

## Biomedical Science & Human Disease

### HLTH 1XXX: 3 Credits

Prerequisite: None

Eligibility: Any Current High School student, or High School graduate

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### DESCRIPTION:

Medical laboratory science professionals are vital healthcare detectives, competent in the collection, processing and analysis of biological specimens, the performance of lab procedures, the maintenance of instruments, and relating lab findings to common diseases/conditions that assist physicians in patient diagnosis and treatment, as well as in disease monitoring or prevention. This course has been designed to introduce students to the field of Medical Laboratory Science. The course combines lecture and laboratory practice, to allow students to demonstrate professionalism and interpersonal skills while achieving competence with common laboratory procedures. Students will be given the opportunity to demonstrate knowledge in making solutions, using aseptic techniques, and handling laboratory equipment. For the online section of the course, students will be assigned case studies, which will include case history presented, clinical signs and symptoms, initial and additional laboratory testing and data, relevant test methodologies employed and accurate interpretation of results.

**COURSE OBJECTIVES:**

1. Demonstrates proper handling of patients/specimens and evaluate situations that may cause adverse issues
2. Demonstrate skill with the microscope, centrifuge, and other laboratory equipment
3. Demonstrate competence with laboratory mathematics and quality control
4. Comply with laboratory safety protocols by demonstrating proper technique
5. Renal anatomy and physiology, formation of urine and microscopic identification of elements found in a urine sediment
6. Basic understanding and analysis of other body fluids
7. Basic understanding of hematology, immunology, clinical chemistry and microbiology with emphasis placed on point of care testing in all areas of the laboratory.
8. Correlate abnormal laboratory test results with various disease states.

**MAJOR TOPICS:**

- Laboratory Safety
  - o Bloodborne Pathogens
  - o Chemical Hygiene
  - o Exposure Control Plan
  - o PPE, Safety Devices & Techniques
- Blood/Specimen Collection & Quality Control
  - o Renal Anatomy & Physiology
  - o Physiologic Assessment Using Urinalysis
  - o Correlating Diseases with Abnormal Results
  - o Laboratory Procedure: Urinalysis
  - o Accuracy & Precision
  - o Statistical Formulas and Implementation
  - o Statistical Analysis of Laboratory Procedures
- Bloodbank, Hematology & Immunology
  - o Blood Cells
  - o White Blood Cell Morphology
  - o Red Blood Cell Morphology
  - o Laboratory Procedure: Identification of Blood Cells Under the Microscope
  - o ABO & RH Blood Types
  - o Laboratory Procedure: ABO/Rh Typing
  - o Autoimmune diseases
- Basic Principles of Clinical Chemistry & Clinical Microbiology
  - o Clinically Significant Pathogen vs. Normal Flora
  - o Bacterial Identification

- Bacterial Morphology: Gram Stains
  - Laboratory Procedure: Gram Stains
  - Glucose Metabolism and Regulation
  - Diseases Associated with Glucose Metabolism
  - Cardiac markers and Tumor markers
- Molecular Module
- DNA Isolation
  - Cell Division
  - Gel Electrophoresis
- Professional Development
- Importance of Effective Communication in a Clinical Setting
  - Effective Written Communication
  - Effective Verbal Communication

**COURSE INSTRUCTOR:** Koela Ray, MSc, MS  
302 Rowell  
Email: [Koela.Ray@uvm.edu](mailto:Koela.Ray@uvm.edu)

Office Hours (July 1<sup>st</sup> – July 26<sup>th</sup>): Through appointment only

**CLASS TIMES (July 1<sup>st</sup> – July 12<sup>th</sup>):**

Lecture: MTWRF 9:00 AM – 12:00 PM (Rowell 102)

Laboratory: MTWRF 1:30 PM – 3:30 PM (Rowell 113)

**RESOURCES:**

**TEXTBOOK (Not Required):**

Linne and Ringsrud's CLINICAL LABORATORY SCIENCE: Concepts, Procedures, and Clinical Applications. 8<sup>th</sup> Edition. Author: Mary Louise Turgeon  
Publisher: Elsevier. ISBN-13: 978-0323530828

UVM Blackboard will be used for all the course materials and online modules.

