



Bioscience Technology - Diploma

PLAR Candidate Guide

Prior Learning Assessment and Recognition (PLAR)

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Prior learning credit options at Saskatchewan Polytechnic

See [Get Credit for What you Know](#) for important information about all options to get credit for prior learning at Sask Polytech, including PLAR, transfer credit, Canadian Armed Forces credit, and equivalency credit.

How to navigate this document

This document contains links to other document sections or webpages. To return to where you were from another section in this document, press the *ALT* key and *left arrow* key at the same time. To return to this webpage from another webpage, close the other webpage or click back on the browser tab for this document.

Contents of this guide

This guide contains the following specific PLAR information and tools for this program

- A. [PLAR fees](#)
- B. [PLAR eligibility and options](#)
- C. [Dates when PLAR assessment is available](#)
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- E. [PLAR contact person](#)
- F. [Self-rating course outlines](#)

A. PLAR fees

Fees for PLAR challenges are set to cover our costs for consultation, assessment, and related administrative tasks. PLAR fees are non-refundable and non-transferrable.

The PLAR fees policy is subject to change for each new academic year. Please see the **Cost** section on the [PLAR webpage](#) for current fee information.

B. PLAR eligibility and options

To be eligible for PLAR for courses in this program, you must first apply for admission and be accepted into the program. You must also consult with the [PLAR contact person](#) and be approved for PLAR assessment.

Course pre-requisites and co-requisites

Some courses have one or more other courses that must be completed first (pre-requisite) or at the same time (co-requisite). See [course outlines](#) in this guide to identify any pre- or co-requisites for each course. Discuss with your [PLAR contact person](#) how to deal with courses with co-requisites.

Block assessment

Some programs may assess a cluster of courses together in one block, which may save you time and effort. Ask the [PLAR contact person](#) whether there are any block assessment options in this program.

C. Dates when PLAR assessment is available

PLAR assessment for this program is available from Sept 1 to June 15 in each academic year.

All PLAR assessment must be completed by June 15 of each academic year.

D. Special directions for this program

1. **Review** the [PLAR process and FAQs](#) and the information in this guide.
2. **Self-rate** your learning for each course using the [Course Outlines](#) in this guide.
3. **Consult** with the [PLAR contact person](#) for PLAR approval. Be prepared to provide your resume, course self-ratings (see [section F](#)), and a partially completed [PLAR application](#). If you are approved for PLAR, the contact person will sign your PLAR application and explain next steps.
4. **Apply** for admission to the program. See [directions](#) for applying.
5. **Register** for PLAR at Registration Services once you have signed approval on your [PLAR Application Form](#). The PLAR fee will be added to your student account.
6. **Finalize** a detailed Assessment Plan with your assigned assessor.
7. **Complete** assessment before your PLAR registration expires.

E. PLAR contact person

Contact the person below to arrange a consultation **after** you have read this guide and [general PLAR information](#) and rated yourself for each course (see next session). Consultation may be by phone, online, or in person. Be prepared to provide your resume, course self-ratings, and a partially completed [PLAR application](#). If agreement is reached to go ahead with PLAR, the contact person will sign approval on your PLAR application and explain the next steps. Admission to the program is required before you can register for PLAR.

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F. Self-rating course outlines

Clicking on a course code below opens a page where you can rate yourself on the knowledge and skills assessed for PLAR credit. For Arts & Sciences courses, clicking on the course code opens another PLAR guide. The [PLAR contact person](#) for this program will refer you to another person to discuss PLAR for courses delivered by Arts & Sciences or another program/department.

COURSE CODE	COURSE NAME	Delivered by another department/program
Semester - 1		
ANAT 183	Vertebrate Anatomy and Physiology	
ANAT 184	Vertebrate Anatomy and Physiology Lab	
CLTR 119	Indigenous Cultural Awareness	Arts & Sciences
BOTA 183	Botany	
BOTA 184	Botany Lab	
CHEM 171	General Chemistry	
CHEM 172	General Chemistry Lab	
MATH 178	Mathematics 1	Arts & Sciences
SAFE 180	Laboratory Safety	
Semester - 2		
CHEM 173	Analytical Chemistry	
CHEM 174	Analytical Chemistry Lab	
CHEM 287	Organic Chemistry	

COURSE CODE	COURSE NAME	Delivered by another department/program
TCOM 105	Communications for Technicians	Arts & Sciences
PHYSL 180	Plant Physiology	
PHYSL 181	Plant Physiology Lab	
QC 179	Quality Assurance and Control	
STAT 181	Introductory Statistics and Computer Applications 1	Arts & Sciences
Semester - 3		
ANIM 182	Care and Management of Laboratory Animals	
BIOC 281	Biochemistry	
GENE 181	Genetics	
STAT 286	Statistics and Computer Applications 2	Arts & Sciences
Semester - 4		
GENE 285	Molecular Biology 1	
GENE 286	Molecular Biology 1 Lab	
HSTC 183	Histotechniques	
LABT 182	Laboratory Preparation Techniques 1	
LABT	Introductory Analytical Instrumentation	
LABT 290	Plant Tissue Culture Lab	
LABT 291	Animal Cell Culture Lab	
MICR 282	General Microbiology 1	
MICR 283	General Microbiology 1 Lab	
Semester - 5		
COMM 289	Communications 2	Arts & Sciences
GENE 287	Molecular Biology 2	
GENE 288	Molecular Biology 2 Lab	

