Perris Union High School District
Course of Study

A. COURSE INFORMATION

Course Title:
(limited to 34 characters with spaces in Infinite Campus)

Honors Medical Interventions

- ☐ New
- ☑ Revised

If revised, the previous course name if there was a change

PLTW Honors Medical Interventions

Transcript Course Code/Number:

604451/ 604452

(To be assigned by Educational Services if it's a new course)

CREDIT TYPE EARNED:	CALPADS CODE:
Life Science	9222-08

Subject Area:

- ☐ Social Science
- ☐ English
- ☐ Mathematics
- ☑ Laboratory Science
- ☐ World Languages
- ☐ Visual or Performing Arts
- ☐ College Prep Elective
- ☐ Other

Is this classified as a Career Technical Education course?

- ☐ Yes
- ☑ No

If yes, which pathway does this course align to?
Pathway Name:

CTE CDE Code:

Grade Level(s)

- ☐ MS
- ☐ HS
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☑ 11
- ☑ 12

Was this course *previously approved by UC* for PUHSD?

- ☑ Yes
- ☐ No

(Will be verified by Ed Services)

Which A-G Requirement does/will this course meet?

D Lab Science	☐ Pending

Credential Required to teach this course:
To be completed by Human Resources only.

Single Subject: Science: Biological Sciences; Health Science

Signature — Date: 3/11/2024

Submitted by: Jennifer West
Site: PVHS Science
Date: 2/14/24
Email: jennifer.west@puhsd.org

Unit Value/Length of Course:

- ☐ 0.5 (half-year or semester equivalent)
- ☑ 1.0 (one-year equivalent)
- ☐ 2.0 (two-year equivalent)
- ☐ Other:

Approvals	Name/Signature	Date
Director of Curriculum & Instruction		03/13/2024
Asst. Superintendent of Educational Services	Kimberly Lee Mackanic	3/14/24
Governing Board		

Prerequisite(s) (REQUIRED):

Principles of Biomedical Science (C or better)
Honors Human Body Systems (C or better)
Biology (C or better)
Chemistry (C or better)

Corequisite(s) (REQUIRED):

Any science elective of the student's choosing including but not limited to AP Biology, AP Chemistry, Honors or AP Physics, Honors Anatomy & Physiology, Nutritional Science, Marine Biology, AP Environmental Science, and Biosustainability.

Brief Course Description (REQUIRED):

Honors Medical Interventions (MI) is a full-year high school course designed to follow Honors Human Body Systems (HBS) in the Biomedical Science pathway. Medical Interventions allows students to investigate the variety of interventions involved in the prevention, diagnosis, and treatment of disease as they follow the lives of a fictitious family. A "How-To" manual for maintaining overall health and homeostasis in the body, the course will explore how to prevent and fight infection, how to screen and evaluate the code in our DNA, how to prevent, diagnose, and treat cancer, and how to prevail when the organs of the body begin to fail. Through these scenarios students will be exposed to the wide range of interventions related to immunology, surgery, genetics, pharmacology, medical devices, and diagnostics.

Each family case scenario will introduce multiple types of interventions, reinforce concepts learned in the previous two courses, and present new content. Interventions may range from simple diagnostic tests to treatment of complex diseases and disorders. These interventions will be showcased across the generations of the family and will provide a look at the past, present, and future of biomedical science.

Lifestyle choices and preventive measures are emphasized throughout the course as well as the important role that scientific thinking and engineering design play in the development of interventions of the future. Students practice problem solving with structured activities and progress to open-ended projects and problems that require them to develop planning, documentation, communication, and other professional skills.

B. COURSE CONTENT

Course Purpose (REQUIRED):

What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

Unit 1: How to Fight Infection

In this unit students are introduced to Sue Smith, the eighteen-year-old daughter of Mr. and Mrs. Smith. Sue is a college freshman who is presenting symptoms of an unknown infectious disease which students eventually identify as bacterial meningitis. Sue survives the infection but is left with hearing impairment. Through this case students will explore the diagnostic process used to identify an unknown infection, the use of antibiotics as a treatment, how bacteria develop antibiotic resistance, how hearing impairment is assessed and treated, and how vaccinations are developed and used to prevent infection. Follow the fictitious Smith family as you learn about the prevention, diagnosis, and treatment of disease. Play the role of biomedical professionals to analyze case information and diagnose and treat your patients. Investigate the medical interventions of the past and present, and begin to brainstorm the innovations of the future.

