SPECIALIZATIONS IN BIOSYSTEMS ENGINEERING

Student's accepted between 2016-2020

BIOMEDICAL

Group A: Sciences Electives - must complete both

Course #	Course Title	Cr Hr	Yr Taken	GRADE
BIOL 1410	Anatomy of the Human Body	3		
BIOL 1412	Physiology of the Human Body	3		

Group C: Complementary Studies - Select 2 Courses

Course #	Course Title	Cr Hr	Yr Taken	GRADE
ENG 1900	Occupational Health and Safety Awareness	3		
ENVR 3400	Introduction to Environment and Health	3		
HIST 4660	History of Health and Disease	6		
HIST 4680	Social History of Health & Disease in Modern CDN	6		
HNSC 1210	Nutrition for Health and Changing Lifestyles	3		
INDG 3240	Indigenous Medicine and Health	3		
KPER 1200	Physical Activity, Health and Wellness	3		
PHIL 2740	Ethics and Biomedicine	3		

Group B: BIOE Design Electives - Select 3 Courses

Course #	Course Title	Cr Hr	Yr Taken	GRADE
BIOE 4414	Imaging & Spectroscopy	4		
BIOE 4610	Assistive Technology Devices	4		
BIOE 4640	Bioengineering Application	4		
BIOE 4650	Textiles in Healthcare and Medical Applications	4		

Group D: Free Electives - Select 2 Courses*

Course #	Course Title	Cr Hr	Yr Taken	GRADE
BIOL 2410	Human Physiology 1	3		
BIOL 2420	Human Physiology 2	3		
BIOL 4470	Physiology of Excitable Cells	3		
CHEM 2100	Organic Chemistry 1: Foundations of Organic Chemistry	3		
CHEM 2700	Biochemistry 1: Biomolecules and an Introduction to Metabolic Energy	3		
CHEM 2710	Biochemistry 2: Catabolism, Synthesis, and Information Pathways	3		
ECE 4610	Biomedical Instrumentation and Signal Processing	4		
KPER 2330	Biomechanics	3		
KIN 4330	Advanced Biomechanics	3		
MECH 4322	Design of Biomechanical Devices (T03)	4		
MECH 4832	Biomaterials in Biomedical Engineering	4		
PHYS 3220	Medical Physics and Physiological Measurement	3		
PHYS 4400	Linear Systems for Imaging	3		

BIORESOURCE

Group A: Sciences Electives - 2 Courses to Complete

Must complete the following course

Course #	Course Title	Cr Hr	Yr Taken	GRADE
SOIL 4060	Physical Properties of Soils	3		

Select 1 Course

BIOE 2600	Plant and Animal Physiology for Engineers	4		
ANSC 3530	The Animal and its Environment	3		
PLNT 2510	Fundamentals of Horticulture	3		

Group C: Complementary Studies - Select 2 Courses

Course #	Course Title	Cr Hr	Yr Taken	GRADE
ABIZ 1000	Introduction to Agribusiness Management	3		
ABIZ 1010	Economics of World Food Issues and Policies	3		
ABIZ 3530	Farm Management	3		
FOOD 1000	Food Safety Today and Tomorrow	3		
GEOG 2520	Geography of Natural Resources	3		

Group B: BIOE Design Electives - Select 3 Courses

Course #	Course Title	Cr Hr	Yr Taken	GRADE
BIOE 4390	Unit Operations 1	4		
BIOE 4412	Light-Frame Building	4		
BIOE 4420	Crop Preservation	4		
BIOE 4440	Bioprocessing for Biorefin	4		
BIOE 4560	Structural Design in Wood	4		
BIOE 4590	Management By-Product	4		
BIOE 4600	Water Management System	4		

Group D: Free Electives - Select 2 Courses*

Course #	Course Title	Cr Hr	Yr Taken	GRADE
AGRI 1600	Introduction to Agrifood Systems	3		
BIOE 2090	Machinery for Agricultural Production	4		
BIOE 2222	Precision Agriculture Concepts and Applications	4		
ENTM 3170	Crop Protection Entomology	3		
FOOD 3010	Food Process 1	3		
FOOD 4260	Water Management in Food Processing	3		
PLNT 2500	Crop Production	3		
PLNT 2510	Fundamentals of Horticulture ᵗ	3		
PLNT 3560	Organic Crop Production on the Prairies	3		
SOIL 3520	Pesticides: Environment, Economics and Ethics	3		

ᵗ PLNT 2510 can be counted as a free elective if ANSC 3530 or BIOE 2600 is taken.