COURSE CODE	COURSE NAME	Delivered by another department/program
IMMU 179	Immunology	
LABT 283	Laboratory Preparation Techniques 2	
LABT	Advanced Analytical Instrumentation	
MICR 284	Applied Microbiology	
MICR 285	Applied Microbiology Lab	
Semester - 6		
PRAC 285	Laboratory Practicum	

ANAT 183 - Vertebrate Anatomy and Physiology

You will study the structure and function of the vertebrate body. You will examine animal cell and tissue types, and organ systems (including the gross anatomical features and function of organs of the integumentary, skeletal, muscular, nervous, digestive, respiratory, circulatory, endocrine and reproductive systems). You will also be introduced to the classification of animals and the characteristics of the vertebrates.

Credit unit(s): 3.0
Pre and Co Requisites: ANAT 184
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Examine the taxonomic levels used in classification methods.			
2. Examine the components and organization of the integumentary system.			
3. Examine the components, organization, and physiology of the musculoskeletal system.			
4. Relate the structure, organization, and physiology of the nervous and sensory systems.			
5. Examine the components and function of the endocrine system.			
6. Relate the components and physiology of blood and the cardiovascular and lymphatic systems.			
7. Examine the components and principles of the lymphatic and respiratory system.			
8. Relate the features of the digestive system and the function of primary digestive organs.			
9. Identify the structures and functions of the urinary and reproductive systems.			

ANAT 184 - Vertebrate Anatomy and Physiology Lab

You will study vertebrate anatomy and physiology as it relates to structure and function using the cat as a model. You will examine animal cell and tissue types and organ systems (including the gross anatomical features and function of organs of the integumentary, skeletal, muscular, nervous, digestive, respiratory, circulatory, endocrine and reproductive systems). You will be introduced to animal classification and the characteristics of vertebrates.

Credit unit(s): 3.0
Pre and Co Requisites: ANAT 183, SAFE 180
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Differentiate animals based on classification methods.			
2. Examine the components and organization of the skeletal system.			
3. Examine the components and organization of the muscular system.			
4. Examine the components of the respiratory system.			
5. Examine the components and organization of the primary digestive organs.			
6. Examine the components and organization of the urogenital system.			
7. Examine the components and organization of the circulatory system.			
8. Examine the structure and organization of the nervous system.			
9. Examine the components of sensory reception.			

CLTR 119 – Indigenous Cultural Awareness

You will gain an understanding of the diversity and richness of First Nations and Métis cultures, histories, and current issues.

Credit unit(s): 2.0
Pre and Co Requisites: ANAT 183
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Recognize pre-contact Indigenous culture.			
2. Describe the history of Métis people.			
3. Examine the impacts of the Fur Trade Era on Indigenous people.			
4. Examine the history leading to the treaties.			
5. Examine the impacts of post-contact education.			
6. Examine cultural practices.			

ANIM 182 - Care and Management of Laboratory Animals

You will study animal production, animal diets, research protocols and care and management. Laboratory experiences will allow you to practice handling, injections and sample collection in small laboratory species.

Credit unit(s): 1.0
Pre and Co Requisites: none
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Discuss the ethics and welfare issues of animal-based research.			
2. Describe the properties and maintenance of the animal facility.			
3. Describe the care and handling of common lab animals.			

BOTA 183 - Botany

You will examine anatomy and function in plants, with emphasis on the angiosperms. The course content includes: plant cells and tissues, development of the primary and secondary plant body, flowering and reproduction, and fruit and seed development. You will also distinguish the characteristics of algae, bryophytes, seedless vascular plants, and gymnosperms.

Credit unit(s): 3.0
Pre and Co Requisites: BOTA 184
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Describe plant cell structure and composition in relation to function.			
2. Examine morphogenesis and development of the cells and tissues of the plant body.			
3. Examine primary structure and development of the root and shoot.			
4. Examine secondary growth of roots and stems.			
5. Examine angiosperm reproduction and early development of the plant body.			
6. Describe the distinguishing features of algae and its potential in the bioscience field.			
7. Describe the distinguishing features of bryophytes and seedless vascular plants.			
8. Describe the distinguishing features of gymnosperm.			
9. Discuss the major cereal, oilseed, pulse, and fiber crops of Canada.			

BOTA 184 - Botany Lab

You will study plant structure and diversity, with emphasis on microscopic analysis. You will examine plant cells and tissues, primary and secondary plant growth, flowers, fruits, and seeds. You will also distinguish the characteristics of algae, bryophytes, seedless vascular plants, conifers, and crops.

