Michigan Technological University
MLS Student Handbook

2020 Edition

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MTU Medical Lab Science Program

Part I: Program Overview

Mission Statement:

We equip students with the knowledge, skills, and integrity needed to successfully enter the profession of Medical Laboratory Science and other health-related professional programs.

Program Learning Goals:

- Goal 1: Apply major concepts of human biology pertinent to MLS.
- Goal 2: Perform laboratory skills used by clinical scientists working in a diagnostic laboratory.
- Goal 3: Process and communicate pertinent clinical information.
- Goal 4: Comprehend MLS professional issues.

Graduate Competencies:

- Demonstrate appropriate specimen collection, processing, analysis, and reporting of results in a timely manner with accuracy and precision
- Apply safety and governmental regulations throughout the pre-analytical, analytical, and post-analytical phases of clinical laboratory testing.
- Utilize the principles and practices of professional and ethical conduct while demonstrating appropriate communication skills to sufficiently meet the needs to educate patients and other healthcare professionals
- Demonstrate professional development through continuing education in the field of Medical Laboratory Science
- Put into practice administrative and supervisory skills as are relevant to the healthcare system and Medical Laboratory Science field
- Employ the use of critical thinking and problem-solving skills to identify and evaluate:
    - Calibration, maintenance, quality assurance, and any necessary corrective actions
    - Appropriate confirmatory testing and reporting of abnormal patient results
- Assist with the implementation of test systems including correlational studies, reference ranges, statistical analysis, etc., to allow confident dissemination of accurate testing results

Career Entry Level Description:

At the point of career entry, the Medical Laboratory Scientist, also known as Clinical Laboratory Scientist or Medical Technologist, will have proficiency in the medical laboratory testing areas of Hematology, Chemistry, Microbiology, Immunology, and Immunohematology (blood banking). They will also have experience in newly emerging diagnostics such as Molecular Testing. This is acquired upon completion of the academic requirements at Michigan Technological University and successful completion of a Clinical Practicum.

MLS Program Accreditation:

The Medical Laboratory Science (MLS) 4+1 program has successfully submitted the Preliminary Report and Self Study. Once the Self Study is approved, we will have achieved "serious applicant" status with the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS, 5600 N. River Road, Suite 720, Rosemont, IL 60018, 773-714-8880, www.naacls.org). The "serious applicant" status allows students that are eligible to take MLS Board of Certification Examination (questions regarding eligibility for such examinations should be directed to ASCP Board of Certification, 800-267-2727; info@ascp.org).

MLS Program Facultybil & Staff:

MLS Program Director:
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MLS Clinical Practicum Coordinator:
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MLS/Biological Sciences Lecturer:
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Responsibilities of the Program Director:

The program director is responsible for the day-to-day operations of the academic program. Duties include, but are not limited to, advising students throughout the MLS program, monitoring curricular requirements in accordance with NAACLS, maintaining outcome data for the academic and clinical programs, monitoring budgetary matters, and managing continuous improvement of the MLS program.

Responsibilities of the Clinical Practicum Coordinator:

The clinical practicum coordinator will be the primary university contact person for practicum students and will be responsible for organizing student practicums, maintaining NAACLS accreditation, teaching the online practicum course, monitoring student progress, and maintaining ongoing communication with affiliates and practicum students.

MLS Program Degree Concentrations:

There are five specialty concentrations available with the Bachelor of Science in Medical Laboratory Science.

1. Medical Lab Science 3+1
    a. Students who choose the 3+1 major are on the fast track to becoming a Medical Lab Scientist. Students spend three years on campus learning fundamental information in preparation for a fourth-year clinical practicum at a NAACLS-accredited teaching hospital that is affiliated with Michigan Tech. The practicum experience will consist of academic studies combined with hands-on experience in the clinical laboratory.

       After successful completion of coursework, hospital training, and the receipt of their BS in MLS, students will be qualified to take an examination for national certification as a Medical Laboratory Scientist.

2. Medical Lab Science 4+1
    a. Students who choose the 4+1 option are on a similar track as 3+1 students, but with an extra year on campus for study and specialization. Students spend the first three years on campus taking fundamental course work, with an additional year on campus for specialty course work.

Following the completion of your coursework and receipt of their BS in MLS, students have two options for completing a clinical practicum:

i. University-based route: Under this route, MTU holds the accreditation and students are able to complete their fifth-year practicum at any one of our non-NAACLS accredited affiliate hospitals. Practicum students will enroll in BL4612 for coursework while receiving hands-on experience in the clinical lab.

