Medical Laboratory Technology Mississippi Curriculum Framework

Program CIP: 51.1004 – Clinical/Medical Laboratory Technician

2017





Published by: Mississippi Community College Board Division of Workforce, Career, and Technical Education 3825 Ridgewood Road Jackson, MS 39211 Phone: 601-432-6155 Email: <u>curriculum@mccb.edu</u>

FACULTY WRITING TEAM MEMBERS

Cindy Higgs, Co-Lin Community College Celia Lea Amber Reulet, Hinds Community College Lajuanda Portis, Hinds Community College Krystal Cox, Meridian community College Sheila Johnson, Meridian Community College Dr. Rana Walley, Mississippi Gulf Coast Community College Patricia Kelly, Mississippi Delta Community College Janet Cooper, Mississippi Delta Community College Rosalyn Singleton, Northeast Mississippi Community College Shannon Goosby, Northeast Mississippi Community College Evelyn Wallace, Pearl River Community College

Administrator Writing Team Members

Brent Duguid, Assistant Dean, Co-Lin Community College Dr. Libby Mahaffey, Dean, Hinds Community College Christy Bokros, Assistant Dean, Hinds Community College Angie Nelson, Chair, Mississippi Gulf Coast Community College Dr. Patty Cooper, Dean, Northeast Mississippi Community College

BUSINESS AND INDUSTRY CONTRIBUTING TEAM MEMBERS

Tony Beard, Baptist Memorial Hospital, Memphis, TN Aaron Parker, Baptist Memorial Hospital, Booneville, MS Jennifer Knight, Baptist Hospita*I Rochelle Logan, St. Dominic Hospital Brandy Blanchard, Merit Health-Rankin Kathy Owens Merit Health –Central Ashley McAfee, Madison Parish Hospital Harry Crosby, Merit Health River Oaks *Kelia Neal, Veteran's Hospital Marcus Willis, Anderson Regional Medical Center Cindy Eubanks, Anderson Regional Medical Center Kathy Lamoreux, Rush Hospital Deborah Axtell, Stone County Hospital Christie Morse, Providence Hospital Susan Savage, Garden Park Medical Center Marta Gale, SRHS Charlyn Austin, Spring Hill Hospital Julie Cornelson, Stone County Hospital

*Denotes an industry member who attended the writing team meeting.

OFFICE OF CURRICULUM AND INSTRUCTION TEAM MEMBERS

Dr. Angela Bryan, Director of Curriculum and Instruction, Mississippi Community College Board LaToya Sterling, Curriculum Specialist, Office of Curriculum and Instruction, Mississippi Community College Board Dr. Teresa Barnes, Curriculum Specialist, Office of Curriculum and Instruction, Mississippi Community College Board

The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), who serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

Copyright[©] 2017 by Mississippi Community College Board For information, please contact <u>curriculum@mccb.edu</u>

Contents

ADOPTION OF N	ATIONAL CERTIFICATION STANDARDS				
INDUSTRY JOB PI	ROJECTION DATA6				
ARTICULATION					
TECHNICAL SKILL	s Assessment				
INSTRUCTIONAL	STRATEGIES				
Assessment St	TRATEGIES				
RESEARCH ABSTR	RACT				
REVISION HISTOR					
PROGRAM DESC	RIPTION				
SUGGESTED COU	rse Sequence				
Required Co	urses10				
Clinical Cour	rse Sequence Options*				
General Edu	cation Core Courses – Medical Laboratory Technology11				
Electives list	ing12				
MEDICAL LABOR	atory Technology Courses				
MLT 1112	Fundamentals of Medical Laboratory Technology/Phlebotomy13				
MLT 1212	Urinalysis Body Fluids15				
MLT 1313	Hematology I17				
MLT 1324	Hematology II				
MLT 1413	Immunology/ Serology				
MLT 1515	Clinical Chemistry23				
MLT 2424	Immunohematology				
MLT 2522	Pathogenic Microbiology I				
MLT 2614	Pathogenic Microbiology II				
MLT 2711	Medical Laboratory Technology Seminar				
MLT 2723	Certification Fundamentals for Medical Laboratory Technology				
MLT 2916, N	/ILT 2925, MLT 2935 Clinical Practice I, II, III				
MLT 2944, N	/ILT 2954, MLT 2964 MLT 2974 Clinical Practicum I, II, III, IV				
RECOMMENDE	D TOOLS AND EQUIPMENT				
RECOMMENDE	RECOMMENDED INSTRUCTIONAL AIDS				
CURRICULUM DE	FINITIONS AND TERMS				
COURSE CR	OSSWALK43				

Adoption of National Certification Standards

The following national certifications have been adopted for the Medical Laboratory Technology curriculum: ACSP[©]. Board of Certification Medical Laboratory Technician, MLT (ACSP[©].) and International Medical Laboratory Technician MLT (ACSP[©]).

The ACSP[©]. Board of Certification (BOC) is a recognized leader in certification of medical laboratory professionals. By earning credentials from the ACSP[©]. BOC, laboratory professionals demonstrate their competence to carry out their responsibilities in this critical profession. In turn, they reap the benefits of better job prospects, higher salaries and the respect of colleagues. Long considered the "gold standard," BOC certification is sought out by seven times as many laboratory professionals as any other lab professional credentialing organization.

INDUSTRY JOB PROJECTION DATA

The Medical Laboratory Technology occupations require an education level of short-term on-the-job training or work experience in a related field. There is expected to be a 16.83% increase in occupational demand at the regional level and 16.83% increase at the state level. Median annual income for this occupation is \$38,376.00 at the state level. A summary of occupational data from the State Workforce Investment Board Data Center is displayed below:

Table 1: Education Level

Program Occupations	Education Level
Medical and Clinical Laboratory Technicians	Associate Degree

Table 2: Occupational Overview

	Region	State	United States
2014 Occupational Jobs	1961	1961	164200
2024 Occupational Jobs	2291	2291	183417
Total Change	330	330	19217
Total % Change	16.83%	16.83%	11.70%
2014 Median Hourly Earnings	\$16.41	\$16.41	\$18.45
2014 Median Annual Earnings	\$34,132.80	\$34,132.80	\$38,376.00
Annual Openings	33	33	1921

Table 3: Occupational Breakdown

Description	2014 Jobs	2024 Jobs	Annual Openings	2010 Hourly Earnings	2010 Annual Earnings 2,080 Work Hours
Medical and Clinical Laboratory	1961	2291	33	\$16.41	\$34,132.80
TOTAL	1961	2291	33	\$16.41	\$34,132.80

Table 4: Occupational Change

Description	Regional	Regional	State %	National %
	Change	% Change	Change	Change
Medical and Clinical Laboratory Technicians	330	16.83%	16.83%	11.70%

ARTICULATION

There is no secondary program in Medical Laboratory Technology to articulate to this program of study.

TECHNICAL SKILLS ASSESSMENT

Colleges should report the following for students who complete the program with a career certificate, technical certificate, or an Associate of Applied Science Degrees for technical skills attainment. To use the approved Alternate Assessment for the following programs of study, colleges should provide a Letter of Notification to the Director of Career Technical Education at the MS Community College Board. Please see the following link for further instructions: http://www.mccb.edu/wkfEdu/CTDefault.aspx.

CIP Code	Program of Study	
51.1004	Clinical/Medical Laboratory Technician	
Level	Standard Assessment	Alternate Assessment
Technical/AAS	ACSP [©] . Board of Certification Medical Laboratory Technician, MLT (ACSP©.) and International Medical Laboratory Technician MLT (ACSP [©] .).	

ONLINE AND BLENDED LEARNING OPPORTUNITIES

Course content includes lecture and laboratory semester credit hours. Faculty members are encouraged to present lecture related content to students in an online or blended learning environment. Training related to online and blended learning will be available to faculty members through the MS Community College Board.

