**Course Description:**

Students learn medical interventions that extend and improve quality of life including gene therapy, use and development of prosthetics, rehabilitation techniques, and supportive care. Students will use 3D imaging, data acquisition software, and current scientific research to design and develop medical intervention products. Students will demonstrate current and emerging strategies and technologies used for collecting, analyzing, recording and sharing information. In addition, students will develop leadership and team-building skills that promote collaboration.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome: 1.1. Employability Skills**

Develop career awareness and employability skills (e.g., face‐to‐face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

1.1.2. Identify the scope of career opportunities and the requirements for education, training,

certification, licensure and experience.

1.1.3. Develop a career plan that reflects career interests, pathways and secondary and

postsecondary options.

1.1.5. Develop strategies for self‐promotion in the hiring process (e.g., filling out job applications,

resumé writing, interviewing skills, portfolio development).

1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate

associated behaviors in fulfilling personal, community and workplace roles.

1.1.7. Apply problem‐solving and critical‐thinking skills to work‐related issues when making decisions

and formulating solutions.

1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive

behavior.

*An “X” indicates that the pathway applies to the outcome.*

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| **Pathways** |  | Health Information Management | X | Medical Bioscience | X | Allied Health and Nursing | |  | Exercise Science and Sports Medicine | X | Therapeutic Services |
| **Green Practices** |  | Green-specific |  | Context-dependent | | X | Does not apply | | |  |  |

**Outcome: 1.2. Leadership and Communications**

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

**Competencies**

1.2.1. Extract relevant, valid information from materials and cite sources of information (e.g.,

medical reports, fitness assessment, medical test results).

1.2.2. Deliver formal and informal presentations.

1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.

1.2.4. Use negotiation and conflict‐resolution skills to reach solutions.

1.2.5. Communicate information for an intended audience and purpose.

1.2.6. Use proper grammar and expression in all aspects of communication.

1.2.7. Use problem‐solving and consensus‐building techniques to draw conclusions and determine

next steps.

1.2.8. Identify the strengths, weaknesses and characteristics of leadership styles that influence

internal and external workplace relationships.

1.2.9. Characteristics of leadership styles that influence internal and external workplace relationships.

1.2.10. Use interpersonal skills to provide group leadership, promote collaboration and work in a

team.

1.2.11. Write professional correspondence, documents, job applications and resumés.

1.2.12. Use technical writing skills to complete forms and create reports.

1.2.13. Identify stakeholders and solicit their opinions.

1.2.14. Use motivational strategies to accomplish goals.

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**Outcome: 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

**Competencies**

1.4.2. Select and use software applications to locate, record, analyze and present information (e.g.,

word processing, e‐mail, spreadsheet, databases, presentation, Internet search engines).

1.4.3. Verify compliance with security rules, regulations and codes (e.g., property, privacy, access,

accuracy issues, client and patient record confidentiality) pertaining to technology specific to

the industry pathway.

1.4.4. Use system hardware to support software applications.

1.4.6. Use an electronic database to access and create business and technical information.

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**Strand 2. Human Body System**

Learners will describe the various anatomy, physiology, and pathophysiology associated with body systems and alterations related to the normal developmental process, obtain a health history, perform an evaluation of the body systems, and document using medical terminology.

**Outcome: 2.1. Human Anatomy, Physiology, and Pathophysiology**

Describe the various human body systems, alterations related to the

normal developmental process and possible dysfunctions.

**Competencies**

2.1.1. Identify body planes, directions, cavities, quadrants and regions.

2.1.3. Describe the structures and functions of the cardiovascular system and trace the path of blood and identify factors affecting blood flow.

2.1.4. Describe how blood pressure is controlled and identify factors influencing changes in blood pressure.

2.1.5. Describe the structures and functions of the respiratory system.

2.1.8. Describe the structures and functions of the digestive/excretory system.

2.1.10. Describe the structures and functions of the immune system.

2.1.14. Describe the structures and functions of the integumentary system.

2.1.15. Describe the difference between pathology and physiology and the conditions typically observed during a disease state.

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**Strand 3. Therapeutic Interventions**

Learners will assist with improving the individual's health outcome and quality of life throughout the lifespan within their scope of practice.

**Outcome: 3.2. Health Promotion Interventions**

Identify and communicate health promotion and wellness to individuals, support systems, and communities.

**Competencies**

3.2.5. Communicate relevant information to promote, maintain and restore overall wellness.

3.2.6. Communicate the medical benefits and risks associated with immunizations and other preventative care across the life span.

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**Outcome: 3.3. Pharmaceutical Interventions**

Prepare, administer, store and document medications, reactions and outcomes according to laws, regulations and authorized health care provider orders and protocols.

**Competencies**

3.3.1. Identify and define terms related to drugs, pharmacology and medicines.

3.3.2. Identify drug classifications.

3.3.6. Describe the therapeutic value of the medication being taken and how to evaluate the

individual’s outcome.