   After successful completion of the clinical practicum, students will be qualified to take an examination for national certification as a Medical Laboratory Scientist, following approval from the MTU Program Director.

ii. Hospital-based route: Under this route, students complete their fifth-year practicum at any NAACLS-accredited hospital. Students may choose to apply to the Michigan Match program, Wisconsin affiliates, Minnesota affiliates, Ohio affiliates, or seek out their own opportunities elsewhere. All coursework and clinical experience is at the discretion of the clinical practicum site under this route.

   After successful completion of the clinical practicum, students will be qualified to take an examination for national certification as a Medical Laboratory Scientist, following approval from the hospital Program Director.

3. Medical Lab Science 4+1 Cytotechnology
   a. The Medical Laboratory Science 4+1 Cytotechnology concentration is similar to the Medical Laboratory Science 3+1 option, but with an added year for additional study and specialization. Students will spend four years on campus—taking three years of fundamental course work plus an additional year of specialty course work—in preparation for a fifth-year clinical practicum, completed at a teaching hospital with an accredited Cytotechnology program. The practicum consists of academic studies combined with extensive hands-on experience in microscopy, diagnosis of malignancies, and other cell abnormalities.

After earning a BS in MLS and successful completion of hospital training, students will be qualified to take an examination for national certification as a Cytotechnologist.

4. Medical Lab Science 4+1 Histotechnology
    a. Students who want to use their degree to become a histologic technician or histotechnologist will pursue the Medical Laboratory Science 4+1 Histotechnology concentration option. Students will spend four years on campus taking fundamental course work, and then have the option to complete a fifth-year histotechnology clinical practicum at an accredited teaching hospital. The practicum is encouraged but not required, and consists of academic studies combined with extensive hands-on experience focusing on tissue preparation.

       After successful completion of University course work and training in a medical histology laboratory (for those who choose to complete a practicum), students will receive a BS in Medical Laboratory Science and be qualified to take an examination for national certification as a Histotechnologist.

5. Medical Lab Science 4+1 Secondary Education Teacher Certificate
    a. Students interested in teaching at the high school level will pursue a degree in Medical Laboratory Science with a 4+1 Secondary Education concentration. They will build a framework of Medical Laboratory Science knowledge and education course work, including directed (student) teaching, that will qualify them to teach high school courses such as biology or chemistry. After successful completion of University course work, students will receive both a BS in Medical Laboratory Science and a secondary school teacher certification.

       Additionally, students may complete a clinical practicum through the university-based or hospital-based route to become qualified to take an examination for national certification as a Medical Laboratory Scientist.

Program Major Requirements:

The following is an overview of the major requirements for the 3+1 and 4+1 degree options:

Medical Laboratory Science 3+1 Major Requirements:

Course Number	Title	Credits	Semester Offered
BL 0600	Practicum and Career Prep	1*	Spring
BL 1020	General Biology II	4	Spring
BL 1600	Intro to Medical Lab Science	1	Fall
BL 1710	Medical Terminology	1	Fall
BL 2010	Anatomy & Physiology I	3	Fall
BL 2011	Anatomy & Physiology I Lab	1	Fall
BL 2020	Anatomy & Physiology II	3	Spring
BL 2021	Anatomy & Physiology II Lab	1	Spring
BL 2100	Principles of Biochemistry	3	Fall
BL 2200	Genetics	3	Spring
BL 2410	Basic Medical Lab Techniques	3	Fall
BL 3210	General Microbiology	4	Fall
BL 3230	Medical Bacteriology	4	Spring
BL 3640	General Immunology	3	Fall, Summer
BL 3780	Medical Parasitology Lab	1	Spring
BL 4030	Molecular Biology	3	Fall
BL 4550	Clinical Chemistry	3	Spring
BL 4640	Clinical Immunology & Serology	2	Fall
BL 4720	Hematology and Hemostasis	3	Fall
BL 4730	Immunohematology Techniques	1	Fall
BL 4750	Medical Lab Instrumentation	2	Spring
BL 4980	SML Core Concept Integration	2	Spring
CH 1150	University Chemistry I	3	Fall, Spring, Summer
CH 1151	University Chemistry I Lab	1	Fall, Spring, Summer
CH 1153	University Chemistry I Recitation	1	Fall, Spring, Summer
CH 1160	University Chemistry II	3	Fall, Spring, Summer
CH 1161	University Chemistry II Lab	1	Fall, Spring, Summer
CH 1163	University Chemistry II Recitation	1	Fall, Spring, Summer
CH 2410	Organic Chemistry I	3	Fall, Spring, Summer
MA 2720	Statistical Methods	4	Fall, Spring, Summer