Credit unit(s): 3.0
Pre and Co Requisites: BOTA 183
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Demonstrate proper use and care of a microscope.			
2. Examine plant cells, tissues, stems, leaves, and roots.			
3. Distinguish primary and secondary plant growth.			
4. Examine flower, fruit, and seed structures and types.			
5. Examine distinguishing characteristics of algae, bryophytes, seedless vascular plants, and conifers.			
6. Identify the major cereal, oilseed, and pulse crops of Canada.			

CHEM 171 - General Chemistry

You will study chemistry concepts and principles as they apply to the biosciences. You will examine the physical and chemical properties of matter. You will study chemical reactions and the thermodynamic properties of chemical reactions.

Credit unit(s): 4.0
Pre and Co Requisites: CHEM 172, MATH 178, SAFE 180
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Describe matter at the macroscopic and microscopic level.			
2. Examine the electron configuration of an atom utilizing quantum theory.			
3. Identify the electron configuration of elements to their chemical and physical properties.			
4. Establish the types and number of chemical bonds formed by atoms, and the stability of a chemical compound from the electron configuration of atoms.			
5. Differentiate properties of solids, liquids, and gases.			
6. Distinguish the properties of a gas.			
7. Interpret the role of thermodynamics in chemical reactions.			
8. Identify physical properties of solutions.			
9. Relate the concepts of entropy and energy to spontaneity and rate of reactions.			
10. Describe the equilibrium concentration of a product of a reversible chemical reaction.			
11. Identify the properties of acids, bases, salts, and buffers.			

CHEM 172 - General Chemistry Lab

You will perform chemical laboratory experiments to explore the physical and chemical properties of matter. You will study the safe handling of chemicals in the laboratory. You will study the math used in the laboratory.

Credit unit(s): 4.0
Pre and Co Requisites: CHEM 171, MATH 178, SAFE 180
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Apply the scientific method of investigating a research problem.			
2. Demonstrate laboratory safety practices.			
3. Use dimensional analysis, algebra, logarithms, and ratio and proportions to solve chemistry lab-based problems.			
4. Use the "mole" concept to solve stoichiometry problems.			
5. Solve stoichiometry problems involving chemical reactions in aqueous solutions.			
6. Identify the physical properties of a solution.			
7. Examine the properties of solids, liquids and gases.			
8. Examine the effect of temperature and reactant concentration on the rate of a chemical reaction.			
9. Identify the physical properties of solutions.			

MATH 178 - Mathematics 1

You will study the fundamental concepts of algebra. a. You will examine linear equations, variation, properties of exponents and logarithms, and graphing of functions. You will apply algebra to biological and chemical applications.

Credit unit(s): 2.0
Pre and Co Requisites: none
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Apply dimensional analysis.			
2. Apply algebra to solve equations			
3. Solve linear and quadratic equations.			
4. Apply logarithms to solve equations.			
5. Use ratio and proportion to solve equations.			

SAFE 180 - Laboratory Safety

You will study topics related to safe working practices and procedures in the bioscience laboratory. You will examine government regulations and industrial laboratory safety guidelines.

Credit unit(s): 1.0
Pre and Co Requisites: none
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Examine provincial and federal legislation regarding hazardous substances.			
2. Examine safety equipment and the safe handling and disposal of chemicals.			
3. Identify potential safety hazards, common accidents, and reporting.			

CHEM 173 - Analytical Chemistry

You will study chemical analysis techniques. You will apply quality assurance to evaluate and standardize acids, bases, and buffers. You will use statistics to validate experimental data.

Credit unit(s): 3.0
Pre and Co Requisites: CHEM 171, CHEM 172, MATH 178
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Describe analytical techniques and their function.			
2. Determine the significance and reproducibility of experimental data using statistics.			
3. Evaluate the need for quality assurance.			
4. Examine the principles of titrimetric analysis.			
5. Examine the role of gravimetric and combustion analysis.			
6. Compare acids and bases in titrimetric analysis.			
7. Explain role of buffers in biological systems.			
8. Examine complexometric titrations.			

CHEM 174 - Analytical Chemistry Lab

You will study topics related to safe working practices and procedures in the bioscience laboratory. You will examine government regulations and industrial laboratory safety guidelines.

Credit unit(s): 3.0
Pre and Co Requisites: CHEM 171, CHEM 172, MATH 178
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Apply laboratory safety procedures.			
2. Apply quality laboratory practices.			
3. Analyze acquired data to determine significance and reproducibility using statistics.			
4. Perform gravimetric methods of analysis.			
5. Perform titrimetric methods of analysis.			
6. Prepare and standardize a solution.			
7. Analyze solutions using various titrimetric techniques.			
8. Evaluate prepared solutions and buffers.			

