

STATE BOARD FOR COMMUNITY COLLEGES AND OCCUPATIONAL EDUCATION

April 12, 2023

TOPIC: Bachelor of Applied Science in Medical Laboratory Science

PRESENTED BY:

Stephanie J. Fujii, Ph.D., President – Arapahoe Community College,
Landon K. Pirius, Ph.D., Vice Chancellor for Academic and Student Affairs,

RELATIONSHIP TO THE STRATEGIC PLAN:

- To provide innovative and responsive educational and economic opportunities in an accessible, inclusive environment that promotes success for the students, employees, and communities we serve.
- Develop accessible and innovative academic programs that match student and workforce needs to prepare students for successful transfer or entry into the workforce.
- Develop bachelor's degrees aligned to our mission, with a strategic focus, and in line with select ACC associate degrees and workforce demand to ensure we contribute to a highly skilled workforce in our communities and beyond.

Explanation:

Pursuant to CCCS's role and mission (§23-60-201, C.R.S.), CCCS may offer technical, career, and workforce development Bachelor of Applied Science (BAS) degree programs. Authority for the Colorado Community College System to offer BAS degrees was made possible by SB14-004 (Community College Four-year Programs), which was signed by the Governor on February 27, 2014.

As stated on the Board Home page, "BAS degrees continue to be of increasing importance in enabling individuals to qualify for and obtain jobs in specialized fields throughout Colorado. Offering BAS and BSN degrees has allowed the community colleges to provide an opportunity for underserved and first-generation students to continue their educational pathway in a familiar community college setting, thus making it more likely these students will persist and complete their degrees while furthering statewide goals toward closing the attainment gap for historically underserved populations. CCCS colleges offer Bachelor's degrees in a growing number of specific disciplines designed to enhance graduates' employment opportunities."

ACC is seeking approval for a BAS in Medical Laboratory Science to create further educational opportunities for those with credentials in Medical Laboratory Technology (MLT) by reducing barriers for students while creating an accessible, affordable, and quality program. The program will enable students to advance in allied health care fields and professions with the BAS degree.

RECOMMENDATION:

Recommendation to the Board for approval of a BAS degree in Medical Laboratory Science for Arapahoe Community College (ACC). The legislative criteria for approval

of a BAS degree are set by SB14-004, Additional information is provided in Attachments.

ATTACHMENT(S):

ACC BAS MLS Key Assessments

ACC BAS MLS Financials

ACC BAS MLS Academic Plan

MLS Course Descriptions

NAACLS Standards for Accredited Programs



**Bachelor of Applied Science in
Medical Laboratory Science**

**Key Assessments for Presentation to the
State Board for Community Colleges and
Occupational Education**

April 12, 2023

*Leader in Innovative Community College
Education*



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Introduction

Arapahoe Community College (ACC) is seeking approval to offer a Bachelor of Applied Science degree in Medical Laboratory Science (BAS MLS). The program consists of 39 credits of 3000-4000 level courses and 18 credits of 1000-2000 level courses that are currently in the Colorado Common Course Numbering System. The program includes a total of 57 credits that will be offered completely online.

There is currently no other BAS MLS program offered by any public or private colleges or universities in Colorado. There are 3 Post Baccalaureate MLS programs in Colorado: 2 in the Denver Metro area and 1 in Pueblo. However, a student must have a bachelor's degree before entering these programs. If a student has an AAS in Medical Laboratory Technology (MLT), there is no bridge program for them to complete the bachelor's degree in MLS in Colorado, and their only choice is to pursue the degree from an out of state institution. Cost of pursuing an out of state degree prohibits those who are seeking the bachelor's degree.

Assessment to ensure program is cost-effective (students, community college system, state)

Currently, ACC has an AAS MLT program which is accredited by the National Accreditation Agency for Clinical Laboratory Sciences (NAACLS). The new BAS MLS program will complement the current AAS program and students will be able to complete their AAS degree and then pursue their MLS degree through ACC. We are projecting that ACC will be able to retain 60% or more of the students who complete their AAS and to recruit non-ACC students who wish to complete their education at the BAS level to be eligible to take the National Registry Exam, which is offered by the American Society for Clinical Pathology.

The laboratory plays a critical role in the health care of a patient. According to the Centers for Disease Control (CDC), "70% of today's medical decisions depend on laboratory test results, showing the important role of clinical laboratories in today's healthcare system" (CDC, 2018). As seen in recent years during the pandemic, the laboratory played and continues to play a vital role in diagnosing COVID infections. Laboratories are stretched thin due to increased demand, and the retirement of many seasoned technologists. The American Society for Clinical Pathologists (ASCP) and the University of Washington Center for Health Workforce Studies did a vacancy survey and reported "Results from this study ... demonstrated that the pandemic affected laboratory staffing mainly through furloughs, staff departure, and early retirement while experiencing workload increases" (Garcia, 2022). This same study showed "The total vacancy rate for staff is 10.6%, and the supervisor vacancy rate is 6.7%" in the core lab, and "Results also reveal that 16.3% of the total core laboratory department employees are expected to retire in the next 5 years." These workers need to be replaced, and the study is evidence that ACC can play a critical role in training new technologists.

According to the Bureau of Labor Statistics (BLS), the national median salary for the holders of the bachelor's degree in 2021 was \$57,800 (BLS, 2022). Salary.com shows the median salary in the Denver area at \$70,637 (salary.com, 2022). O*NET Online shows the average salary for the Colorado region at \$60,670 (O*NET Online, 2022). The cost of the two years education to attain the bachelor's degree at ACC in MLS is currently estimated to be \$15,500.

Workforce Demand Assessment

The BAS MLS program positions ACC to provide advanced education for current Medical Laboratory Technicians and prepares students to sit for the American Society of Clinical Pathologists (ASCP) Board of Certification in MLS.

O*NET Online shows the employment outlook bright in Colorado and the projected growth is 27% between 2020 and 2030. There are 450 projected job openings annually. Nationally, there are projected to be 25,600 job openings annually between 2021 and 2031.

Lab Technologists who hold a bachelor's degree and the MLS credential have many options in the healthcare industry. "Medical lab scientists work in hospitals, clinics, forensic or public health laboratories, as well as pharmaceutical industries, biotechnology companies, veterinary clinics, or research institutions" (Mayo Foundation, 2022).

Colorado Employment Trends

29-2011.00 - [Medical and Clinical Laboratory Technologists](#)

View trends for state: Colorado


In Colorado:

Employment data for **Clinical Laboratory Technologists and Technicians**.

Employment (2020)	5,000 employees
Projected employment (2030)	6,350 employees
Projected growth (2020-2030)	27%
Projected annual job openings (2020-2030)	450

In the United States:

Employment data for **Clinical Laboratory Technologists and Technicians**.