Medical Laboratory Science 4+1 Major Requirements:

Course Number	Title	Credits	Semester Offered
BL 0600	Practicum and Career Prep	1*	Spring
BL 1020	General Biology II	4	Spring
BL 1600	Intro to Medical Lab Science	1	Fall
BL 1710	Medical Terminology	1	Fall
BL 2010	Anatomy & Physiology I	3	Fall
BL 2011	Anatomy & Physiology I Lab	1	Fall
BL 2020	Anatomy & Physiology II	3	Spring
BL 2021	Anatomy & Physiology II Lab	1	Spring
BL 2100	Principles of Biochemistry	3	Fall
BL 2200	Genetics	3	Spring
BL 2410	Basic Medical Lab Techniques	3	Fall
BL 3210	General Microbiology	4	Fall
BL 3230	Medical Bacteriology	4	Spring
BL 3640	General Immunology	3	Fall, Summer
BL 3780	Medical Parasitology Lab	1	Spring
BL 4030	Molecular Biology	3	Fall
BL 4550	Clinical Chemistry	3	Spring
BL 4640	Clinical Immunology & Serology	2	Fall
BL 4720	Hematology and Hemostasis	3	Fall
BL 4730	Immunohematology Techniques	1	Fall
BL 4750	Medical Lab Instrumentation	2	Spring
BL 4980	SML Core Concept Integration	2	Spring
CH 1150	University Chemistry I	3	Fall, Spring, Summer
CH 1151	University Chemistry I Lab	1	Fall, Spring, Summer
CH 1153	University Chemistry I Recitation	1	Fall, Spring, Summer
CH 1160	University Chemistry II	3	Fall, Spring, Summer
CH 1161	University Chemistry II Lab	1	Fall, Spring, Summer
CH 1163	University Chemistry II Recitation	1	Fall, Spring, Summer
CH 2410	Organic Chemistry I	3	Fall, Spring, Summer
MA 2720	Statistical Methods	4	Fall, Spring, Summer

Part II: General Policies

Program Admission:

Admission to the Medical Lab Science Program is made on a rolling basis. Students may enter the program at the start of the Fall or Spring semester, or may transfer in laterally from other programs. GPA and ACT criteria for program admission comply with Michigan Tech standards. Students should have a GPA >3.0 and ACT score greater than or equal to 22. Students who do not meet the criteria will be evaluated on a case-by-case basis.

Tuition, Fees, & Refund Policy:

Please see Student Finance Policies.

Student Grievance & Appeals:

Please see the Dean of Students website.

Attendance:

Attendance policies will be outlined clearly in each course syllabus. Students are expected to arrive on time and attend all classes and labs regularly. In the event that the student is unable to attend class or lab, they must email the instructor prior to the start of class/lab. Please note that not all labs can be made up due to time constraints.

Program Progression:

Students in the Medical Laboratory Science program must comply with all academic and curricular policies set by the Dean of Students Office, including probation, suspension, and possible dismissal. Please familiarize yourself with these policies at the Dean of Students website. Students who wish to complete a practicum at an accredited teaching hospital will be evaluated based on that program's requirements. Students who wish to complete a practicum through the University-based route are required to have a departmental GPA of greater than or equal to 2.75, and an overall cumulative GPA of greater than or equal to 2.5.

Essential Functions/ Technical Performance Standards:

Essential Functions/Technical Performance Standards represent the non-academic requirements of the program. Students must be able to meet and master program essential functions, or request reasonable accommodations to successfully complete these essential functions, in order to participate in the medical laboratory science/clinical practicum programs. All applicants are expected to:

1. **Manual Dexterity:**
   Possess the gross/fine motor skills and hand/eye coordination to safely perform diagnostic procedures which includes performing phlebotomy, using chemicals, specimens, microbiology cultures, laboratory instruments and equipment, and computers

2. **Visual Acuity:**
   -Differentiate different colors and shades, characterize clarity and viscosity of medical specimens, reagents, and chemical reaction end products
   -Examine microscopic specimens and be able to differentiate color, shading, and structural differences
   -Read text, numbers, and graphs in print, on computer monitors, and hand-writing
   -Judge distance, depth, and 2 or 3 dimensional structures

3. **Physical, Mental and Emotional Health:**
   -Function for an 8 hour work day under stressful conditions
   -Be able to recognize emergency situations and react in an appropriate manner
   -Move around the hospital and laboratory freely and safely
   -Follow verbal directions with normal or corrected hearing
   -Be able to bend, stoop and stand; lift 20 pounds; maintain prolonged sitting or standing positions; perform repetitive tasks
   -Maintain concentration with distractions

