to begin their clinical internship prior to the start of the fall semester of senior year.

Prerequisites: A grade of C or higher in MLS 200, MLS 360, BIO 323, plus MLS Program Director approval

POLICIES AND PROCESSES

Service Work

When students are learning in the clinical laboratory setting, they should always be performing testing under the supervision of a clinical instructor — never in place of professional staff. There are no expectations for students to work in the clinical laboratory. If they choose to do so independently, it may not be during clinical academic time.

Advising

The Medical Laboratory Science Program Director serves as the academic advisor for students in this major, guiding them through the program while maintaining confidentiality and impartiality. Advising at Colby-Sawyer College empowers students to shape their own educational experience as they work to achieve the college's learning outcomes and their own personal, academic and career goals. Encouraging student initiative and responsibility is central to an advisor's role. Supported by their advisor, students assume the primary role in fulfilling curricular requirements, accessing campus resources, identifying appropriate off-campus learning experiences and outlining the steps necessary to achieve their goals. Advisors provide guidance and serve as a resource for academic information and a link to campus and community experiences that support student learning and growth.

Clinical Assignments

The clinical lab at Dartmouth-Hitchcock can accommodate a cohort of up to 12 students from Colby-Sawyer each year. If enrollment in the program grows to a point at which placement cannot be immediately guaranteed, the college will work with the Clinical Liaison and/or other partners to identify alternate sites and/or schedules to accommodate all qualified students. Qualification for clinical assignments is contingent upon an average of C or higher in all required courses to date for the major. Students who are not proceeding toward fulfilling this qualification will be advised in advance to retake courses for higher grades and/or reconsider their plans for this major.

Student Grievance and Appeals

Students who have questions or concerns about **issues of discrimination or harassment**, including complaints of sex discrimination in violation of Title IX and age discrimination in violation of the Age Discrimination Act, may contact:

Robin Burroughs Davis, Vice President for Student Development and Dean of Students, Lead Title IX Coordinator
Ware Student Center Room 105, 603.526.3752, rdavis@colby-sawyer.edu

Lisa Lacombe, Director of Hogan Sports Center / Recreation, Deputy Title IX Coordinator
Hogan Sports Center Room 101, 603.526.3775, llacombe@colby-sawyer.edu

Grade Appeals: Students who believe their final grade in a course does not accurately reflect their performance may appeal the grade per this process:

1. The student must discuss the disputed grade with the faculty member. Every effort must be made to resolve the dispute at this stage.
2. If no satisfactory resolution is possible, the student submits a written petition describing the facts of the case to the faculty member's supervising dean. The dean may ask for documentation to support the student's claims. The dean meets with the faculty member and investigates the dispute. The dean makes a written determination with copies to the student and the faculty member.
3. If the student disputes the dean's findings, the student may appeal to the academic affairs coordinator via a written petition describing the

facts of the case and basis of the dispute, including all pertinent documentation. Copies of the petition should be provided to the faculty member and the appropriate dean of schools. The academic affairs coordinator renders the final decision.

Academic Appeals: At the end of the semester in which the action was taken, students who are suspended or dismissed from the college may appeal to the Academic Review Board (ARB).

Criteria for Program Completion

To complete the program, students must complete 120 credits total: 88 credits in required courses for the major plus 32 additional credits for the Liberal Education Program. (There are 40 credits total in the Liberal Education Program, but 8 of these credits are fulfilled within the major: the Science Core and the Quantitative Literacy Proficiency.) Please note that four of the required courses for the major – MLS 481, MLS 482, MLS 483, and MLS 485 Clinical Internships – comprise the 18-week experiential learning on-site at Dartmouth Hitchcock Medical Center. In addition, please note that MLS 460 ASCP Board Preparation is a required course in the major, but the ASCP certification exam itself is not required to complete the program; rather, it is required for certification and is highly recommended to ensure preparation and demonstrate expertise for employment.

Although there is not a minimum grade threshold for any individual course, there is a requirement for an average grade of C or higher in all required major courses in order to proceed into the clinical experience and complete the program.

Per the college catalog, students whose cumulative grade point average (GPA) is below the minimum satisfactory standard of 2.00 for undergraduates are placed on **academic probation** and notified in writing of their status. Academic probation indicates that students must improve their performance or risk **suspension** or **dismissal** at the end of the next semester. A student whose GPA is below 1.50 may be suspended; below a 1.00, a student may be dismissed without having been placed on academic probation in a prior semester. Students who are on academic probation for two or more semesters may be suspended. Students who do not seek readmittance after suspension are withdrawn from the college. Students who are dismissed from the college may not be readmitted. For additional details, please reference the catalog at <https://colby-sawyer.edu/academics/schedules>.

ACADEMIC CALENDAR

Current and past academic calendars can be referenced at <https://colby-sawyer.edu/academics/schedules>.

CONDUCT

Students are expected to abide by the college's personal conduct expectations outlined in [The Code of Community Responsibility](#) and the academic conduct expectations outlined in the [Colby-Sawyer College Undergraduate Catalog](#). In addition, during clinical experiences, professional conduct is expected as students represent Dartmouth Health and the Dartmouth Hitchcock Department of Pathology and Laboratory Medicine. If any prohibited conduct is exhibited, the Clinical Liaison, Program Director, and Dartmouth Health School of Medical Laboratory Science Medical Director will be involved immediately. Examples of prohibited conduct (not all-inclusive) include the following:

- Failure or refusal to act professionally or respectfully
- Purposely attempting to get out of rotation assignments
- Failure or refusal to properly and competently perform assigned work
- Abuse of sick time, absenteeism or lateness
- Unauthorized absence from program
- Use, manufacture, sale or possession of unlawful drugs or alcohol, or being under the influence while on Hospital property
- Sexual harassment
- Fighting or the use of profane, insulting, abusive or threatening language on Hospital premises
- Gambling on Hospital property
- Malicious misuse, destruction, damage or theft of any Hospital property or the property of others
- Smoking in prohibited areas (D-H is a smoke-free environment.)
- Carrying weapons on Hospital property
- Soliciting or accepting tips or other gratuities from patients
- Purposely attempting to circumvent Hospital policy, practice, processes or regulations
- Threats or intimidation by any employee, including supervisors, toward any other employee
- Unauthorized use or dissemination of confidential information
- Failure to comply with Hospital's waste management policy, particularly proper waste disposal practices
- Failure to comply with Hospital's safety rules
- Failure or refusal to follow supervisor's instructions
- Other behavior which violates any other Hospital policy or regulation or interferes with Hospital's operation or provision of proper and safe patient care