



UNIVERSITY OF WYOMING  
at Casper

# Medical Laboratory Sciences

## Student Handbook

2022 Edition

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**University of Wyoming**

Medical Laboratory Sciences

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# UNIVERSITY OF WYOMING at Casper

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Website: <http://www.uwyo.edu/pharmacy/mls-program/index.html>

Dear Students:

Welcome to the University of Wyoming Medical Laboratory Science Program!

Congratulations on selecting a challenging and exciting program that will prepare you for a rewarding career in the clinical laboratory. Medical Laboratory Scientists are highly skilled professionals, qualified by academic and applied science education, who use state of the art instrumentation and methodologies to develop, perform, evaluate and correlate laboratory testing while assuring quality and accuracy. Medical Laboratory Scientists work with physicians, nurses, and other healthcare professionals, providing essential information about the presence, extent, or absence of disease, as well as effectiveness of treatment.

The program curriculum is based on major requirements of the University of Wyoming's College of Health Science, and program-specific requirements for the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) accreditation. Required coursework will be administered in either a synchronous or asynchronous online format or in a distance hybrid manner. The MLS program-specific course content encompasses such disciplines as clinical chemistry, hematology, immunology, immunohematology, microbiology, urinalysis, molecular methodology, laboratory management, clinical research design and laboratory education methodology. As with any course that is presented to the student in a distance education format, discipline, effort, and professionalism is vital for student success. It will be the student's responsibility to be self-motivated to complete coursework, assignments, assessments, and other projects in a timely manner, as well as to contact the program director or faculty if additional support or tutoring is required.

This handbook provides some of the information that you will need throughout the program, but is not a comprehensive statement of all policies and procedures, nor is it intended to preclude the implementation of changes in the MLS program or policies for students. In addition to this handbook, you will want to review the program Bulletin published annually by the University of Wyoming, the Course Schedule, and the MLS program website.

On behalf of the MLS program faculty, I welcome each of you to the program, and we look forward to working with you.

Sincerely,

Jed Doxtater, MS MLS(ASCP)<sup>CM</sup>

Program Director / Associate Clinical Faculty

## Purpose of This Handbook

The Medical Laboratory Science (MLS) Handbook provides you with information regarding policies that are part of the MLS program. This handbook is intended primarily for use of students admitted to the MLS professional program, but is not a comprehensive statement of all policies and procedures. Please keep this Handbook as a reference to which you can refer as needed.

\*This Handbook is not a contract and does not supersede university and trustee regulations. This handbook may be revised at any time by the Medical Laboratory Science program.

## Medical Laboratory Science Faculty / Staff Contact Information

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## Description of the Medical Laboratory Science Profession

Medical Laboratory Scientists are highly skilled professionals, qualified by academic and applied science education, who use state of the art instrumentation and methodologies to develop, perform, evaluate and correlate laboratory testing while assuring quality and accuracy. The Medical Laboratory Scientist has multi-level functions in the areas of analysis and clinical decision making, regulatory compliance, information management, education, quality assurance and performance improvement wherever laboratory testing is researched, developed, or performed. Medical Laboratory professionals practice independently, and collaboratively, and possess skills for financial, operations, marketing, and human resource management of the clinical laboratory. They have the knowledge and skills to educate laboratory professionals, other health care professionals, as well as the public in laboratory practices. Communication skills extend to consultative interactions with members of the healthcare team, external relations, customer service and patient education. Laboratory professionals demonstrate ethical and moral attitudes and principles that are necessary for gaining and maintaining the confidence of patients, professional associates, and the community.

## Career Options

Medical Laboratory Scientists have vast skillsets that allows for expertise in the medical laboratory, and transferable training that enables opportunities for the professional in many non-clinical settings. Careers in this field are generally very stable and secure, as they are less dependent on the economy. Career opportunities can include working as a Medical Laboratory Scientist, Clinical Systems Analyst, Educator, Forensic Scientist, Health Care Administrator, and Laboratory Manager, among others. Non-

clinical opportunities can include computer applications specialist, technical sales representatives, private consulting, research, and other industrial positions.

## **MLS Program Description**

The UW-C Medical Laboratory Sciences (MLS) program is located within the UW College of Health Sciences, under the School of Pharmacy, and is offered on the UW-C campus. The MLS program is composed of 60 credit hours of course work between the junior and senior years, with the final semester being reserved for advanced clinical practicum courses. The program curriculum is based on major requirements of the University of Wyoming's College of Health Science, and program-specific requirements for NAACLS accreditation. Required coursework will be administered in either a synchronous or asynchronous online format, or in a distance hybrid manner. The MLS program-specific course content encompasses such disciplines as clinical chemistry, hematology, immunology, immunohematology, microbiology, urinalysis, molecular methods, laboratory management, clinical research design and laboratory education methodology. The delivery of all MLS course content will occur in a distance education format, consisting of the online presentation of didactic and instructional content, supplemented with on-campus lab sessions. Students will meet at the UW-Casper campus periodically for the courses that require a lab component, or face to face interaction. Successful completion of all required MLS course offerings will result in a B.S. degree from the University of Wyoming, and candidacy for the national certification examination.

## **Accreditation**

The UW-C MLS program is fully accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). Accreditation is a process of external peer review in which an agency grants public recognition to a program of study or an institution that meets established qualifications and educational standards. Participation in the accreditation process is voluntary since there is not a legal requirement for specialized programs and institutions to participate. However, when students complete a NAACLS accredited program they become eligible to sit for national certification examinations for the profession.

The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) is a nonprofit organization that independently accredits medical technologist (MLS), clinical laboratory technician/medical laboratory technician (CLT/MLT), histotechnologist (HTL), histologic technician (HT), pathologists' assistant (Path Asst), diagnostic molecular scientist (DMS) and cytogenetic technology (CT), Phlebotomist (PBT), and clinical assistant (CA) educational programs.

Contact Information: 5600 N. River Rd, Suite 720 • Rosemont, IL 60018 • (773)-714-8880 • [www.naacls.org](http://www.naacls.org)

## **University of Wyoming Mission Statement:**

The University of Wyoming aspires to be one of the nation's finest public land-grant research universities. We serve as a statewide resource for accessible and affordable higher education of the highest quality; rigorous scholarship; technology transfer; economic and community development; and responsible stewardship of our cultural, historical, and natural resources.

In the exercise of our primary mission to promote learning, we seek to provide academic and co-curricular opportunities that will:

- Expose students to the frontiers of scholarship and creative activity and the complexities of an interdependent world;
- Ensure individual interactions among students, faculty, and staff;
- Nurture an environment that values and manifests diversity, free expression, academic freedom, personal integrity, and mutual respect; and
- Promote opportunities for personal growth, physical health, athletic competition, and leadership development for all members of the university community.

As Wyoming's only university, we are committed to outreach and service that extend our human talent and technological capacity to serve the people in our communities, our state, the nation, and the world. The primary vehicles for identifying the specific actions and resource allocations needed to accomplish this complex mission are the university's strategic plans, revised periodically.

The University's policy has been, and will continue to be, one of nondiscrimination, offering equal opportunity to all employees and applicants for employment on the basis of their demonstrated ability and competence without regard to such matters as race, sex, gender, color, religion, national origin, disability, age, veteran status, sexual orientation, genetic information, political belief, or other status protected by state and federal statutes or University Regulations.

## **The College of Health Sciences Mission and Vision Statements:**

### **Mission**

- The College of Health Sciences at the University of Wyoming endeavors to be a leader and partner in the education, innovation, and application of health and human sciences.

### **Vision**

- The University of Wyoming College of Health Sciences vision is encapsulated in the enduring World Health Organization statement, "Health is a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity." (WHO, 1948) We, the members of the College embrace this philosophy in order to meet the challenges and needs of the ever-changing, diverse populations of Wyoming and beyond. We promote optimal health and wellness through interprofessional teaching, research, and service within an inclusive and supportive environment. We embrace rich and diverse learning experiences that

emphasize equity, justice, and genuine participation to prepare highly competent, culturally proficient leaders who can meet current and future health and human needs. We are committed to advancing scientific knowledge and meaningful translational discoveries and the provision of professional, scholarly, and collaborative activities that serve the needs of our distinctive frontier state, the country, and the world.

## **Medical Laboratory Science Mission, Goals, and Outcomes:**

### **Mission**

The mission of the University of Wyoming at Casper's Medical Laboratory Science Bachelors of Science Program is to educate, train, and produce highly competent, ethical professionals who are committed to lifelong learning. The curriculum is designed to prepare students to meet current and future workplace challenges and technological advancements in the profession.

### **Program Goals**

1. Provide education in accordance with the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) standards for Medical Laboratory Science programs.
2. Provide students with adequate knowledge and background experience to successfully complete the national certification examination appropriate to their level of training.
3. Provide the opportunity for students to develop skills in effective communication sufficient to serve the needs of patients, public, and other healthcare professionals.
4. Graduate well qualified Medical Laboratory Scientists who can function at a career entry-level, and are prepared to meet the workforce needs of the state of Wyoming and the nation.
5. Provide students with professional role models so that they may develop and practice professional behaviors, attitudes and ethics necessary to work in, and promote the field of Medical Laboratory Science.
6. Periodically undergo program review to meet the diverse educational needs of students, accreditation standards and industry demands for qualified, skilled entry-level practitioners.
7. Establish an advisory board of professionals, community partners and stakeholders for program development, evaluation and improvement.
8. Promote membership and active participation in professional societies.



## **Outcomes**

### **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.
- G. Theoretical knowledge and technical skills of concepts relating to all content areas required by NAACLS, including Clinical Chemistry, Hematology/Hemostasis, Immunology, Immunohematology, Microbiology, Urine and Body Fluid Analysis, Laboratory Operations and biohazard and safety.

### **Prerequisites for Admission to the MLS Professional Program**

Students must meet the following minimum criteria to be considered for Admitted Major status:

- Completion of the Casper College A.S. degree in MLT within 5 years or B.S. degree in a related science.
- Minimum grade point average (GPA) of 2.0 on all course work transferred into the University of Wyoming at Casper from other academic institutions.
- Successful completion of the Medical Laboratory Technician BOC exam is preferred. Students that have not completed the BOC may be admitted with MLS program director's approval.

Students admitted to the program that do not hold an A.S. in MLT or a B.S. in a related science may be required to complete the University of Wyoming University Studies program in addition to the basic requirements for the Bachelor of Science in Medical Laboratory Science degree.

## Applying for Admission to the MLS Professional Program

- The University of Wyoming Medical Laboratory Sciences program is directly articulated with the Casper College Medical Laboratory Technician program. This relationship allows for Casper College to provide the lower division coursework, with the University of Wyoming providing the upper-division requirements of the degree.
  - Students that enter the program as a freshman will follow the Casper College MLT application process to complete the A.S. MLT degree, and will then matriculate into the Medical Laboratory Sciences program.
  - Students that enter the program with a degree in a related science will apply to both Casper College and the University of Wyoming to complete the MLT and MLS degrees concurrently.
- All MLS courses, excluding the Advanced Clinical Practicum (ACP) courses (MLSK 4981-4984), are open enrollment and are available to MLS and non-MLS declared majors.
- Applying to the Medical Laboratory Sciences professional program occurs during the fall semester prior to the student registering for their first Advanced Clinical Practicum course (see Academic Standards for Progression and Graduation).
- The MLS program director must receive the program application **before finals week** of the semester prior to entering the professional program.
- See the “MLS Professional Program Application” at the end of this Student Handbook.