4. **Behavior:**
   -Be able to work independently, with flexibility and be adaptable to change
   -Be willing to work with sharp objects, hazardous chemicals and infectious/biohazardous material
   -Recognize situations that may be potentially hazardous
   -Conduct work with honesty, compassion, ethical behavior and responsible actions
   -Work as a team in regards to learning, tasks, problem solving and patient care

5. **Intellectual and Creative Thinking:**
   -Perform complex interpretive testing, possess troubleshooting skills, and exercise sound judgement
   - Recognize and correct deviations in testing
   -Prioritize work, be productive, and accurate within realistic time allowances

6. **Communication:**
   The primary language for all verbal and written communication is English.

-Understand and follow verbal, non-verbal and written instructions
-Effectively communicate verbally and in writing
-Clearly present oral presentations to diverse audiences
-Comprehend technical materials: text, numbers, math, graphs, textbooks, journals, instructions, internet, manuals, etc.
-Prepare papers, reports and posters both independently and in group projects
-Take written, oral, computer and laboratory practical exams at the post-secondary level within established time frames
-Interact and communicate effectively and confidentially with laboratory peers, hospital staff, administration, and patients (it should be noted that patients will be of varying ages, and physical and mental states)
-Use computer software, instructional technology, and the Internet for purposes of communication and education

References:

1. Technical Performance Standards/Essential Functions for MTIMPM Hospital-Based Clinical Practicum Programs 8/12/13
2. ASCLS Essential Functions 2012-2016

Laboratory Safety:

Students are required to abide by all safety rules found in the MLS Safety Practices for the Clinical Lab Standard Operating Procedure (SOP):

- Keep all personal items such as coats, notes, books, book bags, handbags, etc. away from potentially contaminated laboratory areas. Items such as these must remain outside of the laboratory or in designated clean areas within the laboratory.
- Proper handwashing is a very important factor in arresting the transmission of disease. Directions for proper handwashing are located at each sink. Wash your hands:
    - Before and after performing any procedure involving use of gloves for patient or personal contact such as venipuncture, capillary puncture, urine collection, throat culture, etc. Remember that **fresh non-latex gloves** must be used for direct contact with each patient.
    - If your hands become contaminated with human blood or other human body fluids.
    - If your gloves become contaminated with human blood or other body fluids. (Note: Remove the contaminated gloves and wash your hands.)
    - Immediately prior to leaving the laboratory.
- Keep fingernails clean and short.
- Keep long hair tied back.
- Notify your lab partner and the instructor if you feel ill, weak, or faint; report any injury to the instructor immediately.

- Dress for safety:
    - Keep in mind that cloth shoes, or shoes that do not cover the entire foot, loose fitting clothing, scarves, neckties, and jewelry may be hazardous and are not to be worn in the laboratory.
    - Wear a fluid resistant laboratory coat (available at the MTU Bookstore and ChemStores), and button it completely to assure maximum personal protection. <u>You will not be allowed to participate in laboratory exercises without an acceptable protective coat.</u> This coat must not be worn outside of the laboratory, and must be stored on the designated coat rack.
    - Wear appropriate masks when dealing with organisms causing tuberculosis. (Note: You will not deal with TB organisms in MTU campus-based student laboratories.)
- **Read the entire assigned laboratory exercise before beginning** and note any special precautions you may need to take. If you are unsure how to safely perform any portion of the procedure, be sure to ask before your proceed.
- Do not eat, drink, smoke, apply cosmetics or lip balm, bite fingernails, or insert contact lenses while in the laboratory, and remember not to moisten labels with your tongue, chew pencils, or lick fingers before turning pages.
- Disinfect your work area with a 1:10 dilution of household bleach (prepared daily) at the beginning and end of each laboratory period.
- Be sure to clean up spills containing human blood or other potentially infectious materials (OPIM) immediately. First, remove any broken glass with forceps and dispose of it in the sharps containers to be autoclaved. Next, absorb as much of the spill as possible with wet paper towels, or spill kit powder if appropriate, being sure to wear non-latex gloves; and wash the area with mild soap to remove protein residue. Finally, flood the spill area with 1:10 dilution of household bleach, allow to stand for 15 minutes, and then complete the clean up by using absorbent paper towels. Dispose of contaminated material in the biohazard bag.
- NEVER pipette by mouth. Appropriate pipetting devices are available for use in each laboratory procedure. Ask if you cannot find them.
- Do not leave pipettes sticking out of reagent bottles, flasks, test tubes, or laying on the bench. Place them in the pipette washer tip up.
- When dealing with human blood and body fluids it is necessary to utilize Universal/Standard Precautions. This means that you must treat ALL human samples and reagents containing human materials as potential carriers of disease.
- Wear protective non-latex gloves when performing procedures involving any human body fluid, including clean up. This includes any contaminated laboratory equipment or supplies such as instruments, test tube racks, or glassware.
- Use laboratory safety goggles (available at the MTU Bookstore) or other appropriate face protection such as plastic/plexiglass shield (available in 20-1103), during any