CHEM 287 - Organic Chemistry

You will study the chemical and physical properties of organic compounds and their applications in industrial bioscience. You will distinguish functional groups of organic molecules and their nomenclature. You will examine organic chemical reactions, stereoisomers and bonding. You will apply laboratory techniques to extract and characterize organic compounds.

Credit unit(s): 4.0
Pre and Co Requisites: CHEM 171, CHEM 172
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome	Competent	Learning	None
Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.			
1. Identify the structure and properties of aliphatic hydrocarbons.			
2. Identify the structure and properties of aromatic hydrocarbons.			
3. Identify the structure and properties of alcohols, phenols, thiols, and ethers.			
4. Identify the structure and properties of aldehydes and ketones.			
5. Identify the structure and properties of carboxylic acids.			
6. Identify the structure and properties of amines, amides, and esters.			
7. Apply quality laboratory practices in the safe handling of an organic compounds.			
8. Perform extractions of organic compounds from samples.			
9. Perform physical separations of organic compounds.			
10. Examine mixtures of organic compounds using chromatography techniques.			
11. Examine stereoisomers using laboratory techniques.			

TCOM 105 – Communications for Technicians

You will learn and practice written, oral and interpersonal communication for the workplace. You will apply these skills as team members and in short presentations. You will also develop effective job search strategies.

Credit unit(s): 2.0
Pre and Co Requisites: none
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Apply job-related communication strategies.			
2. Produce job-related written communication.			
3. Implement teamwork skills.			
4. Implement presentation skills.			
5. Use job search skills.			

PYSL 180 - Plant Physiology

You will examine plant function and interactions with the environment. You will identify plant tissue and cellular function with respect to plant growth regulators, mineral nutrition, water, and environmental factors. You will examine plant metabolism including cellular respiration and photosynthesis reactions.

Credit unit(s): 3.0
Pre and Co Requisites: BOTA 183, PYSL 181
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Discuss the mechanisms and regulatory factors of plant growth and development.			
2. Examine the types and functions of plant growth regulators.			
3. Examine the effect of external factors on plant growth and development.			
4. Describe the flow of energy in the cell.			
5. Examine cellular respiration.			
6. Examine the production of energy via photosynthesis.			
7. Examine mineral nutrition requirements for plants.			
8. Identify the movement of water and solutes in the plant.			
9. Examine major insect pests of greenhouse crops, canola, and wheat.			

PYSL 181 - Plant Physiology Lab

You will examine the effects of plant growth regulators, gravity, light, and mineral deficiency on plants. You will perform experiments as it relates to osmosis, respiration, and photosynthesis. You will manage plants in growth chambers.

Credit unit(s): 3.0
Pre and Co Requisites: BOTA 184, PYSL 180
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Develop a laboratory notebook for experiments.			
2. Perform experiments to analyze cellular respiration and photosynthesis in plants.			
3. Perform a plant breeding experiment.			
4. Perform experiments to examine the effects of light and gravity on plant growth and development.			
5. Perform experiments to examine the effects of plant growth regulators on growth and development of flowering plants.			
6. Perform experiments to determine mineral and water deficiency in plants.			
7. Examine the movement of water and solutes in plants.			
8. Manage plants in a growth chamber.			

QC 179 - Quality Assurance and Control

You will study quality management as it applies to bioscience. You will examine quality control practices in research, development, testing, and manufacture in food production. You will examine professional ethics and conduct.

Credit unit(s): 4.0
Pre and Co Requisites: SAFE 180
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Examine quality systems in bioscience.			
2. Examine quality systems found in research and safety testing in biosciences.			
3. Discuss ethics in the biosciences.			
4. Examine professional conduct in bioscience.			
5. Examine quality practices in a research and development setting.			
6. Examine documentation in quality systems.			
7. Design a Hazard Analysis and Critical Control Point (HACCP) plan for food production.			
8. Examine Good Laboratory Practice (GLP) in nonclinical safety testing.			
9. Perform a laboratory audit.			
10. Examine Good Manufacturing Practice (GMP) as regulated by Health Canada.			

STAT 181 - Introductory Statistics and Computer Applications 1

You will be introduced to elementary probability theory. You will study frequency distributions, measures of central tendency, and variability. You will study sampling theory and statistical applications in bioscience. You will use spreadsheets to assist in learning the statistical concepts.

Credit unit(s): 3.0
Pre and Co Requisites: MATH 178
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Use the principles of introductory statistics in scientific investigation.			
2. Apply basic statistics on populations and probability distributions related to bioscience and chemical technology.			
3. Apply random sampling techniques to general science and engineering studies.			
4. Apply distributions based on samples.			
5. Use regression and correlation analysis.			
6. Use Excel to perform statistical computations.			

BIOC 281 - Biochemistry

You will study the fundamental biological compounds including carbohydrates, lipids, proteins and nucleic acids. You will study the structure of biomolecules as it relates to biological function. You will study metabolic pathways of the cells and tissues. You will perform analytical and biochemical techniques in biosciences.