## Enrichment Rotations

- Students are required to complete an observational enrichment experience during the final MLS semester. This observational experience is designed to demonstrate advanced concepts and topics presented in the MLS curriculum, in a practical setting.
- Observational enrichment experiences provided through the MLS program are limited, and obtaining a site is competitive. Students will undergo a selection process to determine and assign enrichment sites. Students that are unable to complete the enrichment experience have the opportunity to propose an alternative assignment that meets the requirements of the course. This alternative assignment must be approved by the instructor of the course and must be equivalent to the enrichment experience.
- The MLS program will provide documentation requirements, as each site may have different requirements for participation (e.g. vaccination records, HIPPA training, safety training, background check/drug screen etc.).
- Prior to participating in the enrichment experiences, students may be subjected to that agency’s requirements for a background check, drug testing and/or drug abuse prevention policies. Students are then subject to the random drug testing policy of that agency. These background checks are routinely required by schools, hospitals, and other agencies that participate in on-site training. Background checks should be obtained from Viewpoint screening (<https://www.viewpointscreening.com/uwyo>).
- It is the students’ responsibility for the cost for travel, food, lodging, and maintaining vaccination status and health insurance for enrichment rotations.

## **Health Requirements**

- Health Requirements: Health records may be required to participate in enrichment activities including MMR, Tetanus, drug screen, and background check/drug screen. It is the students' responsibility to complete the required forms and to provide copies of health documents to participate in the enrichment activities.
- The student must provide proof of health insurance and Hepatitis B vaccination (or declination) to participate in on-campus student laboratory sessions. Hepatitis B vaccinations are available on the UW-C campus at student health, or at the county health department for a small fee.
- Students may submit a record release form which allows Casper College records and health documents to be transferred to the MLS program.

## **MLS Professional Program Curriculum**

### **Requirements for Graduation**

The program requires 130 credit hours total, with 60 credit hours obtained in the Junior/Senior years to graduate. This includes 42 credits in upper-division major requirements, 30 of which must be obtained from the University of Wyoming. 30 UD credits must be taken from UW to earn a B.S. from UW. A minimum University of Wyoming GPA of 2.0 and a C (2.0 or above) in all courses is required for graduation (a grade of D for 1 non-MLS course is acceptable with Program Director permission as long as the course is not a prerequisite for another course). Granting of the degree or certificate is not contingent upon passing an external certification or licensure exam. The student must discharge all financial obligations to the University, as well as make formal application for graduation. Specific dates will be announced by the Office of the Registrar and Enrollment Services.

## 2 Year MLS B.S. Curriculum Plan for Completion

\*See prerequisite for admission to the MLS professional program pg. 9\*

Fall I			Spring I		
Course #	Course Title	Cr.	Course #	Course Title	Cr.
CHEM 1030	Gen Chem II	4	STAT 2050	Fund. Of Statistics	4
CHEM 2300	Intro to Organic	4	MOLB 3000	Into. Molecular Biology	3
LIFE 3050	Genetics	4	MOLB 3610	Principles of Biochemistry	4
LIFE 3600	Cell Biology	4		UD Electives	3
<b>Total Fall</b>		<b>16</b>	<b>Total Spring</b>		<b>14</b>
			<b>Total Junior Year</b>		<b>30</b>

Fall II			Spring II		
Course #	Course Title	Cr.	Course #	Course Title	Cr.
MLSK 4840	Lab. Educ. Methodology	1	MLSK 4981	Adv. Cl. Pr. Hematology	3
MLSK 4850	Clinical Research Design	2	MLSK 4982	Adv. Cl. Pr. Molecular	3
MLSK 4860	Laboratory Management	3	MLSK 4983	Adv. Cl. Pr. Immunochem	3
MLSK 4870	Advanced Clinical Chemistry	4	MLSK 4984	Adv. Cl. Pr. Microbiology	3
MLSK 4880	Advanced Hematology RBC Disorders	2	MLSK 4890	Professional Career Paths	2
	Upper Division Elective	4			
<b>Total Fall</b>		<b>16</b>	<b>Total Spring</b>		<b>14</b>
			<b>Total Senior Year</b>		<b>30</b>
			<b>Total Program Credit Hours</b>		<b>60</b>

### **Upper-Division Elective Credit hours**

7 upper-division elective credit hours must be completed in the student's junior or senior year. These credits must be 3000 and above and achieved through online outreach or on-campus courses. A list of courses that are acceptable to fulfill this requirement can be made available to the student. If a course is in question, it is highly suggested to the student to contact their academic advisor for requirement fulfillment confirmation. Most students that are bachelor degree holders will have met this credit requirement with their previous degree.

### **Laboratory Sessions and Enrichment Activities**

The final semester of the student's senior year is comprised of didactic material being delivered in an online hybrid manner, supplemented with on-campus, simulated lab sessions at the UW-Casper campus. These lab sessions will be accompanied by an onsite enrichment experience, for the MLSK 4982 Molecular course. Enrichment activity schedules will be announced at the start of the student's final semester. It will be the students' responsibility for all travel and housing costs associated with the on-campus lab sessions and observational enrichment activity.

### **Service Work Statement:**

During scheduled clinical observation rotations, students will operate solely in the capacity of student. They are not paid for any work they might perform during their learning experience. Students enrolled in the Medical Laboratory Sciences program may be employed in an affiliated facility, but this working relationship must remain separate from educational activities.

### **List of Current Enrichment sites**

The following is a current list of enrichment sites that may offer observational clinical experiences for UW-C MLS students. If you are interested in participating in enrichment experiences at any other clinical facility, please contact the Program Director for approval.

- Wyoming Public Health Laboratory, Cheyenne, WY

## Major Required Course Descriptions

### **CHEM 1030 General Chemistry II**

*Course Description:* Second semester of a one-year introductory series. Provides broad coverage of chemistry principles with inorganic and organic systems applications.

*Prerequisites:* CHEM 1020

*Course Information:* Traditional delivery

### **CHEM 2300 Introductory Organic Chemistry**

*Course Description:* Terminal course in organic and beginning biological chemistry.

*Prerequisites:* CHEM 1020, 1050, 1000 or equivalent

*Course Information:* Traditional delivery

### **LIFE 3050 Genetics**

*Course Description:* Introduces principles of heredity and variation in living organisms, including a study of the nature of the genetic material and its transmission, influence of heredity and environment on the development of individual characters, as well as evolution of organisms and artificial selection of plant and animal varieties. Emphasizes application to today's society.

*Prerequisites:* LIFE 1010 and one of LIFE 2022, 2023 or MICR/MOLB 2021 with a grade C or higher in each.

*Course Information:* Online; Zoom synchronous delivery

### **LIFE 3600 Cell Biology**

*Course Description:* Focuses on cell structure, cell function and the regulation of cell processes. Examines many levels of organization, ranging from single molecules and individual cells to multi-cellular systems and the whole organism. Discussion section is required.

*Prerequisite:* completion of LIFE 1010 and one of LIFE 2022, 2023, or MICR/MOLB 2021 with a grade of C or higher in each..

*Course Information:* Online; Zoom synchronous delivery

### **STAT 2050 Fundamentals of Statistics**

*Course Description:* Presents central ideas and fundamental techniques of statistical inference on applications in the biological sciences. Includes probability models and inferences for means, variances and parameters of discrete distributions. Introduces statistical computer packages in biweekly labs.

*Prerequisite:* grade of C or better in MATH 1000, 1400 or equivalent.

*Course Information:* Traditional or online asynchronous delivery

**MOLB 3000 Introduction to Molecular Biology**

*Course Description:* An introduction to molecular biological processes governing cellular events is presented in the context of the structure of genomes, genes and chromosomes, DNA replication, gene expression, signal transduction pathways and the regulation of cellular processes in disease and development. Experimental methods and technologies will also be discussed.

*Prerequisite:* LIFE 1010 and CHEM 1030; MOLB/MICR 2021 recommended.

*Course Information:* Online; Zoom synchronous delivery

**MOLB 3610 Principles of Biochemistry**

*Course Description:* One-semester biochemistry course for life-, health- and physical-science students. Introduces a full range of biochemical concepts including discussion of major macromolecules, metabolism, and molecular biology.

*Prerequisite:* LIFE 1010 and a grade of C or better in CHEM 2300 or 2420.

*Course Information:* Traditional or online asynchronous delivery

## **MLS Course Descriptions**

### **MLSK 4840 Laboratory Education Methodology**

*Course Description:* This course provides an overview of education methodology and issues related to roles as educators in the clinical laboratory profession. Course topics and assignments include pedagogy, curriculum design, assessment and accreditation. Major educational responsibilities for clinical laboratory professionals relating to continuing education, competency assurance, certification and licensure will be addressed.

*Course Information:* Distance delivery.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Define components of learning styles and teaching.
2. Demonstrate the use of instructional methodologies.
3. Formulate and utilize learning objectives to prepare and deliver a focused learning activity.
4. Develop and implement an evaluation tool for the learning activity.
5. Explain the roles of clinical laboratory science education, programs and curriculum and relate the roles to accreditation and certification processes.
6. Relate clinical laboratory education to regulatory agency (NAACLS, CAP, JCAHO) regulations to quality.
7. Design learning objectives, with defined terminal behavior expected of a student (employee), the conditions under which the behavior will occur and the standards by which the student will be evaluated for each of the learning domains.
8. Given a list of verbs, correlate verbs that describe observable behaviors and those that describe non-observable behaviors.
9. Compare and evaluate instruction technology for face-to-face and distance delivery environments.
10. Explain the differences or special considerations for learners with physical challenges or different cultural or ethnic origins.
11. Given case scenarios, evaluate and predict best teaching practices.



## **MLSK 4850 Clinical Research Design**

*Course Description:* A course in research design methods commonly used in clinical research. Emphasis is on research design, process, measurement, regulatory issues, and ethics, as used by investigators. The focus is to equip students with knowledge and skills necessary to critically examine professional literature, methodology and ethical considerations that influence research design.

*Course Information:* Distance delivery.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Demonstrate a foundational understanding of clinical research methodologies described in study protocols with emphasis on study design, operational aspects, and regulatory compliance.
2. Describe various approaches to data collection for human clinical trials including rationale for various clinical endpoints, the use of patient reported outcomes, the mechanics of data collection, and best practices to ensure data integrity.
3. Interpret statistical results from the published studies in the peer reviewed literature and clinical study reports.
4. Incorporate and prioritize the protection of human subjects and other ethical considerations in all aspects of clinical research.
5. Describe sources for regulations, guidance, and best practices commonly used in the conduct of clinical trials and post-marketing studies in the US and abroad.
6. Apply knowledge and skills gained in the basic sciences to the planning, implementation, and evaluation of clinical research.
7. Write scientifically and demonstrate competency in oral presentations involving scientific content.
8. Work collaboratively and contribute to the leadership of programs that integrate clinical and translational science across multiple departments, schools and colleges, clinical and research institutes, and healthcare delivery organizations.
9. Write, communicate, and interact effectively in a professional environment as an entry-level professional
10. Think critically when planning or evaluating a research study, complex operational endeavor, or ethical dilemma
11. Justify the critical role of basic science, clinical, epidemiological, research, and scholarship in understanding and alleviating disease and disability from disease.