INSTRUCTIONAL STRATEGIES

Instructional strategies for faculty members implementing the curriculum can be found through the Office of Curriculum and Instruction's professional development.

ASSESSMENT STRATEGIES

The Office of Curriculum and Instruction's professional development offer assessment strategies to faculty members implementing the curriculum. Additionally, standards were included in course content when appropriate.

RESEARCH ABSTRACT

In the spring of 2017, the Office of Curriculum and Instruction (OCI) met with the different industry members who made up the advisory committees for the Medical Laboratory Technology program. An industry questionnaire was used to gather feedback concerning the trends and needs, both current and future, of their field. Program faculty, administrators, and industry members were consulted regarding industry workforce needs and trends.

Industry advisory team members from the colleges involved with this program were asked to give input related to changes to be made to the curriculum framework. Specific comments related to fundamental skills needed in this program include having the capability of performing testing, ability to lift 20 pounds, critical thinking skills, ability to multi-task, able to interview under a behavior based interview, positive attitude, be able to work different shifts, competence, legible handwriting, and computer skills and must be organized. Pre-employment requirements stated include Medical Laboratory Technician certification, graduate of a NAACLS accredited program, passed background check and drug screening, 2 or 4 year program of study and maintain 36 hours of CEU's every 3-4 years for everyone entering the field after 2004. Most hospitals require ACSP©. eligibility or certification to hire.

Based on industry visits, the need was identified for clinical hour breakouts with flexibility in clinical hour scheduling. Therefore, colleges now have 2 options for clinical course scheduling. A breakdown of the clinical course sequences are listed below. Both options are equal in overall student learning outcomes, semester credit hours, and clinical hours. Please see course pages for student learning outcome details.

Course Number	Course Name	Semester Credit Hours	Lecture Hours	Clinical Hours	Total Contact Hours
MLT 2916	Clinical Practice I	6	0	18	270
MLT 2925	Clinical Practice II	5	0	15	225
MLT 2935	Clinical Practice III	5	0	15	225
	Totals	16	0	48	720

Clinical Course Sequence – Option 1

Clinical Course Sequence – Option 2

Course Number	Course Name	Semester Credit Hours	Lecture Hours	Clinical Hours	Total Contact Hours
MLT 2944	Clinical Practicum I	4	0	12	180
MLT 2954	Clinical Practicum II	4	0	12	180
MLT 2964	Clinical Practicum III	4	0	12	180
MLT 2974	Clinical Practicum IV	4	0	12	180
	Totals	16	0	48	720

REVISION HISTORY:

2011, Revised, Research and Curriculum Unit, Mississippi State University 2017, Revised, Office of Curriculum and Instruction, Mississippi Community College Board

PROGRAM DESCRIPTION

The Medical Laboratory Technology curriculum is a 2-year Associate of Applied Science degree program of study that prepares individuals to work in a medical laboratory. As members of the health-care delivery team, clinical laboratory personnel are responsible for assuring reliable and accurate laboratory test results that contribute to the diagnosis, treatment, prognosis, and prevention of physiological and pathological conditions. This program is designed to meet the standards and requirements for careers in clinical laboratory science. At career entry, the medical laboratory technician will be able to perform routine clinical laboratory tests (such as hematology, clinical chemistry, immunohematology, microbiology, serology/immunology, coagulation, molecular, and or emerging diagnostics) as the primary analyst making specimen oriented decisions on predetermined criteria. Upon successful completion of the AAS program, the student will be eligible to take a national certification examination. This program is accredited by the National Accrediting Agency for Clinical Laboratory Science (NAACLS), 5600 North River Road, Suite 720, Rosemont, IL, 60018, and (773) 714-8880.

SUGGESTED COURSE SEQUENCE

Required Courses

			SCI	H Breakdo	wn		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical	Total Contact Hours	Certification Name
MIT 1112	Fundamentals of Medical	2	1	2		45	
MLT 1212	Urinalysis/ Body Fluids	2	1	2		45	ACSP©. Board
MLT 1313	Hematology I	3	2	2		60	Medical
MLT 1324	Hematology II	4	2	4		90	Laboratory
MLT 1413	Immunology/ Serology	3	2	2		60	I echnician, MLT (ACSP©.)
MLT 1515	Clinical Chemistry	5	3	4		105	and
MLT 2424	Immunohematology	4	2	4		90	International Medical
MLT 2522	Pathogenic Microbiology I	2	1	2		45	Laboratory
MLT 2614	Pathogenic Microbiology II	4	2	4		90	Technician MLT
							(ACSP ©.).
	Clinical Course Sequence*	16	0	0	48	720	
	Totals	45	16	26	48		

Clinical Course Sequence Options*

		Semester				Total	
Option 1	Course Name	Hours	Lecture	Lab	Clinical	Hours	
MLT 2916	Clinical Practice I	6	0		18	270	
MLT 2925	Clinical Practice II	5	0		15	225	
MLT 2935	Clinical Practice III	5	0		15	225	
	Totals	16	0		48	720	

Option 2	Course Name	Semester Credit Hours	Lecture	Lab	Clinical	Total Contact Hours	
MLT 2944	Clinical Practicum I	4	0		12	180	
MLT 2954	Clinical Practicum II	4	0		12	180	
MLT 2964	Clinical Practicum III	4	0		12	180	
MLT 2974	Clinical Practicum IV	4	0		12	180	
	Totals	16	0		48	720	

General Education Core Courses – Medical Laboratory Technology

To receive the Associate of Applied Science Degree, a student must complete all of the required coursework found in the Career Certificate option, Technical Certificate option and a minimum of 15 semester hours of General Education Core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The Southern Association of Colleges and Schools (SACS) Commission on Colleges Standard 2.7.3 from the Principles of Accreditation: Foundations for Quality Enhancement1 describes the general education core.

Section 2.7.3 In each undergraduate degree program, the institution requires the successful completion of a general education component at the collegiate level that (1) is substantial component of each undergraduate degree, (2) ensures breadth of knowledge, and (3) is based on a coherent rationale. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. The courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession

			SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown		SCH Breakdown			Contact H Breakdo	lour wn	Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name																				
	Humanities/Fine Arts	3																										
	Social/Behavioral Sciences	3																										
	Math Elective*	3																										
	Biological Science Elective*	3/4																										
	Chemistry Elective*	3/4																										
	TOTAL	15/17																										

General Education Courses

*Meets NAACLS requirements

1

http://www.sacscoc.org/pdf/2012PrinciplesOfAcreditation.pdf

Southern Association of Colleges and Schools Commission on Colleges. (2012). *The principles of accreditation: Foundations for quality enhancement*. Retrieved from http://www.sassaco.org/ndf/2012PrinciplesOfAcreditation.pdf

NAACLS .Standards for Accredited and Approved Programs (2016). *National Accrediting Agency for Clinical Laboratory Sciences*

https://www.naacls.org/getattachment/d5a69a7a-7323-439e-9db8-1f0ea000b718/2012-Standards-Edited.aspx

Electives listing

			SCH Breakdown			Contact Hour Breakdov		Breakdown	
Course		Semester Credit				Total Contact			
Number	Course Name	Hours	Lecture	Lab	Externship	Hours	Lecture	Lab	Externship
	Medical Laboratory								
MLT 2711	Technology Seminar	1							
	Certification								
	Fundamentals for								
	Medical Laboratory								
MLT 2723	Technology	3							

MEDICAL LABORATORY TECHNOLOGY COURSES

Course Number and Name:	MLT 1112 Fundamentals of Medical Laboratory Technology/Phlebotomy						
Description:	The course includes an overview of the field of Medical Laboratory Technolog as well as familiarization with laboratory safety, microscopes, glassware, and equipment. It also includes laboratory organization, medical ethics, and employment opportunities. Basic laboratory specimen collection techniques are introduced.						
Hour Breakdown:	Semester Credit Hours	Lecture	Lab	Contact Hours			
	2	1	2	45			
Prerequisite:	Instructor Approved						

Student Learning Outcomes:

- 1. Explain the relationship between medical ethics and professionalism to the field of clinical laboratory science.
 - a. Discuss the history of the clinical laboratory, and state the major organizational structure of the hospital laboratory.
 - b. Discuss the importance and impact of medical ethics on patient care, especially confidentiality of test results as required by current federal and state regulations.
 - c. Differentiate among the roles of various health care professionals.
 - d. Explain the responsibilities of each classification of laboratory staff.
 - e. State the regulatory and professional agencies related to laboratories and discuss their functions.
 - f. Discuss federal regulations that impact laboratory operations and management.
 - g. Discuss employment opportunities available to the graduates of Medical Laboratory Technology Programs.