procedure likely to generate droplets containing blood, body fluid, or harsh chemicals. Examples of such procedures include:
    - Opening snap top specimen containers
    - Uncapping any vacutainer type blood or urine collection tube
    - Processing specimens by centrifugation
    - Pouring specimens
    - Use of analyzers with tubing
    - Dilution, pouring, or use of disinfectants
    - Disposing of specimens
- Disinfect goggles and face shield prior to each laboratory session by wiping them with 10% bleach and allow them to air dry; goggles must be worn when handling or transferring chemicals for clinical analyses or chemicals used in specimen preparation for analysis.
- Minimize the production of droplets and aerosols by:
    - Covering all test tubes prior to centrifugation
    - Operating the centrifuge only with its cover closed
    - Leaving the centrifuge cover closed for 15 minutes if a tube breaks during centrifugation. This allows settling of airborne material. Remember to disinfect the centrifuge in accordance with broken glass/spill procedures.
    - Performing activities such as blending, sonicating, and vigorous mixing only in covered containers or in a class I or II biological safety cabinet
    - Removing stoppers from blood tubes only after covering the tube and stopper with a laboratory tissue. Open it "away" from yourself and others.
- When handling chemical reagents be sure to read all labels carefully. Consult Material Safety Data Sheets (MSDS) when appropriate. (Note: Know the locations of MSDS for the chemical reagents you use. There is a hard copy set of all department MSDS in the main Biology office, Dow 740.) MSDS include:
    - Identity of the material and manufacturer
    - Hazardous ingredients/identity information
    - Physical/chemical characteristics
    - Fire and explosion hazard data
    - Reactivity data
    - Health hazard data
    - Precautions for safe handling and use
    - Control measures
- Clearly label all specimens and reagents. If possible, include:
    - Contents
    - Concentration
    - Date of opening and/or preparation
    - Storage requirements

    - Expiration date
    - Hazard information
    - ID of individual who collected the specimen or prepared the reagent
- If you must leave the laboratory, ask someone to assume the responsibility for instruments and reagents actively in use. Do not leave an "active" area unattended.
- Clean, disinfect, and organize your work area before leaving the laboratory. Be sure to dispose of all potentially harmful substances and apparatus properly.
    - With the exception of sharp objects, disposable items contaminated with human blood and other human body fluids much be placed in the biohazard bags provided. These bags will be autoclaved by the laboratory.
    - Needles, lancets, or other "sharps" (including capillary tubes and glass microscope slides) contaminated with biological materials must be placed in the small, rigid plastic safety containers provided. These items go directly into the containers without being broken, cut, or bent. Use only needles that have OSHA approved safety guards. Lock the guard in place before needle disposal and put them, along with their disposable adapter, into the safety container. These containers will be autoclaved by the laboratory staff prior to disposal.
    - Broken glass not presenting a biological hazard must be placed in the designated puncture-resistant cardboard containers or contaminated sharps containers, depending on the size of the broken piece.
    - Human blood, blood products, excretions and secretions must be carefully poured into liquid impervious biohazard bags
    - Materials labeled infective will be autoclaved by the laboratory staff and disposed of in a sanitary landfill
    - Laboratory glassware and plastic ware that is not contaminated with biological materials must be washed according to the instructions provided. Remember to use gloves.
- Do not handle gas cylinders under direct supervision of the instructor. If treated improperly, they can become missiles capable of penetrating walls
- When handling electrical equipment, keep your hands dry and be sure your feet and body are away from any water. Be aware that an electrical shock victim has the potential to conduct current to a rescuer. Campus Facilities handles all utility problems. During normal working hours (8:00 AM – 5:00 PM Monday-Friday) call 487-2303; after normal working hours and on weekends and holidays call Public Safety at 487-2216 and they will call appropriate Campus Facilities personnel.
- Be sure that you know the fire evacuation plan for the laboratory. NEVER use the elevators during a fire. The stairways are designed to be used as inside fire escapes.
- Be sure that you know the location of the following items, and how to use them:
    - Fire extinguisher
    - Fire blanket