## **MLSK 4860 Laboratory Management**

*Course Description:* This course introduces students to laboratory management systems, testing, reimbursement, accrediting/regulatory issues, finances, information systems, QA/QC improvement and supervisory roles in the clinical laboratory. Emphasis is on management and communication skills needed to work successfully as entry-level professionals in a health care setting. This course fulfills USP COM3 requirements

This course fulfills the Communication 3 (COM3) requirement of the 2015 University Studies Program. Students will develop skills in written, oral, and digital communication as appropriate to specific disciplines and courses at the introductory, intermediate, and advanced level. Through repeated instruction, practice, and feedback, the communication sequence will emphasize and progressively develop transferrable skills for students' academic work and future professions. Advanced courses (COM3) will emphasize using the discourse of a discipline or interdisciplinary field to communicate to academic or professional audiences through written, oral, and digital communication.

*Course Information:* Distance delivery.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Diagram and compare laboratory structural organizations for management;
2. Explain management functions and relate to supervisor and management roles and duties;
3. List and evaluate leadership characteristics most important to successful laboratory management;
4. Define and explain the value of job analysis, descriptions, and effective directing for personnel and workgroups for productivity;
5. Describe the professional personnel hierarchy in a laboratory setting and determine a schedule plan to comply with CLIA regulations;
6. Develop teamwork approaches to laboratory workflow situations including the preanalytical, analytical, and post-analytical phases;
7. Explain and demonstrate effective communication;
8. Describe costs within specific categories and explain use in calculating total expenses, cost per test and break-even numbers;
9. Compare and contrast cost containment strategies;
10. Identify costs associated with QA/QC programs and justify their priority as laboratory expenditures;
11. Evaluate marketing strategies and develop a plan which increases laboratory revenues while minimizing laboratory costs;
12. Describe the responsibilities of managers and supervisors have in enforcing laboratory policies and procedures;
13. Discuss the major provisions of CLIA;
14. Evaluate a clinical laboratory procedure and suggest improvements that bring the lab activity into compliance with CLSI and CLIA;
15. Evaluate processes and procedures, and develop performance improvement plans utilizing performance indicators; and
16. Design a chemical hygiene plan that would meet OSHA requirements.

### **COM 3 Learning Outcomes:**

At the end of this course, the student should be able to do the following:

1. Use the discourse of clinical laboratory science to communicate that field's subject matter to academic or professional audiences through written, oral, and digital communication (COM 3-Outcome 1);
2. Find, analyze, evaluate, and document information appropriately as applicable to clinical laboratory science professional setting as demonstrated by completing a substantial communication project that requires appropriate research skills (COM 3-Outcome 2);
3. Recognize and evaluate more advanced aspects of communication that respond to the purposes and needs of audiences in a discipline, interdisciplinary field, or professional setting (COM 3-Outcome 3);
4. Make effective use of multiple drafts, revision, computer technology, peer and instructor comments, and collaboration to show understanding of communication standards in a clinical laboratory science (COM 3-Outcome 4);
5. Observe the accepted conventions of spelling, grammar, organizational structure, punctuation, delivery, and documentation expected in disciplinary, interdisciplinary, or professional contexts (COM 3-Outcome 5);
6. Deliver presentations confidently and professionally, consistent with the standards of the discipline or interdisciplinary field (COM 3-Outcome 6); and
7. Interact effectively with audience members, engage opposing viewpoints constructively, and demonstrate active listening skills (COM 3-Outcome 7).

### **\*MLSK 4870 Advanced Clinical Chemistry**

*Course Description:* This course is designed to introduce students to advanced topics in clinical chemistry in relation to instrumentation, diagnostic testing and its correlation to disease states, and method correlation and validation. Students will demonstrate the ability to describe principles and applications required for the entry level laboratory scientist.

*Course Information:* Distance delivery. A background in advanced clinical chemistry principles and applications are necessary for practice in the clinical laboratory. The student will be given the opportunity to demonstrate the ability to discuss the interrelated human metabolic functions in both normal and disease states, utilize quality control techniques in evaluating the validity and reliability of laboratory data, and describe the importance of accuracy and precision in laboratory work. The student will demonstrate the ability to describe principles relating to carbohydrate metabolism, liver function, electrolytes, blood gases, cardiac markers, lipids and lipoproteins, endocrinology, toxicology, therapeutic drug monitoring, nutritional assessment, prenatal and perinatal testing, instrumentation, quality assurance, quality control, and laboratory mathematics in relation to the clinical chemistry laboratory.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

#### **I. Carbohydrate Metabolism**

1. Classify carbohydrates into their respective groups.
2. Discuss the metabolism of carbohydrates in the body and the mode of action of hormones in carbohydrate metabolism.

3. Differentiate the types of diabetes by clinical symptoms and laboratory findings according to the American Diabetes Association.
4. Explain the clinical significance of the three ketone bodies.
5. Relate expected laboratory results and clinical symptoms to the following metabolic complications of diabetes:
  - Ketoacidosis
  - Hyperosmolar coma
6. Distinguish between reactive and spontaneous hypoglycemia.
7. Describe the principle, specimen of choice, and the advantages and disadvantages of the glucose analysis methods.
8. Describe the three commonly encountered methods of glycosylated hemoglobin, specimen of choice, and source of error.
9. Describe the use of glycosylated hemoglobin in the long-term monitoring of diabetes.
10. Discuss the methods of analysis and the advantages and disadvantages of ketone bodies.

## **II. Liver Function**

1. Diagram the anatomy of the liver.
2. Explain the following functions of the liver: bile secretion, synthetic activity, and detoxification.
3. List two important cell types associated with the liver and state the function of each.
4. Define jaundice and classify the three different types of jaundice.
5. Discuss the basic disorders of the liver and which laboratory tests may be performed to diagnose them.
6. Evaluate liver-related data and correlate that data with normal or pathology states.
7. Compare and contrast how total and direct bilirubin measurements are performed.
8. List the enzymes most commonly used to assess hepatocellular and hepatobiliary disorders.
9. Describe the various types of hepatitis to include cause, transmission, occurrence, alternate name, physiology, diagnosis, and treatment.

## **III. Electrolytes**

1. Define electrolyte, osmolality, anion gap, anion, and cation.
2. Discuss the physiology of Sodium, Potassium, Chloride, Calcium, Phosphate, Magnesium, Bicarbonate.
3. State the clinical significance of Sodium, Potassium, Chloride, Calcium, Phosphate, Magnesium, Bicarbonate.
4. Calculate osmolality, osmolal gap, and anion gap and discuss the clinical usefulness of each.
5. Discuss the analytic techniques used to assess electrolyte concentrations.
6. Correlate the information with disease state, given patient data.
7. Identify the reference ranges for sodium, potassium, chloride, bicarbonate, magnesium, and calcium.
8. State the specimen of choice for the major electrolytes.
9. Discuss the role of the kidney in electrolyte excretion and conservation in a healthy individual.
10. Discuss the usefulness of urine electrolyte results: sodium, potassium, calcium, and osmolality.

## **IV. Blood Gases**

1. Describe the principles involved in the measurement of pH,  $p\text{CO}_2$ ,  $p\text{O}_2$ , and the various hemoglobin species.
2. Outline the interrelationship of the buffering mechanisms of bicarbonate, carbonic acid, and hemoglobin.
3. Explain the clinical significance of the following pH and blood gas parameters: pH,  $p\text{CO}_2$ ,  $p\text{O}_2$ , actual bicarbonate, carbonic acid, base excess, oxygen saturation, fractional oxyhemoglobin, hemoglobin oxygen (binding) capacity, oxygen content, and total  $\text{CO}_2$ .
4. Determine whether data are normal or represent metabolic or respiratory acidosis or metabolic or respiratory alkalosis using the Henderson-Hasselbalch equation and blood gas data. Identify whether the data represent uncompensated or compensated conditions.
5. Identify some common causes of nonrespiratory acidosis and alkalosis, respiratory acidosis and alkalosis, and mixed abnormalities. State how the body attempts to compensate (kidney and lungs) for the various conditions.
6. Describe the significance of the hemoglobin–oxygen dissociation curve and the impact of pH, 2,3-diphosphoglycerate (2,3-DPG), temperature, pH, and  $p\text{CO}_2$  on its shape and release of  $\text{O}_2$  to the tissues.

#### **V. Cardiac Markers**

1. Diagram the anatomy of the heart.
2. Explain the origin of general symptoms of cardiac disease.
3. Discuss the etiology and physiologic effects of the following cardiac conditions:
  - o Congenital heart disease
  - o Hypertensive heart disease
  - o Infectious heart diseases
  - o Coronary heart disease
  - o Congestive heart failure
4. Identify risk factors for coronary heart disease.
5. List features of an ideal cardiac marker.
6. List and briefly describe three novel markers of inflammation currently under investigation.
7. Compare and contrast the specificity and sensitivity of the most commonly used serum cardiac markers.
8. Assess the clinical utility of the various cardiac markers to assess myocardial infarction.
9. Analyze the role of the clinical laboratory in the assessment of a patient with cardiac disease.

#### **VI. Lipids and Lipoproteins**

1. Explain lipoprotein physiology and metabolism.
2. Describe the structure of fatty acids, phospholipids, triglycerides, cholesterol, and the various types of lipoprotein particles.
3. Describe the laboratory tests used to assess lipids and lipoproteins, including principles and procedures.
4. Identify common lipid disorders from clinical and laboratory data.

5. Discuss the incidence and types of lipid and lipoprotein abnormalities.
6. Identify the reference ranges for the major serum lipids.
7. Relate the clinical significance of lipid and lipoprotein values in the assessment of coronary heart disease.
8. Describe the role of standardization in the measurement of lipids and lipoproteins.

## **VII. Enzymes**

1. Define the term enzyme, including physical composition and structure.
2. Classify enzymes according to the International Union of Biochemistry.
3. Discuss the different factors affecting the rate of an enzymatic reaction.
4. Explain enzyme kinetics including zero-order and first-order kinetics.
5. Explain why the measurement of serum enzyme levels is clinically useful.
6. Discuss which enzymes are useful in the diagnosis of various disorders, including cardiac, hepatic, bone, and muscle, malignancies, and acute pancreatitis.
7. Discuss the tissue sources, diagnostic significance, and assays, including sources of error, for the following enzymes: creatine kinase, lactate dehydrogenase, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, acid phosphatase,  $\gamma$ -glutamyltransferase, amylase, lipase, cholinesterase, and glucose-6-phosphate dehydrogenase.
8. Evaluate patient serum enzyme levels in relation to disease states.
9. Discuss the clinical importance for detecting macroenzymes.
10. Discuss the role of enzymes in drug metabolism.

## **VIII. Toxicology and Trace Elements**

1. Define metalloprotein, metalloenzyme, cofactor, trace element, ultratrace element, essential trace element, and nonessential trace element.
2. State the biologic functions of selected essential trace elements.
3. Distinguish between essential and nonessential trace elements.
4. Discuss the clinical significance of selected trace elements and the consequences of deficiency and toxic states.
5. Discuss specimen collection considerations and laboratory determination.
6. Describe instrumentation used for trace element analysis.
7. Define the term *toxicology*.
8. List the major toxicants.
9. Define the pathologic mechanisms of the toxicants discussed in the chapter.
10. Discuss the laboratory methods used to evaluate toxicity.
11. Explain the difference between quantitative and qualitative tests in toxicology.
12. Critically evaluate clinical laboratory data in poisoning cases and provide recommendations for further testing.
13. Define the role of the clinical laboratory in the evaluation of exposure to poisons.

