

PATHOLOGY AND LABORATORY MEDICINE (PATH)

PATH/PATH-BIO 210 – HIV: SEX, SOCIETY AND SCIENCE

3 credits.

HIV kills three million people per year, more than any other infectious disease. We will learn about the transmission, immunology, virology, vaccinology and societal impact of this virus. Six of the world's leading HIV scientists will give guest lectures.

Requisites: None

Course Designation: Breadth – Biological Sci. Counts toward the Natural Sci req

Level – Elementary

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Use science as a tool for understanding the world and solving problems.

Audience: Undergraduate

2. Understand how scientific data, social context, and political decisions impact prevention and treatment of infectious diseases in different community contexts.

Audience: Undergraduate

3. Identify obstacles to implementing effective disease interventions and understand ways to evaluate those interventions.

Audience: Undergraduate

4. Describe the steps of the HIV viral life cycle.

Audience: Undergraduate

5. Discuss how HIV's replication process leads to immune deficiency and AIDS.

Audience: Undergraduate

6. Describe immune responses against viral infection and list reasons why these responses fail to clear HIV infection.

Audience: Undergraduate

7. List reasons why it is challenging to cure HIV infection.

Audience: Undergraduate

8. Discuss approaches for making vaccines against other pathogens and list reasons why it is challenging to apply these approaches to HIV.

Audience: Undergraduate

9. Discuss and evaluate approaches for slowing the spread of HIV in the United States and other countries.

Audience: Undergraduate

10. Describe the processes by which HIV emerged to become a human pathogen.

Audience: Undergraduate

11. Discuss the sources of funding for the global response to HIV/AIDS and evaluate the efficacy of each in achieving its goals.

Audience: Undergraduate

12. Apply the concepts learned in relation to HIV to other emerging and re-

PATH 399 – INDEPENDENT STUDY

1-4 credits.

Directed study projects for freshmen and sophomores.

Requisites: Consent of instructor

Course Designation: Level – Elementary

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Identify concepts learned in coursework begin to apply to real life situations

Audience: Undergraduate

2. Read and learn to effectively search scientific literature

Audience: Undergraduate

3. Begin to develop critical, analytical, and independent thinking skills

Audience: Undergraduate

PATH 404 – PATHOPHYSIOLOGIC PRINCIPLES OF HUMAN DISEASES

3 credits.

Provides a basic understanding of the causes, pathophysiology, pathology and clinical manifestations of disease states from a medical perspective.

Requisites: ZOOLOGY/BIOLOGY 101, ZOOLOGY/BIOLOGY/BOTANY 151, ZOOLOGY 153, or BIOCORE 381

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe the pathophysiologic processes highlighted in the course.

Audience: Undergraduate

2. Explain how clinical manifestations, diagnosis, and prognosis of some common conditions are related to underlying pathophysiologic principles.

Audience: Undergraduate

3. Describe how treatments of some common conditions are based on these same pathophysiologic principles.

Audience: Undergraduate

4. Consider how severe consequences of diseases may be prevented by screening, early diagnosis, modification of risk factors, and mitigation of environmental/occupational exposures.

Audience: Undergraduate

5. Establish a vocabulary of medical terms used by healthcare professionals

Audience: Undergraduate

PATH/M&ENVTOX/PHM SCI/PHMCOL-M/POP HLTH 626 – TOXICOLOGY II

3 credits.

Survey of the basic methods and fundamental biochemical mechanisms of toxicity. Toxicity in mammalian organ systems, techniques for evaluating toxicity, as well as mechanisms of species specificity, and environmental interactions (with toxicant examples) are presented.

Requisites: POP HLTH/M&ENVTOX/ONCOLOGY/PHM SCI/PHMCOL-M 625

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Explain and identify the effects of toxicants on specific organs within the human body

Audience: Both Grad & Undergrad

2. Demonstrate metabolism and reactions of toxicants within organ systems using a given dataset

Audience: Both Grad & Undergrad

3. Classify different means of risk assessment and the conceptual rationale behind these methods

Audience: Both Grad & Undergrad

4. Implement knowledge to design experiments applicable to one's own research

Audience: Both Grad & Undergrad

5. Relate specific organ concepts with conceptual examples from M&ENVTOX 625 to enhance scientific understanding

Audience: Undergraduate

6. Appraise concepts to research to identify future research concepts.

Audience: Graduate

PATH 699 – INDEPENDENT STUDY

1-4 credits.