Unit 1 Lessons

- Lesson 1.1 The Mystery Infection
- Lesson 1.2 Antibiotic Treatment
- Lesson 1.3 The Aftermath – Hearing Loss
- Lesson 1.4 Vaccination

Unit 2: How to Screen What is in Your Genes

In this unit students are introduced to Mr. and Mrs. Smith, Sue's parents. Mr. and Mrs. Smith are very excited to find out they are expecting a new baby. Because the couple is in their early 40s, the doctor has suggested genetic screening and testing. Through this case students will explore how to screen and evaluate the code in our DNA, the value of good prenatal care, and the future of genetic technology.

Unit 2 Lessons

- Lesson 2.1 Genetic Testing and Screening
- Lesson 2.2 Our Genetic Future

Unit 3: How to Conquer Cancer

In this unit students are introduced to Mike Smith, the sixteen-year-old son of Mr. and Mrs. Smith. Mike is diagnosed with osteosarcoma, a type of bone cancer that often affects teenagers. Mike's treatments put him into remission; however, in order to remove all of the cancerous tissue, he had to have most of his arm amputated. Mike now needs a prosthesis. Through this case students will explore the diagnostic process used to determine the presence of cancerous cells, the risk factors and prevention of cancer, rehabilitation after disease or injury, and the design process for new medications, prosthetics, and nanotechnology.

Unit 3 Lessons

- Lesson 3.1 Detecting Cancer
- Lesson 3.2 Reducing Cancer Risk
- Lesson 3.3 Treating Cancer
- Lesson 3.4 Building a Better Cancer Treatment

Unit 4: How to Prevail When Organs Fail

In this unit students are introduced to Mrs. Jones, the forty-four-year-old sister of Mrs. Smith. Mrs. Jones has been struggling with Type 1 Diabetes for twenty years. Over the years, Mrs. Jones did not take good care of herself or properly control her diabetes. She eventually began using an insulin pump and changed her lifestyle to regulate her blood sugar levels, but the damage had already been done. Mrs. Jones is now dealing with end stage renal failure and needs a kidney transplant. Through this case students will explore protein production, blood sugar regulation, dialysis, organ donation and transplantation, and non-invasive surgery techniques. In addition students will create a bionic human.

Unit 4 Lessons

- Lesson 4.1 Manufacturing Human Proteins
- Lesson 4.2 Organ Failure
- Lesson 4.3 Transplant
- Lesson 4.4 Building a Better Body

Course Outline (REQUIRED):

Detailed description of topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered.

Unit 1: How to Fight Infection

Lesson 1.1: The Mystery Infection

The goal of this lesson is to expose students to interventions involved in detecting, fighting, and preventing an infectious disease as they investigate a potential outbreak at a fictitious college. Sue Smith, a freshman, thinks she just has a cold, but further investigation will reveal something far more serious. Students will use various techniques and technologies to diagnose Sue and determine the source of the disease on campus. They will analyze clues found in the history and physical of each possible patient, identify pathogens present in body fluids through DNA sequence analysis, and test for the infectious agent using the antibody-based Enzyme-linked Immunosorbent Assay (ELISA). Students will be introduced to the field of bioinformatics as they explore genetic databases to identify known gene sequences. At the conclusion of the investigation, students will outline a plan to stop a potential outbreak on campus and discuss interventions such as antibiotic therapy and vaccination, two topics to be explored in greater detail in the subsequent lessons.

1.1 Learning Objectives

- Use DNA sequences in a bioinformatics database to determine pathogens.
- Conduct an ELISA test to determine presence and concentration of a specific pathogen.
- Write a case report that analyzes patient medical histories and diagnostic test results.

1.1 Labs: Sequencing the Human Genome Activity, Mystery Solutions using Serial Dilution Lab, Enzyme-Linked Immunosorbent Assay (ELISA) Test for Bacterial Meningitis Lab

Lesson 1.2: Antibiotic Treatment

In this lesson students will review bacterial structure and investigate the mechanisms by which DNA from one bacterial cell is transferred to another. Students then explore various types of antibiotics and their mode of action against the bacteria they target. They suggest an antibiotic treatment for Sue Smith, as she was diagnosed with a bacterial infection in the previous lesson. Finally, students look at the propagation of antibiotic resistant bacteria and how the misuse of antibiotics plays a role in the development of antibiotic resistant bacteria.