2. Recommend and implement currently approved laboratory safety procedures.

- a. Discuss the common laboratory hazards to include the following:
- (1) Chemical
- (2) Fire
- (3) Biological
- (4) Mechanical
- (5) Electrical
- b. Describe and demonstrate the proper method for handling and disposing of biological hazards.
- c. Describe and/or demonstrate the use of basic laboratory safety equipment.
- d. Describe basic first aid procedures.
- e. Explain the appropriate local safety procedures.
- f. Demonstrate compliance with standard precautions.
- g. Discuss and select the appropriate isolation technique for various clinical conditions.
- h. Demonstrate knowledge of SDS by reading and interpreting Material Safety Data Sheets.
- 3. Select and use basic equipment to perform selected laboratory skills.

- a. List the basic tests performed in each of the major departments of the laboratory and explain their purpose.
- b. Perform introductory laboratory skills to include the following:
 - (1) Pipetting
 - (2) Use and care of glassware
 - (3) Use and care of microscopes
 - (4) Use and care of other lab equipment
- 4. Explain and practice laboratory specimen collection techniques. MLT1, MLT2, MLT4
 - a. Perform basic laboratory specimen collection techniques, including phlebotomy.
 - b. Demonstrate protocols used in identification of specimens and the procedures used to maintain accurate patient identity.
 - c. Discuss complications encountered in specimen collection.
 - d. Select an appropriate method of resolving problems of specimen collection.
 - e. Employ measures to maintain patient confidentiality.

ACSP©. Board of Certification Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.)

VII. Laboratory Operations

- 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - D. Regulation
- 2. Safety
- 3. Instrumentation
- 4. Laboratory Mathematics
- 5. Laboratory Information Systems

Course Number and Name:	MLT 1212	Urinalysis B	ody Fluids					
Description:	This course is a miscellaneous urine tests and test profiles ar to diseased sta	is an introduction to urinalysis and laboratory analysis of us body fluids. It includes the basic principles of routine and special and specimen examination through laboratory work. Theory and are also presented for miscellaneous body fluids with correlation states.						
Hour Breakdown:	Semester Cre	dit Hours	Lecture	Lab	Contact Hours			
	2		1	2	45			
Prerequisite:	Instructor App	roved						

Student Learning Outcomes:

1. Describe the formation and composition of urine.

- a. Discuss the history and importance of urinalysis.
- b. Describe the functioning unit of the kidney.
- c. Trace the formation of urine.
- d. Discuss the special urinalysis screening test.

2. Explain the properties involved in the physical, chemical, and microscopic examinations of urine.

- a. List and describe the physical characteristics of urine.
- b. List and describe the chemical characteristics of urine.
- c. Identify the microscopic elements of urine.
- d. Describe specimen collection and handling of urine to include the following:
 - (1) Special instructions to patient
 - (2) Labeling of specimen
 - (3) Specimen containers
 - (4) Specimen preservation

3. Perform the testing involved in the physical, chemical, and microscopic examinations of urine.

- a. Perform the physical examination of urine including color, clarity, and specific gravity.
- b. List and describe the principles of the reactions of the reagent strip testing of urinalysis.
- c. Interpret chemical reactions of reagent strips.
- d. Identify microscopic elements in the urine.
- e. Correlate disease states with abnormal physical, chemical, and microscopic results.

4. Describe the laboratory testing and the formation of other body fluids (i.e., synovial, CSF, seminal, serous body fluids, amniotic fluids, etc.).

a. List and describe physical, chemical, and microscopic tests performed on the following body fluids: synovial, CSF, seminal body fluids, serous body fluids, and amniotic fluids.

b. Correlate abnormal test results with disease states.

ACSP[©]. Board of Certification

Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.)

II. Urinalysis & Other Body Fluids

- 1. Urinalysis
 - A. Physical
 - 1) Color and clarity
 - 2) Specific gravity /osmolality
 - B. Chemical
 - 1) Reagent strip
 - 2) Confirmatory tests
 - C. Microscopic
 - 1) Cells
 - 2) Casts
 - 3) Crystals
 - 4) Contaminants
 - 5) Artifacts/microorganisms
 - D. Physiology

2 Other Body Fluids (Qualitative and Quantitative)

- A. CSF
- B. Amniotic, Synovial, Serous, Semen and Feces
- **VII. Laboratory Operations**
- 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - D. Regulation
- 2. Safety
- 3. Instrumentation
- 4. Laboratory Mathematics
- 5. Laboratory Information Systems

Course Number and Name: MLT 1313 Hematology I

Description: This course is a study of the function of blood, morphology, and maturation of normal cells, blood cell counts, differentials of white cells, and blood collection and handling

Hour Breakdown:	Semester Credit Hours	Lecture	Lab	Contact Hours
	3	2	2	60

Prerequisite:

Instructor Approved

Student Learning Outcomes:

1. Discuss and identify the origin and characteristics of normal blood cell lines.

- a. Identify sites of hematopoiesis.
- b. Outline the development of the blood cell lines to include the following:
 - (1) Erythrocytes
 - (2) Granulocytes
 - (3) Lymphocytes
 - (4) Monocytes
 - (5) Megakaryocytes/platelets
- c. Differentiate morphologic and functional characteristics of developmental stages of each cell line.
- 2. Perform routine manual and automated hematology procedures.
 - a. State the principle of routine manual and automated hematology procedures.
 - b. Prepare, stain, and evaluate manual peripheral blood smears.
 - c. Perform manual and automated cell counts.
 - d. Perform manual and automated hemoglobin and hematocrit determinations.
 - e. Calculate red blood cell (RBC) indices.
 - f. Correlate RBC indices with RBC morphology.
 - g. Identify and recognize factors that may alter test values.
 - h. State normal reference ranges for hematologic test procedures.
- 3. Explain the role of hematology safety.
 - a. Identify appropriate hematology safety techniques.
 - b. Demonstrate appropriate hematology safety techniques.
- 4. Explain and perform quality assurance procedures and interpret quality control data.
 - a. Select the quality control techniques used for routine hematology procedures.
 - b. Perform quality control procedures.
 - c. Record and interpret quality control data.
 - d. Analyze quality control data to determine validity of hematology lab test results.
- 5. Correlate clinical conditions with hematology test results.

a. Correlate and verify automated cell counts and differentials with established criteria and/or peripheral smear exam.

b. Assess physiologic and pathologic causes for variations in hematologic data.

ACSP[©]. Board of Certification

Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.)