3.3.13. Identify altered mental states (e.g., hallucinogens, sensory deprivation) and corrective actions.

3.3.14. Identify fluid and electrolyte imbalances, side‐effects and adverse reactions.

3.3.15. Apply standard practices and procedures that prevent contamination of pharmaceutical products.

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**Strand 4. Assistive Care**

Learners demonstrate the skills and knowledge to provide personal assistive care for the activities of daily living to a variety of individuals across stages of development within their scope of practice.

**Outcome: 4.1. Scope of Practice**

Describe the roles and responsibilities of assistive personnel and identify the medical specialists who treat disorders of each body system.

**Competencies**

4.1.5. Identify the medical specialists who treat disorders of each body system.

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**Outcome: 4.3. Pathogenic Microorganisms, Infection Control and Infection**

Use principles of infection control to prevent the growth and spread of pathogenic microorganisms and infection.

**Competencies**

4.3.1. Describe the chain of infection.

4.3.2. Describe mechanisms for the spread of infection.

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**Strand 5. Bioscience Research and Development**

Learners will demonstrate the skills and knowledge of interpreting laboratory requests, using protective clothing and hazardous material containment, specimen collection procedures, a variety of laboratory testing and techniques and maintenance of laboratory equipment and supplies.

**Outcome: 5.3. Microbiology Testing and Technology**

Describe the morphology and process of reproduction of microorganisms important in clinical disease and biotechnology applications and perform assays as a diagnostic tool to detect the presence of a pathogen when handling and storing specimens and preservatives for biologicals.

**Competencies**

5.3.1. Explain microbial taxonomy and classification systems and use them to identify microbial

organisms.

5.3.2. Compare and contrast cellular structure and functions of prokaryotic and eukaryotic cells.

5.3.3. Differentiate between bacterial metabolism, reproduction, cell structures, and their functions.

5.3.4. Identify aerobic bacteria through morphological, physical and biochemical properties.

5.3.5. Describe the structure of viruses and differentiate between types.

5.3.6. Explain virulence, pathogenicity and the factors that contribute to pathogenicity.

5.3.7. Describe types and features of passive and active transport systems.

5.3.8. Describe molecular behavior of large molecules, including carbohydrates, lipids, proteins and nucleotides.

5.3.9. Explain how chemical energy operates major cell processes (e.g., biosynthesis, movement,

transport, growth).

5.3.10. Explain factors that affect and optimize rates of enzyme assay reactions.

5.3.11. Perform an enzyme‐linked immunosorbent assay (ELISA) and interpret the results.

5.3.12. Perform biochemical assays of proteins, lipids, carbohydrates, nucleic acids and enzymes.

5.3.13. Perform an assay for pathogen and susceptibility.

5.3.14. Describe the uses and limitations of various lab assays (e.g., HPLC, immunoassay, drainage cell, multi aspect, latex agglutination, spectrophotometry).

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| **Pathways** |  | Health Information Management | X | Medical Bioscience | X | Allied Health and Nursing | |  | Exercise Science and Sports Medicine |  | Therapeutic Services |
| **Green Practices** |  | Green-specific |  | Context-dependent | | X | Does not apply | | |  |  |

**Outcome: 5.4. Molecular and Genetic Technology**

Perform molecular and genetic applications using knowledge of nucleic acid structure and function, DNA replication, transcription, translation, chromosome structure and remodeling and regulation of gene expression in prokaryotes and eukaryotes.

**Competencies**

5.4.1. Predict and explain offspring genotypes and phenotypes using basic mode of genetics.

5.4.2. Identify complex gene expression and transmission patterns.

5.4.3. Explain and model the structure of DNA from nucleotide to chromosome.

5.4.4. Model the Central Dogma Theory.

5.4.5. Describe the processes involved in gene regulation.

5.4.6. Identify and isolate peptides and proteins.

5.4.7. Summarize the steps in creating a recombinant DNA molecule.

5.4.8. Isolate and purify nucleic acids, including chromosomal and extra‐chromosomal DNA molecules.

5.4.9. Compare nucleic acids and chromosomal DNA molecules using a sequence database.

5.4.10. Perform and interpret the results of restriction enzyme digests.

5.4.11. Apply concepts of a pedigree.

5.4.12. Perform and interpret the results of a polymerase chain reaction.

5.4.13. Use electrophoresis to separate nucleic acids and determine molecular weight.

5.4.14. Explain results from the Human Genome project and other sequencing projects and explain how gene sequencing is performed.

5.4.15. Perform gene analysis to determine the source of an isolated pathogen.

5.4.16. Explain the role of RNA and its role in gene expression.

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| **Pathways** |  | Health Information Management | X | Medical Bioscience | X | Allied Health and Nursing | |  | Exercise Science and Sports Medicine |  | Therapeutic Services |
| **Green Practices** |  | Green-specific |  | Context-dependent | | X | Does not apply | | |  |  |

**Outcome: 5.5. Laboratory Standard Operational Procedures**

Perform methods and techniques using protocols in order to conduct an experiment.