1.2 Learning Objectives

- Conduct an experiment to determine bacteria sensitivity to antibiotics.
- Experiment on bacterial conjugation, using a resistance plasmid.
- Graph and analyze data to show the effect of antibiotic resistance on bacterial populations.

1.2 Labs: Antibiotic Sensitivity Lab - Using Antibiotic Discs to Determine Efficacy; Superbugs Lab - Bacterial Transformation to Create Antibiotic Resistant Bacteria; Antibiotic Resistance with Patients Activity

Lesson 1.3: The Aftermath - Hearing Loss

The goal of this lesson is to introduce students to the auditory system. Students will investigate the physics of sound, learn how hearing works, and conduct a variety of hearing assessments. Students will be assigned a patient with a specific type of hearing loss. Using the assigned patient case study, students will explore how damage to the outer, middle, and/or inner ear results in hearing loss. Students will learn how to interpret audiograms and match up their patient case study with the corresponding audiogram. Students will then use what they have learned to make a recommendation as to what intervention is the most appropriate for the patient case study. Finally, students will investigate the science behind cochlear implants and debate the use of this medical intervention.

1.3 Learning Objectives

- Create a model and demonstrate the anatomy and physiology of the human ear.
- Case studies on conductive and sensorineural hearing loss.
- Cochlear implant research and debate.

1.3 Lab: Rinne + Speech-in-Noise Hearing Tests

Lesson 1.4: Vaccination

The goal of this lesson is for students to explore infectious disease prevention and the development of vaccinations. Students will discuss the impact vaccination has had on public health over the years and interpret how vaccines have altered disease trends. Students will review how vaccines work in the body and relate this mechanism to the workings of the human immune system. Students will explore the techniques scientists use to produce vaccines. They will delve deeper into the science of recombinant DNA technology and learn how genetic engineering can be used to manufacture viable vaccines. Students will engineer a paper plasmid to produce a viral protein that can be used as a vaccine. Finally, students will explore the career field of epidemiology. Working as epidemiologists, they will brainstorm steps and questions needed to deal with a potential outbreak, analyze data to gather evidence, design epidemiologic studies, and design and implement prevention and treatment strategies.

1.4 Learning Objectives

- Types of vaccines and their development.

- Timeline showing vaccination schedules.
- Epidemiology case study and career exploration.

1.4 Lab: Creating Recombinant DNA

Unit 2: How to Screen What's in your Genes

Lesson 2.1: Genetic Testing and Screening

The goal of this lesson is for students to examine the available types of genetic testing and screening and discuss ethical implications of these tests. Assuming the role of genetic counselors, students will analyze a patient case concerning issues of genetic testing and provide appropriate recommendations. Next, students will explore molecular techniques necessary to complete a genetic test. They will use the tools of molecular biology to extract their own DNA, amplify a part of the gene for bitter-tasting ability, identify their own gene sequence by restriction digest, and view their resultant genotype using gel electrophoresis. Students then have a chance to test their own phenotype and see how well this genotype predicts their own ability. Finally, students will investigate the interventions that exist to help protect and monitor a growing fetus.

2.1 Learning Objectives

- Play the role of a genetic counselor. Create a case study-based presentation on a genetic disorder.
- Conduct a lab experiment to amplify DNA by polymerase chain reaction.
- Conduct a DNA extraction and PCR of our own DNA. Use and a restriction enzyme digest and gel electrophoresis to analyze DNA for the PTC gene. Present the results in a formal lab report.
- Research prenatal screening and diagnostic tests. Analyze patient case studies and provide recommendations for next steps in treatment.

2.1 Labs: PCR Amplification of DNA using Thermocyler + SYBR Stain; Exploring the Genetics of Taste - Using a Single Nucleotide Polymorphism (SNP) to predict Bitter Taste Ability (PTC Paper)

Lesson 2.2: Our Genetic Future

The goal for this lesson is for students to examine how the study of genetics will alter the way doctors and scientists treat disease and the way humans reproduce. Students will learn about gene therapy, debate its safety, and write a policy statement highlighting guidelines and restrictions on gene therapy testing and research. Students will examine available reproductive technology and debate and discuss medical interventions of the future.