IV. Hematology

- 1. Erythrocytes and Leukocytes
 - A. Red Blood Cells and Indices
 - 1) RBC count
 - 2) Hemoglobin, hematocrit and indices
 - B. White Blood Cell Count
 - C. CBC (includes count, morphology and/or differential)
- 2. Other Test
 - A. Reticulocyte Count and Other RBC inclusions
 - B. ESR
 - C. Tests for Hemoglobin Defects (e.g. sickle cell test)
 - D. Other (e.g. G-6 PD)
- 3. Morphology and Differentials
 - A. Red Blood Cell Morphology
 - B. White Blood Cell Morphology
 - C. Differentials
 - **D. Platelet Morphology**
- 4. Platelets and Hemostasis
 - A.Platelets
 - 1) Platelet count
 - 2) Platelet function
- **VII. Laboratory Operations**
- 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - D. Regulation
- 2. Safety
- 3. Instrumentation
- 4. Laboratory Mathematics
- 5. Laboratory Information Systems

Course Number and Name:	MLT 1324 H	ematology II					
Description:	This course includes the study of abnormal cell morphology and diseases involving blood cells, test procedures used in laboratory diagnosis of hematological disease, normal and abnormal hemostasis, and diagnostic procedures for evaluation of bleeding abnormalities and anticoagulant therapy						
Hour Breakdown:	Semester Credit He	ours Lecture	Lab	Contact Hours			
	4	2	4	90			
Prereguisite:	Instructor Approved	1					

Student Learning Outcomes:

1. Discuss and identify the origin and characteristics of abnormal blood cells.

a. Identify and describe physiology of each type of leukocyte.

- b. Describe red blood cell (RBC) production to include hemoglobin synthesis and catabolism and RBC biochemistry.
- c. Identify abnormal RBC and white blood cell (WBC) morphology, inclusions, and
- cytochemical stains.
- d. Evaluate platelets.

2. Correlate clinical conditions with abnormal hematology laboratory results.

- a. Calculate and correlate RBC indices with microscopic morphology and disease states.
- b. Assess lab data to identify major types of anemia.
- c. Recognize leukemic cells and assess lab data in major types of leukemia.

d. Identify the clinical manifestations and cause(s) for hemostatic, thrombotic, and fibrinolytic disease states.

e. Research new concepts and emerging technologies to include bone marrow/stem cell transplant and molecular techniques in diagnosis and treatment of hematologic diseases.

3. Describe the interaction of blood vessels, platelets, coagulation factors, and fibrinolytic

systems in normal and abnormal hemostasis and thrombosis.

a. Describe the production and characteristics of coagulation factors.

b. Evaluate coagulation test data for clinical significance in diagnosis and treatment of hemostatic and thrombotic disorders.

c. Explain the action and laboratory monitoring of anticoagulants in therapy of thrombotic disease.

4. Perform and interpret manual and automated hematology and coagulation procedures.

- a. Discuss the principle of manual and automated hematology coagulation procedures.
- b. Operate and interpret results from hematology and coagulant instruments.
- c. Assess results to evaluate validity and identify sources of error.
- d. Propose solutions to correct erroneous results.
- e. Interpret quality control data to assess validity of patient results.

ACSP©. Board of Certification

Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.)

- **IV. Hematology**
- 1. Erythrocytes and Leukocytes

- A. Red Blood Cells and Indices
 - 1) RBC count
 - 2) Hemoglobin, hematocrit and indices
- B. White Blood Cell Count
- C. CBC (includes count, morphology and/or differential)
- 2. Other Test
 - A. Reticulocyte Count and Other RBC inclusions
 - B. ESR
 - C. Tests for Hemoglobin Defects (e.g. sickle cell test)
 - D. Other (e.g. G-6 PD)
- 3. Morphology and Differentials
 - A. Red Blood Cell Morphology
 - B. White Blood Cell Morphology
 - C. Differentials
 - D. Platelet Morphology
- 4. Platelets and Hemostasis
 - A. Platelets
 - 1) Platelet count
 - 2) Platelet function
 - B. Hemostasis
 - 1) PT, aPTT, TT
 - 2) Fibrinogen, FDP, D-dimer
 - 3) Factors assays
 - 4) Inhibitor anticoagulants
 - 5) Mixing studies
 - 6) Anticoagulant therapy
- VII. Laboratory Operations
- 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - B. Quality Control
 - C. Compliance
 - D. Regulation
- 2. Safety
- 3. Instrumentation
- 4. Laboratory Mathematics
- 5. Laboratory Information Systems

Course Number and Name:	MLT 1413	Immunology/ Serol	ogy				
Description:	This course covers the science of immunology and serology through the of theories and processes related to natural body defenses. Included are antigen-antibody reactions, complement action, cellular response, hum immune response, and the basic serological procedures used to aid in the detection of certain diseases. Throughout this course, special emphasis placed on correlating laboratory results with the patient's probable con-						
Hour Breakdown:	Semester Credit	t Hours Lecture	Lab	Contact Hours			
	3	2	2	60			

Prereguisite:

Instructor Approved

Student Learning Outcomes:

1. Describe the body's immune defenses.

- a. Explain the principal mechanisms of acquired and natural immunity.
- b. Describe the function of the cells of the immune system.
- c. Explain the components of natural immunity and their functions.
- d. List the characteristics of antigens.
- e. Describe the primary immune response.
- f. Describe the secondary immune response.
- g. Differentiate among the five immunoglobulin classes and their functions.
- h. Outline the sequential steps of the classical and alternate complement pathways.
- i. Describe biologic functions associated with complement activation.
- 2. Describe the principles of immunoassays.
 - a. Explain the principles of the commonly used immunoassays.
 - b. Evaluate physiological and pathological causes for variation in expected test results.
 - c. Examine test results to identify and correct technical sources of error.
- 3. Perform routine immunology/serology procedures with emphasis on accuracy and
 - precision.
 - a. Perform the commonly used immunoassay procedures.
 - b. Summarize specimen requirements for commonly used immunoassay procedures.
 - c. Demonstrate the use of proper quality control methods for each testing procedure.
 - d. Interpret the validity of patient test results.
 - e. Prepare accurate, simple, and serial dilutions.
 - f. Calculate specimen concentrations involved in simple and serial dilutions.
- 4. Correlate results of immunological procedures with clinical conditions.
 - a. Correlate the expected serologic test results for commonly encountered clinical conditions.
 - b. Assess causes of false positive and false negative test results.

ACSP[©]. Board of Certification

Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.) V. Immunology

- 1. Immunity
 - A. Autoimmunity

- 1) ANA, anti-DNA
- 2) CRP/RF
- 3) Thyroid antibodies
- **B. Immune Responses**
- C. Physiology of the Immune System
- 2. Infectious Diseases
 - A. Viral
 - 1) EBV infectious mononucleosis
 - 2) Hepatitis
 - 3) HIV/HTLV/CMV
 - 4) Rubella/measles
 - 5) Other viruses
 - B. Microbial
 - 1) Syphilis
 - 2) Other microorganisms
 - **VII. Laboratory Operations**
 - 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - D. Regulation
 - 2. Safety
 - 3. Instrumentation
 - 4. Laboratory Mathematics
 - 5. Laboratory Information Systems

Course Number and Name:	MLT 1515 Clinical C	.nemistry						
Description:	This course is the study of human biochemistry as an aid in the diagnosis of disease processes. It includes chemistry procedures performed on body fluids for aiding in diagnosis of disease processes.							
Hour Breakdown:	Semester Credit Hours	Lecture	Lab	Contact Hours				
	5	3	4	105				
Prerequisite:	Instructor Approved							

Climitant Champinton

Student Learning Outcomes:

Course Number and Newson

1. Describe chemistry test methods used to measure substances in the blood and other body fluids.

a. Identify special safety procedures unique to clinical chemistry.

NALT 4

b. Identify and discuss collection procedures and processing of specimens in clinical chemistry.

c. Describe the procedures for specimen collection related to drug screening (chain of command, legal regulation, etc.).

d. Describe the principles of selected chemistry methods to include the following:

- (1) Spectral techniques
- (2) Competitive binding
- (3) Ion-selective electrodes

e. Discuss the collection procedures of therapeutic drug monitoring and interpretation of test results.

f. Discuss the uses of computerization in clinical chemistry including specimen identification and data management.

g. Demonstrate data input, storage, and retrieval on a computer.

