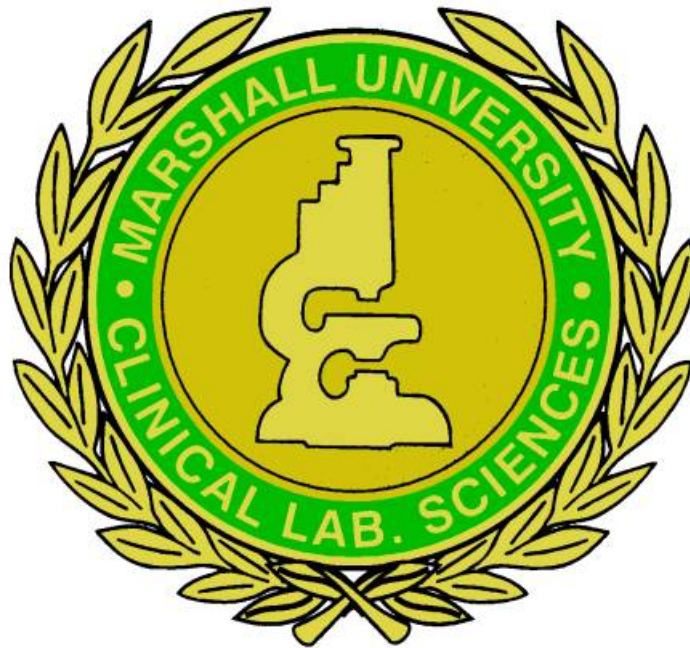


Medical Laboratory Technician (MLT)
And
Medical Laboratory Scientist (MLS)
Student Handbook



Marshall University
Clinical Laboratory Sciences Department
College of Health Professions

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PART I: INTRODUCTION AND GENERAL INFORMATION

This guide is for students seeking admission, or who are already admitted to the MLT and MLS programs and as additional information for individuals looking for information about the Marshall University CLS Programs. For information on admissions, check the current [MU Undergraduate Catalog](#).

The academic calendar can be found by visiting this link:
<http://www.marshall.edu/calendar/academic/>

Tuition and Fees vary from one year to the next, and are different for courses taught online. For a comprehensive description of current course tuition and fees, visit this link: <http://www.marshall.edu/tuition/>

MLT-MLS Ladder Curriculum

These degree programs are quite adaptable to individual student backgrounds, goals, and needs. It is convenient to think of these as two one-year programs with prerequisites. For example, a student who has already completed most of the general course requirements for the bachelor's degree might choose to complete the MLT and MLS programs sequentially in two years. Another student may choose to complete the MLT program, take prerequisites for the MLS program over a period of a year or more, then continue into the MLS program. Some MLT graduates have found employment and then continued working toward the bachelor's degree with tuition paid by an employer.

Students who successfully complete the MU MLT program are eligible to continue on into the MLS program. In order for program officials to know your intentions and to schedule clinical MLS practicum experiences, admission to the MLS program requires that you submit a letter of intent to the MLS Program Director in the spring of the academic year you intend to begin the preclinical MLS course sequence.

Graduates of other NAACLS-accredited MLT programs are also eligible for direct admission to the MLS program. See the MU catalog. Graduates of a NAACLS-accredited MLT program with work experience at the MLS level may apply for advanced standing in the medical laboratory science program.

The General Education Core Curriculum does not apply to associate degrees. However, CLS students who want to complete the bachelor's degree program in Medical Laboratory Science should plan with their academic advisor to include as many Core Curriculum requirements as possible while completing the MLT program curriculum. A listing of Core Curriculum courses offered in the current semester may be found in the schedule of classes and on the [General Education website](#).

Pre-med Option

Clinical Laboratory Sciences programs are excellent pre-medical curricula, when supplemented with additional general studies courses. Students planning to seek admission to post-graduate professional schools should plan their academic program with an additional pre-professional advisor.

Clinical Laboratory Sciences Department Faculty

Dr. Jennifer Perry, Ed.D., BSMT (ASCP) joined the MU faculty in August of 2005 and is currently the chair and program director for CLS programs. She received her Bachelor of Science in Medical Technology from Marshall University in 1994 and her Master of Science in Health Care Administration also from Marshall University in 1999. She obtained a doctorate in Education Leadership from Marshall University in 2014. Dr. Perry spent twelve years in the clinical laboratory field where she supervised operations in the Chemistry and Hematology sections, as well as educated CLS students at the clinical site. She currently holds the rank of Associate Professor and teaches CLS 200, Clinical Biochemistry, CLS 460, Laboratory Management and Education, CLS 464, Laboratory Instrumentation, and also coordinates the MLS clinical experiences (CLS 472 and 473).

Pamela D. Meadows, MS, BSMT (ASCP). Professor Meadows joined the MU faculty in August 2012. She earned her Bachelor of Science degree in Medical Technology and her Master of Science in Health Care Administration, both from Marshall University. She is currently pursuing a doctorate in Education Leadership from Marshall University. Professor Meadows has twenty years of experience in the clinical laboratory, and still works part time as a technologist at CAMC. She currently holds the rank of Assistant Professor and teaches CLS 230, Clinical Hematology, CLS 410, Advanced Immunohematology, CLS 430, Advanced Hematology, CLS 210 Clinical Immunohematology, CLS 255 Clinical Laboratory Problems, CLS 466, Diagnostic Physiology, and coordinator for MLT clinical experiences (CLS 270, 271, 272, and 273).

Dr. Muhammad Amjad, Ph.D., SM(ASCP). Dr. Amjad joined the MU faculty in August 2009. He earned a Bachelor of Science in Microbiology and Biochemistry, a Master's degree in Microbiology, and a Ph.D. in Microbiology from the University of Karachi, Pakistan. Dr. Amjad has experience in the clinical laboratory, and earned a Specialty certification in Microbiology through ASCP in 2003, and a Diplomate of American Board of Microbiology through the American Academy of Microbiology in 2009. Prior to coming to Marshall University, Dr. Amjad was an Assistant Professor and an active researcher in the Clinical Laboratory Sciences Department and School of Medicine at Wayne State University, in Detroit, Michigan. Dr. Amjad holds the rank of Associate Professor and currently teaches CLS 105, Medical Laboratory Terminology, CLS 400, Advanced Clinical Chemistry, CLS 420, Advanced Microbiology, CLS 220 Clinical Microbiology, CLS 310, Immunology and Molecular Diagnostics, and CLS 468 Senior Research/Capstone.