- Fire alarm
- First aid kit
- Eye wash fountain

- In the unlikely event of a severe fire, explosion, chemical spill, or other unusual laboratory disaster:
  - Help any injured party, removing them from the site, if appropriate
  - Shut off all flames and sources of gas
  - Evacuate the laboratory immediately, closing windows and doors as you leave, if possible
  - Summon help. If no faculty or staff member is readily available, sound the fire alarm, leave the area, go directly to a phone, dial one the emergency numbers listed below, and report the emergency.
    - The nearest phones are in:
      - Anatomy lab (20-1101)
      - Stockroom (20-1102)
      - MLS prep room (20-1104)
      - General Biology Lab (20-1106)
      - General Biology Lab (20-1108)
    - The Emergency Red Phone closest to MEEM 1103 is on the 9th floor adjacent to the elevators. Other phones are located adjacent to elevators on floors 1, 5, 6, 7, and 8.
- **FOR ALL EMERGENCIES DIAL 911**
  - Other important numbers you may use to get help (dial 8 to get off-campus numbers):
    - MTU Public Safety 487-2216
    - Biology Main Office (DOW Building) 487-2025
    - Dean of Students Office 487-2212
    - Poison Control Center 8-1-800-562-9781
- Remain calm and make every effort to think clearly if an unexpected situation should occur.
- Medical Waste Disposal
  - All non-breakable items that have the potential to be contaminated with biohazard material are placed in the autoclave biohazard bags. These bags are autoclaved before disposal.
  - Any disposable glass items are to be placed in designated broke glass containers. Any disposable glass items potentially contaminated with biohazard materials are soaked in a 10% bleach solution for 30 minutes, rinsed, then disposed.
  - All non-breakable, non-biohazard materials are placed in the regular trash.
  - All “sharps” are placed in labeled biohazard red sharps containers. When they are 2/3 full they will be sealed and autoclaved prior to disposal.

References:

Center for Disease Control and Prevention, www.cdc.gov (reviewed 11/5/10 – afs)

Department of Biological Science Laboratory Safety Manual, 2008.

Grill, P. personal communication/presentation, Keweenaw Memorial Medical Center Laboratory Safety Training, 2002.

Henry, J.B., Clinical Diagnosis and Management by Laboratory Methods, 20th ed., W. B. Saunders Co., 2001, p. 34-36.

Occupational Safety and Health Administration, U.S. Department of Labor, www.osha.gov (reviewed 11/5/10 – afs)

State of Michigan Department of Energy, Labor, and Economic Growth, http://www.michigan.gov/dleg/0,1607,7-154-11407---,00.html [MIOSHA] (reviewed 11/5/10 – afs)

I have read and do understand the previously listed laboratory safety rules.

Name (print clearly): _____
last first middle initial

Signature: _____

Date: _____

Course number: _____

Hepatitis B/Immunization Policy:

Students in the lab and clinical sites will come into direct contact with human blood and body fluids. In order to participate in some laboratory activities, students must provide proof of Hepatitis B vaccination or antibody titer. Receiving the vaccine protects you, other students, and your future patients. Students who refuse vaccination will have to sign a declination form, indicating that you have been made aware of the vaccine, all risks associated with not receiving the vaccination, and that you may change your mind and become vaccinated at any time. Scheduling to get the vaccine and payment are the responsibility of the student.

Many clinical affiliates require the Hepatitis B vaccine as part of the student's immunization record. Declination of the vaccine may delay the practicum placement for students.

Health Information Portability and Accountability Act (HIPAA):

Students in the MLS program will have the opportunity to tour several labs/healthcare facilities in their courses. Anything that is seen or heard during these tours **stays in the lab per HIPAA regulations.** It is a great experience to be able to tour these labs, and we want to maintain a

professional relationship with these hospitals and ensure that touring can continue. The Health Information Portability and Accountability Act (HIPAA) of 1996 provides the national standard for protecting individuals' medical records and other personal health information. Students are provided with information on the Privacy Rule while in the MLS program and at pre-practicum orientation. Disclosure of patient information to any unauthorized person could result in fines or imprisonment, and is ground for dismissal from the program. Never discuss patient results outside of the laboratory and do not release any patient information to unauthorized individuals.

Granting of the Degree:

Granting of the BS degree in Medical Laboratory Science is not contingent upon passing the national certification exam. While it is encouraged that all students who are eligible to sit for the national certification exam do so, it is not required in order to earn your BS degree.

