

LIFE SCIENCES – SPECIALIZATION (SCIENCE) – BACHELOR OF SCIENCE (HONOURS)

LISC-P-BSH [----]-O (where [----] is a Life Science Sub-Plan)

Subject: Administered by the Associate Dean, (Life Sciences and Biochemistry).

Plan: Consists of 57.00 core units and 27.00 – 36.00 units in one Sub-Plan, as described below.

Program: The Plan, with sufficient electives to total 120.00 units, will lead to a Bachelor of Science (Honours) Degree.

Note: Requirements for this program have been modified. Please consult the 2023-2024 Calendar (<https://queensu-ca-public.courseleaf.com/archive/2023-2024/>) for the previous requirements.

Code	Title	Units
1. Core		
A. Complete the following:		
BIOL 102	Fundamentals of Biology: Molecular and Cell Biology	3.00
BIOL 103	Fundamentals of Biology: Organisms to Ecosystems	3.00
B. Complete 6.00 units from the following:		6.00
CHEM 109 & CHEM 110	General Chemistry I: From Atoms to Matter and General Chemistry II: Thermodynamics and Kinetics	
or		
CHEM 112	General Chemistry	
C. Complete 3.00 units from the following:		3.00
BCHM 102	Introduction to Biochemistry	
PATH 120	Understanding Human Disease in the 21st Century	
D. Complete the following:		
CISC 151	Elements of Computing with Data Analytics	3.00
E. Complete the following:		
ANAT 215	Principles of Human Morphology I	3.00
ANAT 216	Principles of Human Morphology II	3.00
F. Complete the following:		
BCHM 218	Molecular Biology	3.00
G. Complete the following:		
CHEM 281	General Organic Chemistry I (with Virtual Laboratory)	3.00
CHEM 282	General Organic Chemistry II	3.00
H. Complete 3.00 units from the following:		3.00

MICR 221	Fundamental Microbiology	
MICR 271	Introduction to Microbiology	
I. Complete the following:		
PHGY 215	Principles of Mammalian Physiology I	3.00
PHGY 216	Principles of Mammalian Physiology II	3.00
J. Complete 3.00 units from the following:		3.00
BIOL 243	Introduction to Statistics	
STAM 200	Introduction to Statistics	
STAT 263	Introduction to Statistics	
K. Complete the following:		
PHAR 370	Fundamentals of Pharmacology and Therapeutics	3.00
L. Complete 3.00 units from the following:		3.00
MICR at the 300-level or above		
2. Sub-Plans		
A. Complete one of the following Sub-Plans:		27.00-36.00
i. Biomedical Discovery (BMDS-O) (36.00 units)		
ii. Biomedical Sciences (BMSS-O) (27.00 units)		
iii. Cancer Research (CANC-O) (36.00 units)		
iv. Cardiorespiratory Science (CRSS-O) (36.00 units)		
v. Drug Discovery and Human Toxicology (DDHT-O) (36.00 units)		
vi. Neuroscience (NSCI-O) (36.00 units)		
3. Supporting		
A. Complete the following:		
MATH 130	Mathematics for Biochemistry and Life Sciences	3.00
B. Complete the following:		
PHYS 115	Introduction to Physics I	3.00
Total Units		84.00-93.00

Sub-Plans

i. Biomedical Discovery (BMDS-O) (36.00 units)

Code	Title	Units
1. Core		
a. Complete the following:		
BCHM 315	Proteins and Enzymes	3.00
BCHM 316	Metabolism	3.00
b. Complete 12.00 units from the following:		12.00



ANAT 499	Research Project in Anatomy and Cell Biology
CANC 499	Research Project in Cancer Biology and Genetics
EPID 499	Research Project in Epidemiology
MICR 499	Research Project in Microbiology and Immunology
NSCI 499	Research Project in Neuroscience
PATH 499	Research Project in Pathology
PHGY 499	Research Project in Physiology
PHAR 499	Research Project in Pharmacology and Toxicology
REPD 499	Research Project in Reproduction and Development