Accreditation

The MLT and MLS programs at Marshall University underwent the comprehensive reaccreditation process in 2010-11 through the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). Both programs were granted full 7-year accreditation through April of 2018. The contact information for NAACLS is as follows:

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)

5600 N. River Road Suite 720

Rosemont, IL 60018-5119

847-939-3597

773-714-8880

773-714-8886

Web Address: <http://www.naacls.org>

Academic and Professional Advisement

CLS programs are under the administration of the College of Health Professions. The office of the Dean, College of Health Professions (COHP) is located on the 2nd floor of Prichard Hall.

MLT, MLS, and CYT students should be assigned to a faculty member in the Clinical Laboratory Sciences Department for academic and professional advisement. Computer advisement holds must be removed from students' records before they can officially register for classes. For students who have already discussed their academic program with their CLS advisor, academic holds may be removed by a telephonic or email request addressed to the advisor. If the CLS advisor is unavailable, the office of the associate dean of the College of Health Professions may remove academic holds.

Description of the Profession

The following descriptions and entry-level competence statements are extracted from the NAACLS (National Accrediting Agency for Clinical Laboratory Sciences) Essentials for medical laboratory technicians and technologists.

Program Goals and Competencies for the MLT and MLS student

Goals upon graduation from the Medical Laboratory Technology or Medical Laboratory Science program are:

- Prepare graduates with attitudes, knowledge, and skills that prepare them for entry into the clinical laboratory workforce as Medical Laboratory Technicians (MLT) or Medical Laboratory Scientists (MLS).
- Prepare graduates to continue learning advanced knowledge about human health and disease.
- Prepare graduates with knowledge and experience necessary for national certification as a Medical Laboratory Technician (MLT) or Medical Laboratory Scientist (MLS).
- Students show demonstration of minimum levels or proficient performance and knowledge of each clinical specialty studied in the pre-clinical portions of the program, including advanced clinical hematology, clinical chemistry, clinical immunohematology and clinical microbiology as well as laboratory instrumentation and laboratory supervision.

Medical Laboratory Technician:

The clinical laboratory technician/medical laboratory technician is an allied health professional who is qualified by academic and practical training to provide service in clinical laboratory science. The clinical laboratory technician/medical laboratory technician must also be responsible for his/her own actions, as defined by the profession.

Behavioral Objectives for the MLT

The following Behavioral Objectives are expected of all students throughout the duration of the program, which includes all didactic and clinical rotation courses:

- Demonstrate the ability to interact with co-workers and health care professionals effectively
- Demonstrate calm and reasonable judgment in clinical laboratory practices
- Demonstration of commitment to the patient
- Demonstrate ethical and moral attitudes and principles which are essential for gaining and maintaining the trust of professional associates
- Demonstrate an attitude of respect for the patient and confidentiality of the patient's record and/or diagnoses

Competency for the MLT

Clinical laboratory technicians/ medical laboratory technicians are competent in:

- a. Collecting, processing, and analyzing biological specimens and other substances;

- b. Performing analytical tests of body fluids, cells, and other substances;
- c. Recognizing factors that affect procedures and results, and taking appropriate actions within predetermined limits when corrections are indicated;
- d. Performing and monitoring quality control within predetermined limits;
- e. Performing preventive and corrective maintenance of equipment and instruments or referring to appropriate sources for repairs;
- f. Applying principles of safety;
- g. Demonstrating professional conduct and interpersonal communication skills with patients, laboratory personnel, other health care professionals, and with the public;
- h. Recognizing the responsibilities of other laboratory and health care personnel and interacting with them with respect for their jobs and patient care;
- i. Applying basic scientific principles in learning new techniques and procedures;
- j. Relating laboratory findings to common disease processes, and k. establishing and maintaining continuing education as a function of growth and maintenance of professional competence.

Upon graduation and initial employment, the clinical laboratory technician/medical laboratory technician should be able to demonstrate entry-level knowledge and skills in the above areas of professional practice.

Medical Laboratory Scientist (MLS)

The medical laboratory scientist is an allied health professional who is qualified by academic and practical training to provide service in clinical laboratory science. The medical laboratory scientist must also be responsible for his/her own actions, as defined by the profession.

Behavioral Objectives for the MLS

The following Behavioral Objectives are expected of all students throughout the duration of the program, which includes all didactic and clinical rotation courses:

- Demonstrate the ability to interact with co-workers and health care professionals effectively
- Demonstrate calm and reasonable judgment in clinical laboratory practices
- Demonstration of commitment to the patient
- Demonstrate ethical and moral attitudes and principles which are essential for gaining and maintaining the trust of professional associates

- Demonstrate an attitude of respect for the patient and confidentiality of the patient's record and/or diagnoses

Competency for the MLS

Medical Laboratory scientists are competent in:

- a. Developing and establishing procedures for collecting, processing, and analyzing biological specimens and other substances;
- b. Performing analytical tests of body fluids, cells, and other substances;
- c. Integrating and relating data generated by the various clinical laboratory departments while making decisions regarding possible discrepancies;
- d. Confirming abnormal results, verifying quality control procedures, executing quality control procedures, and developing solutions to problems concerning the generation of laboratory data;
- e. Making decisions concerning the results of quality control and quality assurance measures, and instituting proper procedures to maintain accuracy and precision;
- f. Establishing and performing preventive and corrective maintenance of equipment and instruments as well as identifying appropriate sources for repairs;
- g. Developing, evaluating, and selecting 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;
- h. Demonstrating professional conduct and interpersonal skills with patients, laboratory personnel, other health care professionals, and the public;
- i. Establishing and maintaining continuing education as a function of growth and maintenance of professional competence;
- j. Providing leadership in educating other health personnel and the community;
- k. Exercising principles of management, safety, and supervision;
- l. Applying principles of educational methodology, and
- m. Applying principles of current information systems.