Directed study projects for juniors and seniors.

Requisites: Consent of instructor

Course Designation: Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Summer 2025

Learning Outcomes: 1. Apply concepts learned in coursework to real life situations

Audience: Undergraduate

2. Read and effectively search scientific literature

Audience: Undergraduate

3. Develop critical, analytical, and independent thinking skill

Audience: Undergraduate

PATH 750 – CELLULAR AND MOLECULAR BIOLOGY/PATHOLOGY

2 credits.

Emphasizes current understanding of molecular and cellular mechanisms. Wherever possible, human diseases are used to illustrate the outcome at the organismal level of defects in these mechanisms. Focuses on different cell types and how cells function. We also discuss how cells talk to themselves and each other. Topics include mechanisms of cell survival and division. Provides an overview of a broad set of cell biology topics to demonstrate the breadth and diversity of cellular functions.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Explain basic mechanisms of cell signaling

Audience: Graduate

2. Describe how vesicles traffic inside of cells

Audience: Graduate

3. Explain the parts of the cell cycle

Audience: Graduate

4. Explain how and why a cell dies by apoptosis

Audience: Graduate

5. Define cell adhesion receptors, lipid rafts, and phosphatases and explain their role in cellular mobility

Audience: Graduate

6. Explain the role of stem cells in cancer biology

Audience: Graduate

7. Describe B and T cell development pathways and the functions of these cells

Audience: Graduate

8. Describe the roles of B and T cells in defending a host from pathogens

Audience: Graduate

PATH 751 – BIOLOGY OF AGING

2 credits.

Examines the molecular, cellular, physiological, and clinical aspects of aging beyond basic biology in a biomedical/clinical research setting. Aging and age-related diseases are examined via the combined expertise of basic scientists and clinicians covering a range of topics directly relevant to biology of aging research, including the clinical perspective, the research perspective, and the integration of the two.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Understand the scope of aging research and become familiar with the numerous conditions and disorders for which age is a risk factor.

Audience: Graduate

2. Synthesize the biological and clinical aspects of diseases and disorders of aging.

Audience: Graduate

3. Integrate biology across aging diseases and conditions to identify common factors.

Audience: Graduate

4. Appreciate the novel techniques and approaches at the cutting edge of aging research.

Audience: Graduate

PATH 752 – CELLULAR AND MOLECULAR BIOLOGY/PATHOLOGY SEMINAR

1 credit.

The emphasis is on our current understanding of molecular and cellular mechanisms. Wherever possible, human diseases are used to illustrate the outcome at the organismal level of defects in these mechanisms. Discussions focus on immunology and cancer biology. Topics include mechanisms of cell survival, cell division, signal transduction, gene expression, vesicular transport, autophagy and cell death. Explore a broad set of cell biology topics, in greater detail such that they will have a better understanding of the breadth and diversity of cellular functions by the end of the semester. Learn how to critically evaluate the literature and the rigor of research.

Requisites: Concurrent enrollment in PATH 750

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Explain basic mechanisms of cell signaling

Audience: Graduate

2. Describe how vesicles traffic inside of cells

Audience: Graduate

3. Explain the parts of the cell cycle

Audience: Graduate

4. Explain how and why a cell dies by apoptosis

Audience: Graduate

5. Define cell adhesion receptors, lipid rafts, and phosphatases and explain their role in cellular mobility

Audience: Graduate

6. Explain the role of stem cells in cancer biology

Audience: Graduate

7. Describe B and T cell development pathways and the functions of these cells

Audience: Graduate

8. Describe the roles of B and T cells in defending a host from pathogens

Audience: Graduate

9. Learn how to critically evaluate papers for rigor

Audience: Graduate

10. Learn how to design an experiment

Audience: Graduate

PATH 755 – RESPONSIBLE CONDUCT IN RESEARCH: RESEARCH ETHICS, RIGOR, REPRODUCIBILITY AND TRANSPARENCY

2 credits.