**Competencies**

5.5.5. Explain the principles of microscopy and process a specimen for light microscopy.

5.5.7. Perform separation techniques, including chemical separations (chromatography),

centrifugation, distillation and filtration and describe their principles and interpret the results.

5.5.12. Comply with industry‐based and required regulatory quality‐assurance practices (e.g., quality control [QC], Good Laboratory Practice [GLP], Good Manufacturing Practice [GMP]) for documentation.

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**Outcome: 5.6. Culturing**

Perform experimental techniques used in cell biology to study cell growth, manipulation and evaluation.

**Competencies**

5.6.2. Explain classification, composition and preparation of culture media and prepare media for

propagation.

5.6.3. Identify bacteriologic methods necessary for isolation and identification of organisms.

5.6.4. Operate basic microbiology and analytical equipment and examine biological specimens.

5.6.5. Isolate, propagate, maintain and harvest pure cell lines following standard operating procedure (SOP).

5.6.6. Verify culture cell lines and determine the cause or causes of culture failures following standard operating procedure (SOP).

5.6.7. Explain the collection and handling of fungal, mycobacterial and viral specimens following standard operating procedure (SOP).

5.6.9. Describe how vectors are used to transform host and microorganisms.

5.6.10. Correlate bacterial binary fission with generation time.

5.6.11. Describe physical factors that affect microbial growth and identify a normal bacteria

population growth curve.

5.6.12. Calculate values of cell concentration for both batch and continuous cultivation.

5.6.13. Identify hormones used to stimulate cell growth.

5.6.14. Demonstrate cryopreservation techniques by freezing and thawing cells.

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| **Pathways** |  | Health Information Management | X | Medical Bioscience | X | Allied Health and Nursing | |  | Exercise Science and Sports Medicine |  | Therapeutic Services |
| **Green Practices** |  | Green-specific |  | Context-dependent | | X | Does not apply | | |  |  |

**Outcome: 5.7. Fermentation Technology**

Describe and perform fermentation procedures.

**Competencies**

5.7.1. Maintain, classify and analyze types and classes of bioreactors and associated materials.

5.7.2. Explain the principles and importance of sterility in industrial fermentations.

5.7.3. Explain the temperature/pressure relationship of saturated steam to sterilization.

5.7.4. Explain the effect of entrapped air on sterilization effectiveness.

5.7.5. Compare sterilization methods using dry heat versus moist heat.

5.7.6. Demonstrate sterilization by micro‐filtration.

5.7.7. Explain the effect of suspended solids in fermentation media on sterilization effectiveness.

5.7.8. Describe the sources and forms of energy, the relationship between heat and temperature,

how heat is transferred and the factors that affect the rates of reaction in processing.

5.7.9. Describe the functions and physical properties of simple and complex carbohydrates, lipids

and proteins in the fermentation process.

5.7.10. Describe the roles of enzymes as catalysts and the factors that affect enzyme activity in the

fermentation process.

5.7.11. Describe the relationship of oxygen transfer rates to mass transfer.

5.7.12. Perform applications using benchtop fermentor and bioreactor systems.

5.7.13. Monitor microorganism growth and determine the viability of cells.

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| **Pathways** |  | Health Information Management | X | Medical Bioscience | X | Allied Health and Nursing | |  | Exercise Science and Sports Medicine |  | Therapeutic Services |
| **Green Practices** |  | Green-specific |  | Context-dependent | | X | Does not apply | | |  |  |

**Outcome: 5.8. Biotechnology Research and Experiments**

Conduct a problem‐based study, applying scientific methodology and using descriptive statistics to communicate and support predictions and conclusions.

**Competencies**

5.8.5. Select and apply sampling methods that appropriately represent the population to be studied.

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| **Green Practices** |  | Green-specific |  | Context-dependent | | X | Does not apply | | |  |  |

**Strand 6. Health Information Management**

Learners will demonstrate basic computer literacy, health information literacy and skills, confidentially and privacy of health records, information security and basic skills in the use of electronic health records.

**Outcome: 6.1. Health Information Literacy**

Apply principles of systems operations used to capture, retrieve and maintain information from internal and external sources.

**Competencies**

6.1.2. Differentiate between primary and secondary health data sources and databases.

6.1.4. Use health record data collection tools (e.g., electronic medical/health records, meaningful use, document templates).

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| **Pathways** |  | Health Information Management | X | Medical Bioscience | X | Allied Health and Nursing | |  | Exercise Science and Sports Medicine |  | Therapeutic Services |
| **Green Practices** |  | Green-specific |  | Context-dependent | | X | Does not apply | | |  |  |