Upon graduation and initial employment, the clinical laboratory scientist/medical technologist should be able to demonstrate entry-level competencies in the above areas of professional practice.

Medical Laboratory Technology (MLT) Program Outcome Measures

MU MLT Program Graduation Rates*				
Class of:	2013	2014	2015	3-year average
Students entering final half of the program year and graduated/# who began the final half and are not still enrolled in the program	10/10	10/10	9/10	29/30
Yearly Attrition Rate (students who began final half of program but left (voluntarily or involuntarily)/# who began the final half	0/10=0%	0/10=0%	1/10=10%	1/30=3.33%
NAACLS Graduation Rate Threshold for a 3 year period	---	---	---	70%
MU Graduation Rate	100%	100%	90%	96.67%

*To meet NAACLS accreditation standards, graduation rates are calculated based upon the number of students entering the final half of the MLT program. MU has determined the entry point of the final half to be the 2nd semester of the second year of the program.

MU MLT Graduate Placement Rates**				
Class of:	2013	2014	2015	3-year average
NAACLS Threshold for a 3 year period				70%
MU Placement Rates	100%	100%	100%	100%

**Employment in field of study or a closely related field (for those who seek employment) or continuation of education within one year of graduation

MU MLT Program Graduate Certification Rates***				
Class of:	2014	2015	2016	3-year average
NAACLS Threshold for a 3 year period	---	---	---	75%
MU Certification Rates	5/6=83.33%	9/10=90%	10/11=90.9	88.89%

***Certification rates of those taking the exams for the first time within the first year of graduation

Medical Laboratory Science (MLS) Program Outcome Measures

MU MLS Program Graduation Rates*				
Class of:	2013	2014	2015	3-year average
Students entering final half of the program year and graduated/# who began the final half and are not still enrolled in the program	4/5	7/8	8/8	19/21
Yearly Attrition Rate (students who began final half of program but left (voluntarily or involuntarily)/# who began the final half	1/5=20%	1/8=12.5%	0/8=0%	2/21=9.52%
NAACLS Graduation Rate Threshold for a 3 year period	---	---	---	70%
MU Graduation Rate	80%	87.5%	100%	90.48%

*To meet NAACLS accreditation standards, graduation rates are calculated based upon the number of students entering the final half of the MLS program. MU has determined the entry point of the final half to be the 2nd semester of the final year of the program.

MU MLS Graduate Placement Rates**				
Class of:	2013	2014	2015	3-year average
NAACLS Threshold for a 3 year period				70%
MU Placement Rates	100%	100%	100%	100%

**Employment in field of study or a closely related field (for those who seek employment) or continuation of education within one year of graduation

MU MLS Program Graduate Certification Rates***				
Class of:	2014	2015	2016	3-year average
NAACLS Threshold for a 3 year period	---	---	---	75%
MU Certification Rates	0/0	2/3=66.67%	3/4=75%	71.42%

***Certification rates of those taking the exams for the first time within the first year of graduation – extremely low numbers of students taking the exam drives the pass rates down considerably. Only one student failed per exam cycle that chose to take it within one year of graduation.

MLT and MLS Program Entry Expectations

Students entering training for a laboratory career should expect develop the capability to perform the duties required. The following list of entry expectations that are intended to reflect the major responsibilities and duties of CLS jobs.

Interprets and acts upon written and verbal instructions for obtaining specimens.

Collects, labels, transports, and processes specimens for laboratory analysis.

Follows detailed written instructions for performing laboratory testing.

Performs clinical laboratory tests and procedures in order to provide accurate diagnostic data.

Performs quality control procedures to ensure the accuracy of the laboratory data.

Performs preventative and corrective maintenance on equipment to ensure the quality of work.

Communicates results verbally by telephone, by written report, and by computer information system.

Accurately transcribes and records information in laboratory documents.

Maintains work environment to enhance safety and quality of laboratory procedures.

Provides teaching and education to laboratory students and other personnel.

Contributes to the efficient operation of the laboratory.

Demonstrates commitment to the values involved in delivery of quality medical care.

Contributes to the effective operations of the hospital by demonstrating dependability in job performance.

Outcomes Desired by Typical CLS Students

Graduation from a Medical Laboratory Technician (MLT) or Medical Laboratory Science (MLS) educational program

Certification eligibility: ability to qualify for and attain professional certification through ASCP-BOR.

License Eligible: qualified to apply for a license in the state government of West Virginia to practice as a Medical Laboratory Technician or Medical Laboratory Scientist.

Attain Entry Level Skills: Ability to perform all laboratory procedures, ability to cope with the stress of emergency situations, and ability perform work in an experienced manner after orientation to the workplace.

Attain Professional Status: Attain the respect of practicing professional colleagues and their recommendations for employment.

Essential Functions for CLS Students

The following requirements include essential functions that MLT/MLS students must possess so that they will be capable of achieving the objectives of the program and the profession, and so they will not be endangered, nor will they endanger others in the course of their regular work. A student in MLT or MT programs must possess the following essential functions:

Manual Dexterity: must possess the ability to use hand(s) or prosthetic devices with coordination. Tasks that could be required are, but are not limited to 1) performing simple manipulative skills such as washing, writing, streaking plates, etc. 2) performing moderately difficult manipulative skills such as positioning patients for phlebotomy procedures, using computer keyboards, etc. 3) performing difficult manipulative skills such as invasive procedures, calibration of equipment, pulling, pushing and lifting objects greater than 20 lbs. etc.

Fine Motor Skills: must possess the ability to safely and accurately perform all laboratory procedures, manipulate tools, instruments, small objects and other equipment in the laboratory with fingertips or adaptive devices

Mobility: Ability to maneuver around instruments and objects in the classroom and laboratory, as well as in the health care setting/clinical laboratory.