2.2 Learning Objectives

- Research mechanisms of gene therapy and viral vectors. Design appropriate therapies for patient cases.
- Learn the theory and application of gene editing with CRISPR Cas-9 technology.
- Debate the pros and cons of gene therapy. Discussion on the ethics of gene therapy and cloning.
- Research medical careers in the field of in-vitro fertilization and reproductive cloning

2.2 Labs: Designer Babies Activity + Ethics Debate

Unit 3: How to Conquer Cancer

Lesson 3.1: Detecting Cancer

In this lesson students will be introduced to Mike Smith, the sixteen year old son in the Smith family. For the last couple of months, Mike has been experiencing pain in his upper arm that may be indicative of cancer. Through the exploration of Mike's case, students will explore techniques used to diagnose Mike's particular cancer, including diagnostic imaging and examination of cancerous tissue. Students will look at the physiology of cancer and investigate the genes involved with cancer. Students will examine the technology that is being used to give researchers a better understanding of the differences in gene expression in both cancer cells and normal cells. Students learn ways that this technology is being used to potentially develop personalized medicine for treating cancer.

3.1 Learning Objectives

- Analyze patterns and trends in cancer cases. Identify risk factors for cancer.
- Create a graphic organizer showing diagnostic imaging techniques and careers.
- Stain cells from healthy and cancerous tissues. Compare and contrast the cell features.
- Conduct a simulated microarray lab to view gene expression in healthy and cancerous cells
- Analyze gene expression ratios using the Pearson Correlation coefficient formula and/or a spreadsheet to calculate the ratios. Interpret the results to determine the level of gene regulation.

3.1 Labs: Morphology of Cancer Cells Lab, DNA/RNA Microarrays Lab

Lesson 3.2: Reducing Cancer Risk

The goal of this lesson is for students to look at some of the risk factors associated with cancer by exploring the various situations which cause changes to our DNA. In particular, students will investigate mutations caused by UV light, mutations that are inherited, as well as mutations caused by viruses. Students will design and perform an experiment to test the effectiveness of various sunscreens or types of cloth against UV light as they attempt to protect UV-sensitive yeast cells. They will analyze marker analysis results in order to diagnose a BRCA2 gene mutation associated with breast cancer, play the role of a virologist working with viruses associated with cancer, and create a timeline of routine cancer screenings we must complete in our lifetime. Throughout the lesson students will look at lifestyle choices that can reduce the chances that a person will develop particular types of Cancer.

3.2 Learning Objectives

- Design and conduct an experiment to determine the effect of UV radiation on mutant and wild-type yeast. cells. Test the effect of a chosen variable on protecting cells against UV light. Write a formal lab report.
- Research the role of BRCA 1 and BRCA 2 genes in developing cancer. Analyze pedigrees and genetic testing for a fictional family to determine the risk of developing breast cancer.
- Conduct a marker analysis test, using gel electrophoresis to determine genotypes of the members of the Smith family to determine if they have the BRCA mutations.
- Research a career in virology and cancers linked to viral infections. Write mock interview questions and role-play the responses expected from a virologist.
- Research and create a timeline for the recommended cancer screenings.

3.2 Labs: Custom Sunscreen Kit Lab; Breast Cancer Screening and Prevention Lab with Gel Electrophoresis

Lesson 3.3: Treating Cancer

The goal of this lesson is for students to follow Mike Smith as he progresses through treatment for his osteosarcoma. Students will learn about the treatments available for cancer patients, as well as the therapies available to help patients cope with the pain associated with treatment. This lesson begins with an introduction to chemotherapy and radiation therapy. Next students investigate biofeedback therapy. They will use data acquisition software to monitor their body's reaction to stress and test methods to reduce their response level. Students learn that Mike will have to have his arm amputated to prevent further tumor growth. Through this scenario students will study prosthetic limb technologies, design and build a model prosthetic arm, and explore the role physical and occupational therapists play in a patient's rehabilitation following amputation surgery.

