COURSE INFORMATION

Course Prefix/Number: MLT 251
Course Title: Clinical Experience I
Lecture Hours/Week: 0.0
Lab Hours/Week: 15.0
Credit Hours/Semester: 5.0

COURSE DESCRIPTION

This course provides an integrated, clinically based rotation which correlates cognitive and technical skills in selected areas of the clinical laboratory.

COURSE COMPETENCIES

Additional Competencies and objectives for each departmental rotation are listed in the Notebook for Clinical Rotations

Module 1: Hematology
Upon completion of the hematology rotation, the student will be able to:

Automated Cell Counter
- Organize the routine blood samples by:
  - Numbering and/or bar coding the tubes of blood and the request forms.
  - Recording information on the ledger and/or in the computer.
  - Mixing the blood samples.
  - Preparing the blood smears.
- Start-up the automated cell counter following the steps outlined in the procedure manual.
- Perform the routine quality control for the automated cell counter.
- Operate the automated cell counter including:
  - Running samples and recognizing results which are erroneous and/or abnormal.
  - Correlating patient results with the blood smear.
  - Making appropriate dilutions when indicated.
  - Handling fingerstick samples.
  - Handling of low counts.
  - Handling of lipemic samples.
  - Handling of cold agglutinins.
- Perform simple maintenance procedures on the automated cell counter as outlined in the procedure manual.
Hematology Procedures
- Set-up erythrocyte sedimentation rates.
- Perform manual WBC, RBC, and platelet counts.
- Perform spun hematocrits.
- Perform CSF cell counts and differentials.
- Demonstrate sickle cell testing.
- Determine the number of reticulocytes in given blood samples.
- Prepare and stain blood smears.
- Perform WBC differentials and evaluate the WBC morphology.
- Estimate WBC and platelet counts.
- Evaluate RBC morphology.
- Evaluate platelet morphology.
- Correlate the results obtained by the automated cell counter with the smear.
- Correlate histogram results with the other values obtained by the automated cell counter and the blood smear.
- Recognize and describe the commonly encountered hematological diseases, including anemias, leukemias, and others.
- Demonstrate professionalism in dress, conduct, and attitude.

Module 2: Microbiology
- Organize routine specimen cultures by:
  - Number and/or coding the specimens and request forms.
  - Recording information on the ledger and/or in the computer.
- Collect and/or handle specimens according to clinical specification.
- Select culture media for inoculation of specimens.
- Inoculate and incubate specimens.
- Prepare slides for Gram Stain.
- Perform and interpret Gram Stains.
- Identify medically important bacteria.
- Perform and interpret routine bacterial susceptibility testing.
- Perform and evaluate routine quality control testing.
- Prepare specimens for parasite observation/or send off.
- Identify parasites using macroscopic and/or microscopic morphology.
- Prepare specimen for AFB culture
- Select AFB media for specimen culture.
- Inoculate specimens onto AFB media.
- Prepare AFB smears.
- Perform and interpret AFB stains.
- Handle specimens for fungus culture.
- Select media for fungal cultures.
- Inoculate and incubate fungal cultures.
- Perform and interpret tests and stains used in fungus identification.
- Handle specimens for virology.
- Observe and/or perform tests used in virology identification.
- Demonstrate professionalism in dress, conduct and attitude.
Module 3: Chemistry

- Organize routine specimens by:
  - Numbering and/or coding specimens and request slips.
  - Recording information on the ledger and/or computer.
- Collect and handle specimens according to clinical specification.
- Prepare necessary reagents, standards, and controls.
- Perform routine chemical analysis by manual and/or automated methods.
- Explain the basic theory of operation of instrumentation used at the clinical site.
- Perform and evaluate routine quality control testing.
- Perform routine maintenance and simple troubleshooting on instrumentation.
- Recognize and report normal, abnormal, and panic values.
- Correlate laboratory values with clinical significance and/or disease states.
- Demonstrate professionalism in dress, conduct and attitude.