Visual Discrimination: the student should be able to read charts and graphs, read instrument scales, discriminate colors, read microscopic materials, distinguish cloudy from clear and record results. In the course of the program, the CLS student may be required to:

Hearing: must possess the ability to adapt with assistive devices.

Reading: must possess the ability to read, comprehend and follow directions in printed English.

Speech: must possess the ability to verbally communicate effectively in English.

Writing: must possess the ability to communicate in written form in English

Emotional Stability: must possess the ability to work accurately and safely under stress, adapt to changing environments and prioritize tasks.

Travel Requirements: must possess the ability to travel to required education/training destinations, such as the classroom, or clinical facility.

OSHA Category for Bloodborne Pathogens Exposure

In the course of the program, the CLS student will routinely encounter exposure to blood borne pathogens. The student will be required to master safety procedures and knowledge about safety policies, materials, and procedures.

Responsibility for Non-Discrimination

The Marshall University, its clinical laboratory programs, and affiliated hospitals are committed to compliance with Title VI of the Civil Rights Act of 1964 and Section 504 of the Rehabilitation Act of 1973. In the course of the program, CLS student will be expected to perform medical laboratory services without regard to race, sex, religion, age, sexual orientation, handicap, or national origin of patient, physician, nurse, visitor, other student, etc.

Responsibility for Professional Confidentiality

CLS student will be expected to respect the privacy of individuals receiving medical care. Each student will refrain from discussing any patient information with individuals not directly involved with medical treatment of that patient.

Academic Standards

Students must earn a grade of C or better in each CLS course to remain in the program. Feedback on student performance on examinations and practical exercises is usually available the next class or laboratory period. The instructor provides periodic summaries of grades students are earning during each course.

Students must achieve a minimum of a “C” in ALL required courses in the AAS in MLT and the BS in MLS major in order to be eligible for graduation. Any courses in which a grade below a “C” are achieved, the student must retake and achieve a “C” or greater in order to be eligible for graduation. If the course is a CLS course, then this would result in a dismissal from the program, and the student would have to participate in a directed independent study of CLS courses passed, and retake those in which below a “C” was obtained.

Course Evaluation by Students

Suggestions for improving instruction may be submitted at any time. These may be done anonymously, if the student so desires. Email or other written comments may be sent to the instructor at any time.

Students will be invited to evaluate instruction in each course and clinical practicum. The purpose of this evaluation is to help faculty make their instruction more effective. These evaluations are done anonymously. All evaluations for courses are online through your MyMU account, and are administered at the end of each semester. Students are highly encouraged to complete these evaluations, and to include both positive and negative comments regarding their instruction.

Student Services

A variety of services are available free to all MU students. These services include academic advisement, academic skills assistance, a psychology clinic, a speech and hearing center, resident hall advisors, the services of the office for student development, the African-American student office, and various outreach programs of churches and synagogues, including the Campus Christian Center. A student ombudsman is also available. MU Libraries and Computer Services provide numerous services. Many services available to students are listed on the [MU Student Affairs Webpage](#).

Readmission/Reinstatement

Students previously in a CLS program may seek readmission/reinstatement and apply by letter to the program director during the regular admissions period, using the regular admissions procedure. Cover letters should clearly indicate that the student is seeking readmission. Decisions regarding readmitting students to pre-clinical CLS courses will be made by the admissions committee.

No student is guaranteed readmission. Readmitted students may be required to repeat one or more CLS courses or to undertake directed independent study.

Students may not be re-admitted to the MLT program more than twice.

In the online MLS program, students who have lapsed greater than one year from taking courses will be removed from the actively enrolled student roster. It will then be the responsibility of the inactive student to notify the program director if he/she wants to become an active student in the MLS program again, and resume taking coursework.

Appeals and Grievances

The process for appeals and grievances is found in the MU Undergraduate Catalog under the title, Academic Rights and Responsibilities of Students. It is also found in the

MU Student Handbook. Both can be found on the Marshall University Academic Affairs website by visiting this link: http://www.marshall.edu/academic-affairs/?page_id=802

Content of CLS Courses and Student Assessment

CLS Courses generally have three content components: a *knowledge* component (lecture/discussion), a laboratory *performance* (practical experience) component, and an *affective* (attitudinal) component. Course content is arranged in ways the instructors consider appropriate for student mastery of the content and for professional socialization. CLS class meetings may include both lecture and laboratory content, at the instructor's discretion.

Academic credit for course components is defined based on the structure of the learning environment. Generally, the lecture/discussion classes are highly structured and have a ratio of one hour of class for each credit hour. On-campus student laboratory is not as highly structure and lasts 3 hours for each 1 credit hour. Clinical practicum experiences are highly variable regarding instructor – student interactions, so the CLS Department estimates that 40 - 50 hours of clinical practicum is equivalent to one academic credit hour.

The instructor develops each course from written objectives that include knowledge, psychomotor performance, and affective objectives. The syllabus for each course should make clear to students the expectations for each course and the manner in which knowledge and performance will be assessed.

Computer Requirements

All MLT and MLS students need to obtain a username and password from MU Computing Services for access to the Marshall University computer system. Some courses use online supplemental materials that require secure access. For any issues, please contact the MU Help Desk.

PART II. MLT Associate in Applied Science Degree Program

MLT Pre-Clinical CLS Course Descriptions

The pre-clinical technical course sequence includes on-campus courses in clinical specialties and a clinical problems course. Final student evaluation for each course is based on the demonstrated level each student's demonstrated preparation for hospital clinical practicum training

CLS 230, (4 CH) Clinical Hematology prepares students with general medical laboratory vocabulary, knowledge and skills in safety, blood sample collection, use of the clinical microscope and photometer, and ability to manually perform tests done in the complete

blood count and coagulation profile. Knowledge and skills learned in this course are utilized in subsequent CLS courses

CLS 200, (4 CH) Clinical Biochemistry prepares students with general medical laboratory vocabulary, knowledge, and skills needed for performance of routine testing of blood serum or plasma and other body fluids in the clinical chemistry section of a hospital laboratory. Emphasis is on the methods of testing blood and other body fluids, including routine urinalysis. It includes the physiologic connections between blood chemistry test results and disorders they can detect.