Meets the NIH Institutional Training Grant requirements covering all ten of targeted areas in biomedical research. Subject matter incorporates the following topics for instruction: 1) Conflict of interest - personal, professional, and financial; 2) Policies regarding human subjects, and rigor and reproducibility in clinical research; 3) Policies regarding live vertebrate animal subjects, rigor and reproducibility and transparency in pre-clinical research, and safe laboratory practices; 4) Mentor and mentee responsibilities and relationships; 5) Collaborative research including collaborations with industry; 6) Peer review; 7) Data acquisition and laboratory tools (management, sharing and ownership); 8) Research misconduct and policies for handling misconduct; 9) Responsible authorship and publication; 10) The scientist as a responsible member of society, contemporary ethical issues in biomedical research, and the environmental and societal impacts of scientific research.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Demonstrate proficiency in the Federal, State of Wisconsin, and UW-Madison rules and regulations relevant to the performance of research in the sciences.

Audience: Graduate

2. Explain practices and approaches that can enhance the rigor and reproducibility of their work.

Audience: Graduate

3. Demonstrate problem-solving strategies and how to respond properly after witnessing research misconduct.

Audience: Graduate

PATH 802 – HISTOPATHOLOGY FOR TRANSLATIONAL SCIENTISTS

3 credits.

Introduces the pathogenesis of disease via integration of actual autopsy patient cases. Emphasis is placed on understanding the basic mechanisms of disease at the level of cell, organ, and body, as well as the morphologic expression patterns of selected common specific disease processes. Participate in autopsy gross organ conferences as well as microscopic review sessions. Concepts covered in lectures will be applied and reinforced in the interactive autopsy sessions. Observe at least one full autopsy, gaining a three-dimensional understanding of structure and disease.

Requisites: Declared in Cellular and Molecular Pathology graduate program

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Gain an appreciation of how disease processes directly impact patients
Audience: Graduate

2. Be able to distinguish the morphologic patterns of normal versus pathologic tissues
Audience: Graduate

3. Be familiar with the pathogenesis of selected common disease processes
Audience: Graduate

4. Recognize how basic laboratory research may be applied to specific disease processes
Audience: Graduate

PATH 803 – PATHOGENESIS OF MAJOR HUMAN DISEASES

3 credits.

This course will focus on disease pathogenesis and discussion of the leading disease research model. Throughout the course, we will combine expert clinicians, basic scientists, and literature review on specific major diseases.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Develop an understanding of the basic principles of pathology (inflammation, cell death and degeneration and neoplasia).
Audience: Graduate

2. Discuss clinical features of human diseases that are major causes of global death and disability.
Audience: Graduate

3. Define pathogenesis of human diseases that are major causes of global death and disability.
Audience: Graduate

4. Discuss leading disease in vitro and in vivo research models for major human diseases.
Audience: Graduate

5. Develop an understanding of cutting-edge research techniques to study major human diseases.
Audience: Graduate

PATH 807 – IMMUNOPATHOLOGY: THE IMMUNE SYSTEM IN HEALTH AND DISEASE

2 credits.

Gain fundamental knowledge of immunopathology and molecular immunology medicine, and have an in-depth research experience that combines pathobiological and translational immunology research.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Understand the development and function of the immune response in human disease.

Audience: Graduate

2. Understand malfunctions of immune system like immunodeficiency, autoimmunity & allergies.

Audience: Graduate

3. Learn basic mechanisms by which the immune system protects against infectious disease.

Audience: Graduate

4. Understand how the immune system may be manipulated to facilitate transplantation and treat cancer.

Audience: Graduate

PATH 809 – MOLECULAR MECHANISMS OF DISEASE

2 credits.

Focuses on molecular mechanisms of diseases. Course will focus on four modules: Neuroscience, cancer biology, growth factor/matrix biology, and immunology. Course will consist of a one hour lecture and a one hour group discussion.

Requisites: Declared in Cellular and Molecular Pathology graduate program

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Understand how to write a proposal (Grant Workmanship).

Audience: Graduate

2. Develop the ability to critically evaluate research papers and grants (Peer Reviewing).

Audience: Graduate

3. Understand how to design an experiment to test a novel hypothesis.

Audience: Graduate

4. Understand and learn how to give a successful talk.

Audience: Graduate

PATH 900 – SEMINAR

0 credits.

Weekly Seminar for graduate students, professional students, medical professionals.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Gain overall breath of knowledge in disease pathogenesis.

Audience: Graduate

2. Provide a platform for student interaction with invited faculty from UW-Madison and other institutions.

Audience: Graduate

3. Develop skills for communicating complex ideas in a clear and understandable manner.

Audience: Graduate

PATH 901 – STUDENT SEMINAR / JOURNAL CLUB

1 credit.