Teach Out Plan:

NAACLS requires all accredited programs to implement a "Tech out Plan" in the unlikely event of an unanticipated program closure. In the event of a program closure, students will be notified immediately via email. All currently enrolled students will be permitted to complete the program. No new students will be admitted into the program. The Program Director will advise potential/prospective students to help acquaint them with local programs.

Part III: Competencies

MTU MLS Program Entry Level Competencies

Specimen Collection:

1. Demonstrate knowledge and proficiency of the following blood collection procedures:
    a. Patient identification and preparation
    b. Collection device selection and usage
    c. Order of draw
    d. Aseptic technique
    e. Specimen labeling and handling
    f. Capillary and venous collection
    g. Proper use of PPE and adherence to hospital safety regulations

Hematology:

1. Identify and describe the cellular components of blood, bone marrow, and body fluids.
2. Identify and describe the function of the cellular components of blood, bone marrow, and body fluids.
3. Prepare and evaluate blood smears in a timely and accurate manner for the following:
    a. WBC differentials – normal and abnormal
    b. WBC estimate

    c. Platelet estimate
    d. RBC morphology – normal and abnormal
4. Correlate cell morphology and patient values with the correct pathological states.
5. Properly employ the use of various cytochemical stains.
6. Demonstrate the following manual procedures and/or calculations accurately:
    a. Erythrocyte sedimentation rate (ESR)
    b. Reticulocyte counts
    c. RBC indices
    d. WBC correction for nucleated RBC's
    e. Fluid cell counts
7. Employ the use of additional routine or confirmatory testing to the level of accuracy established by the laboratory.
8. Maintain efficient work area by keeping area clean and replenishing supplies and reagents.
9. For instrumentation and equipment:
    a. Describe the principle of operation and key components
    b. Perform necessary calibrations and quality controls
    c. Identify instrumental causes of unexpected patient results
    d. Troubleshoot all analyzer malfunctions
    e. Perform regular preventative maintenance and repairs

Coagulation:

1. List the steps and factors in the coagulation scheme.
2. Perform automated, semi-automated, and manual testing with the level of accuracy established by the laboratory for the following tests:
    a. Prothrombin time (INR); with significance of ISI
    b. Activated partial thromboplastin time
    c. Fibrinogen
    d. D-dimer
    e. Factor assays
    f. Mixing studies
    g. Anticoagulant therapy
3. Correlate patient values with pathological or therapeutic states.
4. Maintain efficient work area by keeping area clean and replenishing supplies and reagents.
5. For instrumentation and equipment:
    a. Describe the principle of operation and key components
    b. Perform necessary calibrations and quality controls
    c. Identify instrumental causes of unexpected patient results
    d. Troubleshoot all analyzer malfunctions
    e. Perform regular preventative maintenance and repairs

Urinalysis:

1. Explain the structure and function of the urinary tract.
2. Perform automated, semi-automated, and manual testing with the level of accuracy established by the laboratory for the following tests:

    a. Urinalysis
    b. Urine pregnancy tests
    c. Other miscellaneous urinalysis tests
3. Identify, analyze, and report the physical and chemical properties and urine constituents.
4. Identify and explain the presence of normal and abnormal elements found in the microscopic examination of urine sediment.
5. Recognize and explain the presence of contaminants and artifacts in the microscopic examination of urine sediment.
6. Explain the chemical reaction of tests and accurately correlate their results to pathological states.
7. Maintain efficient work area by keeping area clean and replenishing supplies and reagents.
8. For instrumentation and equipment:
    a. Describe the principle of operation and key components
    b. Perform necessary calibrations and quality controls
    c. Identify instrumental causes of unexpected patient results
    d. Troubleshoot all analyzer malfunctions
    e. Perform regular preventative maintenance and repairs

Chemistry:

1. Describe specified clinical chemistry assays with reference to the principles of the procedure and chemical reactions involved.
2. Accurately perform procedures including:
    a. Spectrophotometry
    b. Electrophoresis and densitometry
    c. Enzyme immunoassay
    d. Blood gas analysis
    e. Osmometry
    f. Automated instrumentation analysis
3. Apply the appropriate mathematical calculations to practical laboratory situations.
4. Recognize normal and abnormal patient values and correlate results with pathological or therapeutic states.
5. Maintain efficient work area by keeping area clean and replenishing supplies and reagents.
6. For instrumentation and equipment:
    a. Describe the principle of operation and key components
    b. Perform necessary calibrations and quality controls
    c. Identify instrumental causes of unexpected patient results
    d. Troubleshoot all analyzer malfunctions
    e. Perform regular preventative maintenance and repairs