CLS 210, (4 CH) Clinical Immunology is designed to prepare students to perform grouping, safety, and compatibility testing on blood samples prior to transfusion testing, to process and store donor blood and test materials, and to perform serological or immunologic testing.

CLS 220, (4 CH) Clinical Microbiology. Students may take this course without previously completing BSC 250, general microbiology. If possible, however, students should plan to take BSC 250 before entering this course. Students learn to prepare sterile materials, to grow bacteria in pure culture, to identify their genus and species, and to test organisms for susceptibility to antibiotic drugs

CLS 255, (3 CH) Clinical Laboratory Problems, is designed to integrate laboratory knowledge gained in CLS and related courses with respect to patient care and current professional medical laboratory practice. Certain skills are practiced for proficiency prior to entry to clinical practicum. During this course, students are introduced to the hospital setting, rotations are assigned, and the plan for individual clinical experiences is determined. Note: If a student should successfully complete CLS 255 but not enter clinical practicum the same calendar year, that student will be required to register for 1 credit hour of independent study (CLS 285-287) during the term immediately before entry to clinical practicum.

MLT Clinical Practicum Course Sequence

MLT Clinical Practicum, is a 15-week sequence of hospital based experiences in the clinical laboratory areas studied in the preclinical program. Students must be determined eligible before entry, and must provide documentary evidence of the following:

1. Hepatitis B vaccine
2. MMR (documentation of 2 vaccinations)
3. TDaP (within last 10 years)
4. Varicella (history or vaccination)
5. 2-step PPD (to be completed within 30 days of starting clinicals)
6. History and Physical Exam
7. HCV testing
8. CPR

9. Flu vaccine

Students must also have proof of medical insurance for the duration of clinical rotations. If the student does not already have medical insurance, he/she will be required to purchase insurance for the rotation duration. Some rotation sites require background checks and drug screens; if these are required, it is the responsibility of each student to pay for these, therefore, securing funds ahead of time if needed is recommended.

Students are also expected to sign off on the FERPA release form pertaining to records clinical sites will need at the beginning of their admission into the MLT program.

Students are given an opportunity to apply skills and knowledge learned on campus to actual testing situations in a patient care setting under the instruction and supervision of clinical faculty.

Students are selected for available clinical practicum rotations by the CLS faculty; rotation slots are available in Summer and Fall semesters. Tentative assignments are usually made early in the Spring semester prior to summer rotations. Student preferences and academic achievement will be considered in rotation placement decisions, however, overall student GPA is the prevalent decision making factor. Students are given rotation preference and ranking forms early in the CLS 255 course in the Spring semester prior to clinical rotations. Once placements are determined by the CLS program director, students have an opportunity to trade rotation assignments within two weeks of the original assignment. All changes in rotation assignments must be mutually agreed upon by all students involved and submitted in writing to the CLS program director. The CLS program director reserves the right to make final rotation placement decisions. In the event that a student cannot attend clinical rotations during the term that they are placed, they must forfeit their placement slot and site and take the next available placement during the next available clinical rotation term.

Depending on their rotation schedule, students register for the following sequence for either summer session or for the fall term:

CLS 270, Practicum in Clinical Hematology (3 CH).

CLS 271, Practicum in Clinical Biochemistry (3 CH).

CLS 272, Practicum in Blood Banking (Immunohematology) (3 CH).

CLS 273, Practicum in Clinical Microbiology (3 CH).

Hospital practicum hours are normally 7:00 a.m. to 3:00 p.m. Monday through Friday during the rotation period, except for specifically designated holidays. Work hours may vary by departmental rotation. Costs of uniforms, transportation, and housing are borne by the student.

Orientation to Clinical Sites: Orientation to clinical sites is arranged by the MLT clinical coordinator, clinical site, and student prior to beginning rotations. Online testing and other procedures may be required by some clinical sites prior to students starting rotation.

The **MLT Clinical Practicum Handbook** includes specific details about the clinical practicum rotations. A copy of the most recent edition of this publication is made available to students prior to beginning their clinical rotation sequence. Copies of the most recent practicum handbooks are also made available to each clinical affiliate prior to clinical rotation sequences.

Hospital affiliates of the MLT program:

Hospital affiliates of the MLT program:

The number of student rotation slots at each affiliated clinical site varies each year, based on the needs of individual hospitals. The affiliates are:

St. Mary's Medical Center (Huntington, WV)

Thomas Memorial Hospital (S. Charleston, WV)

Charleston Area Medical Center (Charleston, WV)

Holzer Medical Center (Gallipolis, OH)

Cabell Huntington Hospital (Huntington, WV)

Pleasant Valley Hospital (Point Pleasant, WV)

Huntington VA Medical Center (Huntington, WV)

Kings Daughters Medical Center (Ashland, KY)

PART III. Bachelor of Science Degree in Medical Laboratory Science (MLS)

General Academic Requirements

Students should plan to be degree eligible upon completion of clinical practicum. The policies stated in the student's catalog of record must be followed. The CLS Department Chairperson must approve any course substitutions in writing.

The General Education Core Curriculum requirements (see the MU catalog) apply to the MLS bachelor's degree program. These include the following:

Core I: 9 hours

- 3 hours: First Year Seminar (100-level)
- 6 hours of discipline-specific courses with an emphasis on critical thinking and active learning (100- or 200-level). Specific courses that fulfill the requirement are designated CT and listed below.

Core II: 25 hours (100- or 200-level). Specific courses that fulfill Core II may be found under the Core II Course List link on the sidebar.