Employment (2021)	329,200 employees
Projected employment (2031)	351,000 employees
Projected growth (2021-2031)	 7% Average
Projected annual job openings (2021-2031)	25,600

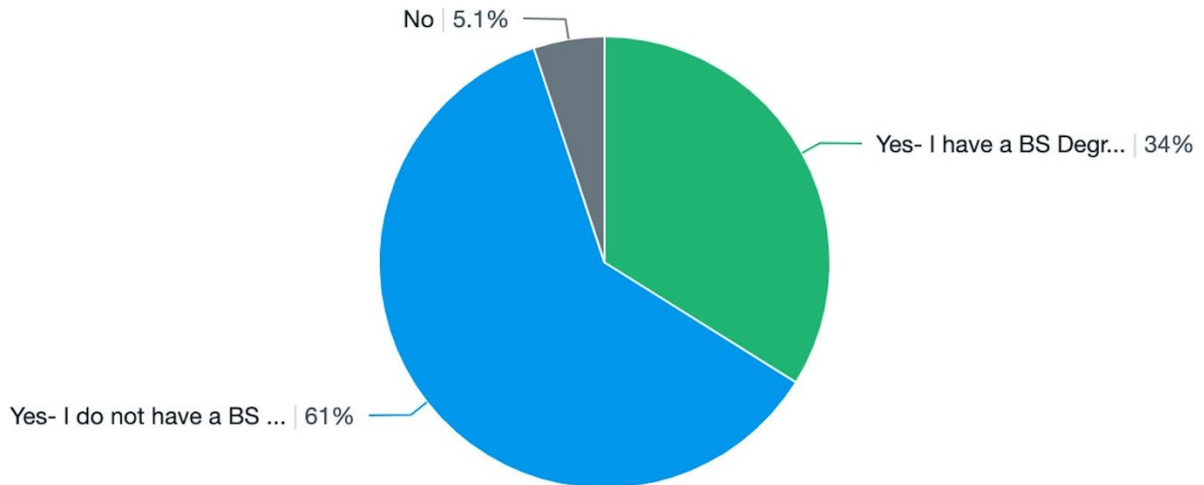
<https://www.onetonline.org/link/localtrends/29-2011.00?st=CO>

Student Demand Assessment

Student surveys were conducted in 2021. ACC had a total of 58 responses. Below is the summary of the data.

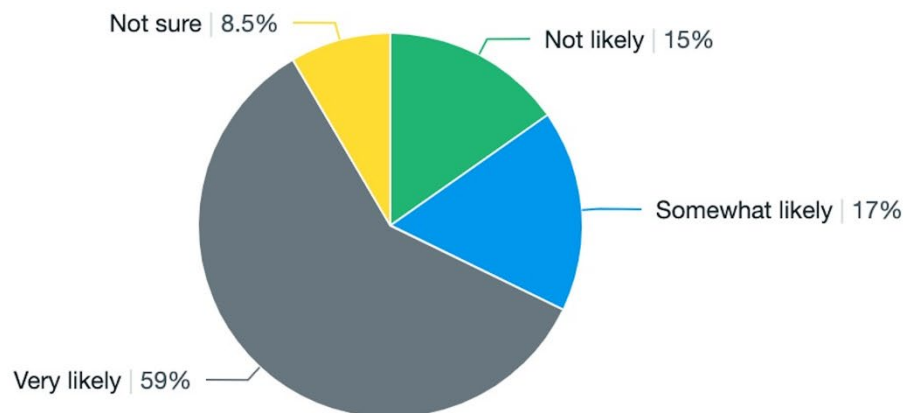
- 95% of individuals are interested in obtaining an MLS bachelor's degree.

Do you have any interest in pursuing a Bachelor's degree in MLS?



- 75% of individuals surveyed are very likely or somewhat likely to enroll in a BAS program at ACC

If ACC were to offer a Bachelor's degree in MLS, how likely would you be to enroll in this program?



Assessment of accreditation and licensing requirements

ACC will seek accreditation of the MLS program through The National Accreditation Agency for Clinical Laboratory Sciences. There is no licensing required.

Program Budget

Please see the budget summary sheet attached. Expenses associated for the Medical Laboratory Science BAS degree are as follows:

- Salary and benefits of program chair (20% in Y0 and 10% in subsequent years)
- Salary and benefits of a new faculty
- Salary and benefits of adjunct faculty
- Equipment startup costs for new staff positions
- Software (MediaLab)
- NAACLS Annual accreditation fees
- Operating and travel to include accreditation fees and select software
- Salaries assume 3% annual increase

Facility and Equipment Costs (licensing, maintenance)

- ❖ No facility costs – program will be offered online.
- ❖ Annual NAACLS Accreditation fee is \$3000/year (1st year includes an application fee of \$792.00) for maintenance of accreditation
- ❖ Equipment – ensuring staff have proper equipment for online course deliveries. See above for projected equipment costs.
- ❖ Software – ensuring students have proper access to software for online courses resources.

The effect of proposed program on existing programs in terms of finances, enrollment, and staffing

The BAS in MLS will not compete with other existing programs and will not impact their enrollments and revenues. The general education requirement will generate FTE and revenues for related programs and will be taught by their faculty.

Faculty and staffing needs analysis

The program will require one full-time faculty and one adjunct faculty

Analysis of student support services, including library resources

The program is online and other than routine, regular support services that the college provides all students; no other services will be needed.

Other assessments, as appropriate

N/A

References:

Centers for Disease Control and Prevention. (2018, November 15). *Strengthening Clinical Laboratories*. Centers for Disease Control and Prevention. Retrieved December 4, 2022, from <https://www.cdc.gov/csels/dls/strengthening-clinical-labs.html>

“Clinical Laboratory Technologists and Technicians : Occupational Outlook Handbook.” *U.S. Bureau of Labor Statistics*, U.S. Bureau of Labor Statistics, 8 Sept. 2022, <https://www.bls.gov/ooh/healthcare/clinical-laboratory-technologists-and-technicians.htm>.

“Colorado Wages: 29-2011.00 - Medical and Clinical Laboratory Technologists.” *O*NET OnLine*, 2022, <https://www.onetonline.org/link/localwages/29-2011.00?st=CO>.

Garcia, Edna, et al. “The American Society for Clinical Pathology 2020 Vacancy Survey of Medical Laboratories in the United States.” *American Journal of Clinical Pathology*, vol. 157, no. 6, 2021, pp. 874–889., <https://doi.org/10.1093/ajcp/aqab197>.

Mayo Clinic College of Medicine and Science. “Medical Laboratory Scientist - Explore Health Care Careers - Mayo Clinic College of Medicine & Science.” *Mayo Clinic College of Medicine and Science*, 2022, <https://college.mayo.edu/academics/explore-health-care-careers/careers-a-z/medical-laboratory-scientist/>.

Salary.com, Site built by: “Clinical Laboratory Scientist Salary in Denver, Colorado.” *Salary.com*, 2022, <https://www.salary.com/research/salary/listing/clinical-laboratory-scientist-salary/denver-co>.

Appendix A

Sample of comments from MLT to MLS survey completed in Feb 2021.

I hope this becomes a possibility as I have completed the MLT program with ACC, and looked into other schools out of state that offer a MLS program. This would be a great opportunity for myself and many other medical laboratory technicians to further their education and careers.

Do it! I would love to get a BS in MLS. Other options didn't seem feasible. It's nice to have something local and if it is done the same way as the MLT program was, then it would be easier to incorporate it with my regular schedule and not take too much time out of work. I don't want to have to stop working to go back to school.

I think it is a vastly needed program that needs to be done in a similar way as the MLT. Made for those who have to work while going to school, and cost affordable:

This is a very exciting prospect. I've been considering this advancement for a while and I'm interested to see how a program from ACC would compare to other options.

Having a mainly online program with opportunity for doing clinical at current job would be the best. Currently looking at enrolling in LSU online which is what they do. I think it would be a fantastic idea!! How fast can it happen? Looking at starting a program this summer.

Appendix B

Letters from industry partners and advisory committee members

I absolutely support ACC incorporating an MLT to MLS bridge program! I think having that educational infrastructure is of vital importance. I think due to a variety of socioeconomic reasons, we have lots of employees may start off as a phlebotomist, transition into a medical lab assistant, and then move on to become an MLT while taking advantage of their employer's tuition reimbursement program. As an MLT they get the broad strokes and basics needed to work in the industry. Giving them the opportunity to not only to expand their knowledge and skill set, but also their earning potential is vital to Colorado's clinical laboratories. We have a huge amount of med techs from the baby boomer generation that are retiring or about to retire, including laboratory leadership. Due to regulatory requirements, not all MLTs meet the requirements to move into those leadership positions. Replacing those retiring with people that have a greater depth of knowledge on the science behind the testing, will only improve outcomes. Furthermore, certain facilities will only hire applicants that have their MLS certification. Therefore, implementing this program only serves to increase potential candidate pools for hospitals as well as broadening the possibilities for those completing the program.