Credit unit(s): 4.0
Pre and Co Requisites: CHEM 287
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.	Competent	Learning	None
1. Examine the structure and biological function of carbohydrates.			
2. Examine the structure and biological function of lipids.			
3. Examine the structure and properties of amino acids.			
4. Examine the structure and biological function of proteins.			
5. Discuss enzymes as biological catalysts.			
6. Identify the metabolic pathways in cells and tissues.			
7. Examine carbohydrates using chemical and chromatographic methods.			
8. Examine lipids using chromatography.			
9. Examine proteins using instrumentation.			
10. Perform an enzyme assay			
11. Examine proteins using PolyAcrylamide Gel Electrophoresis PAGE.			

GENE 181 - Genetics

You will be introduced to transmission, cellular, population and molecular genetics. You will explore Mendelian principles, modes of inheritance, cell division, chromosomes, population dynamics, genes, the genetic code of nucleic acids, gene expression and recombinant Deoxyribonucleic Acid (DNA) technology.

Credit unit(s): 4.0
Pre and Co Requisites: none
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Examine the principles of transmission genetics and inheritance.			
2. Examine monohybrid and dihybrid problems and pedigrees.			
3. Examine the principles of reproduction and growth through the study of cell division.			
4. Identify the principles of sex determination and sex linkage.			
5. Examine linkage and chromosome mapping.			
6. Examine the effects of chromosomal number and structure.			
7. Examine the principles of population genetics.			
8. Describe gene structure and replication in the transmission of hereditary traits.			
9. Examine the principles of information flow from genes to proteins.			
10. Discuss the principles of recombinant Deoxyribonucleic Acid (DNA) technology.			

STAT 286 - Statistics and Computer Applications 2

You will apply statistical concepts including confidence intervals, hypothesis testing, regression and correlation analysis, and categorical data analysis. You will study analysis of variance and non-parametric tests. You will use statistical programs and spreadsheets in the study of statistical applications.

Credit unit(s): 3.0
Pre and Co Requisites: STAT 181
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Apply statistical techniques to advanced problem solving.			
2. Apply hypothesis testing to problem solving in technological fields.			
3. Apply analysis of variance in problem solving in technological fields.			
4. Apply non-parametric methods in a general science setting.			
5. Use Excel to perform advanced statistical computations.			

GENE 285 - Molecular Biology 1

You will study deoxyribonucleic acid (DNA) synthesis methods, transcription and translation in eukaryotes and prokaryotes. You will examine bacterial transcription and regulation of gene expression. You will examine cloning strategies using phage, bacteria, and yeast. You will also examine molecular biology techniques and applications of synthetic biology.

Credit unit(s): 2.0
Pre and Co Requisites: BIOG 281, GENE 181, MICR 283, GENE 286
Equivalent course(s): none

Use a checkmark (P) to rate yourself as follows for each learning outcome		Competent	Learning	None
Competent:	I can apply this outcome without direction or supervision.			
Learning:	I am still learning skills and knowledge to apply this outcome.			
None:	I have no knowledge or experience related to this outcome.			
1.	Examine the structure and biological function of nucleic acids, nucleotides and chromosomes.			
2.	Examine genes, genome content and recombination mechanisms.			
3.	Distinguish prokaryotic and eukaryotic DNA replication and DNA repair mechanisms.			
4.	Examine bacterial transcription and regulation of prokaryotic gene expression.			
5.	Examine cloning strategies and organisms used in cloning and expression.			
6.	Examine molecular biology techniques and the applications of synthetic biology.			

GENE 286 - Molecular Biology 1 Lab

You will isolate, purify, and analyze deoxyribonucleic acid (DNA) using molecular biology techniques. As part of a research project, you will construct recombinant DNA to be used for synthetic biology applications. You will study molecular biological techniques used in cloning and gene expression.

Credit unit(s): 4.0

Pre and Co Requisites: BIOC 281, GENE 181, MICR 282, MICR 283, GENE 285

Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Perform extraction and purification of eukaryotic deoxyribonucleic acid (DNA).			
2. Analyze DNA using gel electrophoresis, DNA blotting and hybridization.			
3. Analyze DNA using PCR.			
4. Manage a laboratory notebook for a research project.			
5. Design a DNA construct for an engineered synthetic organism.			
6. Perform DNA cloning and transformation in bacteria.			
7. Prepare bacterial plasmid DNA for cloning and sequencing.			
8. Analyze DNA sequences using bioinformatics.			
9. Construct a recombinant DNA plasmid for preparation of an engineered synthetic organism for the capstone research project.			

HSTC 183 - Histotechniques

You will study the principles of microtechniques including preparing plant and animal tissues for the production of permanent slides. You will identify the proper use, care and handling of tissue processing equipment, microtomes and related slide preparation equipment. You will demonstrate the use of tissue fixatives and stains, embedding, mounting and storing of paraffin sections. You will perform tissue sectioning, staining, and production of permanent slides.