Module 4: Blood Banking

- Perform ABO and Rh typing.
- Recognize discrepancies between forward typing and reverse grouping, and know the appropriate steps to follow to solve them.
- Determine Rh phenotypes and calculate the genotypes, including Du.
- Describe and perform the compatibility testing procedure, including the crossmatch, auto control, and antibody screening.
- Select appropriate units of donor blood for routine and emergency crossmatching.
- Verify the identification of patients and specimens.
- Record and report results.
- Resolve incompatible crossmatches.
- Run a selected panel for antibody identification.
- Interpret the results obtained on the panel.
- Perform appropriate antigen screening.
- Run the Direct Antiglobulin test in the investigation of autoimmune hemolytic anemia, ABO and Rh hemolytic disease of the newborn, and transfusion reactions.
- Perform prenatal investigations including detection of antibodies in the maternal serum, and determination of the ABO and Rh of the parents.
- Perform postnatal investigations including the ABO and Rh of the baby, the Direct Antiglobulin test on the baby, and an elution and antibody identification when indicated.
- Evaluate patients for Rh immune globulin.
- Work up a transfusion reaction including the clerical check, confirmation of the ABO and Rh on the patient and unit, a Direct Antiglobulin test on the patient's cells, and observation of the patient's serum for hemolysis.
- Describe the preparation of, storage requirements for, and use of various blood components including packed red cells, cryoprecipitated AHF, fresh frozen plasma, and platelets.
- Perform therapeutic phlebotomies.
- Perform QC testing on reagent red cells and antisera.
- Record temperatures of refrigerators, heat blocks, water baths, and freezers.
- Demonstrate professionalism in dress, conduct, and attitude.

COURSE OBJECTIVES

*Additional Course objectives are found in the Notebook for Clinical Rotations

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Module 1: Hematology

- Using patient blood samples, the student will organize them according to laboratory protocol and prepare blood smears satisfactory to the clinical instructor.
- Following guidelines in the procedure manual, the student will start-up the automated cell counter and run the routine quality control obtaining results satisfactory to the clinical instructor.
- Following guidelines in the procedure manual, the student will run patient samples through the automated cell counter obtaining results satisfactory to the clinical instructor.
- Following guidelines in the procedure manual, the student will perform simple maintenance procedures on the automated cell counter satisfactory to the clinical instructor.
- Utilizing patient blood samples and the equipment provided, the student will set up and read ESRs within 90% accuracy of the results obtained by the clinical instructor.
- Utilizing patient blood samples, Unopettes or other manual counting methods and the counting chamber, the student will perform manual RBC, WBC and platelet counts within 90% accuracy of the results obtained by the automated cell counter.
- Using patient blood samples, capillary tubes, and a hematocrit centrifuge, the student will perform spun hematocrits within 95% accuracy of the results obtained by the automated cell counter.
- Utilizing a sickle cell screening kit and patient blood samples, the student will demonstrate the presence of sickling hemoglobins within 100% accuracy of the results obtained by the clinical instructor.
- Using a supravital stain and patient blood samples, the student will determine the number of reticulocytes present within 90% accuracy of the results obtained by the clinical instructor.
- Utilizing blood smears prepared from patient's blood samples and stained with Wright’s stain, the student will perform WBC differentials and evaluate the WBC morphology; estimate the WBC and platelet counts; and evaluate the RBC and platelet morphology, within 95% accuracy of the results obtained by the clinical instructor.
- Utilizing blood smears prepared from patient's blood samples and stained with Wright’s stain, the student will correlate the results obtained by the automated cell counter with the smear within 90% accuracy of the correlations made by the clinical instructor.
- Utilizing blood smears prepared from patient's blood samples and stained with Wright’s stain, the student will correlate histogram results with other values obtained by the automated cell counter and the blood smear within 90% accuracy of the correlations made by the clinical instructor.
- Given blood smears from diagnosed blood dyscrasias, the student will recognize and describe commonly encountered hematological diseases, including anemias and leukemias, within 95% accuracy of the results obtained by the clinical instructor.
- Utilizing information obtained in MLT 101 on professionalism, the student will display appropriate dress, conduct and attitude at all times.

Module 2: Microbiology

- Using patient specimens and requisition slips received for culture, the student will organize and record the specimens according to laboratory protocol with 95% accuracy.
- Utilizing the microbiology procedure manual and verbal instructions from the clinical instructor, the student will collect (where applicable) and handle specimens according to hospital protocol within 95% accuracy of the clinical instructor. (This includes collection and incubation of blood cultures, refrigeration, centrifugation, concentration, packaging for send-off, etc.).
Provided with the microbiology procedure manual and/or verbal instruction, the student will select culture media according to specimen source within 95% accuracy of the clinical instructor.

Given a heat source, culture media, inoculating loop and incubator, the student will inoculate and incubate the specimen according to the procedure manual and to the satisfaction of the clinical instructor.

Provided with the necessary materials and a procedure manual, the student will select (from specimen source) and prepare smears for gram stain satisfactory to the clinical instructor.