Review of current publications on relevant topics selected by department faculty and trainer.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Develop skills to discuss research progress with peer group.

Audience: Graduate

2. Develop excellent presentation skills to communicate complex ideas in a clear and understandable manner.

Audience: Graduate

3. Learn how to provide constructive feedback to strengthen peer student's presentation.

Audience: Graduate

4. Articulate research problems, potentials, and limits within the field of study.

Audience: Graduate

5. Formulate ideas, concepts, designs, and techniques beyond the current boundaries of knowledge within the chosen field of study#

Audience: Graduate

PATH 913 – TECHNIQUES IN VIROLOGY

4 credits.

Culture-based methods for detecting and quantifying viruses. Describe concepts such as viral load, transmissibility, tissue tropism, host immune responses, and the effectiveness of various antiviral therapies. Perform multiple techniques for working with and quantifying viruses. Compare and contrast various methods of detecting and quantifying viruses.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Demonstrate training-level-appropriate understanding of viruses and host biology.

Audience: Graduate

2. Integrate scientific evidence into clinical practice concepts.

Audience: Graduate

3. Effectively communicate basic science concepts related to infectious diseases, immunology, and virology.

Audience: Graduate

4. Demonstrate the ability to evaluate basic science and clinical literature.

Audience: Graduate

5. Develop an understanding of how basic science experiments are conceived, planned, executed, analyzed, and interpreted.

Audience: Graduate

6. Describe how viruses are propagated and quantified.

Audience: Graduate

7. Describe how viral infections are diagnosed.

Audience: Graduate

8. Describe the nuances and caveats associated with different methods of diagnosis.

Audience: Graduate

PATH 914 – CLINICAL MICROBIOLOGY: PHENOTYPIC IDENTIFICATION OF COMMON ORGANISMS

2 credits.

Clinical microbiology lab practice, with a focus on identification of bacteria, fungi, and parasites. Learn techniques in specimen collection, staining, and plating. Gain an understanding of culture media, incubation, isolation, and microscopic and colony characteristics.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Understand different ways of collecting and transporting specimens

Audience: Graduate

2. List common stains used for direct specimen examination

Audience: Graduate

3. Recall different types of culture media and their uses

Audience: Graduate

4. Explain the purpose of varying incubation conditions

Audience: Graduate

5. Recognize common Gram-positive bacteria based on phenotypic characteristics

Audience: Graduate

6. Recognize common fungi based on phenotypic characteristics

Audience: Graduate

7. Recognize common parasites based on phenotypic characteristics

Audience: Graduate

8. Recognize common Gram-negative bacteria based on phenotypic characteristics

Audience: Graduate

PATH 915 – CLINICAL MICROBIOLOGY: OVERVIEW OF TECHNOLOGIES AND METHODOLOGIES

2 credits.

Learn the variety of techniques, methodologies, and instrumentation used in modern clinical microbiology laboratory practice. Gain an understanding of mass spectrometry, NAAT, PCR, sequencing, antigen/antibody detection, antimicrobial susceptibility testing, point-of-care testing, and biomarkers of infection.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Summarize microscopic and phenotypic techniques used for identification

Audience: Graduate

2. Understand MALDI-TOF MS uses, advantages, and limitations

Audience: Graduate

3. Describe NAAT technologies such as PCR and TMA

Audience: Graduate

4. Explain how DNA sequencing works and its role in diagnosis

Audience: Graduate

5. Recognize common uses for antigen and antibody tests

Audience: Graduate

6. List different methods for antimicrobial susceptibility testing

Audience: Graduate

7. Differentiate rapid and POC testing from lab-based testing

Audience: Graduate

8. Discuss methods used for public health and infection control

Audience: Graduate

PATH 916 – CLINICAL MICROBIOLOGY: ANTIMICROBIAL RESISTANCE AND EMERGING PATHOGENS

2 credits.

Understand the battle between humans and infectious diseases.

Learn how microbes evade the immune system and develop resistance to antibiotics. Discuss emerging pathogens and multidrug resistant organisms and the techniques used to combat them.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe how microorganisms evade the immune system

Audience: Graduate

2. List major antibiotic classes and resistance mechanisms

Audience: Graduate

3. Explain the significance of ESKAPE pathogens

Audience: Graduate

4. Recognize the importance of emerging pathogens

Audience: Graduate

5. Recall techniques used to identify resistant and emerging pathogens

Audience: Graduate

6. Understand the role and antimicrobial stewardship

Audience: Graduate

7. Understand the role of infection prevention and control

Audience: Graduate

8. Explain treatment and eradication strategies

Audience: Graduate

PATH 920 – GENERAL PATHOLOGY CLERKSHIP

2-4 credits.