3.3 Learning Objectives

- Analyze cancer patients. Learn about treatment options and write journal entries describing the treatments.
- Conduct an experiment using data acquisition probes and software to simulate biofeedback. Design an experiment to test the use of biofeedback in a stressful situation.
- Research advancements in prosthetic devices. Build and demonstrate a model of a prosthetic arm.
- Collaborative group work to develop a rehabilitation plan for an assigned patient. Students play the roles of occupational and physical therapists as they present a plan to rehab the patient.

3.3 Labs: Biofeedback Therapy with EKG Sensors Lab; Designing and Building a Functional Prosthetic Arm Lab

Lesson 3.4: Building a Better Cancer Treatment

The goal of this lesson is for students to explore the future of cancer treatment. Students will begin this lesson with an investigation into how one drug can cause varied effects in similar patients and learn about personalized medicine, also known as pharmacogenetics. Students will then investigate the set-up of clinical trials and consider the ethics governing clinical trials. Students will study the nanoscale and the possible application of nanotechnology in medicine. Finally, students will research the variety of nanotechnologies currently being developed for the diagnosis and treatment of cancer. They will use everything they have learned in this unit to design their own nanotechnology-based cancer treatment and design a clinical trial to test the safety and efficacy of their designed treatment.

3.4 Learning Objectives

- Learn how precision medicine is used to analyze genetic sequences of patients to determine the best chemotherapy treatment and outcome for a patient.
- Students will learn about new treatments that are being developed to treat cancer patients.
- Students will work in small collaborative groups to analyze the phases and ethics of clinical trials.
- Design a clinical trial for an immunotherapy for an specific type of cancer

3.4 Labs: Medical Ethics Activities: Clinical Trials, History of Medical Trials, Immunotherapy, Nanotherapy

Unit 4: How to Prevail When Organs Fail

Lesson 4.1: Manufacturing Human Proteins

The goal of this lesson is for students to investigate the biomanufacturing of human proteins used for medical interventions. They will first use the process of bacterial transformation to insert a plasmid containing the gene for green fluorescent protein (GFP) into E. coli cells. Students will then use chromatography to separate the GFP protein from the other proteins in the bacterial cells. They will collect proteins in differential fractions and analyze the contents of these fractions using gel electrophoresis. Students will relate their molecular work to the case of Diana Jones, who is a Type 1 diabetic on insulin therapy. Without insulin produced by the biomanufacturing process explored in this lesson, she would have died long ago. As the unit progresses, students will research and design other medical interventions that will help Diana in her battle with diabetes and renal failure.

4.1 Learning Objectives

- Conduct a genetic engineering experiment to transform bacteria with a recombinant plasmid.
- Use models to study the properties of amino acids and view protein shapes created by amino acid interactions.
- Conduct experiments to isolate and purify the proteins created in the bacterial recombination experiment.
- Research careers in pharmaceutical manufacturing. Write a cover letter for a job application.

4.1 Labs: Exploring Biotechnology with GFP (Bacterial Transformation Lab)

Lesson 4.2: Organ Failure

The goal of this lesson is for students to use problem solving and critical thinking skills to solve Diana Jones' medical mystery. Students will investigate Diana's symptoms, suggest further diagnostic tests, and use information they find to piece together the clues provided to make a diagnosis and suggest the best treatment option.

4.2 Learning Objectives

- Work in a collaborative group to analyze a patient's symptoms to come up with a diagnosis and treatment.

4.2 Lab: N/A

Lesson 4.3: Transplant

In Lesson 4.2 students diagnosed Diana Jones with End Stage Renal Disease. In this lesson students will follow Diana as she goes through the transplant process. Students will learn about organ allocation policies by deciding which of two matching patients should receive a donated kidney. Students then learn that members of Diana's family have offered to be potential living donors and must determine who should donate their kidney to Diana based on blood type and tissue type. Students will then practice laparoscopic and general surgery techniques and investigate the members of the transplant team involved along the transplant path. Students conclude the lesson by investigating the similarities and differences between kidney transplants and heart transplants.

4.3 Learning Objectives

- Research criteria for organ transplantation recipients. Analyze a case and create a short slide presentation that explains the criteria used to determine who should receive a donated organ.
- Analyze blood types and histocompatibility data to determine donor and recipient matches.

- Learn how laparoscopic surgical procedures are done and practice a laparoscopic procedure, using a simulated setup.
- Practice suturing techniques on artificial skin or other media.
- Write career journals for medical professionals involved in surgical procedures.