Given gram stain reagents and prepared slides, the student will perform and interpret the gram stain according to standard operating procedure and within 90% accuracy of the results obtained by the clinical instructor.

Utilizing reagents, media, instrumentation, procedure manual, and information obtained in MLT 105, the student will identify routine medically important bacteria to genus and species within 90% agreement of clinical instructor by:
  - Relating organism with unique criteria such as colony morphology, hemolysis, gram stain reaction, disease states, etc.
  - Recognition of and discrimination between normal flora and pathogens.
  - Selection, performance, and interpretation of routine biochemical tests used in identification.

Following guidelines in the procedure manual, the student will perform and interpret bacterial susceptibility testing using the Minimal Inhibitory Concentration (MIC) and/or Agar Diffusion methods satisfactory to the clinical instructor.

Given routine bacteriology quality control procedures, the student will perform these procedures and distinguish if a method is in or out of control with 100% accuracy.

Given materials and instructions, the student will prepare stool specimens for parasite examination satisfactory to the clinical instructor by:
  - Preparing direct wet mount slides using saline and/or iodine.
  - Performing a stool concentration method and preparing slides from the concentrate.
  - Preparing and performing permanent stains. (i.e. Trichrome stain, modified acid fast)

Given procedure manual guidelines, reference text, and a microscope, the student will identify common parasites by macroscopic and microscopic characteristics satisfactory to the clinical instructor.

Utilizing laboratory reagents and a procedure manual, the student will prepare a specimen for acid-fast culture within 90% accuracy by:
  - Selection of specimen source to be concentrated (i.e. sputum vs CSF)
  - Performance of concentration method used

Following guidelines in the procedure manual, the student will select the media to be used for AFB culture within 95% accuracy of the clinical instructor.

With the use of materials provided and after selection of AFB media, the student will inoculate the specimen onto the AFB media to the satisfaction of the clinical instructor.

Given slides, specimens, and instrumentation, the student will prepare smears for AFB stain according to standard operating procedure and to clinical instructor satisfaction.

Utilizing reagents and the procedure manual, the student will perform the AFB staining technique used at the hospital and interpret the stain for the presence or absence of AFB within 90% accuracy of the clinical instructor.
Given specimens for fungal culture, the student will provide the needed environment for the specimen until inoculation takes place with 95% accuracy.

- Using guidelines in the procedure manual, the student will select the specific media to be used for fungus cultures with 95% accuracy.
- Using selected media and instrumentation, the student will inoculate and incubate fungal specimens according to standard operating procedure and to the satisfaction of the clinical instructor.
- Given reagents and instructions, the student will perform and interpret general fungal identification tests such as germ tube, India Ink, and lactophenol cotton blue within 85% accuracy of results obtained by the clinical instructor.
- Given written and/or verbal guidelines, the student will handle specimens for viral culture according to condition requirement with 95% accuracy, (i.e. refrigeration, incubation, dilution, preservation).
- The student will observe and/or perform virology testing at the discretion and to the satisfaction of the clinical instructor. This includes serological/immunochemical test kits, cell line culturing, and staining techniques.
- Utilizing information obtained in MLT 101 on professionalism, the student will display appropriate dress, conduct and attitude at all times.

Module 3: Chemistry

- Using patient specimens and requisition slips received for chemical analysis, the student will organize and record the specimens according to laboratory protocol with 95% accuracy.
- Utilizing written and verbal instructions from the clinical instructor, the student will collect and process specimens according to hospital protocol and within 90% accuracy of the clinical instructor.
- The student will prepare reagents, standards and controls/calibrators using specified vessels and pipetting techniques to the satisfaction of the clinical instructor.
- Utilizing the chemistry procedure manual, reagents, and instrumentation (manual and/or automated), the student will perform the following chemical analyses within 90% accuracy of the results obtained by the clinical instructor:
  a. Carbohydrates
     - Glucose (serum and urine)
     - Glucose tolerance
  b. Electrolytes and minerals
     - Na (serum/urine)
     - K (serum/urine)
     - Cl-
     - CO$_2$
     - Ca++
     - Mg++
     - Li+
     - Iron/TIBC
  c. Enzymes/markers
     - CK
     - Alkaline phosphatase
     - Lipase
     - Isoenzymes
     - LD
     - Acid phosphatase
     - AST (SGOT) GGT
     - ALT (SGPT) Amylase
     - G6PD
     - Troponin
d. Lipids
   Lipid profile
   Cholesterol
   Triglycerides
   HDL