## **IX. Therapeutic Drug Monitoring**

1. Discuss the characteristics of a drug that make therapeutic drug monitoring essential.
2. Identify the factors that influence the absorption of an orally administered drug.
3. Relate the factors that influence the rate of drug elimination.
4. Define drug distribution and the factors that influence it.

5. Calculate volume of distribution, elimination constant, and drug half-life.
6. Relate the concentration of a circulating drug to pharmacokinetic parameters.
7. Name the therapeutic category of each drug presented in this chapter.
8. Describe the major toxicities of the drugs presented in this chapter.
9. Identify the features of each drug presented in this chapter that may influence its serum drug concentration.

#### **X. Nutritional Assessment**

1. Discuss the contribution of individual nutrient classes to human metabolism.
2. Discuss therapeutic nutrition support by enteral and parenteral routes.
3. List biochemical parameters used to monitor nutritional status.
4. Describe the biochemical roles of vitamins.
5. Correlate alterations in vitamin status with circumstances of increased metabolic requirements, age-related physiologic changes, or pathologic conditions.
6. Describe drug–nutrient interactions that influence vitamin status.
7. Delineate laboratory procedures used in the assessment of vitamin status.
8. Discuss the role of the laboratory in nutritional assessment and monitoring.
9. List the populations at risk for malnutrition.
10. Identify the plasma protein changes as a result of stress.
11. Describe some of the electrolyte and mineral abnormalities associated with total parenteral nutrition.

#### **XI. Instrumentation**

1. Explain the general principles of each analytic method.
2. Discuss the limitations of each analytic technique.
3. Compare and contrast the various analytic techniques.
4. Discuss existing clinical applications for each analytic technique.
5. Describe the operation and component parts of the following instruments: spectrophotometer, atomic absorption spectrometer, fluorometer, osmometer, ion-selective electrode, and pH electrode.
6. Outline the quality assurance and preventive maintenance procedures involved with the following instruments: spectrophotometer, fluorometer, osmometer, ion-selective electrode, and pH electrode.
7. Explain the general principles of chromatography and mass spectrometry.
8. Discuss the limitations and clinical applications of chromatography and mass spectrometry.
9. Describe the operation and component parts of the following instruments: mass spectrometer and gas chromatograph.
10. State the principle of each of the following methods:
  - Double diffusion
  - Radial immunodiffusion
  - Immuno-electrophoresis
  - Immunofixation electrophoresis
  - Nephelometry
  - Turbidimetry

Competitive immunoassay  
Noncompetitive immunoassay  
Immunoblot  
Direct immunocytochemistry  
Indirect immunocytochemistry  
Immunophenotyping by flow cytometry

11. Compare and contrast the general types of labels used in immunoassays.
12. Classify an immunoassay, given its format, as homogeneous or heterogeneous, competitive or noncompetitive, and by its label.
13. Explain how the concentration of the analyte in the test sample is related to the amount of bound labeled reagent for competitive and noncompetitive immunoassays.
14. Describe the pre-analytical, analytical and post analytical phases in regards to Chemistry analysis in the clinical lab including specimen type and rejection criteria.

## **XII. Endocrinology**

1. Understand the concept of open-loop negative feedback and relate this to the function of the various hypothalamic–pituitary–endocrine target gland loops.
2. Understand the effects of pulsatility and cyclicity on the results of hormone measurements.
3. Differentiate between tropic and direct effector in relationship to pituitary hormones.
4. Discuss the regulation of prolactin secretion.
5. State the non-neoplastic causes of prolactin elevation.
6. Understand the difference between primary and secondary endocrine deficiency states.
7. Describe the clinical features of the excess and deficiency states for growth hormone, prolactin, and vasopressin.
8. Relate the physiology underlying the strategies used for screening and definitive testing for suspected disorders of growth hormone.
9. Explain how the adrenal gland functions to maintain blood pressure, potassium, and glucose homeostasis.
10. Describe steroid biosynthesis, regulation, and actions according to anatomic location within the adrenal gland.
11. Discuss the pathophysiology of adrenal cortex disorders, namely Cushing’s syndrome and Addison’s disease.
12. Differentiate the adrenal enzyme deficiencies and their blocking pathways in establishing a diagnosis.
13. Describe the synthesis, storage, and metabolism of catecholamines.
14. List the appropriate laboratory tests to differentially diagnose primary and secondary Cushing’s syndrome and Addison’s disease.
15. Discuss the biosynthesis, secretion, transport, and action of the sex steroids and gonadotropins.
16. Describe the hypothalamic–pituitary–ovarian and hypothalamic–pituitary–testicular axes and how they regulate sex steroid and gonadotropin hormone production.
17. Explain the principles of each diagnostic test for pituitary–gonadal axes dysfunction.
18. Correlate laboratory information with regard to suspected gonadal disorders, given a patient’s clinical data.
19. Describe the appropriate laboratory testing protocol to effectively evaluate or monitor patients with suspected gonadal disease
20. Discuss the biosynthesis, secretion, transport, and action of the thyroid hormones.



21. Describe the hypothalamic–pituitary–thyroid axis and how it regulates thyroid hormone production.
22. Explain the principles of each thyroid function test discussed.
23. Correlate laboratory information with regard to suspected thyroid disorders, given a patient’s clinical data.
24. Describe the appropriate laboratory thyroid function testing protocol to use to effectively evaluate or monitor patients with suspected thyroid disease.
25. Discuss the physiologic role of the pancreas in the digestive process.
26. List the hormones excreted by the pancreas, together with their physiologic roles.
27. Describe the following pancreatic disorders and list the associated laboratory tests that would aid in diagnosis: acute pancreatitis, chronic pancreatitis, pancreatic carcinoma, cystic fibrosis, and pancreatic malabsorption.
28. Describe the physiology and biochemistry of gastric secretion.
29. List the tests used to assess gastric and intestinal function.
30. Explain the clinical aspects of gastric analysis.
31. Evaluate a patient’s condition, given clinical data.

### **XIII. Tumor Markers**

1. Discuss the incidence of cancer in the United States.
2. Explain the role of tumor markers in cancer management.
3. Identify the characteristics or properties of an ideal tumor marker.
4. State the major clinical value of tumor markers.
5. Name the major tumor types and their associated markers.
6. Describe the major properties, methods of analysis, and clinical use of  $\alpha$ -fetoprotein, cancer antigen 125, carcinoembryonic antigen,  $\beta$ -human chorionic gonadotropin, and prostate-specific antigen.
7. Explain the use of enzymes and hormones as tumor markers.

### **XIV. Non-Nitrogen Compounds**

1. List the nonprotein nitrogen components of the blood and recognize their chemical structures and relative physiologic concentrations.
2. Describe the biosynthesis and excretion of urea, uric acid, creatinine, creatine, and ammonia.
3. Describe the major pathological conditions associated with increased and decreased plasma concentrations of urea, uric acid, creatinine, creatine, and ammonia.
4. State the specimen collection, transport, and storage requirements necessary for determinations of urea, uric acid, creatinine, creatine, and ammonia.
5. Discuss commonly used methods for the determination of urea, uric acid, creatinine, creatine, and ammonia in plasma and urine. Identify sources of error and variability in these methods and describe the effects on the clinical utility of the laboratory measurements.
6. Recognize the reference intervals for urea, uric acid, creatinine, and ammonia in plasma and urine. State the effects of age and gender on these values.
7. Describe the use of the urea nitrogen/creatinine ratio to distinguish prerenal, renal, and postrenal causes of uremia.

## **XV. Pediatric Testing**

1. Define the adaptive changes that occur in the newborn.
2. Describe the developmental changes that occur throughout childhood.
3. Discuss the problems associated with collecting blood from small children.
4. Understand the role of point-of-care testing in pediatric settings.
5. Summarize the changes that occur in children with regard to electrolyte and water balance, endocrine function, liver function, and bone metabolism.
6. Explain how drug treatment and pharmacokinetics differ between children and adults.
7. Discuss the procedures used to diagnose inherited metabolic diseases.
8. Describe the development and disorders of the immune system.

## **XVI. Method Evaluation**

1. Define the following terms: quality control, accuracy, precision, descriptive statistics, reference interval, random error, sensitivity, specificity, systematic error, and confidence intervals.
2. Calculate the following: sensitivity, specificity, efficiency, predictive value, mean, median, range, variance, and standard deviation.
3. Understand why statistics are needed for effective quality management.
4. Read a descriptive statistics equation without fear.
5. Understand the types, uses, and requirements for reference intervals.
6. Understand the basic protocols used to verify or establish a reference interval.
7. Appreciate how the test cutoff affects diagnostic performance.
8. Evaluate laboratory data using multirules for quality control.
9. Graph laboratory data and determine significant constant or proportional errors.
10. Determine if there is a trend or a shift, given laboratory data.
11. Discuss the processes involved in method selection and evaluation.
12. Discuss proficiency testing programs in the clinical laboratory.
13. Describe how a process can be systematically improved.

**\*MLSK 4880 Advanced Hematology: Erythrocytes and Disease**

*Course Description:* Advanced hematology principles and techniques prepare students for practice in the clinical laboratory. This course will focus on advanced topics of hematology, focusing on normal and abnormal erythrocytes in relation to assessment, and disease correlation.

*Course Information:* Distance delivery This course will focus on hematology principles relating to the RBC structure and components, hematopoiesis, hemoglobin, the peripheral blood smear, anemias, hemoglobinopathies, and thealassemias.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Identify the sites of hematopoiesis during embryonic and fetal development, childhood, and adulthood.
2. Associate physical findings with presence of hematologic disease.
3. Compare and contrast the phenotypic characteristics differentiating the hematopoietic stem cells and progenitor cells.
4. Explain the principles of hemoglobin synthesis and metabolism
5. Identify erythrocyte abnormalities, and associate findings to disease process.
6. Correlate patient history and clinical symptoms with laboratory results in anemic states.
7. Associate laboratory analyses with their use in detecting and identifying hemoglobinopathies.
8. Describe the typical peripheral blood morphology associated with thalassemia.

**\*MLSK 4890 Professional Career Paths and Review**

*Course Description:* The Medical Laboratory Sciences program prepares students for a variety of graduate degrees and careers in laboratory medicine. This course is designed to help students investigate career and education opportunities after becoming a certified Medical Laboratory Scientist and also provides students with a cumulative review to ensure mastery of content.

*Course Information:* Distance delivery

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Compare and contrast continuing education opportunities for the certified Medical Laboratory Scientist.
2. Discuss career opportunities for the certified Medical Laboratory Scientist available within and outside of the clinical laboratory.
3. Demonstrate mastery of all presented content in Immunohematology utilizing LabCE simulation examinations and other assessment tools by achieving a 75% or greater.
4. Demonstrate mastery of all presented content in Urinalysis and Body Fluids utilizing LabCE simulation examinations and other assessment tools by achieving a 75% or greater.
5. Demonstrate mastery of all presented content in Clinical Chemistry utilizing LabCE simulation examinations and other assessment tools by achieving a 75% or greater.
6. Demonstrate mastery of all presented content in Hematology utilizing LabCE simulation examinations and other assessment tools by achieving a 75% or greater.
7. Demonstrate mastery of all presented content in Immunology utilizing LabCE simulation examinations and other assessment tools by achieving a 75% or greater.
8. Demonstrate mastery of all presented content in Microbiology utilizing LabCE simulation examinations and other assessment tools by achieving a 75% or greater.
9. Demonstrate mastery of all presented content in Laboratory Operations utilizing LabCE simulation examinations and other assessment tools by achieving a 75% or greater.