2. Correlate health and disease states with chemistry test results.

a. Describe and evaluate diseases and chemistry test results associated with abnormal metabolism including carbohydrate, protein, and lipids.

b. Describe and evaluate diseases and chemistry test results associated with abnormal function including liver, kidney, heart, and endocrine.

3. Perform laboratory tests outlined by the test manufacturer to determine the presence and/or amount of substance(s) in the blood and other body fluids.

a. Perform selected chemistry tests including manual and semi-automated methods.

b. Demonstrate the operating techniques of the equipment used in the clinical chemistry laboratory, with emphasis on accuracy and precision.

c. Demonstrate calibration of selected instruments and test equipment.

d. Indicate when to refer to an appropriate source for repairs or consultation.

4. Solve laboratory mathematics problems.

a. Identify and utilize the basic units of measurement in the metric system.

- b. List and perform dilution calculations.
- c. List and utilize different methods used to state concentrations of substances in clinical chemistry.

5. Perform quality control procedures as used in the clinical chemistry laboratory with

emphasis on accuracy and precision.

a. List and describe various statistical methods used in clinical chemistry.

b. Prepare quality control (QC) specimens, perform selected assays on QC specimens, and record results.

c. Interpret QC data on selected clinical chemistry procedures.

d. Document corrective action taken in troubleshooting instruments and out-of-range QC values.

ACSP[©]. Board of Certification

Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.)

III. Chemistry

- 1. Carbohydrates, Acid Base and Electrolytes
 - A. Carbohydrates
 - 1) Glucose
 - 2) Glycated hemoglobin
 - 3) Other Carbohydrates (e.g. lactate)
 - B. Acid Base
 - 1) pH,PCO2, pO2
 - 2) Osmolality, base excess
 - C. Electrolytes
 - 1) Sodium, potassium, chloride, bicarbonate, anion gap
 - 2) Calcium, magnesium, phosphorus
- 2. Proteins and Other Nitrogen-Containing Compounds
 - A. Protein and Other Nitrogen- Containing Compounds
 - 1) Total protein, albumin
 - 2) Globulins (alpha 1, alpha2, beta, gamma)
 - 3) Ferritin, transferrin
 - 4) Iron and TIBC
 - 5) Ammonia
 - 6) Creatinine, BUN
 - 7) Uric acid
 - 8) Troponin
 - 9) Other (e.g., BNP)
 - B. Heme Derivatives
 - 1) Hemoglobin (S, fetal, A₂, plasma)
 - 2) Bilirubin, urobilinogen
 - 3) Other (e.g., myoglobin)
- 3. Enzymes, Lipids and Lipoproteins
 - A. Enzymes
 - 1) Amylase, lipase
 - 2) AST, ALT
 - 3) CK, LD
 - 4) ALP
 - 5) GGT
 - B. Lipids and Lipoproteins
 - 1) Cholesterol (total, HDL, LDL)
 - 2) Triglycerides
 - 3) Phospholipids
 - 4) Other lipids and lipoproteins
- 4. Special Chemistry (endocrinology, Tumor Markers, TDM, Toxicology)
 - A. Endocrinology and Tumor Markers
 - 1) $T_3 T_4$ TBG, TSH

- 2) hCG, FSH, LH, estradiol
- 3) Other hormones (e.g. costisol)
- 4) Tumor markers (e.g., alpha fetoprotein, CEA, hCG, PSA)
- B. TDM and Toxicology
 - 1) Therapeutic drug monitoring
 - 2) Drugs of abuse
 - 3) Other toxicology (e.g., carbon monoxide)

VII. Laboratory Operations

- 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - D. Regulation
- 2. Safety
- 3. Instrumentation
- 4. Laboratory Mathematics
- 5. Laboratory Information Systems

Course Number and Name:	MLT 2424 Immu	nohematology					
Description:	This course includes collection, processing, storage, and utilization of blood components. It also includes the study of immunological principles and procedures for blood typing, cross matching, antibody detection, identification, and investigation of hemolytic disease of the fetus and newborn.						
Hour Breakdown:	Semester Credit Hours	Lecture	Lab	Contact Hours			
	4	2	4	90			
Prerequisite:	Immunology/ Serology	MLT 1413)					

Student Learning Outcomes:

- 1. Relate principles of immunology to immunohematology.
 - a. Correlate the immunologic response to the immunohematology theory.

b. State antigen and antibody characteristics with reactions in various media and temperatures.

2. Describe the basic concepts of genetics.

a. Apply basic concepts of genetics to various blood group systems.

b. Evaluate and interpret inheritance from results of blood bank procedures.

c. Determine statistical probability in inheritance of a given characteristic in an individual.

3. Assess component utilization in transfusion therapy

a. Explain techniques for collection, processing, storage, and shipment of blood components.

- b. Identify blood component of choice for transfusion therapy.
- c. Select pre-transfusion compatibility testing procedures required for component therapy.
- d. Identify types of transfusion reactions and perform investigative testing.
- e. Assess and perform appropriate tests in investigation of transfusion reactions.

f. Identify hemolytic disease of the fetus and newborn.

4. Perform basic procedures used in a blood bank laboratory.

- a. Assess patient condition to select required procedures for immunohematology.
- b. Perform and interpret routine pre-transfusion and compatibility patient testing.

c. Understand the principles applied for recognition for differentiation of blood group antigens and antibodies.

d. Apply the principles of immunohematology to the procedures used in the blood bank laboratory.

5. Explain, perform, and interpret quality control in the blood bank laboratory.

a. Identify and perform the daily quality assurance practices and safety practices used in the blood bank.

- b. Identify sources of error and recommend corrective procedures.
- c. Assess physiologic and pathologic causes for discrepant test results.

d. Select and employ safe transfusion practices in the presence of unusual test results.

ACSP[©]. Board of Certification

Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.)

- I. Blood Bank
- 1. Blood Group Systems
 - A. Genetics
 - 1) Basic
 - 2) Molecular
 - 3) Inheritance of blood groups
 - 4) Applies
 - 5) Parentage
 - B. Chemistry, Antigens
 - 1) ABO
 - 2) Lewis
 - 3) Rh
 - 4) MNS
 - 5) P, Globoside
 - 6) Li
 - 7) Kell
 - 8) Kidd
 - 9) Duffy
 - 10) Lutheran
 - 11) Other
 - 12) Antigens of high incidence
 - 13) Antigens of low incidence
 - 14) HLA
 - 15) Platelet specific
 - 16) Granulocyte specific
 - C. Role of Blood Groups in Transfusion
 - 1) Immunogenicity
 - 2) Antigen frequency
 - 2. Antibody Screen and Identification
 - A. Antibody Screen
 - B. Antibody Identification
 - 1) Duffy
 - 2) Li
 - 3) Kell
 - 4) Kidd
 - 5) Lewis
 - 6) MNS
 - 7) P
 - 8) Rh
 - 9) Multiple antibodies
 - 3. Crossmatch and Special Test
 - A. Crossmatch
 - B. Special Test
 - 1) DAT
 - 2) Phenotyping and genotyping
 - 3) Elution/absorption
 - 4) Antibody titer
 - 5) Pre-warm technique
 - 6) Rosette and Kleihauer- Betke
 - 4. Blood Donation, Transfusion theraph, Transfusion Reaction and Hemolytic Disease of the Fetus and Newborn (HDFN)
 - A. Blood Donation
 - 1) Donor Requirements

- B. Transfusion Therapy
 - 1) RBC
 - 2) PLT
 - 3) FFP
 - 4) Cryoprecipitated AHF
 - 5) RhlG
- **C.** Transfusion Reaction
- D. HDFN