Credit unit(s): 3.0
Pre and Co Requisites: ANAT 183, ANAT 184, BOTA 183, BOTA 184
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Prepare plant and animal tissues for processing.			
2. Prepare plant and animal tissues for infiltration and embedding in paraplast.			
3. Prepare sections of paraplast embedded tissues using a microtome.			
4. Describe the preparation of frozen tissues using a cryostat.			
5. Describe the preparation of plastic embedded tissues for sectioning using an ultra-microtome.			
6. Use stains and fixatives for plant and animal tissues.			
7. Prepare sections on slides for staining and processing.			
8. Prepare slides of plant and animal tissues.			

LABT 182 - Laboratory Preparation Techniques 1

You will prepare material for teaching laboratories to gain technical experience. You will prepare chemical solutions, stains, reagents and various types of culture media. You will study the operation and care of laboratory equipment, inventory procedures and ordering supplies along with general housekeeping duties required in a laboratory.

Credit unit(s): 2.0
Pre and Co Requisites: MICR 282, MICR 283
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Perform written and verbal instructions in the preparation of laboratory materials and performance of assigned duties.			
2. Demonstrate time-management skills in performance of assigned duties and the ability to work effectively as a team.			
3. Prepare a variety of media and solutions to be used in bioscience laboratories.			
4. Apply principles of sterilization and decontamination in preparation and disposal of laboratory materials.			
5. Maintain a clean, well-stocked workplace including laboratory glassware and plastic ware.			
6. Maintain accurate records of laboratory activities.			

LABT - Introductory Analytical Instrumentation

You will examine the use of spectrophotometry and electroanalysis instruments in the biosciences. You will apply basic maintenance and operating techniques for using electrodes and spectrophotometers. You will perform analysis of samples using analytical instruments to produce data. You will prepare analytical solutions and use statistics to evaluate data.

Credit unit(s): 4.0
Pre and Co Requisites: CHEM 174
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Discuss fundamentals of electrochemistry and spectrophotometry.			
2. Describe the components of electrodes and their applications.			
3. Describe the components and operation principles of ultraviolet-visible (UV-VIS) spectrophotometers.			
4. Describe the components and operating principles of atomic absorption spectrophotometers (AAS).			
5. Create calibrations for analytical instruments through the appropriate choice of external standards, matrix matching and standard addition.			
6. Validate the accuracy of analytical instruments applying appropriate quality control procedures.			
7. Perform analysis of samples using ultraviolet-visible (UV-VIS) spectrometers.			
8. Perform analysis of samples using atomic absorption spectrometry (AAS).			
9. Perform analysis of samples using electrochemical methods.			
10. Examine data produced using electrodes.			
11. Examine data produced from a UV-VIS spectrometer.			
12. Examine data produced from atomic absorption spectrometers.			

LABT 290 - Plant Tissue Culture Lab

You will examine plant tissue culture techniques. You will perform sterilization techniques, prepare plant tissue culture media, and produce plant cultures.

Credit unit(s): 2.0
Pre and Co Requisites: PYSL 180, PYSL 181, MICR 282, MICR 283
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Examine plant tissue culture media components and types of tissue culture.			
2. Demonstrate aseptic techniques while working in a laminar flow hood.			
3. Perform plant callus culture techniques.			
4. Produce micro propagated plants.			
5. Examine plant transformation techniques.			
6. Perform microspore culture techniques.			

LABT 291 - Animal Cell Culture Lab

You will prepare animal cell culture media and materials. You will study the safe handling and disposal of cell culture materials. You will maintain and subculture cell lines and prepare a primary cell culture.

Credit unit(s): 2.0
Pre and Co Requisites: ANAT 183, ANAT 184, MICR 282, MICR 283
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Demonstrate aseptic techniques and use cell culture equipment while working in a biosafety cabinet.			
2. Prepare sterile media and materials used in cell culture.			
3. Compare different cell types in cell culture.			
4. Prepare a primary cell culture and manage a cell line			
5. Perform a surface -volume cell line passage.			
6. Perform a viability count cell line passage.			

MICR 282 - General Microbiology 1

You will study the diversity of microorganisms. You will examine the characteristics of microbes including anatomy, nutrition, growth, and control. You will study methods, techniques, and the use of equipment such as microscopes.

Credit unit(s): 3.0
Pre and Co Requisites: ANAT 183, ANAT 184, LABT 182, MICR 283
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Differentiate the biological entities studied by microbiologists.			
2. Examine the use of microscopy.			
3. Examine bacterial anatomy and physiology.			
4. Examine the anatomy of archeal cells.			
5. Identify morphological characteristics of bacteria and reactions during staining.			
6. Distinguish the purposes of various types of culture media and techniques.			
7. Examine bacterial growth, reproduction, and metabolism.			
8. Examine environmental factors that affect microbial growth and cultivation.			
9. Examine principles and procedures of microbial control methods.			