Thanks,

Holly Fal, MLS (ASCP)^{cm}
Quality Specialist Labs, Training & Education
Centura Health

O: 303.673.7413
9100 E. Mineral Cir | Centennial, CO 80112
centura.org

I think this is extremely valuable. Over the years we have had quite a few MLTs who have “bridged” to MLS, but they had to find programs in other locations. I don’t know how all organizations handle MLT versus MLS, but at my organization, MLT’s do the same work as MLS, but at a much lower pay rate. When I talk to people about a possible medical laboratory career, I always urge that they go for the MLS rather than the MLT for that reason, but there are many people who cannot invest the time and money on the MLS route, at least, not right away. I think this will fill a huge need.

Thanks!

Karin Ingle

Manager Laboratory Services

University of Colorado Hospital

☎ 720.848.7059 **Toll bypass** 191.87059

Karin.Ingle@uchealth.org

uchealth.org

The logo for uchealth, featuring the word "uchealth" in a lowercase, sans-serif font. The letters are dark red, and a thin red horizontal line is positioned directly beneath the text.



Kellene Neuharth

8300 West 38th Avenue, Wheat Ridge, CO 80033

December 2, 2022

To Whom It May Concern:

Lutheran has partnered with Arapahoe Community College for many years providing Medical Laboratory Technician (MLT) students clinical internships. Several of these graduates have been hired by our organization and have become long-term employees.

Many of our MLT associates continue their education by pursuing a four-year Bachelor of Science degree in Medical Laboratory Science. I support Arapahoe Community College pursuit of a MLS (Medical Lab Science) bridge program and very much look forward to providing my employees with an established and affordable career pathway in Denver.

Arapahoe Community College graduates are skilled and knowledgeable scientists that are essential to our laboratory workforce. The MLT to MLS bridge program would add a much-needed service for our future laboratory community by developing competent and professional clinical laboratory scientists.

Sincerely,

A handwritten signature in black ink that reads "Kellene Neuharth".

Kellene Neuharth Laboratory
Manager
SCL Health Lutheran Medical Center

Addendum (Attachments)

1. Budget Summary
2. MLS Academic Plan
3. MLS Course Templates
4. National Accrediting Agency for Clinical Laboratory Science (NAACLS) Standards for Accredited Programs

**ACC Program Financial Analysis
BAS MLS Program
Analysis Summary**

	Rate per credit hour	Total	Y0	Y1	Y2	Y3	Y4	Y5
SFTE		159.1		11.2	25.6	32.2	40.8	49.3
Revenues								
	\$	\$	\$	\$	\$	\$	\$	\$
Resident Tuition	263.20	1,256,517	-	88,435	202,138	254,514	321,894	389,536
Non-Resident Tuition								
Tuition Differential								
Adjusted COF/FFS	\$ 94.00	\$ 448,756		\$ 31,584	\$ 72,192	\$ 90,898	\$ 114,962	\$ 139,120
Gaming								
Fees: High Cost								
Fees: Program								
Grants								
Miscellaneous Revenue								
Estimated Total Revenues	\$ 357.20	\$ 1,705,273	\$ -	\$ 120,019	\$ 274,330	\$ 345,412	\$ 436,856	\$ 528,656

Expenses

		\$	\$	\$	\$	\$	\$	\$
Admin Salaries		51,444	13,479	7,009	7,290	7,581	7,884	8,200
Admin Benefits	36%	\$ 18,520	\$ 4,853	\$ 2,523	\$ 2,624	\$ 2,729	\$ 2,838	\$ 2,952
Faculty Salaries		\$ 358,468		\$ 66,183	\$ 68,830	\$ 71,584	\$ 74,447	\$ 77,425
Faculty Benefits	35%	\$ 126,898		\$ 23,429	\$ 24,366	\$ 25,341	\$ 26,354	\$ 27,408
Adjunct Wages		\$ 72,167	\$ 37,527		\$ 8,660	\$ 8,660	\$ 8,660	\$ 8,660
Adjunct Benefits	21%	\$ 15,155	\$ 7,881	\$ -	\$ 1,819	\$ 1,819	\$ 1,819	\$ 1,819
Classified Salaries		\$ -						
Classified Benefits		\$ -						

Hourly Wages	\$	-					
Hourly Benefits	\$	-					
Operating	\$	\$	\$	\$	\$	\$	\$
	49,500	2,000	7,500	10,000	10,000	10,000	10,000
Travel	\$	-					
Capital	\$	-					
Grant Expenses	\$	-					
Estimated Total Expenses	\$	\$	\$	\$	\$	\$	\$
	692,152	65,740	106,644	123,589	127,713	132,003	136,464
Estimated Net Operating Income (DE Only)	\$	\$	\$	\$	\$	\$	\$
	1,013,121	(65,740)	13,375	150,741	217,699	304,853	392,192
Estimated Net Operating Income (DE & 30% IDC)	\$	\$	\$	\$	\$	\$	\$
	709,184	(46,018)	9,362	105,519	152,389	213,397	274,535
Cumulative Return on Investment		\$	\$	\$	\$	\$	\$
		(46,018)	(36,655)	68,863	221,253	434,650	709,184

[Appendix A](#)

Student ID: _____
 Student Name: _____
 Adviser Name: _____

Catalog: 2024-2025 Arapahoe Community College Catalog
 Program: Medical Laboratory Science BAS –Academic Plan
 Minimum Credits Required: _____

Medical Laboratory Science BAS - Academic Plan

This Bachelor of Applied Science degree prepares students to advance in the field of Medical Laboratory Science. This completely online program prepares technologists to be able to perform high complexity testing in the clinical lab. It also prepares technologists to assume supervisory and leadership roles in the clinical laboratory. As a certified MLS, employment is available in hospitals, clinics, veterinary, industrial, environmental and research laboratories.

A full-time student can complete this Bachelor of Applied Science (BAS) degree in two years and a part-time student can complete it in 3 years. This degree prepares students to advance in the field of Medical Laboratory Science. Graduates of this NAACLS-accredited program are eligible to take the America Society for Clinical Pathologists national board exam and awarded the ASCP credential.

Course Availability

Total Credits = 120

Required Courses - General Education Courses	Credits	Pre or Co Reqs Required	Course Available Fall?	Course Available Spring?	Course Available Summer?
AAS Degree General Education Coursework*	25	N/A	N/A	N/A	N/A
ENG 1022 – English Composition II: GT-CO2	3	Yes	Yes	Yes	Yes
SOC 2018 – Sociology of Diversity: GT-SS3	3	Yes	Yes	Yes	Yes
MAT 1260 - Introduction to Statistics GT-MAT1*	3	No	Yes	Yes	Yes
CHE 1112 – General College Chemistry II with Lab: GT-SC1*	5	Yes	Yes	Yes	Yes
BIO 2104 – Microbiology with Lab: GT-SC1	4	Yes	Yes	Yes	Yes