V. Immunology

1. Immunity

- B. Immune Responses
- C. Physiology of the Immune System
- VII. Laboratory Operations
 - 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - D. Regulation
 - 2. Safety
 - 3. Instrumentation
 - 4. Laboratory Mathematics
 - 5. Laboratory Information Systems

Course Number and Name:	MLT	2522 Pathogenic	: Microbiology	/			
Description:	Basic skills, principles, and techniques for the staining, culturing, isolation, identification of parasites, viruses, and fungi of medical importance are emphasized in this course. This course covers the morphology, physiology cycles, and epidemiology of parasites with emphasis on human pathogeni parasites. Identification of the parasites, viruses, and fungi from human material is also included.						
Hour Breakdown:	Seme	ster Credit Hours	Lecture	Lab	Contact Hours		
	2		1	2	45		
Prerequisite:	Instruc	tor Approved					

Prerequisite:

Student Learning Outcomes:

- 1. Describe the life cycle of medically important parasites.
 - a. Describe the modes of infection for medically important parasites
 - b. Recognize the diagnostic stages of medically important parasites.
- 2. Discuss isolation and identification techniques used in a clinical parasitology laboratory.
 - a. Identify the various body fluids that might be examined for the presence of parasites.
 - b. Describe the use of concentration techniques in parasitology.
 - Describe the microscopic techniques used to identify medically important parasites. c.
- 3. Identify medically important parasites.
 - a. Correlate test results with clinical conditions.
 - Correlate other laboratory findings with results in the parasitology laboratory. b.
- 4. Discuss transmission methods of disease and host susceptibility.
 - a. Describe the various ways that diseases are transmitted.
 - b. Identify conditions that lead to increased host susceptibility.
 - c. Identify a reportable disease.
- 5. Identify organisms of medical importance, and correlate results with reading of plates,
 - stain characteristics, biochemical studies, and molecular studies.
 - a. Correlate laboratory test results with clinical conditions.

b. Evaluate stain characteristics, colony morphology, and biological and differential tests for identification of pathogenic organisms including viruses and fungus.

c. Perform tests and recognize criteria for identification of pathogenic organisms including viruses and fungus.

- 6. Perform safety, quality control (QC), and infection control practices of the microbiology laboratory.
 - a. Perform routine diagnostic microbiologic testing using aseptic techniques.
 - b. Explain and follow safety and standard precautions that are followed in and related to the microbiology laboratory.
 - c. Perform routine QC procedures.

7. Explain the principle and operation of automated instrumentation.

- a. List and discuss examples of automated instrumentation for a microbiology laboratory.
- 8. Explain procedures used for collection of microbiology specimens from various body sites.

a. Describe appropriate specimen containers for aseptic collection of microbiological

specimens.

b. Explain the collection of specimens from various body sites.

ACSP[©]. Board of Certification

Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.)

4. Fungus, Viruses, Mycobacteria and Parasites

- A. Fungi
 - 1) Yeast (e.g., Candida, Cryptoccoccus)
 - 2) Dimorphic fungi (e.g., Blastomyces, Coccidioides, Histoplasma, Sporothrix)
 - 3) Dermatophytes (e.g., direct specimen examination)
 - 4) Zygomycetes (e.g. *Rhizopus*)
 - 5) Opportunistic molds/separate hyaline, molds (e.g., Aspergillus, Penicillium)
 - 6) Pneumocystis
- C. Viruses and Other Microorganisms
 - 1) Viruses (e.g., specimen collection/transport/processing, rapid antigen detection)
 - 2) Other microorganisms (e.g., Chlamydia)
- D. Parasites
 - 1) Blood and tissue protozoa (e.g., *Plasmodium, Trypanosoma*)
 - 2) Intestinal and urogenital protozoa (e.g., *Cryptosoporidium, Entamoeba, Giardia, and Trichomonas*)
 - 3) Intestinal and tissue helminths (e.g., Ascaris, Enterobius, hookworm, Schistosoma, Taenia, Trichinella, Trichuris)

VII. Laboratory Operations

- 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - E. Regulation
- 2. Safety
- 3. Instrumentation
- 4. Laboratory Mathematics
- 5. Laboratory Information Systems

Course Number and Name:	MLT 2614	Pathogenic Microbio	logy II				
Description:	Basic skills, principles, and techniques for the staining, culturing, isolation, and identification of microorganisms of medical importance are emphasized in this course. Included are techniques used in determining the sensitivity of pathogenic bacteria to different antibiotic and other drugs.						
Hour Breakdown:	Semester Credit	Hours Lecture	Lab	Contact Hours			
	4	2	4	90			
Prerequisite:	Instructor Approv	ved					

Student Learning Outcomes:

1. Discuss transmission methods of disease and host susceptibility.

- a. Describe the various ways that diseases are transmitted.
- b Identify conditions that lead to increased host susceptibility.
- c. Identify a reportable disease.

2. Identify organisms of medical importance, and correlate results with reading of plates,

stain characteristics, biochemical studies, and molecular studies.

a. Correlate laboratory test results with clinical conditions.

b. Evaluate stain characteristics, colony morphology, and biological and differential tests for identification of pathogenic organisms including AFB.

c. Perform tests and recognize criteria for identification of pathogenic organisms including AFB.

d. Identify normal flora at various body sites.

3. Perform susceptibility testing.

a. Compare and contrast the various in-vitro methods for determining antimicrobial susceptibility.

b. Interpret results of in-vitro susceptibility tests as resistant, intermediate, and susceptible.

4. Perform safety, quality control (QC), and infection control practices of the microbiology laboratory.

a. Perform routine diagnostic microbiologic testing using aseptic techniques.

b. Explain and follow safety and standard precautions that are followed in and related to the microbiology laboratory.

c. Perform routine QC procedures.

5. Explain the principle and operation of automated instrumentation.

a. List and discuss examples of automated instrumentation for a microbiology laboratory.

6. Explain procedures used for collection of microbiologic specimens from various body sites.

a. Describe appropriate specimen containers for aseptic collection of microbiological specimens.

b. Explain the collection of specimens from various body sites.

ACSP©. Board of Certification Medical Laboratory Technician, MLT and International Medical Laboratory Technician, MLT (ACSP©.) VI. Microbiology

Includes biochemical, immunologic, serologic, and molecular methodologies, required for identification and detection of microorganisms and antimicrobial susceptibility testing

- 1. Aerobic Gram-positive Cocci
 - a. Microbiology and Antimicrobial Susceptibility Testing
 - b. Micrococcus, Streptococcus, Enterococcus
- 2. Gram-negative Bacilli
 - a. Enterobacteriaceae: Citrobacter, Escherichia, Enterobacter, Klebsiella, Morganella, Proteus, Providencia, Salmonella, Serratia, Shigella, Yersinia
 - b. Other Gram-negative Bacilli: Acinetobacter, Aeromonas, Bordetella, Brucella, Campylobacter, Francisella, Haemophilus, Legionella, Pasteurella, Pseudomonas, Burkholderia, HACEK, Stenotrophomonas, Vibrio
- 3. Gram-negative Cocci, Gram-positive Bacilli and Anaerobes
 - a. Aerobic Gram-negative Cocci (e.g., *Neisseria, Moraxella*)
 - b. Aerobic or Facultative Gram-positive Bacilli: Bacillus, Corynebacterium, Gardnerella, Lactobacillus, Listeria
 - c. Anaerobes
 - 1) Gram-positive: *Clostridium, Peptostreptococcus, and Propionibacterium* 2) Gram-negative: *Bacteroides, Fusobacterium*
 - 27 Grain negative. Ducteronics, rusobuctern
- 4. Fungus, Viruses, Mycobacteria and Parasites
 - B. Mycobacteria
 - 1) Mycobacterium tuberculosis complex (e.g., M. tuberculosis)
 - 2) Other Mycobacterium (e.g., M. avium-intracellulare, rapid growers)

VII. Laboratory Operations

- 1. Quality Assessment / Troubleshooting
 - A. Pre-Analytical, Analytical, Post-Analytical
 - **B. Quality Control**
 - C. Compliance
 - D. Regulation
- 2. Safety
- 3. Instrumentation
- 4. Laboratory Mathematics
- 5. Laboratory Information Systems

Course Number and Name:	MLT 2711 Medie	al Laboratory Teo	chnology Semi	nar				
Description:	This course represents a synthesis of previous didactic, laboratory, and clinical experiences. It is designed to facilitate activities incorporated in student and professional organizations and to allow students to select and present a case study.							
Hour Breakdown:	Semester Credit Hours	E Lecture	Lab	Contact Hours				
	1		2	30				
Prerequisite:	Instructor Approved							

Student Learning Outcomes:

1. Demonstrate professionalism and team-building skills by participating in club activities and/or professional organizations.