Understand the central role that diagnostic pathology and laboratory testing play in medical care in all specialties. Review your course work in anatomic and clinical Pathology and add to your fund of knowledge. Familiarize yourself with the workings of a busy diagnostic tissue laboratory. Participate in daily "clinical-pathologist" discussions concerning the effects of various pathological conditions as they relate to specific clinical problems. Understand the role of anatomic and clinical pathology as they contribute to the understanding of disease processes.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Describe the role of the pathology laboratories and pathologists in patient care

Audience: Graduate

2. Describe the specimen requirements, processing, and workup of patient samples in the pathology laboratory area in which they rotated

Audience: Graduate

3. Demonstrate increased facility with the underlying basic science knowledge required for these areas (eg histology, anatomy, molecular biology, microbiology, etc.)

Audience: Graduate

4. Independently assess patient materials and construct a differential diagnosis of the disease process involved

Audience: Graduate

5. Communicate and collaborate with consultants and/or primary clinical team and other providers to coordinate care

Audience: Graduate

6. Review, interpret and present current literature to support the diagnostic workup

Audience: Graduate

PATH 921 – TRANSFUSION MEDICINE CUSTOMIZED

2 credits.

Maximize preparedness for residency by correlating basic science concepts with practical decision-making in clinical transfusion medicine. Tested topics are customized based on the student's specialty interests. Topics include hemostasis, immunology of transfusions, transfusion reactions, red blood cell (RBC) antigens and antibodies, product modifications, lab tests, indications, therapeutic apheresis, blood donation, special patient populations and circumstances such as obstetrics or neonates, and massive transfusion in surgery and trauma.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Explain the basic physiology of hemostasis and how it relates to lab testing and transfusion practice.

Audience: Graduate

2. Explain the basic immunology of red cell antigens, antibodies, and acute and delayed hemolysis.

Audience: Graduate

3. Explain the immunology of ABO blood-typing, antibody screen and identification, and direct antiglobulin test.

Audience: Graduate

4. Explain the pathophysiology and management of transfusion reactions.

Audience: Graduate

5. Explain the basic physiology of and indications for blood products and product modifications.

Audience: Graduate

6. Explain the pathophysiology and management of typical diseases treated by therapeutic apheresis.

Audience: Graduate

7. Explain the basic steps in blood donation and donor screening.

Audience: Graduate

8. Explain the pathophysiology and management of the alloimmunization of pregnancy.

Audience: Graduate

9. Explain the physiology of neonates that lead to special transfusion practices.

Audience: Graduate

10. Explain the pathophysiology of a massive transfusion and the coagulopathy of trauma.

Audience: Graduate

PATH 922 – LABORATORY MEDICINE CUSTOMIZED

2 credits.

Learn the basic science principles of common laboratory tests. Apply this knowledge to assignments in which you make clinical judgments and answer common patient questions about lab test interpretations. Customize the curriculum based on your specialty interests.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Define and apply the concepts of sensitivity and specificity.

Audience: Graduate

2. Define and apply negative and positive predictive value. Explain how these values are influenced by the prevalence (prior probability) of disease in defined populations (Bayes theorem).

Audience: Graduate

3. Describe how reference intervals are derived and used and the different types of reference intervals including those derived from population distributions, from expert consensus recommendation, or from evidence-based determination of “threshold” values based on a test’s predictive value in a clinical algorithm.

Audience: Graduate

4. Explain why 5% percent of laboratory test results from healthy individuals might fall outside a reference range.

Audience: Graduate

5. Explain the concept of variability in repeated measurements, as well as variability within and between individuals.

Audience: Graduate

6. Describe the contributors to analytical uncertainty (precision, accuracy, bias, coefficient of variation) and how the sources of variability relate to clinical interpretation of changes in test results.

Audience: Graduate

7. Discuss the consequences of ordering unnecessary testing.

Audience: Graduate

8. Explain the roles of preanalytical and postanalytical variables in affecting test results and thereby impacting patient care.