Required Courses - Major Courses	Credits	Pre or Co Reqs Required	Course Available Fall?	Course Available Spring?	Course Available Summer?
AAS Degree Major Coursework	38	N/A	N/A	N/A	N/A
MLS 3110 – Advanced Hematology	4	No	Yes	No	No
MLS 3120 - Hemostasis	2	No	Yes	No	No
MLS 3130- Clinical Immunology & Virology	3	No	Yes	No	No
MLS 3140- Adv Urinalysis & Bodily Fluids	3	No	Yes	No	No
MLS 3150- Advanced Immunohematology	3	No	No	Yes	No
MLS 3160- Advanced Molecular Biology	3	No	No	Yes	No
MLS 3170- Adv Parasitology and Mycology	2	No	No	Yes	No
MLS 4080 Clinical Internship	8	No	NoSha	Yes	No
MLS 4110 Advanced Clinical Microbiology	4	No	Yes	No	No
MLS 4120 Advanced Clinical Chemistry	3	No	Yes	No	No
MLS 4130 Laboratory Management	2	No	Yes	No	No
MLS 4140 Clinical Correlations	2	No	No	Yes	No

Program Outcomes

Recommended Course Sequence (Full-Time Track)

General Ed Requirements

Year 1: Fall

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 3110 – Advanced Hematology	4 Credits			
MLS 3120- Hemostasis	2 Credits			
MLS 3130- Clinical Immunology and Virology	3 Credits			
MLS 3140- Advanced Urinalysis & Bodily Fluids	3 Credits			

Year 1: Spring

Course Name	Credits	Term Taken	Grade	Gen Ed
CHE 1112- General Chemistry II w/ Lab GT-SC1*	5 Credits			
MLS 3150- Advanced Immunohematology	3 Credits			
MLS 3160- Advanced Molecular Biology	3 Credits			
MLS 3170- Advanced Parasitology and Mycology	2 Credits			

Year 1: Summer

Course Name	Credits	Term Taken	Grade	Gen Ed
ENG 1022 – English Composition II: GT-CO2	3 Credits			
MAT 1260 - Introduction to Statistics GT-MAT1*	3 Credits			
BIO 2104 – Microbiology with Lab: GT-SC1	4 Credits			

Year 2: Fall

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 4110 Advanced Clinical Microbiology	4 Credits			
MLS 4120 Advanced Clinical Chemistry	3 Credits			
MLS 4130 Laboratory Management	2 Credits			
SOC 2018 – Sociology of Diversity: GT-SS3	3 Credits			

Year 2: Spring

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 4140 Clinical Correlations	2 Credits			
MLS 4080 Clinical Internship	8 Credits			

Recommended Course Sequence (Part-Time Track)

General Ed Requirements

Year 1: Fall

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 3110 – Advanced Hematology	4 Credits			
MLS 3120- Hemostasis	2 Credits			

Year 1: Spring

Course Name	Credits	Term Taken	Grade	Gen Ed
CHE 1112- General Chemistry II w/ Lab GT-SC1*	5 Credits			
MLS 3170- Advanced Parasitology and Mycology	2 Credits			

Year 1: Summer

Course Name	Credits	Term Taken	Grade	Gen Ed
MAT 1260 - Introduction to Statistics GT-MAT1*	3 Credits			
BIO 2104 – Microbiology with Lab: GT-SC1	4 Credits			

Year 2: Fall

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 3130- Clinical Immunology and Virology	3 Credits			
MLS 3140- Advanced Urinalysis & Bodily Fluids	3 Credits			
MLS 4130 Laboratory Management	2 Credits			

Year 2: Spring

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 3160- Advanced Molecular Biology	3 Credits			
MLS 3150- Advanced Immunohematology	3 Credits			

Year 2: Summer

Course Name	Credits	Term Taken	Grade	Gen Ed
ENG 1022 – English Composition II: GT-CO2	3 Credits			
SOC 2018 – Sociology of Diversity: GT-SS3	3 Credits			

Year 2: Fall

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 4110 Advanced Clinical Microbiology	4 Credits			
MLS 4120 Advanced Clinical Chemistry	3 Credits			

Year 3: Spring

Course Name	Credits	Term Taken	Grade	Gen Ed
MLS 4140 Clinical Correlations	2 Credits			
MLS 4080 Clinical Internship	8 Credits			

MLS Course Templates

Request Type: NEW/GEN

Requestor: Jennifer Kellogg, ACC

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **3110**

Course Title (short): **Advanced Hematology**

Course Title (long): **Advanced Hematology**

Credit Hours: **4**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Covers the composition of blood and diseases related to blood disorders. Emphasis is on studying diagnostic procedures and interpreting laboratory findings that correlate with hematological disease states.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a hematology laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Classify anemias and their related pathophysiologies.
4. Discuss leukemias, lymphomas, and nonmalignant WBC (White Blood Cell) disorders and their related pathophysiologies.
5. Evaluate case histories and lab results and be able to suggest a reasonable differential diagnosis.
6. Describe miscellaneous hematology procedures.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Hematology physiology
- II. Anemias
- III. Lymphomas and leukemias
- IV. Platelet defects
- V. Cell counts

- VI. Differentials
- VII. Hemoglobin and hematocrit
- VIII. Stains
- IX. Other hematology testing
- X. Flow cytometry
- XI. Molecular testing

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **3120**

Course Title (short): **Hemostasis**

Course Title (long): **Hemostasis**

Credit Hours: **2**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Covers the hemostasis and coagulation system. The coagulation pathway, including the extrinsic and intrinsic pathway, is discussed. Course covers bleeding and clotting abnormalities and platelet disorders and correlates lab results with disease states.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a hemostasis laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Detail the coagulation and fibrinolytic pathway.
4. Select appropriate tests for measuring different facets of the hemostasis system.
5. Discuss disorders of the hemostasis system.
6. Correlate abnormal test results to disease states.
7. Analyze lab results and case history and provide a differential diagnosis.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety in the laboratory
- II. Specimen
 - A. Collection
 - B. Transport
 - C. Processing
- III. Coagulation cascade
- IV. Coagulation factors and disorders
- V. Fibrinolytic pathway

- VI. Vascular system
- VII. Disease states of coagulation factor deficiencies
- VIII. Disseminated Intravascular Coagulation
- IX. Laboratory determinations of the hemostasis system

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **3130**
Course Title (short): **Clinical Immunology & Virology**
Course Title (long): **Clinical Immunology & Virology**
Credit Hours: **3**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Discusses theory, application, and evaluation of laboratory methodologies in the clinical immunology laboratory. This course emphasizes infectious disease serology and virology and includes principles of assessment of immunologically related disorders.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a clinical immunology laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Discuss the immune response and its involvement in both healthy states and disease states.
4. Select appropriate laboratory procedures to diagnose diseases caused by disorders of the immune system.
5. Distinguish diseases of other systems in which the immune response is involved in pathogenesis.
6. Discuss and be able to detect major viral pathogens in the body.
7. Analyze lab results and case history to provide a differential diagnosis of immunologic and viral states.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety in the laboratory
- II. Specimen
 - A. Collection

- B. Transport
- C. Processing
- III. Immune system physiology
- IV. Immune response
- V. Immunoglobulins
- VI. Antigen-antibody interactions
- VII. Complement
- VIII. Autoimmunity
- IX. Hypersensitivity
- X. Immunoproliferative diseases
- XI. Immunodeficiency
- XII. Transplantation
- XIII. Infectious disease serology
- XIV. Serologic procedures
- XV. Virology specimen sources
- XVI. Major viral pathogens and disease states
- XVII. Direct detection of viral pathogens

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **3140**

Course Title (short): **Adv Urinalysis & Body Fluids**

Course Title (long): **Advanced Urinalysis and Body Fluids**

Credit Hours: **3**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Covers the anatomy and physiology of the renal system. This course discusses physical, microscopic, and chemical analysis of urine and describes body fluid counts and analyses . Disease correlation of abnormal urine and body fluids is examined.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a urinalysis laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Discuss the renal system and the anatomy of the renal system.
4. Perform a complete urinalysis.
5. Correlate abnormal urine results to various disease states.
6. List the different body fluids and sites from which they are recovered.
7. Correlate abnormal body fluid counts and test results to various disease states.
8. Analyze lab results and case history and be able to provide a differential diagnosis.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety in the laboratory
- II. Specimen
 - A. Collection
 - B. Transport