- a. Attend scheduled club meetings and activities.
- b. Evaluate the financial needs of a club or organization.

2. Present and critique various case studies.

- a. Identify patient from laboratory or clinical experiences with an interesting diagnosis and a clinical course that includes medical laboratory work.
- b. Present case study to a peer audience

Course Number and Name:	MLT 2723 Cert	ification Fundamen	tals for Medica	al Laboratory Technology			
Description:	This course is an in-depth study and review of material covered in the MLT curriculum. It is designed to prepare the student for the national certifying exams.						
Hour Breakdown:	Semester Credit Hou	rs Lecture	Lab	Contact Hours			
	3	3	0	45			

Prerequisite:

Completion of all didactic Medical Laboratory Technology courses

Student Learning Outcomes:

1. Correlate laboratory skills from areas with knowledge obtained from didactic and clinical experiences.

- a. Recognize and relate disease states with abnormal test results.
- b. Demonstrate acceptable proficiency in the cognitive level on all areas tested.
- c. Recognize color plate visuals and correlate with each area studied.

2. Compare student's pretesting results in each area with post-testing results.

- a. Recognize weak areas in knowledge and application.
- b. Diagnose strengths and weaknesses in each area by evaluating test results.
- 3. Practice computer constructed tests by using computer software.
 - a. Develop computer skills to enable improved test taking strategies.
 - b. Analyze the computer-aided testing results and formulate correct responses.

4. Correlate registry/certifying item descriptor list with curriculum content.

- a. Compare registry/certifying item descriptor list with the content of task areas tested.
- b. Construct test questions to correlate with item descriptor list.
- c. Recognize the three taxonomic levels and practice the utilization of each level.
- 5. Prepare for a certification exam.
 - a. Complete a mock certification exam.

b. Utilize test results to identify areas of knowledge that should be targeted for further study in preparation for a certification exam.

Course Number and Name: MLT 2916, MLT 2925, MLT 2935 Clinical Practice I, II, III

Description:

This course includes clinical practice and didactic instruction in a clinical affiliate and/or comparable simulated environment. Areas covered are hematology, clinical chemistry, immunohematology, urinalysis, microbiology, coagulation, and serology.

Hour Breakdown:

Semester Credit Hours	Lecture	Clinical Practice	Contact Hours
6	0	18	270
5	0	15	225

Prerequisite:

Instructor Approved

Student Learning Outcomes:

1. Process and collect specimens for testing and analysis.

- a. Determine the suitability of specimens submitted for standard laboratory testing.
- b. Use appropriate protective techniques in collection and processing of laboratory samples.

2. Perform analytical examinations on cellular products and body fluids.

- a. Analyze laboratory specimens according to the laboratory procedure manual.
- b. Apply basic scientific principles in learning new methodologies and techniques.
- c. Correlate laboratory findings with disease.

3. Recognize factors that affect testing procedures and results, and take action when predetermined limits are exceeded.

- a. Specify technical factors influencing test results.
- b. Assess physical and pathologic causes for variation in test results.

c. Interpret laboratory data and follow established protocol when predetermined limits are exceeded.

- d. Discuss and observe data input, storage, and retrieval on a computer.
- 4. Participate in an established quality control program.

a. Maintain and monitor an effective quality control program according to laboratory protocol.

b. Interpret and evaluate quality control data to determine validity of patient test results.

c. Explain corrective action according to laboratory protocol.

d. Maintain preventive and corrective maintenance on laboratory equipment and

instrumentation, including referral to an appropriate source for repairs and consultation.

5. Demonstrate professional conduct, communication, and interpersonal relations with

laboratory personnel, patients, other health care professionals, as well as with the public.

a. Interact and communicate with other laboratory and health care professionals to aid in patient care.

b. Recognize the importance of continuing education as an ongoing process.

c. Practice measures to protect confidentiality of patient test data.

6. Demonstrate technical processes sufficient to orient new employees.

- a. Communicate essential knowledge for job performance to new employees.
- b. Demonstrate laboratory procedures in order to orient new employees for skills required for the job.
- c. Practice using evaluation instruments to assess the performance of skills by new employees.

Course Number and Name:

MLT 2944, MLT 2954, MLT 2964 MLT 2974 Clinical Practicum I, II, III, IV

Description:

This course includes clinical practice and didactic instruction in a clinical affiliate and/or comparable simulated environment. Areas covered are hematology, clinical chemistry, immunohematology, urinalysis, microbiology, coagulation, and serology.

Hour Breakdown:	Semester Credit Hours	Lecture	Clinical Practice	Contact Hours
	4	0	12	180

Prerequisite:

Instructor Approved

Student Learning Outcomes:

1. Process and collect specimens for testing and analysis.

- a. Determine the suitability of specimens submitted for standard laboratory testing.
- b. Use appropriate protective techniques in collection and processing of laboratory samples.
- 2. Perform analytical examinations on cellular products and body fluids.
 - a. Analyze laboratory specimens according to the laboratory procedure manual.
 - b. Apply basic scientific principles in learning new methodologies and techniques.
 - c. Correlate laboratory findings with disease.

3. Recognize factors that affect testing procedures and results, and take action when predetermined limits are exceeded.

a. Specify technical factors influencing test results.

b. Assess physical and pathologic causes for variation in test results.

c. Interpret laboratory data and follow established protocol when predetermined limits are exceeded.

- d. Discuss and observe data input, storage, and retrieval on a computer.
- 4. Participate in an established quality control program.

a. Maintain and monitor an effective quality control program according to laboratory protocol.

b. Interpret and evaluate quality control data to determine validity of patient test results.

c. Explain corrective action according to laboratory protocol.

d. Maintain preventive and corrective maintenance on laboratory equipment and

instrumentation, including referral to an appropriate source for repairs and consultation.

5. Demonstrate professional conduct, communication, and interpersonal relations with

laboratory personnel, patients, other health care professionals, as well as with the public.

a. Interact and communicate with other laboratory and health care professionals to aid in patient care.

b. Recognize the importance of continuing education as an ongoing process.

c. Practice measures to protect confidentiality of patient test data.

6. Demonstrate technical processes sufficient to orient new employees.

a. Communicate essential knowledge for job performance to new employees.

- b. Demonstrate laboratory procedures in order to orient new employees for skills required for the job.
- c. Practice using evaluation instruments to assess the performance of skills by new employees.