e. Protein and non-protein nitrogen compounds
   Total protein (serum, urine, CSF)
   Albumin
   BUN
   Creatinine/creatinine clearance
   Uric acid
   Globulin - A/G ratio

f. Bilirubin
   Total
   Direct
   Indirect
   Neonatal

g. Blood gases
   pH
   HCO₃⁻
   pCO₂
   O₂ saturation
   pO₂

h. Immunochemical assays
   - Utilizing the procedure manual, text books, and information obtained from MLT 125, the student will explain to the satisfaction of the instructor, the basic theory of operation of each chemistry instrument used at the clinical affiliate.
   - Given control specimens, reagents, control charts, and instructions, the student will perform and record routine quality control testing obtaining results within + 2 SD of the established mean. The student will utilize the Westgard rules for simple troubleshooting.
   - Given a procedure manual and/or verbal instructions, the student will perform and record routine maintenance and troubleshooting on chemistry instrumentation to the satisfaction of the clinical instructor.
   - Given patient results, the student will recognize and report normal, abnormal, and panic values according to hospital protocol and within 90% accuracy of the clinical instructor.
   - Utilizing laboratory values from specific groups of tests, the student will associate these tests/values with certain disease states or organ involvement to the satisfaction of the clinical instructor.
   - Utilizing information obtained in MLT 101, the student will display appropriate dress, conduct and attitude at all times.

Module 4: Blood Banking

- Using antisera and reverse grouping cells, the student will perform ABO and Rh typing on patient blood samples within 100% accuracy of the results obtained by the clinical instructor.
- Utilizing antisera and reverse grouping cells, the student will resolve discrepancies between forward typing and reverse grouping obtaining results satisfactory to the clinical instructor.
- Using Rh typing sera, the student will determine Rh phenotypes and calculate the genotypes on a minimum of two patients within 100% accuracy of the results obtained by the instructor.
- Given a rack of blood bank reagents, the student will perform the compatibility testing procedure -- including typing, the crossmatch, auto control, and antibody screen -- on
patient blood samples within 100% accuracy of the results obtained by the clinical instructor.

- Given units of donor blood the student will select appropriate types for routine and emergency crossmatches within 100% accuracy of the selections made by the clinical instructor.
- Observing patient armbands and requisitions and verifying verbally with patient or patient representative, the student will verify the identification of patients and specimens within 100% accuracy according to the clinical instructor's observations.
- Using blood bank ledger sheets and/or the blood bank computer, the student will record and report results with 100% accuracy according to the clinical instructor's observations.
- Following guidelines in the procedure manual, the student will resolve incompatible crossmatches to the satisfaction of the clinical instructor.
- Accommodating patient armbands and requisitions, the student will verify the identification of patients and specimens within 100% accuracy according to the clinical instructor’s observations.
- Using blood bank ledger sheets and/or the blood bank computer, the student will record and report results with 100% accuracy according to the clinical instructor’s observations.
- Following guidelines in the procedure manual, the student will resolve incompatible crossmatches to the satisfaction of the clinical instructor.
- Given a cell panel, the student will identify a minimum of five antibodies within 100% accuracy of the results obtained by the clinical instructor.
- Using specially selected antisera, the student will perform antigen typings, other than ABO, within 100% accuracy of the results obtained by the clinical instructor.
- Given patient cells, the student will utilize anti-human globulin to run Direct Antiglobulin tests within 100% accuracy of the results obtained by the clinical instructor.
- Using prenatal blood samples, the student will perform ABO, Rh, and antibody screening tests within 100% accuracy of the results obtained by the clinical instructor.
- Using cord bloods, the student will perform an ABO and Rh, a Direct Antiglobulin test, and an elution with antibody identification when indicated, on each sample within 100% accuracy of the results obtained by the clinical instructor.
- Utilizing patient blood samples, blood bank reagents, and a selected test for fetal-maternal bleed-over, the student will evaluate patients for Rh immune globulin within 100% accuracy of the results obtained by the clinical instructor.
- Given specimens from patients with possible transfusion reactions, the student will perform transfusion workups within 100% accuracy of the results obtained by the clinical instructor.
- Given the specified components, the student will prepare fresh frozen plasma, cryoprecipitated AHF, and platelets for transfusion, to the satisfaction of the clinical instructor.
- Using known cells and antisera, the student will perform quality control on his/her rack of reagents each day obtaining the expected results.
- Utilizing information obtained in MLT 101 on professionalism, the student will display appropriate dress, conduct and attitude at all times.