Audience: Graduate

9. List common sources of preanalytical errors.

Audience: Graduate

10. Describe the effects of blood-drawing technique on test results.

Audience: Graduate

11. Compare and contrast the use of specimen tubes with various colored tops, as well as other specimen containers, and why they cannot be used interchangeably.

Audience: Graduate

12. Describe the broad categories of situations that may result in test interference such as incomplete tube fill, hemolysis, lipemia, bilirubinemia, cross-reacting and interfering substances.

Audience: Graduate

13. List some important limitations and pitfalls of common lab tests.

Audience: Graduate

PATH 923 – SICKLE CELL DISEASE AND PUBLIC HEALTH

2 credits.

Patients with sickle cell disease can present to any medical specialty with manifestations or complications of the disease. Using a disease-focused biopsychosocial approach, the goal is the identification and understanding of barriers to health and the potential opportunities for improvement.

The topics surveyed include: 1) clinical review, 2) community voices, 3) diversity, equity, and inclusion, 4) practical communication skills, 5) actionable examples of quality improvement, 6) health care systems, 7) economics, 8) global health, 9) ethics, and 10) advocacy via intellectual persuasion.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Explain the basic epidemiology, genetics, pathophysiology, diagnosis, clinical manifestations, & treatments for sickle cell disease (SCD).

Audience: Graduate

2. Explain the common stigmas and misconceptions related to SCD, race, racism, pain, and addiction as well as their impacts on health care decision-making.

Audience: Graduate

3. Explain and apply some common practical written and oral communication skills in clinical settings involving the care of individuals with SCD that maximize respect and quality.

Audience: Graduate

4. Focusing patients and populations with SCD, describe how quality improvement tools can be incorporated into the clinical and community settings and how these translate across populations

Audience: Graduate

5. Explain 4 health care systems models of SCD care & how your future practice can contribute.

Audience: Graduate

6. Explain the economic burdens of SCD, reasons why there is a shortage of hematologists, the basic economics of price controls, and different economic policy views.

Audience: Graduate

7. Explain some challenges that affect patients with SCD in different countries, reasons why these challenges exist, and different views on opportunities for improvement.

Audience: Graduate

8. Describe the application of ethical frameworks in influencing policies that impact the health of patients and populations with SCD.

Audience: Graduate

9. Frame a persuasive policy advocacy message that seeks to positively impact health outcomes for individuals with SCD.

Audience: Graduate

PATH 924 – IMMUNOHEMATOLOGY

2 credits.

Utilize a case-based learning approach to interpret blood bank test results such as ABO typing data, antibody screens, antibody panels, and direct antiglobulin tests. Identify antibodies to red blood cell and platelet antigens. Demystify the inner workings of the blood bank clinical laboratory. Improve your ability to understand and communicate results from the blood bank.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Demonstrate knowledge of the basic science principles of pretransfusion testing including ABO/Rh testing, RBC antibody screen, and antibody identification.

Audience: Graduate

2. Identify RBC antibodies from an antibody panel.

Audience: Graduate

3. Demonstrate knowledge of alloimmunization of pregnancy.

Audience: Graduate

4. Demonstrate knowledge of refractoriness to platelet transfusions.

Audience: Graduate

5. Demonstrate knowledge of neonatal alloimmune thrombocytopenia.

Audience: Graduate

6. Communicate interpretations of these results to patients in layman's terms.

Audience: Graduate

PATH 926 – PATHOLOGY: CLINICAL MICROBIOLOGY-MARSHFIELD

2-12 credits.

Clinical elective for fourth year medical students.

Requisites: Declared in Medicine program

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2024

Learning Outcomes: 1. Explain the role of the clinical laboratory and microbiology section in diagnosing infectious diseases and guiding their treatment

Audience: Graduate

2. Describe various methods for identifying infectious agents including culture, mass spectroscopy, and genetic analyses

Audience: Graduate

3. Explain the role of the microbiology laboratory in maintaining antibiotic stewardship and the importance of this endeavor in public health

Audience: Graduate

PATH 949 – GENETICS THROUGH THE LIFE CYCLE

4 credits.

The genome impacts human health and disease from the moment of conception throughout growth, development, and aging. This course offers a comprehensive overview of clinical laboratory testing in the fields of medical genetics and public health. Topics include how genetic testing is integrated into patient care, including prenatal genetics, newborn screening, genetic testing in children and adults, and oncology genetics. Students will develop a strong foundational knowledge of basic genetics principles, identify indications for genetic testing, interpret population screening results and the implications for public health, assess the utility of diagnostic testing, and recognize the limitations of genetic testing and clinical laboratory medicine. It is anticipated that students will incorporate these concepts, knowledge, experiences, and evidence in their future clinical practice.