## **MLSK 4981 Advanced Clinical Practicum – Hematology**

*Course Description:* Advanced hematology principles and techniques prepare students for practice in the clinical laboratory. Topics include leukopoiesis, leukemias, lymphomas, hemostasis, coagulopathies, urinalysis and body fluids. Laboratory will focus on abnormal smears, normal and leukemic bone marrow evaluations, and coagulation mixing studies, factor assays and body fluids related to clinical disease states.

*Course Information:* Internet-Hybrid delivery. Students will meet for 4 days (Thursday-Sunday) for a concentrated laboratory session at the UW-Casper Campus. It will be the students' responsibility for all travel and housing expenses associated with the on-campus laboratory sessions.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

### **Unit I: Urinalysis and Body Fluids**

1. Describe renal anatomy and physiology.
2. Correlate clinical and laboratory data to renal diseases.
3. Describe anatomy and physiology related to other body fluids.
4. Interpret results of body fluid analysis and correlate to clinical conditions
5. Identify cells, crystals, microorganisms, casts, artifacts, and other microscopic elements from specimens using a microscope and from computer images.
6. Be aware and utilize laboratory safety and quality control protocols.
7. Explain the normal formation of urine, including those portions of the kidney significant to the filtration and resorption of fluids and chemicals.
8. Correlate normal & pathological states associated with the various chemicals, physical and microscopic findings.
9. Describe the chemical reactions of the various sections of the dipstick including an explanation of the reactions that occur in normal & pathologic states.
10. Determine the appropriate confirmatory test to be performed subsequent to abnormal findings on the dipstick.
11. Correlate normal & abnormal urine microscopic with findings on the dipstick results.
12. Correlate normal & abnormal urine microscopic findings with the absence or presence of normal & pathologic states.
13. Describe the appropriate formation of body fluids.
14. Correlate normal & abnormal microscopic and chemical findings in the various body fluids.

### **Unit II: Hematology**

15. Determine suitability of hematology specimens and dispose of them in the appropriate biohazard containers.
16. Perform and evaluate pre-analytical, analytical, and post-analytical procedures to ensure the quality of medical laboratory results.
17. Demonstrate compliance with OSHA safety regulations for blood-borne pathogens.
18. Describe the process of hematopoiesis and describe known oncogenesis related to leukemias.
19. Prepare and evaluate bone marrow aspirates and peripheral blood smears.

20. Identify, characterize, and differentiate normal and abnormal erythrocytes, leukocytes, platelets.
21. Perform peripheral blood smear and bone marrow observations and interpretation which includes morphologic features of red blood cells, leukocytes and platelets. Any abnormal or atypical features should be described in detail. Morphologic description of bone marrow should address the following features:
  - a. Cellularity
  - b. Presence of abnormal infiltrates (lymphoid aggregates, clusters of immature myeloid cells, granuloma, metastatic tumor infiltrates, etc.)
  - c. Myeloid-to-erythroid ratio
  - d. Maturation of megakaryocytic, erythroid and granulocytic precursors
  - e. Presence (and severity) of dysplasia
  - f. Bone trabeculae
22. Explain the principles and application of flow cytometry to normal cell differentials, lymphocyte characterization, leukemia, and lymphoma.
23. Review peripheral blood smear, marrow aspirate smears and biopsies on assigned cases and predict clinical diagnosis.
24. Interpret ancillary studies which have been performed such as flow cytometry and correlate with bone marrow evaluation, peripheral smears and clinical diagnosis.
25. Compare general definitions and distinguishing characteristics of hematologic malignant conditions.
26. Describe and compare molecular testing available for hematologic malignancies.
27. Compare and contrast peripheral and bone marrow cytochemical procedures and their interpretation for FAB classification of leukemia.

### **Unit III: Hemostasis**

28. Evaluate clotting and platelet disorders based upon laboratory data.
29. Differentiate acquired and hereditary coagulation disorders.
30. Utilize PT and aPTT-based clotting assays with mixing studies to identify and differentiate coagulopathies.
31. Explain and utilize tests to detect intravascular coagulation, and in particular, the principles and use of the D-dimer and FDP tests.

## **MLSK 4982 Advanced Clinical Practicum – Molecular**

*Course Description:* Principles of molecular technology used in clinical laboratories. Laboratory experiences include cytogenetics, nucleic acid extraction, hybridization, detection, amplification, sequencing, microarrays, and in-situ hybridization. Emphasis is on the areas of the clinical laboratory that use molecular techniques related to genetics, oncology, infectious disease, and identity testing for forensic and transplant purposes.

*Course Information:* Internet-Hybrid delivery. Students will meet for 4 days (Thursday-Sunday) for a concentrated laboratory session at the UW-Casper Campus, supplemented by observational enrichment experience at a clinical site. It will be the students' responsibility for all travel and housing expenses associated with the observational enrichment rotation and on-campus laboratory session.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Describe and compare basic nucleic acid structure (DNA, mRNA, tRNA, and rRNA), composition and function.
2. Describe and compare types, collection and transport of clinical specimens.
3. Describe pre-analytical, analytical, and post analytical processes and complication associated with clinical specimens.
4. Explain and compare bonding pattern and specificity of the nitrogen base pairs.
5. Locate DNA and forms of RNA in prokaryotic and eukaryotic cells.
6. Explain the processes of replication, transcription, and translation, and relate to biotechnology.
7. Compare and contrast nuclear replication mechanisms for prokaryotic, eukaryotic, and viral pathogens.
8. Describe and evaluate types of target sequences (DNA, mRNA, tRNA, and rRNA) used in clinical laboratory testing.
9. Describe and compare types of direct nucleic acid testing including:
  - a. Basic steps
  - b. Homogeneous testing systems
  - c. In situ hybridization
  - d. Chromosomal
10. Explain how the following hybridization detection methods work:
  - a. Fluorescence
  - b. Chemiluminescence
  - c. Radioactivity
  - d. Protein ligand (biotin-avidin, enzyme)
11. Explain the use of the Southern transfer and hybridization techniques in the application of DNA fingerprinting and human genomic identity testing.
12. Analyze and interpret restriction fragment polymorphism patterns and relate to paternity and crime scene investigations.
13. Explain and demonstrate the specific binding of probes in a complex environment and relate this to the environment found in clinical specimens.
14. Describe and design probe hybridization conditions considering the following:
  - Temperature, salt, formamide, pH and probe length affects
  - Calculations for  $T_m$
15. Describe, design, and evaluate nucleic acid probe design considering the following:

Length  
Sequence composition  
Labels for detection

16. Explain the spatial relationship of nucleic acid targets found within cells.
17. Perform and evaluate pre-analytical, analytical, and post-analytical procedures to ensure the quality of medical laboratory results.
18. Explain and demonstrate the specificity of binding between probes and target sequences found within cells.
19. Explain and demonstrate the effects of nonspecific binding of probes as this relates to QA and QC.
20. Explain and compare amplification processes including:
  - a. Basic steps of an amplification process
  - b. Principles of methods available
    1. PCR, LCR, SDA, NASBA, TMA
21. List and compare the function of PCR components in the reaction mixes.
22. Compare the variations of the PCR process:
  - a. LCR
  - b. Reverse Transcription-PCR
  - c. Real time PCR
23. Explain the application of PCR to STR's in forensic, diagnostic and paternity testing.
24. Be aware and utilize laboratory safety and quality control protocols.

### **MLSK 4983 Advanced Clinical Practicum – Immunohematology**

*Course Description:* Principles of immunology theory, blood group systems, genetics, and immunohematology techniques. Procedures including evaluation of blood samples, pretransfusion compatibility testing, and transfusion reactions are studied. Serologic testing and problem-solving in antibody identification and complex procedures are stressed. Laboratory emphasizes modern practices, resolution of compatibility problems and advanced antibody identification methods.

*Course Information:* Internet-Hybrid delivery. Students will meet for 4 days (Thursday-Sunday) for a concentrated laboratory session at the UW-Casper Campus. It will be the students' responsibility for all travel and housing expenses associated with the on-campus laboratory sessions.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Explain basic concepts of immunology – including the body's immunologic response to invasion and the concepts of blood group genetics.
2. Explain and apply concepts and principles of the ABO and Rh typing to causes of discrepancies and select methods used to resolve them.
3. Explain antigen-antibody reactions, the characteristics of different blood group systems and the clinical significance of the antibodies formed, including cases of autoimmune hemolytic anemia.
4. Discuss pretransfusion and compatibility testing, selection of appropriate blood products as pertaining to proper ABO/Rh and antigen negative units for red cells and other blood components, importance of proper patient identification and need for crossmatch.



5. Discuss donor screening, testing, and processing and its importance, donor reactions and how to manage patient therapy.
6. Discuss and compare transfusion therapy and practice for autologous and directed blood donations, and determine criteria for proper use.
7. Explain when an antibody screen should be followed by an antibody identification for transfusion recipients, blood donors, and obstetrical patients.
8. Correctly perform all steps of an antibody identification procedure including elution and enhancement methods with cell panels and patient phenotyping.
9. Describe and compare the typical serological pattern of a cold and warm autoantibody. Predict the effect on ABO/Rh typing, antibody screen results, DAT results, and methods to overcome serologic problems.
10. Explain the principle of an autoadsorption technique and the purpose of ZZAP in said technique.
11. Classify adverse effects of blood and blood component transfusions and hemolytic disease of the fetus and newborn. Evaluate test results for transfusion reactions and prenatal testing results as they relate to situational evidence.
12. Interpret fetal maternal bleed testing, calculate the dose of Rh immune globulin for therapy.
13. State the importance of quality control and quality assurance of reagents, equipment, and processes in transfusion service.
14. Follow standard safety precautions of the laboratory.
15. Adhere to the procedures and policies of transfusion service including the preparation and storage of blood products, donor evaluation, transfusion, record keeping, and processing of components.
16. Compare clinical indications for the uses for transfusion of the following blood components: packed cells, fresh frozen plasma, cryoprecipitate, random donor platelet concentrates, HLA matched platelets, granulocyte concentrates
17. Compare current testing procedures for infectious diseases in blood donations; recognize advantages and disadvantages of methods.
18. Perform and evaluate pre-analytical, analytical, and post-analytical procedures to ensure the quality of medical laboratory results.
19. Be aware and utilize laboratory safety and quality control protocols.
20. Demonstrate competency in routine hospital blood bank clinical and management decisions through selection of blood products for patients with multiple antibodies and maintaining adequate blood inventories for provided services.
21. Demonstrate knowledge of regulatory requirements mandated by the federal and state governments or non-governmental certifying agencies.

## **MLSK 4984 Advanced Clinical Practicum – Microbiology**

*Course Description:* Focus is on underlying mechanisms of microbial pathogenesis, host responses to infectious disease and clinical diagnosis procedures. Emphasis is on detailed mechanisms of infection, pathogenesis, and major discoveries and technologies in medical microbiology. Current issues in esse and global health, epidemiology, bioterrorism, biotechnology and vaccination programs will be studied.