- 6 hours: Composition
- 3 hours: Communication
- 3 hours: Math
- 4 hours: Physical or Natural Science
- 3 hours: Social Science
- 3 hours: Humanities
- 3 hours: Fine Arts

Additional University Requirements

- 6 hours of Writing Intensive credit in any discipline at any level
- 3 hours of Multicultural or International coursework in any discipline at any level
- Capstone project in the major

***Transfer students with 26 or more college credits must complete one CT course in Core I, all of Core II and the additional University requirements. Students enrolled at Marshall University prior to Summer 2010 who change majors and/or colleges may choose to remain under their current general education requirements or they may opt into the Core Curriculum under the same terms as transfer students. Core II may be fulfilled through a combination of transfer and Marshall credit hours.**

One (3 hour) Critical Thinking course (CLS 105 CT, Medical Laboratory Terminology), one (3 hour) Writing Intensive course (CLS 310, Clinical Immunology and Molecular Diagnostics), and the capstone project (CLS 468, Senior Research) of the core curriculum are included in CLS courses.

Employment and Personal Commitments vs. Study

The CLS Department will make reasonable accommodation for employment or other obligations outside of school when such accommodations are fair to all students and faculty and do not interfere with academic performance. Many MLS students have worked at least part time in a medical laboratory as paid medical laboratory technicians or phlebotomists, while others have worked in local businesses.

Paid duties should not conflict with student status. Work hours must be exclusive of educational hours whenever a student works in the same laboratory where they have clinical practicum rotations.

MLS Program Course Descriptions

The courses at the MLS level include CLS 310 (Clinical Immunology and Molecular Diagnostics) CLS 430 and 410 (Advanced Hematology and Blood Bank), CLS 400 and 420 (Advanced Chemistry and Microbiology), CLS 460 (Laboratory Management and Education), CLS 464 (Laboratory Instrumentation), CLS 466 (Diagnostic Physiology), CLS 468, (Clinical Laboratory Research/Senior Capstone), and CLS 499 (Readings in Laboratory Medicine). The student must meet prerequisites for these courses, including successful completion of a NAACLS accredited MLT program.

CLS 310, (3 CH) Clinical Immunology and Molecular Diagnostics. This course requires that the student have basic, practical knowledge of the human immune system. It involves discussion of the of immunoglobulin development, cell-cell interactions in the immune response, and the role of cytokines as they apply to diagnosis and treatment of disease. Transplantation immunology, immune disease processes, flow cytometry, DNA analysis, and DNA probe technology are examined. This is a writing intensive (WI-approved) course.

CLS 410 & 430 (2 credits each), Advanced Clinical Hematology and Blood Banking requires that a student has completed a MLT program, including CLS 230 and CLS 210, or equivalent, as well as CLS 310 (Clinical Immunology and Molecular Diagnostics). This course instructs the students in advanced theory and practice of analyzing the formed elements and the clotting mechanism of human blood. Other body fluid analysis will be discussed. This course will also instruct students in advanced red cell antigen biochemistry, organization of each system and resolution of serological problems that occur in patient's samples. Appropriate component therapy and storage biochemistry will also be discussed. It is split into two 8-week components.

CLS 400 & 420, (2 credits each), Advanced Clinical Biochemistry and Microbiology requires that a student has completed a MLT program, including CLS 200 and CLS 220, or equivalent, as well as CLS 310 (Clinical Immunology and Molecular Diagnostics). It is split into two 8-week components. Part of the course is a survey of current knowledge and techniques used in the laboratory identification and treatment of microbial infections. The other part is a survey of current knowledge and techniques involving chemical analysis of blood body fluids.

CLS 460, (3 CH) Clinical Laboratory Management and Education, requires that a student has successfully completed a MLT program, including clinical practicum, as well as ECN 200 or equivalent (survey of economics). The course prepares the student for supervisory and leadership roles in a hospital laboratory. Students learn to prepare budgets, delegate duties, make effective supervisory decisions, comply with

professional standards and regulations, to evaluate performance in the clinical laboratory, and conduct educational programs in the clinical laboratory setting.

CLS 464, (3 CH) Laboratory Instrumentation, requires that a student has successfully completed a MLT program. Students learn to identify technical malfunctions in laboratory instruments and to make effective purchase decisions about instrument maintenance and. Students also learn to effectively utilize microcomputers as tools for word processing, data information analysis, and data entry and retrieval. This course includes laboratory work on digital electronics circuits, laboratory instrument troubleshooting & repair, and computer projects.

CLS 466, (2 CH) Diagnostic Physiology, requires that the student has successfully completed a MLT program. This advanced course assumes a comprehensive knowledge of medical laboratory testing, which is applied to case studies of diseases in complex diagnostic situations. Students learn to use critical thinking with regard to laboratory test data to assist physicians in confirming and ruling out alternative diagnoses and in detecting pathologic alterations.

CLS 468 (2 CH), Clinical Laboratory Research, requires that the student has completed a MLT program and is actively involved in a hospital laboratory setting in which to conduct research; this is the senior capstone course. The student identifies a research project of use to the hospital laboratory, prepares a written research proposal, gains approval of all authorities involved, completes the project, and prepares both written and oral presentation of results within one semester. Students meet periodically with their faculty research advisor and correspond via email on a consistent basis through the project. The written report must be prepared in a professional manner that would be suitable for publication in a state or regional laboratory journal. Oral reports will be presented to an audience of laboratory professionals.

CLS 499 (2 CH), Seminar in Laboratory Medicine. Students and faculty present and critique articles from recent clinical laboratory-related publications.

CLS 472 and CLS 473 (6 CH), Senior Clinical Practicum I & II. Medical Laboratory Science clinical practicum, involves the senior MLS student in a series of projects and situations which prepare the student to perform technically in all areas of the clinical laboratory and to have additional attitudes, knowledge, and skills needed for technical supervision of a laboratory section.

