Bachelor of Science in Medicinal Plant Sciences

Length: **34 Months**
Credential: Bachelor of Science Degree

The Bachelor of Science in Medicinal Plant Sciences program consists of a rigorous, translational curriculum that emphasizes a foundation in chemistry, biology, physics and laboratory sciences with a focus on extraction, separation, and analysis of compounds and chemicals from plant material. Curriculum also provides a fundamental learning of cannabis extractions and concentrates. The program also provides general education coursework in advanced oral and written communication, social sciences, philosophy, and humanities. This degree prepares students for direct entry into research laboratories, clinical health sciences, medical cannabis cultivation, manufacturing and testing laboratories to perform extraction, purification and analysis of compounds from plants, quality control/quality assurance safety testing and forensic chemistry used in drug testing. In addition to attendance in all courses, students will be required to complete out-of-class assignments. These assignments include but are not limited to reading, exercises and problem solving, projects, research, papers, and presentations. A student can anticipate out-of-class activities that equal about two (2) hours for every one (1) hour of lecture, and about one (1) hour for every one (1) hour of lab. Upon successful completion of the program (see Graduation Requirements section of the catalog), students could enhance an existing laboratory science technician career, seek, or obtain entry-level employment in a medicinal plant science related field.

Program Outcomes:

At the completion of this program, students should be able to:

- Develop in-depth core knowledge in chemistry, biology, physics and laboratory sciences
- Develop advance knowledge in medicinal plant chemistry, plant physiology and kingdom
- Develop competency in extraction, separation and analysis of plant compounds
- Develop foundational knowledge in cannabis extractions and concentrates
- Advanced in-depth research, analytical and critical thinking skills

Course Code	Course Title	Contact Hours	Semester Credit Hours
Core Concentration Requirements			
BIO210	Biology	75	4.0
BIO215	Physiology	60	4.0
BIO330	Biochemistry	75	4.0
BIO350	Molecular Biology	90	4.0
BIO370	Virology / Infectious Diseases	60	4.0
BIO380	Immunology	60	4.0
ML160	Clinical Chemistry I	60	3.0
ML170	Clinical Microbiology I	60	3.0
ML210	Professional Interpening	45	3.0
ML265	Clinical Chemistry II	60	3.0
ML275	Clinical Microbiology II	60	3.0
ML240	Extractions & Concentrates Fundamentals	60	4.0
CHEM240	Chemistry	75	4.0
CHEM404	Medicinal Plant Chemistry I	75	4.0
CHEM405	Medicinal Plant Chemistry II	75	4.0
MPS410	Plant Physiology	60	4.0
MPS415	Plant Kingdom	60	4.0

PHY300	Physics I	75	4.0
ZO201	Pharmacology	45	3.0
ZO211	Microbiology	75	4.0
	Subtotal	**1,305**	**74.0**
General Education Requirements			
BIO320	Environmental Biology	45	3.0
EH102	Speech	45	3.0
EH111	College Composition	45	3.0
ENV101	Environmental Geology	45	3.0
GEN305	Advanced Written Communications	45	3.0
GEN310	Advanced Oral Communications	45	3.0
GEN325	Sociology	45	3.0
GEN330	Introduction to Philosophy	45	3.0
HY103	US History 1865 to Present	45	3.0
MS110	College Algebra	45	3.0
MS315	Statistics	60	4.0
PY101	Introduction to Psychology	45	3.0
PY202	Lifespan Development	45	3.0
ZO115	Human Anatomy and Physiology of the Structural Systems	75	4.0
ZO116	Human Anatomy and Physiology of the Organ System	75	4.0
	Subtotal	**750**	**48.0**
	Grand Total	**2,055**	**122.0**

BIO210 Biology **4 Semester Credit Hours**

Prerequisites: None

Topics covered in the course include: chemistry of life, cell structure and membranes, cellular functions (metabolism, respiration, photosynthesis, communication, and reproduction), genetics (inheritance patterns, DNA structure and function, gene expression, and biotechnology), and evolution. This course involves both lecture and lab components.

BIO215 Physiology **4 Semester Credit Hours**

Prerequisites: ZO115, ZO116

The focus of this course will be the nervous system, muscle physiology, and special senses. Discussions will include ion movement, action potentials, synapses & receptors, the central, peripheral and autonomic nervous systems, excitation-contraction coupling in skeletal muscle and the mechanisms specific to vision, hearing, smell & taste, in addition to the somatosensory system.