*Course Information:* Internet-Hybrid delivery. Students will meet for 4 days (Thursday-Sunday) for a concentrated laboratory session at the UW-Casper Campus. It will be the students' responsibility for all travel and housing expenses associated with the on-campus laboratory sessions.

*Objectives/Outcomes/Standards:* At the end of this course the student should be able to do the following:

1. Describe, compare and perform isolation procedures, characterization, identification, and typing of medically important bacteria.
2. Describe, compare and perform processing of clinical specimens for bacteriological and molecular testing.
3. Be aware and utilize laboratory safety and quality control protocols.
4. Select and organize work space based upon industry standards and bio-safety requirements of bacteriology laboratory.
5. Compare and utilize common laboratory methods for the identification and typing of bacteria
  - a. Microscopy and staining
  - b. Colony morphology
  - c. Cultural and biochemical properties of Bacteria
  - d. Rapid and automated methods
6. Describe, compare and utilize the principles, procedures and application of serological and immunological methods.
  - a. Agglutination and precipitation tests
  - b. Immunostaining and immunofluorescence tests
  - c. ELISA, Radioimmunoassay (RIA)
  - d. Immunoelectrophoresis
7. Describe, compare and utilize the principles, procedures and application of typing methods-
  - a. Biotyping,
  - b. Serotyping
  - c. Phage typing,
8. Describe, compare and utilize the principles, procedures and application of molecular methods;
  - a. DNA and RNA target direct
  - b. Amplified methods: TMA, PCR, real-time PCR
  - c. Phage transduction
9. Compare theory, advantages, and potential limitations of serological and molecular techniques
10. Perform data analysis and interpretation of experimental results using a variety of software and web-based resources
11. Properly document experiments, results, and data analysis using an electronic laboratory notebook

12. Perform and evaluate pre-analytical, analytical, and post-analytical procedures to ensure the quality of medical laboratory results.

## **Comprehensive Final Examination**

Students will take a proctored comprehensive exam in MLSK 4890 Professional Career Paths and Review. This exam will simulate the Board of Certification exam in content, score requirements and completion time allowed. Students must score 75% or better in each of the content areas including Blood Bank, Urinalysis and Body Fluids, Chemistry, Hematology, Immunology, Microbiology, and Laboratory Operations. Students that do not meet the minimum score requirements will receive remedial materials for the deficient content areas and will have until the end of the semester to submit the remedial materials to the instructor. Students that do not submit the materials by the end of the semester will receive an incomplete for the course, which may result in the student not being eligible to sit for the BOC exam.

## **Certification Eligibility and Examination**

Upon completion of the MLS program, students will be expected to sit for national certification examinations. Student success and passing of these examinations will be an indicator of individual student success and quality of program educational experiences. Students are not required to obtain a passing score on national certification examinations to complete the B.S. MLS degree requirements. Students would be eligible to sit for the national certification examination as an MLS generalist, competence in all areas of the clinical laboratory as a Medical Laboratory Scientist.

### **Certification Agencies**

Address: American Society for Clinical Pathology (ASCP)  
ASCP Board of Certification Phone: 800-267-2727 option 2, 1  
33 West Monroe St, Suite 1600 Fax: (312) 541-4998.  
Chicago, IL 60603

American Medical Technologists (AMT)  
P.O. Box 1831 Phone: 800-275-1268  
710 Higgins Road Fax: (847) 823-0458  
Park Ridge, IL 60068

### **Teach-Out Plan**

In the circumstance of a catastrophic event that would limit the University's ability to offer the Medical Laboratory Sciences coursework, or the program as a whole, the University will make reasonable effort to assist the affected students. The University will help to ensure that students will experience minimal disruption in the pursuit of their courses. Individuals that are affected by this circumstance will be notified as soon as possible and advised by faculty, advisors, and counselors regarding suitable options, including the transfer to comparable programs.

## **Professional Societies**

The following is a list of professional organizations within the field of medical laboratory sciences. These organizations are made up of professional members, and provide leadership, promote the profession, practice, and advancement of the field of medical laboratory sciences.

### **Contact information:**

American Society for Clinical Laboratory Science (ASCLS)

1861 International Drive, Suite 200

McLean, VA 22102

(571) 748-3770

<http://www.ascls.org>

American Society for Clinical Pathology (ASCP)

2100 West Harrison Street

Chicago IL 60612

(312) 738-1336

<http://www.ascp.org>

American Association for Clinical Chemistry (AACC)

1850 K Street, NW Suite 625

Washington, DC 20006-2213

(202) 857-0717

<https://www.aacc.org/>

American Association of Blood Banks (AABB)

8101 Glenbrook Road

Bethesda, MD 20814-2749

(301) 907-6977

<http://www.aabb.org>

American Society for Microbiology (ASM)

1752 N Street, N.W.

Washington, D.C. 20036-2904

(202) 737-3600

<http://www.asm.org>

American Society of Hematology

2021 L Street NW, Suite 900

Washington, DC 20036

(202) 776-0544

<http://www.hematology.org/>

## **Essential Functions**

Applicants must meet certain essential functions as defined by NAACLS. If you feel that you do not meet these essential functions, careful consideration should be made and advisement received before entering the MLS Program. Essential functions are the abilities and essential functions that a student must be able to perform to be successful in the learning experiences and completion of the program.

### **Observational Requirements:**

The MLS student must be able to:

- Observe laboratory demonstrations in which biologicals are tested for their biochemical, hematological, immunological, microbiological, and histochemical components.
- Characterize the color, odor, clarity, and viscosity of biologicals, reagents or chemical reaction products.
- Employ a clinical grade binocular microscope to discriminate among the structural and color (hue, shading, and intensity) differences of microscopic specimens.
- Read and comprehend text, numbers, and graphs displayed in print and on a video monitor.

### **Movement Requirements:**

The MLS student must be able to:

- Move freely and safely about a laboratory.
- Reach laboratory bench-tops and shelves, patients lying in hospital beds or patients seated in specimen collection furniture.
- Travel to numerous clinical laboratory sites for practical experience.
- Perform moderately taxing continuous physical work, often requiring prolonged sitting, over several hours.
- Maneuver phlebotomy and culture acquisition equipment to safely collect valid laboratory specimens from patients.
- Control laboratory equipment (i.e., pipettes, inoculating loops, test tubes) and adjust instruments to perform laboratory procedures.
- Use an electronic keyboard to operate laboratory instruments and to calculate, record, evaluate, and transmit laboratory information.
- Perform fine hand manipulations with dexterity.

### **Communication Requirements:**

The MLS student must be able to:

- Read and comprehend technical and professional materials.
- Follow verbal and written instructions in order to correctly and independently perform laboratory test procedures.
- Clearly instruct patients prior to specimen collection.
- Effectively, confidentially and sensitively converse with patients regarding laboratory tests.

- Communicate with faculty members, fellow students, staff, and other health care professionals verbally and in a recorded format.
- Independently prepare papers, prepare laboratory reports, and take paper, computer, and laboratory practical examinations.

**Behavioral Requirements:**

The MLS student must:

- Be able to manage the use of time and be able to systematize actions in order to complete professional and technical tasks within realistic constraints.
- Possess the emotional health necessary to effectively employ intellect and exercise appropriate judgment.
- Be able to provide professional and technical services while experiencing the stresses of task-related uncertainty and a distracting environment.
- Be flexible and creative and adapt to professional and technical change.
- Recognize potentially hazardous materials, equipment, and situation and proceed safely in order to minimize risk of injury to patients, self, and nearby individuals.
- Adapt to working with unpleasant biologicals.
- Support and promote the activities of fellow students and of health care professionals.
- Realize that the promotion of peers helps furnish a team approach to learning, task completion, problem-solving and patient care.
- Be honest, compassionate, ethical and responsible.

**The American Society for Clinical Laboratory Science (ASCLS) Code of Ethics**

The Code of Ethics of the American Society for Clinical Laboratory Science sets forth the principles and standards by which clinical laboratory professionals practice their profession.

**Duty to the Patient**

Clinical laboratory professionals are accountable for the quality and integrity of the laboratory services they provide. This obligation includes maintaining individual competence in judgment and performance and striving to safeguard the patient from incompetent or illegal practice by others.

Clinical laboratory professionals maintain high standards of practice. They exercise sound judgment in establishing, performing and evaluating laboratory testing.

Clinical laboratory professionals maintain strict confidentiality of patient information and test results. They safeguard the dignity and privacy of patients and provide accurate information to other health care professionals about the services they provide.

## **Duty to Colleagues and the Profession**

Clinical laboratory professionals uphold and maintain the dignity and respect of our profession and strive to maintain a reputation of honesty, integrity, and reliability. They contribute to the advancement of the profession by improving the body of knowledge, adopting scientific advances that benefit the patient, maintaining high standards of practice and education, and seeking fair socioeconomic working conditions for members of the profession.

Clinical laboratory professionals actively strive to establish cooperative and respectful working relationships with other health care professionals with the primary objective of ensuring a high standard of care for the patients they serve.

## **Duty to Society**

As practitioners of an autonomous profession, clinical laboratory professionals have the responsibility to contribute from their sphere of professional competence to the general well-being of the community.

Clinical laboratory professionals comply with relevant laws and regulations pertaining to the practice of clinical laboratory science and actively seek, within the dictates of their consciences, to change those which do not meet the high standards of care and practice to which the profession is committed.

## **Honor Code and Code of Conduct** (<http://www.uwyo.edu/dos/conduct/index.html>)

The University of Wyoming Medical Laboratory Sciences program requires its students to maintain the professional competence, behavior, and integrity required to be successful in the profession. The MLS code of conduct is designed to address the unique needs and management of the program, and is intended to be complementary but subordinate to the University of Wyoming Regulations (UW Regulations). Students that fail to meet the professional conduct requirement will be subject to probation or dismissal from the program based on the UW regulations for the student code of conduct and academic dishonesty. The student code of conduct is expected to be followed in all aspects of the MLS program, including enrichment rotations.

### **Academic Dishonesty** (UW Regulation 2-114)

Academic dishonesty is an action attempted or performed that misrepresents one's involvement in an academic endeavor in any way, or assists another student in misrepresenting his or her involvement in an academic endeavor. All members of the University community are responsible for upholding the values of academic integrity. The faculty considers academic integrity a matter of common concern, not merely a private issue between instructor and student. Honesty in all academic endeavors is a component of academic integrity that is vital to the educational functions of the University. Whatever form academic dishonesty may take, the faculty considers it as establishing a student's failure to demonstrate the acquisition of knowledge and the failure to apply it to an academic endeavor. It is a student's responsibility to learn the standards of conduct for the performance of academic endeavors; it is an instructor or faculty member's responsibility to make reasonable effort to make known the standards of conduct for the performance of academic endeavors. Through an atmosphere of mutual respect, we enhance the value of education and maintain high standards of academic excellence. Failure on the part of the student to observe and maintain standards of academic honesty requires corrective action as hereafter authorized. For complete academic dishonesty standard and procedure, please review UW regulation

## **Academic Standards for Progression and Graduation**

The following academic standards are expected to be followed by all students admitted to and graduating from the professional program. Any deviation from these academic standards will constitute grounds for probation or termination from the professional program. Students that do not meet the following academic standards will be placed on probation. Probation is a period of time in which the student is allowed to continue in the program under supervision.