2. Option

a. Complete 3.00 units from the following course list: 3.00

LISC_List_M

b. Complete 9.00 units from the following course list: 9.00

LISC_List_C at the 300-level or above

c. Complete 6.00 units from the following course list: 6.00

LISC_List_C at the 200-level or above

Total Units 36.00

ii. Biomedical Sciences (BMSS-O) (27.00 units)

Code	Title	Units
1. Core		
a. Complete the following:		
BCHM 315	Proteins and Enzymes	3.00
BCHM 316	Metabolism	3.00
2. Option		
a. Complete 12.00 units from the following course lists:		12.00
LISC_List_D at the 400-level or above		
LISC_Labs_E at the 400-level or above		
b. Complete 9.00 units from the following course lists:		9.00
LISC_List_D		
LISC_Labs_E		
3. Additional Requirements		
a. 6.00 units must be from LISC_Labs_E		
Total Units		27.00

iii. Cancer Research (CANC-O) (36.00 units)

Code	Title	Units
1. Core		
a. Complete the following:		
BCHM 315	Proteins and Enzymes	3.00
BCHM 316	Metabolism	3.00
b. Complete the following:		
CANC 440	Cancer Biology and Therapeutics	3.00
c. Complete the following:		
CANC 499	Research Project in Cancer Biology and Genetics	12.00
2. Option		
a. Complete 3.00 units from the following:		3.00
LISC_List_M		
b. Complete 6.00 units from the following course list:		6.00
LISC_List_F at the 400-level		
c. Complete 6.00 units from the following course list:		6.00
LISC_List_F		
Total Units		36.00

iv. Cardiorespiratory Science (CRSS-O) (36.00 units)

Code	Title	Units
1. Core		
a. Complete the following:		
BCHM 315	Proteins and Enzymes	3.00
BCHM 316	Metabolism	3.00
b. Complete the following:		
PHGY 355	Biomedical Respiratory Physiology	3.00
c. Complete 6.00 units from the following:		6.00
CRSS 453 Principles in Cardiorespiratory Science I		
CRSS 454 Cardiovascular Sciences		
CRSS 456 Molecular and Cellular Basis of Cardiovascular Disease		
d. Complete 12.00 units from the following:		12.00
ANAT 499	Research Project in Anatomy and Cell Biology	
PATH 499	Research Project in Pathology	
PHAR 499	Research Project in Pharmacology and Toxicology	
PHGY 499	Research Project in Physiology	
2. Option		
a. Complete 3.00 units from the following course list:		3.00
LISC_List_M		

b. Complete 6.00 units from the following course list: 6.00

LISC_List_G	
Total Units	36.00

v. Drug Discovery and Human Toxicology (DDHT-O) (36.00 units)

Code	Title	Units
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1. Core

a. Complete the following:

BCHM 315	Proteins and Enzymes	3.00
BCHM 316	Metabolism	3.00

b. Complete 6.00 units from the following: 6.00

DDHT 459	Principles of Drug Discovery	
DDHT 460	Principles of Drug Development	
PHAR 416	Xenobiotic Disposition and Toxicity	
PHAR 480	Drug Discovery and Development	

c. Complete 12.00 units from the following: 12.00

ANAT 499	Research Project in Anatomy and Cell Biology	
CANC 499	Research Project in Cancer Biology and Genetics	
EPID 499	Research Project in Epidemiology	
MICR 499	Research Project in Microbiology and Immunology	
NSCI 499	Research Project in Neuroscience	
PATH 499	Research Project in Pathology	
PHGY 499	Research Project in Physiology	
PHAR 499	Research Project in Pharmacology and Toxicology	
REPD 499	Research Project in Reproduction and Development	

2. Option

a. Complete 3.00 units from the following: 3.00

LISC_List_M	
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b. Complete 3.00 units from the following course list: 3.00