Microbiology:

1. Perform a variety of bacteriological procedures to demonstrate proficiency in identifying 90% of usually occurring bacteria
2. Perform and accurately interpret the laboratory-established procedures for each of the following:

    a. Inoculation and streaking of aerobic and anaerobic organisms
    b. Gram stain and microscopic examination of clinical materials and culture isolates
    c. Identification of aerobic and anaerobic bacteria by serological, biochemical, and antimicrobial testing
    d. Sensitivity testing
    e. Acid fast staining
    f. Ova and parasites
    g. Fungus identification
    h. Blood cultures
    i. Wet preps
3. Differentiate normal and pathogenic flora.
4. Correlate abnormal patient results with the appropriate pathogenic states.
5. Describe the principles and procedures of molecular testing.
6. Maintain efficient work area by keeping area clean and replenishing supplies and reagents.
7. For instrumentation and equipment:
    a. Describe the principle of operation and key components
    b. Perform necessary calibrations and quality controls
    c. Identify instrumental causes of unexpected patient results
    d. Troubleshoot all analyzer malfunctions
    e. Perform regular preventative maintenance and repairs

Immunohematology:

1. Explain the basic methods and principles of immunohematology testing.
2. Explain the significance of special requirements with regard to:
    a. Patient identification
    b. Specimen labeling
    c. Transcription of results
    d. Record keeping
    e. Release of units for transfusion
    f. Emergency uncrossmatched release
3. Perform the following procedures on patient specimens with 100% accuracy and correct interpretation:
    a. ABO and Rh
    b. Antibody screen
    c. Weak D testing
    d. Antibody identification
    e. Direct and Indirect Antiglobulin tests
    f. Pre-transfusion crossmatch and compatibility testing
    g. Elutions, adsorptions, neutralizations
    h. Titers
    i. Donor unit processing of components
    j. Rh Immune Globulin
    k. Transfusion reaction

4. Describe, perform, evaluate, and interpret immunohematology testing required for blood and blood component therapy
5. Correlate results with patient condition.
6. Describe blood components currently available for therapeutic use with regard to:
    a. Storage
    b. Preparation
    c. Infusion
    d. Indications for use
    e. Leukocyte reduction methods
    f. Irradiation
    g. Autologous/directed donation
7. List the general health requirements, disease markers, and reasons for exclusion of potential blood donors
8. Select the appropriate components for patient transfusion given their blood type, antibody screen, and patient history.
9. Appropriately prioritize patient work with regard to urgency of the situation.
10. Maintain efficient work area by keeping area clean and replenishing supplies and reagents.
11. For instrumentation and equipment:
    a. Describe the principle of operation and key components
    b. Perform necessary calibrations and quality controls
    c. Identify instrumental causes of unexpected patient results
    d. Troubleshoot all analyzer malfunctions
    e. Perform regular preventative maintenance and repairs

Immunology/Serology:

1. Identify the cells and organs of the immune system and explain their functions.
2. Describe immunologic principles for the method of testing performed, including the limitations of the test system and diagnostic significance of the results.
3. Accurately perform or discuss the following procedures:
    a. Serologic screening, serial dilutions and titers
    b. Flocculation, latex and RBC agglutination
    c. Precipitation methods
        i. RID
        ii. Ouchterlony
    d. Immunoelectrophoresis/Immunofixation
    e. ELISA
    f. Direct and indirect immunofluorescence
    g. Flow cytometry
4. Maintain efficient work area by keeping area clean and replenishing supplies and reagents.
5. For instrumentation and equipment:
    a. Describe the principle of operation and key components
    b. Perform necessary calibrations and quality controls

c. Identify instrumental causes of unexpected patient results
d. Troubleshoot all analyzer malfunctions
e. Perform regular preventative maintenance and repairs

Management/Education:

1. Distinguish between cognitive, affective, and psychomotor domains.
2. Prepare a resume and cover letter.
3. Explain routine maintenance and calibration of laboratory equipment and identify necessary corrective action to maintain quality controls.
4. Identify and explain pre-analytical, analytical, and post-analytical sources of error in laboratory testing.
5. Explain the principles of laboratory management, supervision, and continuing education.
6. Demonstrate communication skills with all levels of hospital personnel while maintaining professional and ethical conduct.
7. Describe the integration of laboratory information systems (LIS) with electronic health records.
8. Discuss the process of certification, accreditation, proficiency and competency testing, and laboratory inspection.