### **Professional Program (Final Semester)**

The MLS program curriculum is composed of general education courses (non-MLS) and major required courses (MLS specific). The professional program is defined as the semester in which the student enters the Advanced Clinical Practicum coursework. This coursework includes MLSK 4981, 4982, 4983, 4984 and can be initiated in either the junior or senior class standing. The MLS program will track the students' NAACLS benchmarks from the start of the professional program until graduation.

### **Academic Standards**

1. Students who drop or withdrawal from the same general education course twice will result in denial of admission or termination from the professional program.
2. Students who earn an F in a general education course will be required to repeat the course earning a D or better.
3. Students who have earned a D in 2 or more general education courses will result in denial of admission or termination from the professional program. Students must maintain the necessary prerequisite grade requirements for course and degree completion.
4. Students who drop or withdrawal from an MLS course will be placed on probation and will be allowed to continue the program under supervision.
5. Students must earn a GPA of 2.0 or better in both general education and major required courses, cumulatively to graduate.
6. Students shall not be allowed to progress to the final semester until all courses in the previous semesters are successfully completed and a cumulative GPA of 2.0 is obtained.

### **Probation**

Students that do not meet the minimum academic standards stated above for MLS course work, or do not meet the behavioral expectations/requirements of the program will be placed on probation. In this period of time, students will be allowed to continue in the program under supervision, but will submit a petition which is an individualized plan of study for the next semester that is developed by the student in agreement with and signed by an academic advisor.



## **Course Syllabus** (UW-Regulation 6-809)

### Course Syllabus Requirement

A syllabus makes clear the expectations and requirements the parties are expected to fulfill. The instructor of a course shall provide a copy of the course syllabus to the students at the beginning of the semester. The syllabus may be distributed via hard copy or by electronic means. Syllabi are projections of activities that will take place over several months, however, teachers can modify it to fit unforeseen circumstances. All changes should be clearly announced in class. The contents of a syllabus are flexible, but shall include the following:

- i. A description of the course, including its purpose, content, and goals;
  - ii. Meeting times and/or schedule of the course;
  - iii. The general requirements and expectations for the course;
  - iv. The instructor's contact information and office hours;
  - v. Academic dishonesty policies, with a statement or a reference to UW Regulation 6-802
  - vi. Grading and attendance policies;
  - vii. A list of required materials, including texts, etc;
  - viii. A statement or a reference to the University Disability Support Services website, which may be found at <http://uwadmnweb.uwyo.edu/udss/facultyandstaff/tipsforteaching.asp>;
  - ix. If a USP course, include what requirement(s) it fulfills.
- D. Substantive changes made to the syllabus by the instructor during the semester shall be communicated in writing to the students.
- E. Individual colleges and departments may develop additional guidelines for course syllabi.
- F. An instructor's failure to comply with this regulation does not relieve a student from the responsibility to meet the academic requirements of the course as determined by the instructor.

## **Student Absence Policy** (UW Regulation 6-713)

**Class Attendance:** Each student shall attend the lectures, recitations, and laboratories and participate in fieldwork deemed necessary to fulfill adequately the academic requirements of each class. Each instructor, at the beginning of every semester, shall stipulate the attendance policy necessary for satisfactory completion of the course.

**Authorized Absences:** For participation in a University-sponsored activity or for unusual circumstances, such as personal hardship, an authorized absence may be issued to the student by the Dean of Students or the Dean's authorized representative. If a student has been hospitalized, or if the student has been directed by the Student Health Service or the student's private physician to stay at the student's place of residence because of illness, the Health Service medical staff or the student's private physician may issue a statement to the student giving the dates of the student's confinement.

**Recognition of Authorized Absences:** All instructors shall permit students who have officially authorized absences to make up work without penalty in the classes missed. An authorized absence, however, merely gives the individual who missed the class an opportunity to make up the work and in no way excuses the student from the work required.

### **ADMINISTRATIVE PROVISIONS.**

- a. Statements from authorized medical sources that verify absences due to illness should be shown directly to instructors concerned. The decision to excuse such absences lies with the instructor, and the Dean of Students will not verify such statements.

- b. The Student Health Service medical staff will, upon the request of the student, issue statements whenever restricted activity is recommended for a limited period of time.

## **Student Evaluations** (UW Regulation 5-800)

The purpose of a system for evaluation of academic personnel's teaching effectiveness and of student learning is twofold:

- a. To provide feedback to academic teaching personnel from students and colleagues to aid in the improvement of instructional methods, course content, and student learning; and
- b. To provide independent data on teaching effectiveness for consideration in the decision-making processes related to continued employment, salary, promotion, tenure and/or awards.

## **Student Services**

### **Disability Support Services**

All students are held to the same academic and technical standards. Applicants/students with disabilities seeking accommodation must discuss their disability and accommodation needs with the University Disability Support Services ([udss@uwyo.edu](mailto:udss@uwyo.edu) or 307-766-6189 TTY: 307-766-3073). If appropriate and upon request and registration of the applicant, a reasonable accommodation will be made consistent with the University of Wyoming guidelines.

#### *University Support Services:*

UDSS assists UW in its effort to promote and ensure equal access to UW's programs and services. Accommodations for Outreach School students are similar to those provided for students on the Laramie campus, but may be coordinated in a different fashion due to distance factors. Students anticipating the need for disability-related accommodations in their outreach courses should contact and provide documentation of their disability to UDSS as early as possible. Early contact will help ensure minimal delays in initiating services. UDSS coordinators will work with students to identify appropriate accommodations and facilitate these with faculty. Access more information regarding assistance for Outreach students at <http://www.uwyo.edu/udss/uw-outreach-students/>. Contact UW Disability Services for more information Phone: (307) 766-6189

#### *Casper College Support Services:*

Casper College follows the American with Disabilities Act and Section 504 of the Rehabilitation Act in providing services and accommodations to students with disabilities.

While it is the college's responsibility to notify students of services and how to access those services, it is the student's responsibility to self-identify and request accommodations. Accommodations are determined on an individual basis according to required documentation of disability. Services provided through Disability Services located in the Student Success Center, 3rd Floor Gateway, may include but are not limited to:

- Assistance in completing the admissions process
- Academic advising

- Career counseling
- Classroom accommodations (sign language/oral interpreters, note-takers, readers, appropriate seating arrangements, etc.)
- Alternate testing, taped text information, print materials in alternate format (Braille)
- Priority registration
- Referral to resources on and off-campus
- Use of assistive technology (screen readers, scan and read programs, assistive listening equipment, adaptive keyboards, zoom text, voice recognition programs, tape recorders, spell checkers, laptop computers, etc.)

Contact CC disability services counselor for more information. Phone: 307-268-2557

### **University Counseling Center (UCC)**

UCC offers individual counseling, group counseling, outreach programming, and graduate training programs. All primary status enrolled UW students are eligible for free counseling, regardless of age, ethnicity, gender, ability, race, religion, sexual orientation, veteran status, political belief or progress toward academic degree. UCC is a Safe Zone for all students seeking services.

To get started: Come to 341 Knight Hall during our WALK-IN Hours for a brief initial interview session with a counselor.

Monday through Friday: 9:00 am - 11:30 am

Tuesday through Friday: 1:00-2:30 pm

Crisis intervention services are also offered during regular clinic hours (8:00 am - 5:00 pm) for students with urgent problems. Please call or walk-in and inform our receptionist you have an urgent crisis. For after-hours crises, call 766-8989 and ask for the on-call counselor. If you are experiencing an emergency, call 911.

### **Casper College Wellness and Counseling Services**

Dealing with depression, exploring relationship issues, adjusting to college life, working through life transitions, and developing study skills are common concerns among college students. Our professional counselors are trained to assist students, as well as faculty and staff, in examining and resolving these and other difficulties that might interfere with educational and personal success. The counselors offer individual, couple, family and group counseling as well as consultations and crisis intervention. These services are free and confidential. The length of therapy varies, with a primary focus on short-term treatment directed at helping students function in a college environment. We do not have the capacity to manage chronic conditions requiring intensive or frequent contacts. If this short-term care model will not adequately meet students' needs, your counselor will discuss referral resources.

Office Hours:

Monday through Friday: 8:00 am – 5:00 pm (Fall and Spring semesters)

Monday through Friday: 7:30 am – 4:30 pm (Summer semester)

To make an appointment, call 307-268-2267, or visit the office on the second floor of the Student Union/University of Wyoming at Casper building, room 202.

### **Library Services**

UW-C MLS students have access to multiple library services including UW libraries, and the Goodstein library located on Casper College Campus. These services can provide help with research projects, access to 400 databases, study rooms, laptops checkout, over 88,000 books and 250,000 e-books for student use. For online access to these resources, please visit the UW-C library services website at

<http://libguides.caspercollege.edu/uwcc>

<http://libguides.uwyo.edu/medicallabscience>

### **UW-Casper Computer Lab**

The UW-Casper maintains one computer lab for student use. The computer lab in UU 324 of the Union/University Building on Casper College campus has 20 PCs, 4 Macintosh G5 computers, a scanner, and a high-speed printer, and is available for UW students. As an enrolled UW student, you are given a \$7.50 print budget each semester. Printing is charged against your budget at a sliding scale, and you can buy more prints via an online utility that will charge your UW account.

Available software: Adobe: Acrobat; Audition; Dreamweaver; Illustrator; InDesign; Photoshop ChemBio Office, Skype, GIMP, SketchUp, ArcGIS, ERDAS IMAGINE Programming Language Suites, Stats: SPSS; SAS; R; R Studio; JMP; Minitab, Microsoft Expression, Microsoft Office 2013

Current hours for UU 324:

Fall and Spring Semesters

Monday - Thursday: 8 a.m. - 9:30 p.m.

Friday: 8 a.m. - 5 p.m.

Saturday - Sunday: Please contact the front desk for weekend hours information at 307-268-2713.

Summer Semester and Breaks

Monday - Friday: 7:30 a.m. - 4:30 p.m. and some evenings

Saturday - Sunday: Please contact the front desk for evening and weekend hours information at 307-268-2713.

### **Student Advising**

Academic advising is a collaborative relationship between a student and an academic advisor. The purpose of this collaboration is to ensure students' academic success by developing educational goals that meet personal interests, values and abilities. Advising will be provided through the MLS program, and an advisor will be assigned once the student has been accepted to the University of Wyoming and has declared the MLS major.

Student Responsibilities:

- It is the responsibility of the student to schedule an appointment with their academic advisor prior to advising week.
- Students must provide official copies of their transcripts to the Registrar's office in Laramie for any coursework completed outside of the University of Wyoming.

PERC Advising Number:

- Students will receive an advising PERC number before registration for spring and fall semesters (not required for summer semester) from their academic advisor. This number is required for course registration.

### **Financial Aid Counseling and Scholarships**

The University of Wyoming at Casper is fortunate to have many different donors who support various scholarships specifically for UW-Casper full-time and part-time students. To qualify for these scholarships, you must be seeking a degree offered through the UW-Casper, and meet the criteria set forth for each scholarship. UW-Casper students are also eligible to apply for scholarships offered through the UW main campus and UW-Casper.