4.3 Labs:

- Medical Ethics Discussions: Organ Transplants; Blood and Tissue Typing in in Organ Donation Lab; Simulated Laparoscopic Surgery Lab

Lesson 4.4: Building a Better Body

The goal of this lesson is for students to investigate some of the technologies researchers are exploring as they strive to replace damaged organs, including xenotransplantation and tissue engineering. Students will investigate how these technologies work and then construct an argument from the perspective of different stakeholders arguing over whether or not further research for these interventions should be banned. In the final activities, students will have the chance to reflect on everything they have explored in this course. They will think about how science is changing the ability of humans to survive in the face of illness and injury and use what they learned during the course to design their own version of a super human. As they review the Smith family tree, students will reflect on the role medical interventions play in preventing, diagnosing, and treating disease. Finally, students will consider their own career aspirations.

4.4 Learning Objectives

- Create a graphic organizer to compare xenotransplantations and tissue engineering.
- Review all of the medical interventions learned throughout the year. Work in a group to design a superhuman with bionic features or other medical enhancements. Create a poster and presentation to explain how and why the enhancements would be made.

4.4 Labs:

- Medical Ethics Discussions: Bionic Features for Humans

Writing Assignments (REQUIRED):

Give examples of the writing assignments and the use of critical analysis within the writing assignments.

- Students will maintain a formal laboratory notebook.
- Students will maintain a career journal.
- Technical writing will consist of formal lab reports and case reports. Reports will include background research with properly cited primary sources, analyzed experimental data, discussion, and a conclusion.

INSTRUCTIONAL MATERIALS (REQUIRED)	
Textbook #1: N/A	
Title:	Edition:
Author:	ISBN:
Publisher:	Publication Date:
Usage: ☐ Primary Text ☐ Read in entirety or near	
Textbook #2: N/A	
Title:	Edition:
Author:	ISBN:
Publisher:	Publication Date:
Usage: ☐ Primary Text ☐ Read in entirety or near	
Supplemental Instructional Materials *Please include online, and open source resources if any.*	
• National Cancer Institute: www.cancer.gov • National Human Genome Research Institute: www.genome.gov • National Foundation for Infectious Diseases: www.nfid.org/infectious-diseases/ • United Network for Organ Sharing: www.unos.org	
Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.* If more space is needed than what is provided, please attach a backup as applicable.	
Cost for a class set of textbooks: $	Description of Additional Costs:
Additional costs: $5000	Lab and activity supplies
Total cost per class set of instructional materials:	$5000

Key Assignments (REQUIRED):

Please provide a detailed description of the Key Assignments including tests, and quizzes, which should incorporate not only short answers but essay questions also. How do assignments incorporate topics? Include all major assessments that students will be required to complete

- Group presentations
- Case study analysis
- Graphic organizers
- Lab notebooks
- Lab practicum
- Projects
- Lab or case reports
- Lesson quizzes
- Unit exams

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be used.

- Collaborative groups work
- Hands-on laboratory experiments
- Virtual simulations
- Experimental design
- Modeling
- Role playing
- Graphing
- Direct interactive instruction
- Note taking
- Researching primary sources
- Issue-based inquiry
- Group discussions
- Debate
- Group presentations

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

This course will assess student progress with both formative and summative assessments.

- Group presentations
- Individual and group projects
- Lab notebooks
- Lab practicum
- Lab or case study reports
- Lesson quizzes
- Unit exams
- Cumulative final exam
- Cumulative final project

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)				
Day(s)	**Objective**	**Standard(s)**	**Chapter(s)**	**Reference**
14	Lesson 1.1 - The Mystery Infection	N/A	N/A	N/A
9	Lesson 1.2 - Antibiotic Treatment	N/A	N/A	N/A
9	Lesson 1.3 - The Aftermath: Hearing Loss	N/A	N/A	N/A
8	Lesson 1.4 - Vaccination	N/A	N/A	N/A
15	Lesson 2.1 - Genetic Testing & Screening	N/A	N/A	N/A
6	Lesson 2.2 - Our Genetic Future	N/A	N/A	N/A
14	Lesson 3.1 - Detecting Cancer	N/A	N/A	N/A
14	Lesson 3.2 - Reducing Cancer Risk	N/A	N/A	N/A
11	Lesson 3.3 - Treating Cancer	N/A	N/A	N/A
13	Lesson 3.4 - Building a Better Cancer Treatment	N/A	N/A	N/A
17	Lesson 4.1 - Manufacturing Human Proteins	N/A	N/A	N/A
2	Lesson 4.2 - Organ Failure	N/A	N/A	N/A
14	Lesson 4.3 - Transplant	N/A	N/A	N/A
9	Lesson 4.4 - Building a Better Body	N/A	N/A	N/A