- C. Processing
- III. Examination of urine
 - A. Physical
 - B. Chemical
 - C. Microscopic
- IV. Renal anatomy and physiology
- V. Urine and correlation of disease states
- VI. Examination of body fluids
 - A. Physical
 - B. Chemical
 - C. Microscopic
- VII. Physiology of body fluids
- VIII. Body fluids and correlation of disease states

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **3150**
Course Title (short): **Advanced Immunohematology**
Course Title (long): **Advanced Immunohematology**
Credit Hours: **3**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Discusses theory, application, and evaluation of laboratory methodologies in the clinical immunohematology laboratory. This course emphasizes techniques to provide safe, compatible blood components for transfusion and addresses blood donor collection, processing, and storage, as well as diagnosis and management of hemolytic conditions, including Hemolytic Disease of the Newborn.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a Clinical Immunohematology Laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Incorporate Association for the Advancement of Blood and Biotherapies (AABB) standards to collect, process, test, and store donor blood.
4. Explain how to perform pre-transfusion testing to include ABO/Rh/antibody screening and identification.
5. Apply theory, application, and evaluation of blood bank procedures to safe transfusions of blood components.
6. Investigate transfusion reactions.
7. Integrate quality assurance and management in the Clinical immunohematology laboratory.

8. Analyze lab results and case history to resolve complex immunohematology problems.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety in the laboratory
- II. Specimen

- A. Collection
- B. Transport
- C. Processing
- III. Donor blood collection and processing
- IV. Blood components and storage of components
- V. Blood component quality control
- VI. Genetics of blood group systems
- VII. Biochemistry and antigens of blood group systems
- VIII. Role of blood groups in transfusion
- IX. Hemolytic Disease of the Fetus and Newborn
- X. Immune hemolytic anemias
- XI. ABO/Rh testing
- XII. Antibody detection and identification
- XIII. Direct antiglobulin testing
- XIV. Transfusion practice and crossmatching
- XV. Quality assurance in the blood bank
- XVI. Special tests and reagents in the blood bank

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **3160**

Course Title (short): **Advanced Molecular Biology**

Course Title (long): **Advanced Molecular Biology for the Clinical Lab**

Credit Hours: **3**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Covers theory, application, and evaluation of various molecular methods including polymerase chain reaction, reverse transcription, fluorescence in situ hybridization, and probe hybridization as related to genetic disorders, tumor markers, and infectious disease.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a molecular laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Analyze the structure of DNA, methods of replication and recombination, and gene expression.
4. Discuss various methods used for diagnosis of disease in a molecular laboratory.
5. Analyze lab results and case history to suggest a differential diagnosis.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety in the laboratory
- II. Specimen
 - A. Collection
 - B. Transport
 - C. Processing
- III. Nucleic acid structure
- IV. Methods of replication

- V. Gene recombination
- VI. Polymerase chain reaction
- VII. Reverse transcription
- VIII. Fluorescence in situ hybridization
- IX. Probe hybridization
- X. Methods used in the clinical laboratory

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **3170**

Course Title (short): **Adv Parasitology & Mycology**

Course Title (long): **Advanced Parasitology and Mycology**

Credit Hours: **2**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Discusses clinically relevant parasites and fungi. This course covers life cycles, modes of transmission, and the impact that these parasites and fungi have on health and disease states. and includes methods of laboratory diagnosis and identification.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a parasitology/mycology laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Examine the importance of various parasitic infections in human health and disease.
4. Describe collection techniques, specimen processing, and laboratory procedures to identify parasites of medical importance.
5. Discuss the importance of various fungi infections on human health and disease.
6. Describe collection techniques, specimen processing, and laboratory procedures to identify fungi of medical importance.
7. Analyze case history and lab results to provide a differential diagnosis of parasitic or fungal infections.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety in the laboratory
- II. Specimen

- A. Sources
- B. Collection
- C. Transport
- D. Processing
- III. Major pathogens and disease states
- IV. Morphology and growth characteristics of major pathogens
 - V. Identification of major pathogens
 - VI. Macroscopic identification
 - VII. Microscopic identification
 - VIII. Other identification methods

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **4080**

Course Title (short): **Internship**

Course Title (long): **Internship**

Credit Hours: **0 - 12**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

To be determined by the individual instructor. A course description will be developed for each course and documented within the course syllabus.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

To be determined by the individual instructor. A list of outcomes will be developed for each course and documented within the course syllabus.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

To be determined by the individual instructor. A topical outline will be developed for each course and documented within the course syllabus.

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **4110**

Course Title (short): **Advanced Clinical Microbiology**

Course Title (long): **Advanced Clinical Microbiology**

Credit Hours: **4**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Encompasses a comprehensive study of clinically significant bacteria. This course discusses techniques used to collect specimens, identify bacteria, and perform anti-microbial testing. Microbes of major body sites, including normal flora and pathogens, are examined.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a Clinical Microbiology Laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Identify normal flora for relevant culture sites.
4. Distinguish common infectious agents and correlate them to disease.
5. Analyze culture techniques for relevant culture sites.
6. Explain the processes and mechanisms by which pathogens are isolated and identified.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety in the laboratory
- II. Specimen
 - A. Collection
 - B. Transport

C. Processing

III. Media

IV. Stains used in the microbiology lab

V. Staphylococci, Streptococci and Enterococci

VI. Gram negative cocci

VII. Enterobacteriaceae

VIII. Pseudomonas

IX. Non-fermentative gram-negative rods

X. Fastidious and other miscellaneous gram-negative rods

XI. Spore forming and non-spore-forming gram-positive rods

XII. Branching and filamentous gram-positive rods

XIII. Mycobacteria

XIV. Susceptibility testing

XV. Culture sites

A. Blood and bone marrow

B. Cerebrospinal fluid

C. Body fluids from normally sterile sites

D. Respiratory

E. Gastrointestinal

F. Skin

G. Soft tissue

H. Wound

I. Bone

J. Genital and urine

XVI. Identification methods

XVII. Bioterrorism of microbial agents

Request Type: NEW/GEN

Requestor: Jennifer Kellogg, ACC

Part #1: General Course Information

Course Prefix: MLS **Course Number:** 4120

Course Title (short): **Advanced Clinical Chemistry**

Course Title (long): **Advanced Clinical Chemistry**

Credit Hours: 3

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Discusses theory, application, and evaluation of laboratory methodologies in the clinical chemistry laboratory. This course covers correlation of laboratory data with diagnosis of various conditions involving carbohydrates, proteins and enzymes, acid-base balance, electrolytes, and special chemistry procedures.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Apply the necessary skills and procedures that are commonly used in a clinical chemistry laboratory.
2. Describe proper safety skills and techniques used for handling specimens.
3. Identify instrumentation and methodologies found in a clinical chemistry laboratory
4. Evaluate the physiology and analytical procedures of chemistries related to carbohydrates, proteins, enzymes, acid-base metabolism, electrolytes, hormones, and other systems.
5. Discuss organ function and related chemistries of major systems of the body.
6. Implement quality assurance and management in the clinical chemistry laboratory
7. Analyze lab results and case history to form a differential diagnosis

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Safety Laboratory
- II. Specimen
 - A. Collection
 - B. Transport
 - C. Processing
- III. Carbohydrates
- IV. Lipids
- V. Heme derivatives
- VI. Enzymes
- VII. Proteins
- VIII. Acid-base determinations
- IX. Electrolytes
- X. Endocrinology
- XI. Therapeutic drug monitoring
- XII. Toxicology
- XIII. Instrumentation
- XIV. Quality assurance

Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **4130**

Course Title (short): **Laboratory Management**

Course Title (long): **Laboratory Management**

Credit Hours: **2**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Covers theory, application, and evaluation of laboratory management and discusses ethics, diversity, operations, compliance and regulatory issues, method evaluation, and quality assurance. Critical thinking and problem solving as well as educational methodology are emphasized.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Analyze quality control and quality assurance in a laboratory setting.
2. Describe implementation of quality control to produce accurate and quality laboratory results.
3. Discuss implementation of professional and ethical behavior that complies with industry standards in the laboratory setting.
4. Analyze diversity and its implications in a laboratory setting.
5. Discuss compliance and regulatory issues in a clinical laboratory setting.
6. Design an education program to help train future lab professionals.
7. Evaluate new test methods in a clinical laboratory and ascertain best practices for implementation.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Ethics
- II. Diversity
- III. Laboratory operations
- IV. Quality assurance
- V. Compliance and regulatory issues

VI. Method evaluation
VII. Education methods

VIII. Request Type: NEW/GEN

Requestor: **Jennifer Kellogg, ACC**

Part #1: General Course Information

Course Prefix: **MLS** Course Number: **4140**

Course Title (short): **Clinical Correlations**

Course Title (long): **Clinical Correlations**

Credit Hours: **2**

Part #2A: Revised Course Description

N/A

Part #2B: Current Course Description

Summarizes previous MLS courses using case study analyses and critical thinking exercises to interpret data and correlate lab results to disease diagnosis.

Part #3A: Revised Learning Outcomes

N/A

Part #3B: Current Learning Outcomes

1. Relate different lab results to the appropriate laboratory department.
2. Distinguish abnormal and normal laboratory results.
3. Analyze lab results to present a differential diagnosis.
4. Create a case study presentation.
5. Analyze a relevant case history based on hypothetical results and present a differential diagnosis.

Part #4A: Revised Topical Outline

N/A

Part #4B: Current Topical Outline Required

- I. Case study analysis
- II. Case study presentations

NAACLS Standards for Accredited Programs

Adopted 2012, Revised 9/2013, 1/2014, 4/2014, 10/2014, 11/2014,
10/2015, 4/2016, 6/2016, 11/2016, 11/2017, 5/2018, 11/2018, 5/2019,
10/2019, 5/2020, 11/2020, 5/2021, 10/2021, 06/2022, 10/2022

The logo for NAACLS features the acronym "NAACLS" in a bold, black, sans-serif font. The letters are set against a light blue, semi-transparent circular background that has a subtle gradient and a slight glow effect.

National Accrediting Agency
for Clinical Laboratory Sciences

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STANDARDS FOR ACCREDITED PROGRAMS

Core Standards

I. Sponsorship

A. Sponsoring Institution

The sponsor of an educational program must be one of the following:

1. A post-secondary academic institution accredited by an institutional accrediting agency that is recognized by the U.S. Department of Education and given the authority to provide post-secondary education, which awards a minimum of a certificate at the completion of the program.
2. A hospital, medical center, or laboratory accredited by an applicable recognized agency (see Standards Compliance Guide), which awards a minimum of a certificate at the completion of the program.
3. A secondary or post-secondary institution recognized by the state in which it is located. (for Phlebotomy and Medical Laboratory Assistant programs only)
4. An institution recognized by the national government or a regional/national accrediting agency for higher education of the country in which it is located as a post-secondary academic institution with degree granting authority. (for programs outside of the United States)

B. Consortium Sponsor

A separate and distinct entity consisting of two or more members that exists for the purpose of operating an educational program. Where a consortium exists, at least one member of the consortium must meet the requirements of a sponsoring institution specified in I.A. The creation of the consortium must be clearly documented as a formal memorandum of

understanding and signed by all members. This document shall contain the following elements:

1. governance of the consortium
2. lines of authority within the consortium for the educational program
3. responsibilities of each member in the delivery of the educational program

C. Multi-location Sponsor

1. A specified campus location of an entity that controls a system of campuses, which is accredited by an institutional accrediting agency that is recognized by the U.S. Department of Education and given the authority to provide postsecondary education. The specified campus location delivers the educational program in its entirety and awards a minimum of a certificate at the completion of the program.
2. A specified location of an entity that controls a system of hospitals, medical centers, or laboratories accredited by an applicable recognized agency (see Standards Compliance Guide), which awards a minimum of a certificate at the completion of the program.

D. Responsibilities of the Sponsor

1. The sponsor has primary responsibility for:
 - a. supporting curriculum planning and course selection by program faculty and staff
 - b. appointing faculty and staff
 - c. maintaining student transcripts permanently
 - d. granting the degree and/or certificate documenting satisfactory completion of the educational program
 - e. ensuring that appropriate personal safety measures are addressed for students and faculty

- f. ensuring that all provisions of the Standards are met
- g. ensuring that graduates of the program have obtained or will obtain the minimum degree and/or certificate upon completion of the program

Pathologists' Assistant programs: a master's degree or higher, or a certificate for students who hold or complete the required degree

MLS, DMS, HTL, and CG, programs: a baccalaureate degree or higher, or a certificate for students who hold or complete the required degree

MLT and HT programs: an associate degree or higher, or a certificate for students who hold or complete the required degree

Phlebotomy and Medical Laboratory Assistant programs: a certificate for the student

- 2. The sponsor must ensure that the activities assigned to students in the clinical setting are educational.
- 3. There must be documented ongoing communication between the sponsor and its affiliates for exchange of information and coordination of the program.
- 4. The sponsor must provide eligible students the opportunity to participate in applied clinical experiences.
- 5. The sponsor must have a formal affiliation agreement with all other entities that are involved in the education of the students, which describes:
 - a. the relationship
 - b. the roles
 - c. the responsibilities of the sponsor and that entity.

II. Assessment and Continuous Quality Improvement

A. Systematic Assessment

There must be a documented plan for continuous and systematic assessment of the effectiveness of the program.

B. Outcome Measures

A review of the results of the following outcomes measures from the last three active years must be documented, analyzed and used in program assessment and continuous quality improvement of the program to include an annual submission to NAACLS. If outcome measure(s) does/do not meet the stated NAACLS approved benchmarks (see Standards Compliance Guide), then an analysis and action plan must be submitted to correct the deficiency (ies).

1. External certification results
2. Graduation rates
3. Placement rates (i.e., employment positions in the field of study or pursuit of further education)
4. Attrition rates
5. Other (optional): such as results of capstone projects, faculty feedback, exit or final examinations, exit interviews with graduates, student and graduate professional leadership, impact of the program on local and regional healthcare, etc.

C. Program Assessment and Modification

The results of program outcomes measures and assessment must include findings from graduate and employer feedback and be:

1. Reflected in ongoing curriculum development, resource acquisition/allocation, and program modification.
2. Analyzed to demonstrate the effectiveness of any changes implemented.

III. Resources

A. General Resources

1. The sponsor must provide sufficient financial resources for the continued operation of the education program to meet documented goals.
2. Resource assessment of personnel and physical resources must be a part of continuous program evaluation.

B. Personnel

1. The sponsor must appoint sufficient number of personnel to achieve program outcomes.

C. Physical Resources

1. The sponsor must provide physical resources such as facilities, equipment and supplies, information resources, and instructional resources sufficient to achieve program outcomes.