**ONLINE Module (July 17<sup>th</sup> – July 28<sup>th</sup>):** There will be no standard meeting times during the online session. Students will be assigned case studies starting July 14<sup>th</sup>, 2023. Case studies with assignments will be posted in sections with specific deadlines. These due dates for the assignments, can be found in the course schedule. Dates will be reviewed

during the first two weeks, and in addition, will be sent as reminders prior to the due dates.

Online modules will require about 5 to 7 hours of work, per week, which students can complete at their convenience. Students are expected to work independently on the cases and discuss with the rest of the class at the end of each case, through online discussion forums.

***Late work will not be accepted.*** Assignments will not be graded after the deadline. If there is an extenuating circumstance, instructor should be contacted by via email, ***prior*** to the assignment is due to make alternate arrangements.

### **DISCUSSION FORUMS**

Discussion Forums are a way for students to engage with each other about the course content. Each lesson module will have a question that links to a forum. Students can also access each forum by clicking on the **DISCUSSIONS** button in the course navigation links. In order to get full credit for each discussion, students will need to post a thoughtful, well-written response to the question and respond to one of their classmates' answers.

### **EXAMS AND GRADING POLICY:**

**GRADING:** Course grade will be derived from the cumulative efforts of final presentation for lecture and lab, class participation and exams, and completion of case study homework.

A letter grade for this course will be determined by the following:

#### **Lecture**

Homework	15%
Final Exam	20%
Presentation and Discussion	15%
Participation (Quizzes)	20%
Case study Homework	20%

#### **Laboratory**

Laboratory	10%
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<b>Total</b>	<b>100%</b>
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The letter grade earned in the course will be based on the numerical ranges given below.

<60 = F	60 - 62 = D-	70 - 72 = C-	80 - 82 = B-	90 - 92 = A-
	63 - 66 = D	73 - 76 = C	83 - 86 = B	93 - 96 = A
	67 - 69 = D+	77 - 79 = C+	87 - 89 = B+	97 - 100 = A+

Students are encouraged to discuss their grade status with the instructor at any time.

**VIRTUAL LABORATORY AND LABORATORY ASSIGNMENTS:** Most laboratory exercise will be accompanied by a series of questions, mostly multiple choice and some short answers and will be graded. Some questions may require students to research the answers outside of the laboratory content available. The course laboratory portion is worth 10% of the course grade. The laboratory exercises are intended to help students have a better understanding of the material covered in the lectures.

**Participation:** Participation in the lecture and laboratory, is expected and worth 20% of the final grade. Skipping lecture material will definitely impact the understanding of course contents and affect grades. Most laboratory sessions are designed to help with better understanding of the lecture concepts.

**Presentation:** Presentation guidelines and a list of topics will be provided after the first week of classes. Students will have the option of selecting a topic from the list but does not have to it.

**ACADEMIC INTEGRITY:** The concepts of academic integrity apply to this course. This means that all work turned in under your name, including laboratory reports, laboratory quizzes and exams must be the product of your own work or else appropriately referenced. Copying the work of others without permission or without identifying it as someone else's work is plagiarism and is a violation of academic honesty. Unless specifically noted, all work should be done independently.

**Code of Academic Integrity:** All academic work must conform to the UVM Code of Academic Integrity: <http://www.uvm.edu/~uvmppg/ppg/student/acadintegrity.pdf>. Violations may be in any of the following categories: plagiarism, fabrication, collusion or cheating. Any student, member of the University staff, or faculty may report any perceived violation of this Code to the Center for Student Ethics and Standards. Charges will be heard by the Academic Integrity Council. Sanctions may range from a letter of warning to dismissal from the University.