C. HONORS COURSES ONLY
Indicate how much this honors course is different from the standard course.
The honors course involves conducting the “optional” laboratory experiments that are part of the curriculum in order to give students more hands-on, practical experience with using professional laboratory equipment. Students will be required to design experiments and communicate their findings in formal lab reports. Students will also be required to take a cumulative final exam. There is also a cumulative final project in which students will apply the medical interventions that they have learned throughout the year to create a “superhuman” that has at least 8 modifications to make a theoretically more superior human. This will be a collaborative group project that will culminate in an oral presentation before the whole class.

D. BACKGROUND INFORMATION

Context for course (optional)

The following outlines the skills and content knowledge students are expected to obtain in the Honors Medical Interventions course. It includes computational and analytical skills as well as technical skills that come from experience with tools, software, lab work, and engineering design. This detailed list of skills and knowledge illustrates the immediate, applicable contributions that MI students can make within a workplace.

Laboratory Skills

- Aseptic technique
- Bacterial plating
- Micropipetting
- DNA extraction
- Restriction enzyme digest
- DNA gel electrophoresis
- Protein gel electrophoresis
- Hydrophobic Interaction Chromatography (HIC)
- Bacterial transformation

Clinical Skills

- Karyotyping
- Quantitative Enzyme-linked Immunosorbent Assay (ELISA) analysis
- Interpretation of audiograms
- Blood typing
- Tissue typing

Equipment and Software Proficiencies

- Productivity software (Google Docs, Sheets, Slides)
- Vernier probes and sensors
- Data Acquisition Software (Vernier Logger Pro)
- Microscope
- Thermal cycler

Scientific Experimentation Skills

- Design and conduct reliable scientific experiments
- Analyze and interpret laboratory data
- Construct graphs (by hand and using graphing software)
- Interpolate and extrapolate data from a graph
- Draw conclusions based on experimental data
- Thoroughly and clearly communicate results and conclusions both orally and in writing

Professional Skills

- Group collaboration
- Planning and organizing
- Time management
- Problem-solving

- Technical writing
- Verbal and written communication
- Decision-making
- Creative thinking

Course Knowledge

Overarching Themes

- Homeostasis
- Biomedical science careers
- Bioethics
- Design process
- Interrelationship between body systems and health/disease
- Current and future medical interventions

Infectious Disease

- Epidemiology
- Bioinformatics/DNA sequence analysis
- Antibiotic mode of action and antibiotic resistance
- Bacterial transduction, transformation, and conjugation
- Physics of sound and anatomy and physiology of the ear
- Hearing loss and audiograms
- Cochlear implant technology
- Vaccine production and mechanism

Innovative Medicine

- Prenatal screenings
- Gene therapy
- Reproductive technology
- Xenotransplantation and tissue engineering

Molecular Biology

- Recombinant DNA technology and genetic engineering
- DNA microarrays
- Restriction Fragment Length Polymorphisms (RFLP) and marker analysis
- Single Nucleotide Polymorphisms (SNPs) and pharmacogenetics
- Biomanufacturing of human proteins

Cancer Genetics, Diagnostics, and Treatment

- Diagnostic imaging
- Histology
- Statistical analysis
- Biofeedback therapy
- Prosthetic limb technology
- Nanomedicine
- Clinical trials

Organ Transplant

- End Stage Renal Disease
- Organ allocation policies and organ transplant
- Laparoscopic surgical techniques
- Antigen/antibody interactions
- Pedigree construction/analysis

History of Course Development (optional)

This course was first written in 2015. In 2021, it was revised to include the Honors designation and update the course prerequisites and corequisites. The purpose of the current revision is to update the title and make the course more accessible to students throughout the district.