Recommended Tools and Equipment

CAPITALIZED ITEMS

1. Analyzer, Chemistry, Dry Slide (1 per program) 2. Analyzer, Chemistry, Wet Reagents (1 per program) 3. Analyzer Chemistry Ion Specific Electrode (1 per program) 4. Analyzer, Coagulation (1 per program) 5. Analyzer, Hematology (1 per program) 6. Analyzer, Urine Chemistry (1 per program) 7. Autoclave (1 per program) 8. Bath, Water (1 per 5 students) 9. Blood Bank Gel System (1 per program) 10. Cabinet, Biological Safety (1 per program) 11. Cabinet, Flammable (1 per program) 12. Centrifuge, Cell Washer (1 per lab) 13. Centrifuge, General Lab (2 per lab) 14. Centrifuge, Immunological (1 per student) 15. Centrifuge, Microhematocrit (1 per lab) 16. Chair, Blood Drawing (1 per lab) 17. Computer, CD ROM with Soundcard and DVD (1 per 3 students) 18. Counter, Differential Electronic (1 per student) 19. Fibrometers (1 per lab) 20. Freezer, small (1 per program) 21. Hood, Fume (1 per program) 22. Incubator, CO2 (1 per lab) 23. Incubator, Dri Bath (small, 1 per student; large, 1 per 4 students) 24. Incubator, General, table top model or stand-alone (1 per lab) 25. Microscopes, Binocular (1 per student) 26. Microscope, Dual Head (1 per lab) 27. Microscope, Fluorescent (1 per lab) 28. Microscope, Objectives, 40X (1 per student) 29. Microscope, Objectives, 100X (1 per student) 30. Microscope, Objectives, 50X (1 per student) 31. Microscope, Phase Contrast (1 per lab) 32. Microscope Trinocular (1 per lab) 33. Monitor, Cholesterol (1 per program) 34. Ovens, Drying (1 per program) 35. Printer (1 per 2 computers) 36. Refrigerator (commercial, 1 per lab; home, 2 per lab) 37. Refractometer (1 per 5 students) 38. Reader, Capillary Tube (1 per lab) 39. Rotator, Automatic with Timer (1 per lab) 40. System, Electrophoresis (1 per program) 41. Spectrophotometer (1 per 5 students) 42. Stainer, Slide (1 per lab) 43. System, Microbiology ID Sensitivity (manual, 1 per lab) 44. System, Water Purification (1 per program) 45. TV Monitor (1 per program) 46. VCR/DVD player(1 per program) 47. Video Monitor and Camera (1 per program)

NON-CAPITALIZED ITEMS

1. Arms (1 per 4 students)

2. Blanket, Fire (1 per lab)

3. Box, Rh View (1 per 5 students)

4. Container, Hazardous Waste (small, 1 per 5 students; large, 2 per lab)

5. Counter, Hematologic (1 per student)

6. Counter, Differential Manual (1 per student)

7. Eye Wash Station (1 per lab)

8. Hot Plate with Stirrer (2 per lab)

9. Incinerator, Bacteriologic (1 per student)

10. Jar, Anaerobic system (2 per lab)

11. Microscope, Objectives, 4X (1 per student)

12. Microscope, Objectives, 10X (1 per student)

13. Mixer, Vortex (2 per program)

14. Monitor, Glucose (1 per program)

15. Pipets, Automatic (1 per 2 students)

16. Projector, Overhead (2 per program)

17. Rotator, Tube Rocker (1 per lab)

18. Safety Shower (1 per lab)

19. Scale, Balance (1 per lab)

20. Station, Hazardous Spill (1 per lab)

21. Viewers, Agglutination (1 per student)

22. Washer, Pipette (1 per lab)

23. Timers (1 per student)

24. Glassware, assorted set (1 set per student)

25. Hemacytometer (1 per student)

26. Stopwatches (1 per 2 students)

27. Thermometers (reference, 1 per lab; regular, 5 per lab)

28. Tray, Phlebotomy (1 per 4 students)

29. Fluid resistant lab stool (1 per student)

RECOMMENDED INSTRUCTIONAL AIDS

- 1. Presentation System (1 per lab)
- 2. Projector Screen (2 per program)
- 3. Projector Slide (1 per program)
- 4. Scanner, Regular and/or Kodachrome

5. Station, SDS Information (1 per program)

6. Interactive whiteboard (1 per program)

7. Document camera or digital visual presenter (1 per program)

8. Classroom response system (1 set per program)

9. Laptop/tablets

10. Smart TV

11. Laboratory software

SLIDE OR CD SETS:

1. Blood and Tissue Parasites

2. Body Fluids

3. Clinical Chemistry

4. Immunohematology

5. Immunology/Serology

6. Intestinal Parasites

7. Microbiology

8. Mycology

9. Normal and Abnormal
10. Protozoa
11. Urinalysis/Sediment

CURRICULUM DEFINITIONS AND TERMS

- Course Name A common name that will be used by all community colleges in reporting students
- Course Abbreviation A common abbreviation that will be used by all community and junior colleges in reporting students
- Classification Courses may be classified as the following:
 - Career Certificate Required Course A required course for all students completing a career certificate.
 - Technical Certificate Required Course A required course for all students completing a technical certificate.
 - o Technical Elective Elective courses that are available for colleges to offer to students.
- Description A short narrative that includes the major purpose(s) of the course
- Prerequisites A listing of any courses that must be taken prior to or on enrollment in the course
- Corequisites A listing of courses that may be taken while enrolled in the course
- Student Learning Outcomes A listing of the student outcomes (major concepts and performances) that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
 - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
 - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
 - Activities that include integration of academic and career-technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary careertechnical programs
 - Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas
- Sequencing of the course within a program is left to the discretion of the local college. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

- In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:
 - Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
 - Revising or extending the student learning outcomes
 - Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

COURSE CROSSWALK

Course Crosswalk												
Medical Laboratory Technology												
CIP 51.1004 – Medical Laboratory Technology												
Note: Courses that have been added or changed in the 2017 curriculum are highlighted.												
	Existing		Revised									
2011	MS Curriculum Fran	mework	2017 MS Curriculum Framework									
Course	se Course Title Hours Course Course Tit		Course Title	Hours								
Number			Number									
	Fundamentals of			Fundamentals of Medical								
	Medical Laboratory			Laboratory								
MLT 1111	Technology/Phlebotomy	1	MLT 1112	Technology/Phlebotomy	2							
MLT 1212	Urinalysis/ Body Fluids	2	MLT 1212	Urinalysis/ Body Fluids	2							
MLT 1313	Hematology I	3	MLT 1313	Hematology I	3							
MLT 1324	Hematology II	4	MLT 1324	Hematology II	4							
MLT 1413	Immunology/ Serology	3	MLT 1413	Immunology/ Serology	3							
MLT 1515	Clinical Chemistry	5	MLT 1515	Clinical Chemistry	5							
MLT 1523	Principles of Organic		MLT 1523	Principles of Organic and								
	and Biochemistry	3		Biochemistry	3							
MLT 2424	Immunohematology	4	MLT 2424	Immunohematology	4							
MLT 2512	Parasitology	2										
			MLT 2522	Pathogenic Microbiology I	2							
			MLT 2614	Pathogenic Microbiology II	4							
	Medical Laboratory			Medical Laboratory Technology								
MLT 2711	Technology Seminar	1	MLT 2711	Seminar	1							
	Certification											
	Fundamentals for											
	Medical Laboratory			Certification Fundamentals for								
MLT 2723	Technology	3	MLT 2723	Medical Laboratory Technology	3							
MLT 2812	Clinical Instruct-		MLT 2812									
	mentation	2		Clinical Instruct- mentation	2							
MLT 2916	Clinical Practice I	6	MLT 2916	Clinical Practice I	6							
MLT 2926	Clinical Practice II	6	MLT 2925	Clinical Practice II	5							
MLT 2936	Clinical Practice III	6	MLT 2935	Clinical Practice III	5							
			MLT 2944	Clinical Practicum I	4							
			MLT 2954	Clinical Practicum II	4							
			MLT 2964	Clinical Practicum III	4							
			MLT 2974	Clinical Practicum IV	4							