MLS Clinical Experiences

Students are expected to participate in advanced clinical experiences at the MLS level, and it is the responsibility of each student to secure their own clinical site and get clinical affiliation agreements signed, and a copy given to the MLS Program Director. Since the MLS program is online, most students are already working MLTs, therefore, are responsible for initiating the clinical affiliation agreements with their respective clinical sites. Students are selected for available MLS clinical practicum rotations at the

discretion of the CLS faculty. Students are also entirely responsible for submitting all required documents/tests, background checks, etc. to the clinical site, and are responsible for bearing the entire expense of any of these items.

Students in the MLS program are not required to participate in a full clinical rotation as with the MLT program, rather, perform advanced level clinical tasks. The clinical tasks at the MLS level are as follows, but not limited to:

- Instrumentation Projects (maintenance, troubleshooting, operation)
- Research Project/Capstone
- Molecular Diagnostics Hands-On Experience

Students are required to participate in a hands-on Molecular Diagnostics workshop held on Marshall University campus on the Wednesday of finals week in May preceding graduation. If a student is greater than 60 miles from campus and has a prior instructor-approved clinical site to perform hands-on molecular diagnostics procedures, he/she does not have to travel to campus for the day long workshop. Students **MUST** have prior approval before the on-campus workshop can be waived.

MLS Clinical Experiences – Clinical Sites

Local Clinical Sites for the MLS Program are listed below. Sites for distance students vary year to year, based on geographical location of students. A complete record of all past and previous clinical agreements for the MLS program may be found in the CLS department.

Local Clinical Sites:

St. Mary's Medical Center (Huntington, WV)

Thomas Memorial Hospital (S. Charleston, WV)

Charleston Area Medical Center (Charleston, WV)

Holzer Medical Center (Gallipolis, OH)

Cabell Huntington Hospital (Huntington, WV)

Pleasant Valley Hospital (Point Pleasant, WV)

Huntington VA Medical Center (Huntington, WV)

Kings Daughters Medical Center (Ashland, KY)

Part IV. Graduation and Certification for MLT and MLS

Applying for Graduation

Students enrolled in the final courses of their curriculum and who anticipate successful completion of MLT or MLS sequence, related general studies, and General Education Core Curriculum requirements (for bachelor's degree candidates), apply for graduation during the semester in which those requirements will be completed. Students usually apply for graduation while in their clinical rotations. Students pay the graduation fee at the Office of the Bursar, and then complete the application for graduation at the College of Health Professions Office of Student Services located on the 2nd floor of Prichard Hall.

Applying For Professional Certification Examinations

Information regarding professional certification and licensure requirements is available on the [ASCP website](#).

Successful completion of the CLS programs prepares students for non-governmental professional certification. The student submits an application to the professional certification agency, which is the [ASCP Board of Registry](#). Students may apply for MLT and MLS certification examination online through ASCP's website. Once the student has applied for examination, a notification is sent to the program director for verification of completion of programs.

Examination fees are listed on the certifying agency web site and in their current application packet. The graduate is responsible for submitting a complete transcript to the agency upon completion of the program.

PART V. LABORATORY POLICIES AND SAFETY RULES

Each Laboratory Period:

Clean bench tops with 10% bleach solution after laboratory.

Everything has a place. Return each item to its place at the end of each laboratory period.

Microscopes are to be covered with plastic and replaced in their assigned cabinets.

You are expected to buy and use your own rolls of paper toweling at your work area as well as a laboratory coat to be worn during all laboratory sessions.

Universal precautions are to be followed regarding blood borne pathogens. That is, all human body fluids and their simulations are to be treated as if they contain a highly infectious agent. Universal precautions require that protective barriers be employed

appropriately for the kinds of hazards associated with handling body fluid specimens. These include use of latex gloves, face shields, eye protection, and gowns.

Microorganisms used in the clinical microbiology course are potentially deadly pathogens and should be handled as little as necessary and only using proper, aseptic technique. Use the biological safety cabinet for inoculation of sputum specimens.

We share duties. You may be required to assist in laboratory cleanup, care, quality control, and maintenance on a rotating basis. Volunteers are welcome.

Waste Management

Discard waste paper, put reagents in their boxes and return them to their proper storage place; put sera or cells in refrigerator if they are to be reused.

Biohazard medical waste includes material that has been contaminated with human body fluids and has a reasonable possibility of transmitting infectious disease to someone who might pick through the trash. Waste sharp objects or glass must be placed into a safe, labeled container. Do not put ordinary trash into the biohazard waste container. We pay for disposal of each ounce of medical waste.

Security

Your personal materials, as well as laboratory educational equipment and reagents would take a long time and considerable expense to replace. Be careful that doors are locked and that portable equipment is out of sight upon leaving the laboratory. Ask any CLS instructor to let you in when you need to get into the locked laboratory.

Safety Procedures

Learn the locations and types of fire extinguishers in the laboratory. Learn how to use them and on what kinds of fires each type may be used. Be familiar with the fire alert system, the fire escape plan, and how to report a fire. When fire alarms sound, evacuate the building immediately.

Learn the location of all circuit breakers and master switches in the laboratory and learn the procedure to follow if someone should be electrocuted. Learn the location and proper use of fire blankets, eyewash station, and shower.

Clothing should not be too tight to inhibit movement or so floppy that it could become entangled in equipment or catch on furniture. Long hair should be secured away from the face, and beards should be neatly trimmed. Long hair can become contaminated with chemicals and biological fluids and may also contaminate work areas, reagents, and specimens, and may be a fire hazard.

Develop the habit of keeping your hands away from the mouth, nose, and eyes to prevent self-inoculation with infectious agents. Develop the habit of frequently washing the hands, particularly between patient contacts. Always wash hands before leaving the laboratory area. Never eat, chew, smoke, or drink in the laboratory. Do not store food or beverages in laboratory refrigerators used for specimen or reagent storage.

Pens and pencils used when wearing protective gloves should be cleaned with bleach and left in the laboratory.

Specimen Handling

Prevent aerosols and the possible spread of infectious reagents by 1) never opening the lids of centrifuges until the centrifuge has come to a complete stop and 2) only opening specimen tubes using safety devices or by gently twisting the stoppers and lifting them out.