Requisites: Declared in Medicine program

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2023

Learning Outcomes: 1. Demonstrate knowledge of fundamental principles of genetics

Audience: Graduate

2. Differentiate a screening test versus a diagnostic test

Audience: Graduate

3. Identify indications for genetic testing

Audience: Graduate

4. Assess the clinical utility of a genetic test

Audience: Graduate

5. State the limitations of genetic tests and clinical laboratory medicine

Audience: Graduate

PATH 950 – INFECTIOUS DISEASE DETECTIVES

2 credits.

In much of the world, infection remains the leading cause of disease and death. While medicine has made great strides in the diagnosis and treatment of infection, new and deadly pathogens continue to emerge, and antibiotic resistance continues to grow. No matter what a physician's specialty, understanding principals of infectious disease manifestations, diagnosis and treatment are key.

Requisites: Declared in the Medical program with 4th year standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Identify characteristic gross/histologic features seen in various types of infectious disease

Audience: Graduate

2. Demonstrate understanding of the relative merits of various infectious disease diagnostic testing modalities

Audience: Graduate

3. Relate basic concepts of inflammation and mechanisms of infectious disease to potential clinical manifestations

Audience: Graduate

4. Demonstrate understanding of the collaborative relationship between the pathology department and treating physicians in cases of infectious disease

Audience: Graduate

PATH 960 – PATHOLOGY FOR SURGEONS

2 credits.

The surgeon-pathologist relationship is an integral aspect of the surgical care process. The intraoperative and postoperative findings of the pathologist confirm that the appropriate course of action was taken, and this information determines what the surgeon will tell the patient and his or her family about the disease entity, prognosis, and recommended next steps. In this basic science selective, future surgeons will have the opportunity to refresh their understanding of essential anatomy and histology, and deepen their knowledge of disease pathophysiology. They will also engage in multiple practical learning activities such as cutting a frozen section, working up a transfusion reaction, staining and interpreting an FNA cytology slide, assisting in prosecting (grossing) surgical pathology and autopsy specimens and following up on the diagnosis/molecular testing/tumor board discussion to enhance their understanding of the pathologist's critical role in managing surgical patients.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Reinforce knowledge of critical human anatomy and improve anatomic dissection skills

Audience: Graduate

2. Compare and contrast the indications, interpretative considerations, and relative merits of cytologic versus tissue diagnosis via core or open biopsy

Audience: Graduate

3. Develop familiarity with basic concepts of molecular testing and how it impacts disease diagnosis, prognosis and choice of targeted therapy

Audience: Graduate

4. Explain the pathophysiology of transfusion reactions and review other potential pitfalls of intraoperative blood product utilization

Audience: Graduate

5. Deepen understanding of disease features and the integral role pathologists play in management of surgical patients

Audience: Graduate

PATH 962 – THE MOLECULAR BASIS OF HEMATOLOGIC MALIGNANCIES

2 credits.

Understanding molecular mechanisms of hematologic disease, and developing a foundation in the principles of relevant molecular assays, is critical to providing appropriate patient care. Topics include bases of neoplastic disorders of the hematopoietic and lymphoid systems, how underlying molecular abnormalities contribute to the pathophysiology of these diseases, and the evolving spectrum of molecular and cytogenetic/FISH testing and other ancillary testing (such as flow cytometry), which are often utilized in the work-up of hematopoietic and lymphoid malignancies. Learn about strengths and weaknesses of these technologies, and how pathologists integrate results of molecular testing with the traditional histologic exam to produce accurate diagnoses and drive clinical decision making. Develop an understanding of how knowing the underlying molecular pathology of a hematopoietic or lymphoid malignancy can inform prognosis and guide therapy.

Requisites: MED SC-M 810, 811, 812, and 813

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe basic processes underlying normal hematopoiesis and lymphocyte development.

Audience: Graduate

2. Apply basic principles, advantages, and limitations of the most common forms of ancillary testing in hematopathology, including flow cytometry, cytogenetics/FISH, and select molecular assays.

Audience: Graduate

3. Explain types of molecular abnormalities observed in neoplasia and how these abnormalities contribute to neoplastic growth via various cellular pathways.