METHODS OF INSTRUCTION

Instruction consists of hands on application of procedures in the clinical laboratory setting, as well as review of notes, textbooks, and lab manuals. Computer assisted instruction is also utilized to review theory of rotational departments.

MINIMAL STANDARDS

A grade of C or better is required in the class to continue in the MLT program. Also, each student must be proficient as documented on the final evaluation with an “M” for each critical skill by the end of the department rotation. Failure to do either of these will result in dismissal from the program.
COURSE REQUIREMENTS

- Attend clinical consistently. Any days missed must be made up in the department where the absence occurred at the discretion of the clinical faculty/facility.
- Absences for the semester greater than 10% will be cause for withdrawal from the program.
- A departmental pretest must be taken and passed with a score of 70% or better by each student before he/she may begin each rotation.
- Students take departmental finals after each rotation and this average will determine the final grade for the course, provided that the student meets entry level competence (M) on the clinical practice evaluations.
- If the student does not meet proficiency of critical competencies as documented on the mid rotation evaluation (as U or N) at the mid-point of the rotation for any department, the student is given the remainder of the rotation to obtain proficiency as evidenced by a “meets”(M) on the final evaluation. If the student is not proficient by the end of the rotation, the student will not be allowed to continue in the program.

Academic Integrity
The policies stated in the York Technical College Handbook will be enforced. Any student violating these policies will be subject to academic discipline.

Missing a Clinical
Any clinical absences must be made up in the department in which the absences occurred, and at the discretion of the clinical coordinator and the departmental supervisor.

Clinical coordinators are asked to keep a complete and thorough record of each student's attendances and tardies. Absences and tardies greater than 10% per semester will be reviewed by an appropriate faculty committee and may result in the student's being dropped from the program. Three (3) tardies are counted as one absence.

If a student must be absent or tardy from clinical, he/she must notify the departmental supervisor and the clinical coordinator before the work day begins.

If a student must be absent from clinical or class, he/she must also notify the MLT faculty at York Tech. before 10 A.M. on the day of the absence (leaving voice mail is acceptable).

EVALUATION STRATEGIES/GRADING

The semester grade is based on two components, practice and theory. The practice component is measured by the hospital evaluations, and the theory component is measured by the departmental finals. All hospital evaluations must be satisfactory and passing by the end of the rotation in order to pass the course.

- Perform all laboratory exercises at a satisfactory level as specified in the clinical evaluation forms.
- A passing score must be attained on all departmental pretests and departmental finals.
- A score of 70 or better must be attained in all MLT courses.
**Grading Scale**

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<thead>
<tr>
<th>Grade</th>
<th>Range</th>
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<tr>
<td>A</td>
<td>90 - 100</td>
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<tr>
<td>B</td>
<td>80 - 89</td>
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<td>C</td>
<td>70 - 79</td>
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<td>D</td>
<td>60 - 69</td>
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<td>F</td>
<td>Below 60</td>
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A grade of C or better must be obtained in this class for progression in the MLT program.

Students take departmental finals after each rotation and this average will determine the final grade for the course, provided that the student meets entry level competence (M) on the clinical practice evaluations.

The departmental finals are weighted depending on whether they are major departments such as hematology, or minor departments such as serology.

- Major concentrations (Hematology, Microbiology, Chemistry, and Blood Bank) will average together to count as 75% of the total points earned for theory
- Minor concentrations (Phlebotomy, Serology, Urinalysis, and Coagulation) will average together to count as 20% of the total points earned for theory.
- Media Lab (Computer assisted Instruction) counts as 5%

*Two major rotations will occur in each semester. The number of minor rotations will vary depending on which semester hematology is done because coagulation and urinalysis are typically part of the hematology rotation. Phlebotomy is typically done in the Fall semester as the first rotation but can vary on a case by case basis and depending on available scheduling of clinical sites. Serology will be scheduled for each individual student based on clinical site location of serology testing, as this varies per lab as to which department houses serology.

**ENTRY LEVEL SKILLS**

Student must have satisfactorily completed all didactic courses as outlined for the first year of the Program.

**PREREQUISITES**

All didactic courses as outlined for the first year of the program must have been completed satisfactorily.*

**CO-REQUISITES**

MLT 242, MLT 252

**NOTE:** MLT classes must be taken in accordance with the curriculum display as outlined in the college catalog and MLT program handbook.

**DISABILITIES STATEMENT**

Any student who feels s/he may need an accommodation based on the impact of a disability should contact the Special Resources Office (SRO) at 803-327-8007 in the 300 area of Student Services. The SRO coordinates reasonable accommodations for students with documented disabilities.