Please visit the following website for financial aid and scholarship opportunities

- <http://www.uwyo.edu/sfa/>
- Note: The UW school code for the FAFSA form is 003932

### **Tuition and Fees**

Tuition is charged according to the students' program and career classification. Undergraduate credit will appear on a student's undergraduate transcript. Graduate credit will appear on a student's graduate transcript. The University of Wyoming trustees and administration reserve the right to change tuition and fees at any time.

## How much do I pay?

University of Wyoming cost estimate	Cost FA20- SP 21
Resident Undergraduate Per Credit Hour	145.00
Advising Fees Per Credit Hour	6.00
Resident Graduate Per Credit Hour	282.00
Non-resident Undergraduate Per Credit Hour	603.00
Advising Fees Per Credit hour	6.00
Non-resident Graduate Per Credit Hour	843.00
UW-Casper Class Fees Per Credit Hour	40.00
Online Class Fees Per Credit Hour	25.00

## How to Pay

There are several methods by which you may pay your tuition and fees.

- Credit Card: Call (800) 370-3188, (307) 766-2313, (307) 268-2713, (877) 264-9930, or to pay online visit [Cashnet](#), the University of Wyoming online cashier.
- Check, Cash, or Credit Card (Mastercard or Visa): Deliver payments to the UW-Casper Student Services Office, 435 University Union, 125 College Drive, Casper, WY 82601, or mail to Cashier's Office, University of Wyoming, Dept. 3623, 1000 E. University Ave., Laramie, WY 82071.
- Financial Aid: Available financial aid will be applied to your tuition first; any remaining funds will be credited to your UW Cowboy Card.
- Tuition Waivers: Employee, spouse of an employee, or cooperating agency waivers must be submitted prior to any other form of payment being credited to the student's account. Waivers are due no later than the final payment deadline.
- Third-Party Billing: Notify the UW-Casper Student Services Office at registration of any third party who is paying your tuition so the appropriate billing is processed.
- Wyoming Senior Citizen Students: Students age 65 and over are not charged tuition and mandatory fees. Wyoming senior citizen students are admitted to the university on a space-available basis, and student benefits are not available.
- Custom Payment Plan Enrollment Fee: Students may contact the UW-Casper Student Services Office for authorization to apply for a one-time payment extension if they are unable to pay their final balance in full by the required deadline. There is a \$75 non-refundable application fee for each semester, and the fee is added to the student's account at the time application is made.

## Tuition Waiver

Eligible students must obtain the necessary [form](#). After completing the form, the student should have it signed by his/her supervisor and the appointing authority. This form should be submitted to the UW-Casper Student Services Office at the time of registration as a method of payment. Any fees or additional charges are not covered by the waiver and are the responsibility of the student.

Incomplete forms will not be accepted. It is the responsibility of the student to see that forms are filled out completely. Forms received after the end of the semester cannot be applied to previous semester charges. The student will be responsible for any balance due.

## Applications and Fees

Students interested in enrolling in outreach courses must first [apply to UW](#) and pay a one-time application fee — \$40 for undergraduates and \$50 for graduates.

Students enrolled in both the UW-C MLS program and CC MLT program must apply to both institutions and fulfill requirements of each individual institution. This may include paying application fees, sending transcripts and vaccinations to both institutions

## Refund policies

Student course refunds are based on the percent of the class time elapsed at the time of official withdrawal. If a student drops prior to the beginning of a course, a full refund is issued. After the beginning of a semester, the amount of tuition to be refunded is based on the number of class hours elapsed and the schedules below. Delivery fees are not refundable after the end of the drop period

### INSTITUTIONAL REFUND SCHEDULE

Institutional Refund Schedule	
Before first day of semester	100%
Semester Class Day 1-8	100%
Semester Class Day 9-15	75%
Semester Class Day 16-20	50%
Semester Class Day 21-25	25%
Semester Class Day 26 forward	0%

## Commonly-Used Phone Numbers

<b>UW-Casper</b>	(877) 264-9930 (307) 268-2713
UW-Laramie	(800) 342-5996
Credit card payments/Accounts receivable	(800) 370-3188
Admissions	(800) 342-5996
Athletic tickets	(800) 922-9461
Bookstore	(800) 370-2676
Library-Outreach (in-state calls only)	(800) 442-6757
Registrar (Registration & Records)	(800) 733-7867
Financial Aid	(307) 766-2116
<b>Casper College</b>	(800) 442-2963 (307) 268-2110
Admissions	(307) 268-2458
Bookstore	(307) 268-2202
Financial Aid	(307) 268-2503
Library	(307) 268-2269
Nurse	(307) 268-2263
Registrar	(307) 268-2220
<b>Wyoming Student Loan</b>	(800) 999-6541



# MLS Professional Pledge

As a clinical laboratory professional, I strive to:

- Maintain and promote standards of excellence in performing and advancing the art and science of my profession
- Preserve the dignity and privacy of others
- Uphold and maintain the dignity and respect of our profession
- Seek to establish cooperative and respectful working relationships with other health professionals
- Contribute to the general well-being of the community.

I will actively demonstrate my commitment to these responsibilities throughout my professional life.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
date

## Signature Sheet

Signing this document verifies that you have read and understand the policies and guidelines outlined in this student handbook. You agree to abide by these policies while enrolled in MLS courses and clinical experiences. Signing this form indicates your understanding of and your willingness to comply with these policies.

My signature below indicates that I have read the MLS B.S. Program Policies in full and understand that this program has academic standards and essential functions that I must be able to meet to be successful and progress in the program curriculum, and as a professional. My signature indicates that I understand these regulations and am willing to comply with them.

My signature below indicates that I understand that I am financially responsible for any Emergency care which I might receive as a result of illness or injury while enrolled in any MLS course or while assigned to an enrichment activity of the UW-C MLS- B.S. Program.

Signature:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed name



**University of Wyoming  
College of Health Sciences  
School of Pharmacy  
Department of Medical Laboratory Sciences**

## ***Application for Admission***

Applying to the UW Medical Laboratory Sciences program occurs during the semester prior to the student entering the final Advanced Clinical Practicum semester. To be considered for admission, the applicant must meet the following academic standards:

1. Student may not receive more than 1 letter grade of D in any required general education course.
2. Student must obtain a letter grade of C or better in any MLS required course.
3. Student must achieve, or anticipate obtaining a cumulative GPA of 2.0.
4. Student may not drop or withdrawal from the same general education or major required course twice.

### **Instructions to the Applicant:**

1.  Complete the attached application form.
2.  Sign and date essential functions acknowledgment form.
3.  Sign and date MLS Professional Pledge and Signature Sheet at the end of the student handbook.
4.  Return documents by the mid-term of the semester prior to entering the professional program to:

Jed Doxtater  
UW-Casper Medical Laboratory Sciences Program  
125 College Dr.  
Casper, WY 82601

**An applicant's acceptance into the Medical Laboratory Sciences program is contingent upon the following requirements:**

1. Submission of completed application.
2. Completion of prerequisite academic classes per MLS program requirements (see student handbook)
3. Ability to meet essential functions as defined by NAACLS
4. Meeting academic standards.

### **Essential Functions**

Applicants must meet certain essential functions as defined by NAACLS. Essential functions are the abilities and essential functions that a student must be able to perform to be successful in the learning experiences and completion of the program.

**Observational Requirements:**

The MLS student must be able to:

- Observe laboratory demonstrations in which biologicals are tested for their biochemical, hematological, immunological, microbiological, and histochemical components.
- Characterize the color, odor, clarity, and viscosity of biologicals, reagents or chemical reaction products.
- Employ a clinical grade binocular microscope to discriminate among the structural and color (hue, shading, and intensity) differences of microscopic specimens.
- Read and comprehend text, numbers, and graphs displayed in print and on a video monitor.

**Movement Requirements:**

The MLS student must be able to:

- Move freely and safely about a laboratory.
- Reach laboratory bench-tops and shelves, patients lying in hospital beds or patients seated in specimen collection furniture.
- Travel to numerous clinical laboratory sites for practical experience.
- Perform moderately taxing continuous physical work, often requiring prolonged sitting, over several hours.
- Maneuver phlebotomy and culture acquisition equipment to safely collect valid laboratory specimens from patients.
- Control laboratory equipment (i.e., pipettes, inoculating loops, test tubes) and adjust instruments to perform laboratory procedures.
- Use an electronic keyboard to operate laboratory instruments and to calculate, record, evaluate, and transmit laboratory information.
- Perform fine hand manipulations with dexterity.

**Communication Requirements:**

The MLS student must be able to:

- Read and comprehend technical and professional materials.
- Follow verbal and written instructions in order to correctly and independently perform laboratory test procedures.
- Clearly instruct patients prior to specimen collection.
- Effectively, confidentially and sensitively converse with patients regarding laboratory tests.
- Communicate with faculty members, fellow students, staff, and other health care professionals verbally and in a recorded format.
- Independently prepare papers, prepare laboratory reports, and take paper, computer, and laboratory practical examinations.

**Behavioral Requirements:**

The MLS student must:

- Be able to manage the use of time and be able to systematize actions in order to complete professional and technical tasks within realistic constraints.
- Possess the emotional health necessary to effectively employ intellect and exercise appropriate judgment.
- Be able to provide professional and technical services while experiencing the stresses of task-related uncertainty and a distracting environment.
- Be flexible and creative and adapt to professional and technical change.
- Recognize potentially hazardous materials, equipment, and situation and proceed safely in order to minimize risk of injury to patients, self, and nearby individuals.
- Adapt to working with unpleasant biologicals.
- Support and promote the activities of fellow students and of health care professionals.
- Realize that the promotion of peers helps furnish a team approach to learning, task completion, problem solving and patient care.
- Be honest, compassionate, ethical and responsible.

I am able to meet the above listed essential functions:

\_\_\_\_\_  
Student Signature

\_\_\_\_\_  
Date

**Equal Opportunity**

*The University will provide all applicants for admissions, employment and all University employees with equal opportunity without regard to race, gender, religion, color, national origin, disability, age, protected veteran status, sexual orientation, gender identity, genetic information, creed, ancestry, political belief, or any other applicable protected category or participation in any protected activity. The University ensures non-discriminatory practices in all matters relating to its education programs and activities and extends the same non-discriminatory practices to recruiting, hiring, training, compensation, benefits, promotions, demotions, transfers, and all other terms and conditions of employment*

Application for Admission to the UW-C  
Medical Laboratory Sciences Program

Please attach a recent  
Photograph here.  
(Optional)

Full Name of Applicant: \_\_\_\_\_  
Last First Middle

Name if Different From Above: \_\_\_\_\_  
(may appear on your records)

\_\_\_\_\_  
(Mailing Address) City State Zip

\_\_\_\_\_  
(Permanent Address) City State Zip

\_\_\_\_\_  
Home Phone Work Phone Cell Phone

\_\_\_\_\_  
Student ID Number E-mail Address: UW / Personal

Name of Parent, Nearest Relative or Legal Guardian: \_\_\_\_\_

\_\_\_\_\_  
(Mailing Address) City State Zip

Phone: \_\_\_\_\_

High School: \_\_\_\_\_ Year Graduated: \_\_\_\_\_  
City State

Application for Admission to the UW-C  
Medical Laboratory Sciences Program

Cumulative GPA \_\_\_\_\_

Anticipated Graduation: Sp / Fa / Su  
(Circle one)

Year: \_\_\_\_\_

Below this Line is for administrative use:

Student meets all program requirements:

Yes

No

Comments:

Program Director:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Faculty:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date