MICR 283 - General Microbiology 1 Lab

You will study standard methods and techniques used in the culture, examination, and identification of microbes. You will study the characteristics of growth and control of microorganisms through application of laboratory methods for cultivation of bacteria. You will apply laboratory techniques for safely handling, isolating, and identifying bacteria.

Credit unit(s): 3.0
Pre and Co Requisites: ANAT 183, ANAT 184, LABT 182, MICR 282
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Demonstrate technical skills as required in a microbiology laboratory.			
2. Demonstrate biosafety skills as required in a microbiology laboratory.			
3. Collect samples for microbiological examination.			
4. Demonstrate the use of various types of culture media.			
5. Prepare cultures of microbes under appropriate conditions.			
6. Perform standard microbiological laboratory procedures/analyses.			
7. Evaluate data from various laboratory analyses.			
8. Apply standard microbiological analyses to identify an unknown microbe.			
9. Develop competence and professionalism in the microbiology laboratory.			

COMM 289 - Communications 2

You will study technical writing and oral presentation skills for the technologist. You will practice research methods, report writing, and oral presentation skills appropriate to the profession.

Credit unit(s): 3.0
Pre and Co Requisites: COMM 191 or TCOM 102 or TCOM 105
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Conduct research for a technical report.			
2. Create presentation-quality technical reports.			
3. Use graphics technology to illustrate technical reports and presentations.			
4. Present technical information orally.			
5. Develop short reports.			

GENE 287 - Molecular Biology 2

You will study ribonucleic acid (RNA), transcription and RNA Splicing. You will study translation, protein folding and cellular localization. You will examine regulatory RNA mechanisms of gene expression. You will apply bioinformatics to analytical data from molecular biology methods including Polymerase Chain Reaction (PCR) based techniques, Deoxyribonucleic Acid (DNA) sequencing and molecular markers. You will examine gene editing techniques such as clustered regularly interspaced palindromic repeats (CRISPR).

Credit unit(s): 2.0
Pre and Co Requisites: GENE 285, GENE 286, GENE 288
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Examine the structure and function of ribonucleic acid (RNA).			
2. Examine eukaryotic transcription and regulation of gene expression.			
3. Examine RNA splicing and post-transcriptional RNA processing.			
4. Examine RNA translation, protein folding, and cellular localization.			
5. Examine genome editing techniques.			
6. Examine molecular biology methods used to analyze nucleic acids and proteins.			

GENE 288 - Molecular Biology 2 Lab

You will study molecular biology techniques to separate, isolate and purify ribonucleic acids (RNA) and proteins. You will study polymerase chain reaction (PCR) based techniques to analyze nucleic acids. You will analyze proteins using molecular biology techniques. You will apply bioinformatics using molecular markers, real time PCR, and deoxyribonucleic acid (DNA) sequencing. You will use clustered regularly interspaced palindromic repeats (CRISPR) techniques to engineer a bacterial genome.

Credit unit(s): 4.0
Pre and Co Requisites: GENE 285, GENE 286, GENE 287
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Perform ribonucleic acid (RNA) isolation and purification.			
2. Analyze RNA quality using electrophoresis.			
3. Analyze RNA quality using reverse transcriptase polymerase chain reaction (RT-PCR).			
4. Analyze gene expression using reverse transcriptase quantitative polymerase chain reaction (RT-qPCR).			
5. Analyze deoxyribonucleic acid (DNA) using quantitative real time polymerase chain reaction (qPCR).			
6. Perform protein extraction, isolation, and purification.			
7. Examine proteins using polyacrylamide gel electrophoresis (PAGE) and blotting techniques.			
8. Analyze recombinant proteins by enzyme assay.			
9. Use clustered regularly inter- spaced palindromic repeats (CRISPR) techniques to engineer a bacterial genome.			
10. Analyze DNA sequences of genome edited bacteria.			

IMMU 179 - Immunology

You will study introductory hematology and immunity. You will study how the immune system interacts with health and disease. You will study immunological laboratory techniques and medical applications.

Credit unit(s): 3.0
Pre and Co Requisites: ANAT 183, ANAT 184
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Describe cellular, molecular and genetic mechanisms responsible for the function of the immune system.			
2. Describe the cell-mediated branch of the adaptive immune system.			
3. Diagram the anatomy of the immune response.			
4. Describe the structure and biological properties of immunoglobulins.			
5. Describe the mechanisms by which antibody diversity is generated.			
6. Describe the role of vaccines in immunity.			
7. Describe tolerance as it occurs in immunity.			
8. Describe immunological disorders and cancer as it relates to immunopathology.			
9. Describe transplantation immunology.			

LABT 283 - Laboratory Preparation Techniques 2

You will apply Laboratory Preparation Techniques. You will prepare materials for teaching laboratories and apply quality control and assurance to the documentation of laboratory activities. You will demonstrate basic supervisory and leadership skills, operate, and maintain laboratory equipment, assist with inventory and perform general laboratory duties.