ENVIRONMENTAL

Group A: Sciences Electives - 2 courses to complete

Must complete the following course

Course #	Course Title	Cr Hr	Yr Taken	GRADE
SOIL 4060	Physical Properties of Soils	3		

Select 1 course

BIOE 2600	Plant and Animal Physiology for Engineers	4		
AGEC 2370	Principles of Ecology	3		
BIOL 2300	Principles of Ecology	3		

Group C: Complementary Studies - Select 2 Courses

Course #	Course Title	Cr Hr	Yr Taken	GRADE
ABIZ 2390	Introduction to Environmental Economics	3		
ENVR 1000	Environmental Science 1 - Concepts	3		
ENVR 2000	Environmental Science 2 - Issues	4		
ENVR 2810	Envir. Critical Thinking and Scientific Research	4		
ENVR 3160	Environmental Responsibilities and the Law	4		
ENVR 3400	Introduction to Environment and Health	3		
ENVR 3750	Green Building and Planning	3		
ENVR 3850	Sustainable Manitoba (A)	3		
ENVR 4050	Ecosystem Management	3		
ENVR 4400	Advanced Issues in Environment and Health	3		
GEOG 2520	Geography of Natural Resources	3		
PHIL 2750	Ethics and the Environment	3		

Group B: BIOE Design Electives - Select 3 Courses

Course #	Course Title	Cr Hr	Yr Taken	GRADE
BIOE 4412	Design of Light-Frame Building Systems	4		
BIOE 4460	Air Pollution Assessment	4		
BIOE 4590	Management By-Product	4		
BIOE 4600	Water Management System	4		
BIOE 4620	Remediation Engineering	4		

Group D: Free Electives - Select 2 Courses*

Course #	Course Title	Cr Hr	Yr Taken	GRADE
AGEC 2370	Principles of Ecology ᵗ	3		
CIVL 3690	Environmental Engineering Analysis	4		
CIVL 3700	Environmental Engineering Design	4		
CIVL 4350	Hazardous Waste Treatment	4		
ENVR 2550	Environmental Chemistry	3		
ENVR 3110	Environmental Conservation and Restoration	3		
GEOG 3730	Geographic Information Systems	3		

ᵗ AGEC 2370 can be counted as a free elective if BIOE 2600 is taken.

*Note: additional courses taken from Group B or C can be used to fulfill Group D electives.

Last updated: June 2022

BIOSYSTEMS ENGINEERING DESIGN ELECTIVES

Students are required to take 3 BIOE design electives. Specific courses are required if a Specialization is
BIOE design electives are typically offered in a two-year rotation. The department will ensure that design electives satisfying each of the three specializations are offered each academic year.

BIOE Design Electives (General Program)			
Course #	**Course Title**	**CH**	**Prerequisites**
BIOE 4390	Unit Operations 1	4	BIOE 2790, BIOE 3320 (co-req), BIOE 3270 (co-req)
BIOE 4412	Design of Light-Frame Building	4	BIOE 2110, BIOE 3590
BIOE 4414	Imaging & Spectroscopy for Biosystems	4	BIOE 3270
BIOE 4420	Crop Preservation	4	BIOE 2110
BIOE 4440	Bioprocessing for Biorefin	4	BIOE 2110, BIOE 3320 (co-req)
BIOE 4460	Air Pollution Assessment & Management	4	BIOE 2790 or MECH 2262
BIOE 4560	Structural Design in Wood	4	BIOE 3590 or CIVL 3770
BIOE 4590	Management of By-Products from Animal Production	4	BIOE 2790 or MECH 2262
BIOE 4600	Design of Water Management System	4	SOIL 4060 or CIVL 3730
BIOE 4610	Design of Assistive Technology Devices	4	BIOL 1412
BIOE 4620	Remediation Engineering	4	BIOE 2790
BIOE 4640	Bioengineering Applications in Medicine	4	BIOL 1410, BIOL 1412, BIOE 3320
BIOE 4650	Textiles in Healthcare and Medical Applications	4	BIOE 2590, BIOE 3320 (co-req)

Biomedical Specialization Design Electives (select 3 courses)			
Course #	**Course Title**	**CH**	**Prerequisites**
BIOE 4414	Imaging & Spectroscopy for Biosystems	4	BIOE 3270
BIOE 4610	Design of Assistive Technology Devices	4	BIOL 1412
BIOE 4640	Bioengineering Applications in Medicine	4	BIOL 1410, BIOL 1412, BIOE 3320
BIOE 4650	Textiles in Healthcare and Medical Applications	4	BIOE 2590, BIOE 3320 (co-req)

Bioresource Specialization Design Electives (select 3 courses)			
Course #	**Course Title**	**CH**	**Prerequisites**
BIOE 4390	Unit Operations 1	4	BIOE 2790, BIOE 3320 (co-req), BIOE 3270 (co-req)
BIOE 4412	Design of Light-Frame Building	4	BIOE 2110, BIOE 3590
BIOE 4420	Crop Preservation	4	BIOE 2110
BIOE 4440	Bioprocessing for Biorefining	4	BIOE 2110, BIOE 3320 (co-req)
BIOE 4560	Structural Design in Wood	4	BIOE 3590 or CIVL 3770
BIOE 4590	Management of By-Products from Animal Production	4	BIOE 2790
BIOE 4600	Design of Water Management System	4	SOIL 4060 or CIVL 3730

Environmental Specialization Design Electives (select 3 courses)			
Course #	**Course Title**	**CH**	**Prerequisites**
BIOE 4412	Design of Light-Frame Building	4	BIOE 2110, BIOE 3590
BIOE 4460	Air Pollution Assessment & Management	4	BIOE 2790 or MECH 2262
BIOE 4590	Management By-Products from Animal Production	4	BIOE 2790 or MECH 2262
BIOE 4600	Design of Water Management System	4	SOIL 4060 or CIVL 3730
BIOE 4620	Remediation Engineering	4	BIOE 2790 or MECH 2262

Revised: May 30, 2023