Always use protective gloves to handle body fluid specimens: they may carry the risk of hepatitis or other infection.

Protective Clothing

Disposable lab gowns are to be worn whenever you handle specimens or reagents. Remove your lab coat or change to a different lab coat when going to non-laboratory areas. When in the laboratory work area, keep the lab coat buttoned. Use safety glasses and face shields as directed. Wear protective gloves whenever working with reagents or samples.

Only closed-toe, nonskid-sole shoes should be worn in order to prevent possible injuries from falls, objects accidentally dropped, or broken glassware

Use safety glasses and face shields when manipulating potentially hazardous material.

Laboratory Accidents, First Aid

Learn what to do if someone passes out or has an injury or common first aid emergency. Always make a written record after any lab-related injury, particularly needle sticks of any kind. Forms for these reports are available from the instructor. Both student and instructor should complete such forms and submit copies to the CLS Department chairperson.

If an accident or other health emergency occurs in the student laboratory, be sure first aid assistance is provided, and immediately notify campus ambulance Service, campus extension 4357 (HELP).

Please use the following steps following exposure to blood and body fluids and needle sticks:

1. Wash needle sticks and cuts with soap and water
2. Flush splashes to the nose, mouth, or skin with water
3. Irrigate eyes with clean water, saline, or sterile irrigates
4. Immediately notify faculty member or preceptor of exposure
5. Seek medical attention within two hours
6. Follow CDC Guidelines for Blood borne infectious diseases

Handling, Hazards, and Proper Disposal of Chemicals

Learn the hazards associated with each chemical you use. Store chemical reagents properly and learn the procedure for cleaning up after accidental spills of chemicals or biological fluids, and at the end of each laboratory period. Use care when transferring chemicals between containers; add strong acid to water slowly. Learn and follow the procedure for proper disposal of infectious and biologic specimens, needles, and broken glassware. Read all labels and instructions carefully.

Student Lab Stations

This laboratory is for use of CLS faculty and students admitted to the CLS programs. The lab should be locked when not in use. Guests are permitted only with the permission of a CLS department instructor. Each student is assigned to one station and is responsible for the equipment at that station. One small drawer at each station is for personal effects, and the other two are for materials unique to specific laboratory courses. Microscopes and other equipment are to be kept in working order and stored properly when not in use. Books not used in lab should be placed along the wall, not on bench tops. Each student is responsible for the cleanliness and good order of his or her own bench area (including instruments on bench tops) and drawer space.

Equipment

Students should not operate new or unfamiliar equipment until having received instructions and authorization. This includes audio-visual and computer equipment. If an item of equipment does not function properly, return it in its proper place, but leave a note with the laboratory instructor identifying the instrument, its location, and its problem. Borrowing of equipment from other stations must be approved by the instructor. Borrowed equipment is to be returned to its proper place at the end of the laboratory period in which it was borrowed. **Storage and preparation rooms are not for student use.**

Job Placement

In the MLT program, students prepare a cover letter and resume and practice interview skills during the course CLS 255 and are given tips on seeking laboratory positions after graduation. In the online MLS program, approximately 95% of students are already working MLTs in the profession.

Students and graduates are urged to use the MU placement services office to locate potential employers and to develop a self-presentation packet.

The Clinical Laboratory Sciences Department does not guarantee employment of graduates, and graduate is generally on his or her own for locating employment. Laboratory managers inform department faculty of job openings, so graduates seeking employment should check periodically with the CLS Department.

Professional Organizations

CLS students have, at various times, formed a student society at MU, but there is currently no active CLS student organization. Students are encouraged to form such an organization and to become student members of the WV Chapter of the American Society for Clinical Laboratory Science and to attend annual meetings. MLT and MLS Students are expected to compete in interscholastic competitions at state meetings whenever possible.

For more information regarding the American Society for Clinical Laboratory Science, please visit this link: <http://www.ascls.org/>

Professional Scholarships and Financial Aid

The staff of Student Financial Assistance at Marshall University assists students in furthering their education through the use of scholarships, grants, low interest loans, and employment. The Student Financial Assistance staff, 122 Old Main, administers all forms of financial assistance, including scholarships.

The WV Society for Clinical Laboratory Science (WVSCLS) offers a student scholarship each year for one MLT student and one MLS student in the state. The scholarships are for \$1000 each, and there is an application process. Information will be given at the beginning of the semester to all students.

The Mary W. George Medical Technology Scholarship is awarded to an actively enrolled senior MLS student on the basis of professional dedication, academic achievement, and financial need and is worth approximately \$500-1000. Senior MLS students may apply for this scholarship in the fall semester. Information is available at the CLS Department office and is also sent to eligible students through online courses during the fall semester.

Additional scholarships are also available to both MLT and MLS students through national professional organizations, including the American Society of Clinical Pathologists and the American Society for Clinical Laboratory Science. Additional information is available in the CLS Department. Marshall students have won such scholarships in past years.

Marshall University Clinical Laboratory Sciences Student Handbook

Statements of Understanding

I have access to a copy of the Medical Laboratory Technician (MLT) & Medical Laboratory Scientist (MLS) current Student Handbook in the CLS Department and/or on the CLS Department website.

Any questions I asked regarding the contents of the Student Guide were answered to my satisfaction.

I have read the description of the work in this career field

I have read the physical and the mental requirements (essential functions) of this field and believe I can meet them.

I have read and understand the goals and objectives of the CLS programs.

I know my academic advisor and understand my responsibilities in the process of mandatory advisement.

I understand the academic requirements for progression in my CLS program.

I understand the procedure used for assigning clinical practicum rotations, including alternate status.

I have reviewed the clinical training sites and rotation periods.

I understand that there are academic requirements, health tests, medical insurance, and immunization requirements for entry to clinical practicum, and agree to sign the FERPA form to release the above pertinent information to clinical sites.

Any questions I asked regarding the contents of the student guide were answered to my satisfaction.

Student Name (printed)

Student Signature

Date