IV. Students

A. Publications and Disclosures

1. The following must be defined, published, and readily available to prospective and enrolled students:
 - a. program mission statement;
 - b. program goals and graduate competencies;
 - c. programmatic accreditation status including the name, address and contact information for NAACLS;
 - d. results of external certification outcomes, graduation rates outcomes, placement rates outcomes of the last three active years;
 - e. list of clinical facilities;

- f. admission criteria, including essentials functions, advance placement, transfer of credits and credits for experiential learning;
- g. list of course descriptions including the number of academic credit hours per course (if appropriate);
- h. names and academic rank or title of the program director and faculty; (and medical director for Pathologists' Assistant programs)
- i. current tuition and fees including withdrawals and refund policies;
- j. policies and processes by which students may perform service work must be published
- k. policies and procedures for:
 - 1. advising and guiding students through the program while maintaining confidentiality and impartiality;
 - 2. clinical assignment specifically addressing when placement cannot be immediately guaranteed;
 - 3. student grievance and appeals;
 - 4. criteria for program completion including probation, suspension, and dismissal
- l. academic calendar
- m. rules and regulations governing acceptable personal and academic conduct, including behavior expectations for clinical experience

B. Student Records

- 1. The program must maintain student records, conforming to any governmental or sponsor regulations. Record examples include admission, evaluation, counseling, advising, grades, credits, etc.

2. The student transcript/student record must be retained permanently by the sponsor and contain at least:
 - a. legal name;
 - b. grades and credits;
 - c. dates of admission and completion
- C. Health and Safety
 1. Health
 - a. The program must provide evidence that the health and safety of students, faculty, and patients during educational activities is safeguarded.
 2. Safety
 - a. The program must provide evidence that each student enrolled has received biohazard and safety training.

V. Operational Policies

Fair Practices

- A. Student recruitment and admission must be non-discriminatory in accordance with existing governmental regulations and those of the sponsor.
- B. Faculty recruitment and employment practices must be non-discriminatory in accordance with existing governmental regulations and those of the sponsor.
- C. The granting of the degree or certificate must not be contingent upon any type of external certification or licensure examination.
- D. A general plan must be provided, addressing temporary and permanent program closure. In the event of such closure, a detailed plan must be submitted to NAACLS within 30 days of the official announcement.
- E. Service work by students in clinical settings outside of academic hours must be noncompulsory.

- F. Students may not be substituted for regular staff during their student experiences.

VI. Administrative: Maintaining Accreditation

Program/Sponsoring Institution Responsibilities

Programs are required to comply with administrative requirements for maintaining accreditation including:

- A. Submitting required documentation by NAACLS by the established deadline. These include but are not limited to Self-Study Reports, Applications for Continuing Accreditation and required Progress Reports, Interim Report and Action Plans;
- B. Paying accreditation fees, as determined by NAACLS, by the due date;
- C. Informing NAACLS of relevant administrative and operational changes within 30 days. These include changes in program official names, physical addresses, URL or telephone numbers; status (e.g. inactivity, closure) or location, and institution name;
- D. Agreeing to a site visit date before the end of the period for which accreditation is awarded;
- E. Submitting an outcomes report on an annual basis to NAACLS addressing major changes, if any, and program assessment standards (Standard II) by the established deadline date;
- F. Verifying compliance with these Standards upon request from NAACLS, which may include submitting to an off cycle site visit.

Unique Standards Medical Laboratory Scientist (MLS)

PREAMBLE

Objectives

The purpose of these Standards and the Description of the Profession is to establish, maintain, and promote standards of quality for educational programs in the clinical laboratory sciences and to provide recognition for educational programs which meet or exceed the minimum standards outlined in this document.

The Standards are to be used for the development and evaluation of medical laboratory science programs. Paper reviewers and site visit teams assist in the evaluation of the program's compliance with the Standards. Lists of accredited programs are published for the information of students, employers, and the public.

DESCRIPTION OF THE MEDICAL LABORATORY SCIENTIST PROFESSION

The medical laboratory scientist is qualified by academic and applied science education to provide service and research in clinical laboratory science and related areas in rapidly changing and dynamic healthcare delivery systems. Medical laboratory scientists perform, develop, evaluate, correlate and assure accuracy and validity of laboratory information; direct and supervise clinical laboratory resources and operations; and collaborate in the diagnosis and treatment of patients. The medical laboratory scientist has diverse and multi-level functions in the principles, methodologies and performance of assays; problem-solving; troubleshooting techniques; interpretation and evaluation of clinical procedures and results; statistical approaches to data evaluation; principles and practices of quality assurance/quality improvement; and continuous assessment of laboratory services for all major areas practiced in the contemporary clinical laboratory.

Medical laboratory scientists possess the skills necessary for financial, operations, marketing, and human resource management of the clinical laboratory.

Medical laboratory scientists practice independently and collaboratively, being responsible for their own actions, as defined by the profession. They have the requisite knowledge and skills to educate laboratory professionals, other health care professionals, and others in laboratory practice as well as the public.

The ability to relate to people, a capacity for calm and reasoned judgment and a demonstration of commitment to the patient are essential qualities. Communications

skills extend to consultative interactions with members of the healthcare team, external relations, customer service and patient education.

Medical laboratory scientists demonstrate ethical and moral attitudes and principles that are necessary for gaining and maintaining the confidence of patients, professional associates, and the community.

Description of Entry Level Competencies of the Medical Laboratory Scientist

At entry level, the medical laboratory scientist will possess the entry level competencies necessary *to perform* the full range of clinical laboratory tests in areas such as Clinical Chemistry, Hematology/Hemostasis, Immunology, Immunohematology/Transfusion medicine, Microbiology, Urine and Body Fluid Analysis and Laboratory Operations, and other emerging diagnostics, and will play a role in the development and evaluation of test systems and interpretive algorithms.

The medical laboratory scientist will have diverse responsibilities in areas of analysis and clinical decision-making, regulatory compliance with applicable regulations, education, and quality assurance/performance improvement wherever laboratory testing is researched, developed or performed.

At entry level, the medical laboratory scientist will have the following basic knowledge and skills in:

- A. Application of safety and governmental regulations and standards as applied to clinical laboratory science;
- B. Principles and practices of professional conduct and the significance of continuing professional development;
- C. Communications sufficient to serve the needs of patients, the public and members of the health care team;
- D. Principles and practices of administration and supervision as applied to clinical laboratory science;
- E. Educational methodologies and terminology sufficient to train/educate users and providers of laboratory services;
- F. Principles and practices of clinical study design, implementation and dissemination of results.

VII. MLS Program Administration

A. Program Director

The program must have a NAACLS approved medical laboratory professional serving as program director who meets the following qualifications and executes all required responsibilities.

1. Qualifications

- a. has an earned master's or doctoral degree;
- b. holds ASCP-BOC or ASCPⁱ-BOC generalist certification as a Medical Laboratory Scientist/Medical Technologist.
- c. has three years of teaching experience;
- d. has knowledge of education methods and administration as well as current NAACLS accreditation procedures and certification procedures.

2. Responsibilities

The program director must:

- a. be responsible for the organization, administration, instruction, evaluation, continuous quality improvement, curriculum planning and development, directing other program faculty/staff, and general effectiveness of the program;
- b. provide evidence that s/he participates in the budget preparation process;
- c. engage in a minimum of 36 hours of documented continuing professional development every 3 years;
- d. be responsible for maintaining NAACLS accreditation of the program;
- e. have regular and consistent contact with students, faculty and program personnel

3. Faculty Appointments

The program director must have a faculty appointment at the sponsoring institution or must have a faculty appointment in each affiliated academic institution. In the case of a clinical based program, the program director's appointment at affiliated academic institutions may be a regular one, a non-salaried clinical or courtesy appointment, or an adjunct appointment, depending upon the regulations of the academic institution.

Program Directors who have been approved as a program director of a NAACLS accredited MLS program prior to October 1, 2013 remain eligible as a program director.

B. Site Program Coordinator (required for multi-location programs only; assigned to each participating site)

1. Qualifications

The site program coordinator must:

- a. have an academic degree appropriate to the program level;
- b. hold the same level certification required of a program director;
- c. have at least one year of experience in medical laboratory science education.