BIO320 Environmental Biology **3 Semester Credit Hours**

Prerequisites: None

Principles of environmental systems and ecology, including biogeochemical cycles, energy transformations, abiotic interactions, symbiotic relationships, natural resources and their management, lifestyle analysis, evolutionary trends, hazards and risks, and approaches to ecological research.

BIO330 Biochemistry **4 Semester Credit Hours**

Prerequisites: BIO210

The course discussed the major classes of biomolecules and the metabolism of these molecules. This course is designed to provide an understanding of the relationship between the components of food and the components of living organisms. Special attention is paid to biochemistry in the context of human nutrition. This course involves both lecture and lab components.

BIO350 Molecular Biology **4 Semester Credit Hours**

Prerequisites: None

A thorough examination of the basic structure and function of cells, with an emphasis on eukaryotic cell biology. The objective is to use knowledge of molecular biology to interpret results and draw conclusion about research findings and technological applications. Topics include cell-cycle growth and death; protein structure, DNA replication, repair, and recombination; gene expression; RNA processing; and molecular transport, traffic, and signaling. Discussion also

covers the application of recombinant CAN, genetic engineering, and other current molecular biology technology. This course involves both lecture and lab components.

BIO370 Viral / Infectious Diseases **4 Semester Credit Hours**

Prerequisites: None

The course is a study of infectious diseases. Attention is given to nomenclature, classification, symptomology, prevention and treat parasitic, viral, bacteria, and viral and fungal infections.

BIO380 Immunology **4 Semester Credit Hours**

Prerequisites: BIO215

This course discussed the principles of immunology including: development of the immune system, innate immunity, immunoglobulin structure and genetics, antigen-antibody reactions, the major histocompatibility complex reactions and antigen presentation, T cell receptors (genetics, structure, selection), T cell activation and effector functions, anergy and apoptosis, cytokines, phagocytic cell function, immune responses to infectious organisms and tumors, autoimmune diseases, autoimmunity, allergies, and immune deficiencies.

CHEM240 Chemistry **4 Semester Credit Hours**

Prerequisites: None

Principles of chemistry dealing with the structure of matter, periodic system, chemical bonding, formulas and equations are studied in this course. Laboratory work provides an opportunity to see the applications of these chemical principles. This course involves both lecture and lab components.

CHEM404 Medicinal Plant Chemistry I **4 Semester Credit Hours**

Prerequisites: CHEM240

Structure and chemical properties of plant secondary metabolites, including alkaloids, terpenoids and flavonoids. Students will plan their research projects and will begin cultivation of the plants they will use. They will also learn about methods of extraction, analysis of plant secondary metabolites and principles of good laboratory practice (glp). This course involves both lecture and lab components.

CHEM 405 Medicinal Plant Chemistry II **4 Semester Credit Hours**

Prerequisites: CHEM404

Medicinal properties of plant secondary metabolites, including alkaloids, terpenoids and flavonoids. In the laboratory students will extract medicinal compounds from plants, analyze them using various instrumental and chemical methods in order to complete their proposed project and present it to their peers. This course involves both lecture and lab components.

ML160 Clinical Chemistry I **3 Semester Credit Hours**

Prerequisite: None

An introduction to analytical techniques, instrumentation, and basic principles of clinical chemistry methods. Presents the theory and application of biochemical analytes, including clinical significance and normal reference ranges. This course involves both lecture and lab components.

ML170 Clinical Microbiology I **3 Semester Credit Hours**

Prerequisite: None

This course will include basic concepts of microbiology. Emphasis will be placed on cell structure and function of human, pathogenic microorganisms. Disease, resistance, and immune system function will be included. Methods of microbe control will be introduced. A student laboratory will be utilized for experiences in fundamental microbiology techniques. This course involves both lecture and lab components.

ML210 Professional Interpening **3 Semester Credit Hours**

Prerequisite: None

This course is designed to provide students principles in evaluating cannabis flower for total quality control, psychotropic effects, and variety type designation. The course will focus on cannabis origins and history, speciation controversy, strain name dilemma, cannabis anatomy, chemistry of cannabinoids and terpenes, unacceptable physical

and aroma characteristics, aroma perception technique, and predictors of psychotropic effects.