**REASONABLE ACCOMODATION FOR LEARNING DISABILITIES:** In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and

appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course. Please click on this link, Accommodation Guidelines, to better understand the process. A student's accommodation letter lists those accommodations that will not be implemented until the student meets with their faculty to create a plan. Contact SAS: A170 Living/Learning Center; 802-656-7753; [access@uvm.edu](mailto:access@uvm.edu); or [www.uvm.edu/access](http://www.uvm.edu/access)

**USE OF MOBILE TECHNOLOGY IN CLASSROOM:**

This class is discussion based and students will be allowed to use electronics like laptops, tablets and cell phones during most classes, to allow full participation in class activities and discussions. Cell phones should otherwise, be turned off, or set to vibrate before coming into lectures and always during laboratory sessions. However, if technology use is causing distraction to others, students will be asked to refrain from using it and will negatively impact their participation grade. Cell phones can never be used as calculators during any class sessions. If there are any questions or concerns, please be in touch with the course instructor.

**NAME USED IN CLASS:** The official UVM roster now lists a student's "preferred" name. If you wish to be addressed by a different name than what is listed, please let us know.

**COURSE EVALUATION:** An anonymous, on-line course evaluation is expected to be completed by each student at the end of the course.

**Key points to remember throughout the course:**

- Take part in class discussions. Asking questions will make the course more interesting to you and will help clarify subject matter for everyone.
- Be sure that you understand the foundational principals discussed in class. Memorizing slides before an exam will not help you in this course.
- There is a large amount of material covered in this course. Studying in small groups tends to be effective in classes like this. You can learn from one another.
- The final exam is a comprehensive exam. Start keeping an inventory of what you've learned. You will use it again, and you will build on it in future semesters, if you wish to join the program!

**Tentative Schedules for Lecture (Rowell 102; 8:30am – 12:00pm)  
and Lab (Rowell 113; 1:00 – 3:30pm)**

*The course schedule listed below may change with little notice. Please be flexible as we progress through this course.*

Day: Date	Topic
<b>Week #1</b>	<b>Unit # 1 (Lab Essentials, Techniques and Cells)</b>
M: 07/03	Introduction and Lab Essentials Biology of Cell Normal flora vs. Pathogen <i>Lab: Microscopy</i> <i>Lab: Microbial Ubiquity</i>
W: 07/05	Proteins and Enzymes Spectrophotometry, Molecular Techniques <i>Lab: Spectrophotometry</i> <i>Lab: DNA Extraction</i>
R: 07/06	Red and White Cell morphology, Cell Division <i>Lab: Smear and Wright Staining</i> <i>Differential</i>
F: 07/07	Sample Collection and Quality Control Pre-Analytical Variables Basic Immunology <i>Lab: Immunology Technique</i>
<b>Week #2</b>	<b>Unit # 2 (Specimen Analysis)</b>
M: 07/10	ABO & RH Blood Types Transfusion Medicine, Pregnancy <i>Lab: A/B/O/Rh Blood typing</i> <i>Lab: Dilution and Titration</i>
T: 07/11	Glucose Metabolism and Regulation Diseases Associated with Glucose Metabolism Liver <i>Lab: Electrophoresis</i>
W: 07/12	Renal Anatomy and Physiology Urine and body fluids <i>Lab: Kidney function and Urine Analysis</i>

R: 07/13	Cardiovascular Diseases Tumor Markers <i>Lab: Point of Care Testing</i>
<b>F: 07/14</b>	<b>Day Off</b>
<b>Week #3</b>	<b>Unit # 3 (Practice Cases: Online)</b>
M: 07/17	Practice Cases opens (9am)
T: 07/18	Practice Case continues
W: 07/19	Practice Case closes (5pm) Discussion forum for practice cases opens (5pm)
R: 07/20	Discussion forum for practice cases closes (9pm)
F: 07/21	Cases 1 and 2 are available
<b>Week #4</b>	<b>Unit # 4 (Cases and Final: Online)</b>
M: 07/24	Cases 3 and 4 are available
T: 07/25	Cases 1 and 2 are due (9pm) Case 5 opens (9am)
W: 07/26	Cases 3 and 4 are due (9pm)
R: 07/27	Cases 5 is due (End of the day at 11:59pm) Final Exam opens (9am)
F: 07/28	<b>Final Exam Due at 5pm</b>