2. Responsibilities

The site program coordinator, when required, is responsible for:

- a. coordinating teaching and clinical education;
- b. evaluating program effectiveness;
- c. maintaining appropriate communications with the program director.

C. Faculty

1. Didactic Instructor Appointments

The program must have qualified faculty/instructors who hold appointments within the educational program (e.g., certified professionals in their respective or related fields). The program must ensure and document ongoing professional development of the program faculty/instructors.

a. Qualifications

Faculty/instructors designated by the program must:

- i. demonstrate adequate knowledge and proficiency in their content areas;
- ii. demonstrate the ability to teach effectively at the appropriate level.

b. Responsibilities

The responsibilities of the faculty/instructors must include:

- i. participation in teaching courses;
- ii. evaluation of student achievement;
- iii. development of curriculum, policy and procedures;
- iv. assessment of program outcomes.

2. Clinical Liaison

At least one clinical liaison, who is employed by the clinical site, must be designated at each clinical site affiliated with the program to coordinate clinical experiences for students.

a. Qualifications

The clinical liaison must:

- i. Be a medical laboratory professional who demonstrates the ability to effectively coordinate clinical experiences of the students;
- ii. demonstrate knowledge of the program discipline;

iii. have at least one year experience as a medical laboratory professional.

b. Responsibilities

The clinical liaison must be responsible for:

- i. coordinating clinical instruction at the site;
- ii. maintaining effective communication with the program director or designee.

D. Advisory Committee

There must be an advisory committee composed of individuals from the community of interest (e.g., practicing professionals, academic professionals, scientific consultants, administrators, pathologists and other physicians, public member) who have knowledge of clinical laboratory science education.

1. Responsibilities

The advisory committee of the program shall have input into the program/curriculum to maintain current relevancy and effectiveness.

VIII. MLS Curriculum Requirements

A. Instructional Areas

1. Prerequisite courses in biological sciences, chemistry and mathematics that provide the foundation for course work required in the laboratory science program.
2. The curriculum must address pre-analytical, analytical and post-analytical components of laboratory services. This includes principles and methodologies, performance of assays, problem-solving, troubleshooting techniques, interpretation and evaluation of clinical procedures and results, statistical approaches to data evaluation, principles and practices of quality assurance/quality improvement, and continuous assessment of laboratory services for all major areas practiced in the contemporary clinical laboratory.

The program curriculum must include the following scientific content:

- a. Clinical chemistry
 - b. Hematology/Hemostasis
 - c. Immunology
 - d. Immunohematology/transfusion medicine
 - e. Microbiology
 - f. Urine and body fluid analysis
 - g. Laboratory Operations
3. Application of safety and governmental regulations and standards as applied to clinical laboratory science.
 4. Principles and practices of professional conduct and the significance of continuing professional development.
 5. Communications sufficient to serve the needs of patients, the public and members of the health care team.
 6. Principles and practices of administration and supervision as applied to clinical laboratory science.
 7. Educational methodologies and terminology sufficient to train/educate users and providers of laboratory services.
 8. Principles and practices of clinical study design, implementation and dissemination of results.
- B. Learning Experiences
1. Learning experiences (courses, practica, other required activities) must be properly sequenced and include necessary content and activities to enable students to achieve entry level competencies in each major discipline as listed in Standard VIII.A.2.
 2. After demonstrating competency, students, with qualified supervision, may be permitted to perform procedures.

C. Evaluations

Evaluation systems must relate to course content and support program competencies. If there is evidence that competencies are not adequately achieved (through feedback mechanisms as described in Standard II.B) then course objectives will be examined in detail to assure that the objectives are behavioral, include all domains and relate directly to the evaluations used.

1. These evaluation systems must be employed frequently enough to provide students and faculty with timely indications of the students' academic standing and progress.
2. The evaluation systems must serve as a reliable indicator of the effectiveness of instruction and course design.

Appendix A

Arapahoe Community College Program Financial Analysis BAS MLS Program Analysis Summary

- SFTE
 - Total – 159.1
 - Y1 – 11.2
 - Y2 – 25.6
 - Y3 – 32.2
 - Y4 – 40.8
 - Y5 – 49.3
- Revenues
 - Resident Tuition
 - Rate per credit hour – \$263.20
 - Total – \$1,256,517
 - Y0 - \$0
 - Y1 – \$88,435
 - Y2 – \$202,138
 - Y3 – \$254,514
 - Y4 – \$321,894
 - Y5 – \$389,536
 - Adjusted COF/FFS
 - Rate per credit hour – \$94.00
 - Total – \$448,756
 - Y1 – \$31,584
 - Y2 – \$72,192
 - Y3 – \$90,898
 - Y4 – \$114,962
 - Y5 – \$139,120
 - Estimated Total Revenues
 - Rate per credit hour – \$357.20
 - Total – \$1,705,273
 - Y1 – \$120,019
 - Y2 – \$274,330
 - Y3 – \$345,412
 - Y4 – \$436,856
 - Y5 – \$528,656
- Expenses
 - Admin Salaries
 - Total – \$51,444
 - Y0 – \$13,479
 - Y1 – \$7,009
 - Y2 – \$7,290
 - Y3 – \$7,581
 - Y4 – \$7,884

- Y5 – \$8,200
- Admin Benefits
 - Rate per credit hour – 36%
 - Total – \$18,520
 - Y0 – \$4,853
 - Y1 – \$2,523
 - Y2 – \$2,624
 - Y3 – \$2,729
 - Y4 – \$2,838
 - Y5 – \$2,952
- Faculty Salaries
 - Total – \$358,468
 - Y1 – \$66,183
 - Y2 – \$68,830
 - Y3 – \$71,584
 - Y4 – \$74,447
 - Y5 – \$77,425
- Faculty Benefits
 - Rate per credit hour – 35%
 - Total – \$126,898
 - Y1 – \$23,429
 - Y2 – \$24,366
 - Y3 – \$25,341
 - Y4 – \$26,354
 - Y5 – \$27,408
- Adjunct Wages
 - Total – \$126,898
 - Y0 – \$37,527
 - Y2 – \$8,660
 - Y3 – \$8,660
 - Y4 – \$8,660
 - Y5 – \$8,660
- Adjunct Benefits
 - Rate per credit hour – 21%
 - Total – \$15,155
 - Y0 – \$7,881
 - Y2 – \$1,819
 - Y3 – \$1,819
 - Y4 – \$1,819
 - Y5 – \$1,819
- Operating
 - Total – \$49,500
 - Y0 – \$2,000
 - Y1 – \$7,500

- Y2 – \$10,000
- Y3 – \$10,000
- Y4 – \$10,000
- Y5 – \$10,000
- Estimated Total Expenses
 - Total – \$692,152
 - Y0 – \$65,740
 - Y1 – \$106,644
 - Y2 – \$123,589
 - Y3 – \$127,713
 - Y4 – \$132,003
 - Y5 – \$136,464
- Estimated Net Operating Income (DE Only)
 - Total – \$1,013,121
 - Y0 – \$(65,740)
 - Y1 – \$13,375
 - Y2 – \$150,741
 - Y3 – \$217,699
 - Y4 – \$304,853
 - Y5 – \$392,192
- Estimated Net Operating Income (DE & 30% IDC)
 - Total – \$709,184
 - Y0 – \$(46,018)
 - Y1 – \$9,362
 - Y2 – \$105,519
 - Y3 – \$152,389
 - Y4 – \$213,397
 - Y5 – \$274,535
- Cumulative Return on Investment
 - Y1 – \$(46,018)
 - Y2 – \$(36,655)
 - Y3 – \$68,863
 - Y4 – \$221,253
 - Y5 – \$709,18