Audience: Graduate

4. Describe the molecular basis, pathophysiology, and laboratory evaluation of known or suspected myeloid malignancies (including MDS, MPN, MDS/MPN, AML, and systemic mastocytosis)

Audience: Graduate

5. Describe the molecular basis and pathophysiology of clonal hematopoiesis of indeterminate potential (CHIP) and clonal cytopenia of uncertain significance (CCUS), and understand how these entities may complicate the molecular evaluation of suspected myeloid malignancies.

Audience: Graduate

6. Describe the molecular basis, pathophysiology, and laboratory testing of lymphoid malignancies, including lymphoblastic lymphomas/leukemias and B-cell and T-cell lymphomas.

Audience: Graduate

7. Describe the role of precision medicine and the utility of current and evolving targeted therapies in hematolymphoid disorders.

Audience: Graduate

PATH 963 – WOMEN'S GLOBAL HEALTH: A FOCUS ON WOMEN'S CANCERS AND PUBLIC HEALTH INTERVENTIONS

2 credits.

Unique opportunity for fourth year medical students to develop an intervention project focused on women's health and cancer prevention, diagnosis, treatment, or awareness globally and locally. Explore how women's health is influenced by both biological and sociocultural factors. Observe components of diagnosis of women's related cancers. Analyze molecular components of cancers used for diagnosis and treatment. Deconstruct the unique diseases that affect women throughout the life cycle and social factors that influence them.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2023

Learning Outcomes: 1. Deconstruct differences in female biology that impact medical/public health research and health outcomes

Audience: Graduate

2. Describe the burden of cancers among women globally and locally

Audience: Graduate

3. Critique scientific literature to assess for inclusion of women's specific issues and/or inclusion of women in outcome analysis

Audience: Graduate

4. Identify solutions to address unique women's health challenges

Audience: Graduate

5. Propose public health interventions that address cancer-related women's health challenges

Audience: Graduate

PATH 970 – GENOMICS, PROTEOMICS, AND METABOLOMICS: A DEEP DIVE INTO OMICS DATA ANALYSIS

2 credits.

Advances in medicine are increasingly being driven by "big data" analyses, including proteomics, genomics, and metabolomics. Basic knowledge of how to analyze these datasets can allow one to generate and test hypotheses that have the potential to transform a field. In this course, students will conduct individual data mining expeditions using a collection of large proteomics and metabolomics data sets. Formulate hypotheses about the interrelationships of molecules and their potential relationship to health, disease, and biological phenotypes. Basic background instruction on "omics" methodologies, heritability studies, and analytical methods will be provided. Provides the basic knowledge to carry out future 'omics analyses; using scientific inquiry to potentially transform the practice of medicine.

Requisites: MED SC-M 810, 811, 812 and 813; or Declared in Cellular and Molecular Pathology Graduate Program

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Examine and critically evaluate databases for adequacy of data.

Audience: Graduate

2. Demonstrate understanding of biological variability, data scaling, and data normalization schemes

Audience: Graduate

3. Demonstrate a basic understanding of statistical associations using bioinformatics, such as hierarchical clustering and correlation matrices.

Audience: Graduate

4. Demonstrate a basic understanding of analyte pathways using bioinformatics databases such as Uniprot.

Audience: Graduate

5. Demonstrate appropriate consideration of false discovery.

Audience: Graduate

6. Develop hypothetical models of molecular interactions.

Audience: Graduate

7. Synthesize knowledge of molecular pathways and apply this knowledge to potential health and clinical factors.

Audience: Graduate

8. Prepare and defend a hypothetical model of molecular interactions.

Audience: Graduate

9. Demonstrate critical thinking skills and an understanding of the underlying science behind analytical methodologies

Audience: Graduate

PATH 990 – RESEARCH

1-8 credits.

For Grad and medical students desiring advanced pathology; work done under the direction of a senior staff member.

Requisites: Declared in Medicine program or Cellular and Molecular Pathology graduate program

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Summer 2025

Learning Outcomes: 1. Exhibit a broad understanding of general principles in the field of pathology and laboratory medicine.

Audience: Graduate

2. Conduct independent research using a variety of approaches.

Audience: Graduate

3. Think critically to address research challenges.

Audience: Graduate

4. Exhibit and foster professional and ethical conduct in their research.

Audience: Graduate

5. Collaborate with other investigators within or outside the thesis lab.

Audience: Graduate