ML240 Extractions & Concentrates Fundamentals 4 **Semester Credit Hours**
Prerequisite: None
This course will provide understanding of cannabis extraction techniques and the products they produce. Emphasis will be placed on extraction methods including solvent extractions, ethanol, hydrocarbon, CO2, solventless/mechanical extractions, hash/bubble hash, rosin, post-processing, solvent recovery, decarboxylation, winterization, distillation/isolation. The course will provide further understating of the types of Concentrates, and flower vs. concentrates.

ML265 Clinical Chemistry II **4 Semester Credit Hours**
Prerequisite: ML160
Expanding upon concepts learned in Clinical Chemistry I, this course further examines the principles and procedures of various tests performed in Clinical Chemistry. Integral to this course is continued explanation of the physiological basis for the test, the principle and procedure for the test, and the clinical significance of the test results, including quality control and normal values. This course involves both lecture and lab components.

ML275 Clinical Microbiology II **3 Semester Credit Hours**
Prerequisite: ML170
Expanding on concepts learned in Clinical Microbiology I, this course provides further instruction in basic microbiology with emphasis placed on viruses, fungi, and parasites. Epidemiology and infection control will be introduced. A student laboratory will be utilized for experiences in fundamental microbiology techniques. This course involves both lecture and lab components.

MPS410 Plant Physiology **4 Semester Credit Hours**

Prerequisites: CHEM240
Principles of plant nutrition, metabolism, plant water relations, transport of materials in plants and physiological aspects of plant growth and development. Methods of studying plant functions are emphasized.

MPS415 Plant Kingdom **4 Semester Credit Hours**

Prerequisites: CHEM240
A treatment of form, life cycles and evolutionary relationships of algae, fungi, bryophytes and vascular plants.

MS315 Statistics **4 Semester Credit Hours**
Prerequisites: MS110
This course studies the theory of statistics. Estimation, with a focus on properties of sufficient statistics and maximum likelihood estimators. Hypothesis testing, with a focus on likelihood ratio tests and the consequent development of "t" tests and hypothesis tests in regression and ANOVA.

PHY300 Physics I **4 Semester Credit Hours**
Prerequisites: None
This course discusses the topics of mechanics, heat, wave motion, and vibration. This course involves both lecture and lab components.

ZO115 Human Anatomy and Physiology of the Structural Systems **4 Semester Credit Hours**
Prerequisite: None
In this course, basic bio-organization and six areas of the body structural systems are studied. The gross and microscopic structures and function of integumentary system, skeletal system, muscular system, nervous system, endocrine system and special senses are explored. Emphasis is placed on the diseases and diagnostic procedures related to each of these systems. This course involves both lecture and lab components.

ZO116 Human Anatomy and Physiology of the Organ Systems **4 Semester Credit Hours**
Prerequisite: None

The gross and microscopic structures and function of the blood, the male and female reproductive systems, cardiovascular system, lymphatic system, respiratory system, digestive system, and urinary system are explored. Emphasis is placed on the diseases and diagnostic procedures related to each system. This course involves both lecture and lab components.

ZO201 Pharmacology **3 Semester Credit Hours**

Prerequisites: ZO101

This course presents the student with general concepts of pharmacology and drug administration throughout the life span. Basic information about drug classifications, drug side effects, drug interactions, the use and abuse of drugs and drug reactions is covered. Emphasis is placed on the mechanism of action and effect of commonly prescribed drugs for each body system. The metric and apothecary systems, dosage applications/calculations, prescription translation, and charting will also help develop the course.

ZO211 Microbiology **4 Semester Credit Hours**

Prerequisite: ZO115, ZO116.

This course uses biological principles to help the student understand microorganisms as they relate to health sciences. Learning is focused on the metabolism, the environment, and the genetics of microorganisms. Topics include the body's response to microorganisms, disease, and the body's defense mechanisms, the infection cycle, and transmission from host to host. Chemistry is integrated for understanding the enzymatic functions and microbial physiology. This course includes a laboratory which explores the physiological, nutritional, and environmental needs of bacteria and fungi. Sterilization techniques, the use of the microscope, and the antibiotic susceptibility of bacteria are also studied. Laboratory activities include cultivation techniques, microscopy, biochemical assays, immunoassays and identification. This course involves both lecture and lab components.