Credit unit(s): 3.0

Pre and Co Requisites: LABT 182, MICR 282, MICR 283, MICR 284, MICR 285

Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Practice professional laboratory behaviour.			
2. Manage a safe, clean, and well-stocked workplace.			
3. Manage standard laboratory equipment.			
4. Prepare solutions and media for specialized laboratory settings.			
5. Perform quality assurance (QA) and quality control (QC) on materials prepared in the laboratory.			
6. Perform calculations as required in laboratory tasks.			
7. Apply elements of quality control and quality assurance to the documentation of laboratory activities.			
8. Apply basic supervisory and leadership skills.			
9. Apply industry standards and regulations for use and disposal of laboratory materials.			

LABT – Advanced Analytical Instrumentation

You will be introduced to the principles of analytical separation using gas chromatography(GC) and liquid chromatography (LC) instrumentation. You will study detection methods including mass spectrometry MS. You will examine the applications of GC and LC in the biosciences. You will study application of GC and LC techniques. You will study sample preparation for GC and LC analysis. You will examine data produced from a Gas chromatograph Mass spectrometer GC-MS.

Credit unit(s): 4.0
Pre and Co Requisites: CHEM 174 LABT AAA
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Discuss the basic theory and components of gas and liquid chromatography.			
2. Examine gas chromatography (GC) data.			
3. Examine high performance liquid chromatography (HPLC) data.			
4. Examine the application of mass spectrometers in the bioscience industry.			
5. Examine mass spectrometry (MS) data produced by GC or HPLC1.			
6. Examine the accuracy of analytical instruments using appropriate quality control procedures.			
7. Create calibration standards and samples for instrumental analysis.			
8. Apply calibrations for analytical instruments through the appropriate choice of external and internal standards, matrix matching, and standard addition.			
9. Perform analyses using gas chromatography (GS).			
10. Perform analyses using liquid chromatography.			
11. Interpret gas chromatography mass spectra data.			
12. Demonstrate the safe operation of gas chromatography (GC) and high-performance liquid chromatography (HPLC) instruments.			

MICR 284 - Applied Microbiology

You will study the application of microbiology in bioscience related areas including the environment, food production and preservation, and industrial settings. You will examine several ecosystems and the roles of microbes within them. You will study the preparation and maintenance of microbe culture collections and the role of microbes in plant pathology.

Credit unit(s): 3.0
Pre and Co Requisites: MICR 282, MICR 283, LABT 182, LABT 283, MICR 285
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Describe bacterial culture preservation.			
2. Describe methods used in microbial ecology.			
3. Describe the marine and freshwater microbial ecosystem.			
4. Describe the terrestrial microbial ecosystem.			
5. Examine types of microbial interactions in the environment.			
6. Examine the microbiology of food.			
7. Examine applied environmental microbiology.			
8. Discuss the major types of biotic diseases affecting agricultural crops.			
9. Discuss applications of microbiology in industry including bio-reaction processes and industrial fermentation.			

MICR 285 - Applied Microbiology Lab

You will study environmental sampling for microbes. You will examine bioreactors and usage. You will perform microbial analysis of environmental samples. You will document and examine collected data.

Credit unit(s): 3.0
Pre and Co Requisites: MICR 282, MICR 283, LABT 182, LABT 283, MICR 284
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Demonstrate technical skills as and biosafety skills required in a microbiology laboratory.			
2. Perform biological analyses of air, soil, and water samples.			
3. Perform sub-culturing and identification of an unknown fungus.			
4. Perform biological analyses of milk samples.			
5. Perform biological analyses of food samples.			
6. Perform biological analyses to determine the effectiveness of sanitation.			
7. Examine data from laboratory analyses.			
8. Conduct bench-scale bio-reaction processes.			
9. Demonstrate competence and professionalism in the microbiology laboratory.			

PRAC 285 - Laboratory Practicum

Basic theoretical courses complement more advanced technique-oriented courses where emphasis will be placed on your competency in laboratory skills.

Your practicum consists of working in a private laboratory for four weeks in May. You will not be paid and you must find your own accommodation if you are placed outside of Saskatoon.

Credit unit(s): 8.0
Pre and Co Requisites: GENE 284, MMU 280, LABT 281, LABT 282, LABT 283, MICR 281
Equivalent course(s): none

<p>Use a checkmark (P) to rate yourself as follows for each learning outcome</p> <p>Competent: I can apply this outcome without direction or supervision. Learning: I am still learning skills and knowledge to apply this outcome. None: I have no knowledge or experience related to this outcome.</p>	Competent	Learning	None
1. Demonstrate general and specialized laboratory skills.			
2. Interact effectively with coworkers and preceptors.			
3. Demonstrate computer skills.			
4. Demonstrate general employability skills.			
5. Maintain quality assurance.			
6. Conduct applied research under direction.			