LISC_List_J	
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c. Complete 6.00 units from the following course list: 6.00

LISC_List_K at the 200-level or above	
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Total Units	36.00
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vi. Neuroscience (NSCI-O) (36.00 units)

Code	Title	Units
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1. Core

a. Complete the following:

BCHM 315	Proteins and Enzymes	3.00
BCHM 316	Metabolism	3.00

b. Complete 3.00 units from the following: 3.00

NSCI 323	Foundational Neuroscience	
NSCI 324	Systems Neuroscience	

c. Complete the following:

NSCI 499	Research Project in Neuroscience	12.00
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2. Option

a. Complete 3.00 units from the following course list: 3.00

LISC_List_M	
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b. Complete 6.00 units from the following course list: 6.00

LISC_List_L at the 400-level	
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c. Complete 6.00 units from the following course list: 6.00

LISC_List_L	
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Total Units	36.00
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4. Additional Requirements

A. Students may take no more than 12.0 units from: ANAT 499/12.0; ANAT 599/6.0; BCHM 421/6.0; BCHM 422/6.0; BCHM 594/3.0; BCHM 595/6.0; BCHM 596/12.0; CANC 499/12.0; DISC 591/3.0; DISC 592/3.0; DISC 593/3.0; DISC 594/3.0; DISC 598/6.0; DISC 599/6.0; EPID 499/12.0; HSCI 591/3.0; HSCI 592/3.0; HSCI 593/3.0; HSCI 594/3.0; HSCI 595/3.0; HSCI 598/6.0; HSCI 599/6.0; LISC 499/12.0*; LISC 594/3.0; LISC 595/6.0; LISC 596/6.0; MICR 499/12.0; NSCI 499/12.0; PATH 499/12.0; PHAR 499/12.0; PHGY 499/12.0; REPD 499/12.0.

5. Substitutions

A. Students who have completed MATH 120 or MATH 121, may count 3.00 units towards Supporting **3.A**. The other 3.00 units will be counted towards the student's elective requirement.

B. Students who have completed PHYS 104, PHYS 106, or PHYS 118 may count 3.00 units towards Supporting **3.B**. The other 3.00 units will be counted towards the student's elective requirement.

6. Notes

A. PSYC 100 is a prerequisite for all higher-level psychology courses. Some psychology courses listed as approved science options have limited enrolments and may not be available to Life Sciences students.

B. Students wishing to take 300- and 400-level BIOL courses as options should review the prerequisites for these courses. Some upper year BIOL courses require BIOL 205 as a prerequisite which is an option under **2.C**.

C. A maximum of 6.00 units from courses offered by other Faculties and Schools may be counted toward the program



and/or Plan requirements. This includes courses in COMM, LAW, NURS, and courses offered by Smith Engineering.

Life Sciences Course Lists

The following lists contain courses offered through other Departments. In accordance with Academic Regulation 2.6 (Access to Classes), students do not have enrolment priority in all of these courses. Access to these courses may only be made available during the Open Enrolment period, and then only if space permits.

LISC_List_C

Code	Title	Units
Options in the Biomedical Discovery Sub-Plan (BMDS-O)		
ANAT, BCHM, CANC, CRSS, DDHT, EPID, LISC, MICR, NSCI, PATH, PHAR, PHGY, and REPD ¹		
BIOL 205	Mendelian and Molecular Genetics	3.00
BIOL 321	Animal Behaviour	3.00
BIOL 322	Environmental Physiology of Animals	3.00
BIOL 330	Cell Biology	3.00
BIOL 331	Analytical Genomics	3.00
BIOL 334	Comparative Biochemistry	3.00
BIOL 339	Animal Physiology	3.00
BIOL 350	Evolution and Human Affairs	3.00
BIOL 369	Sex and Evolution	3.00
BIOL 401	Experimental Approaches to Animal Physiology	3.00
BIOL 403	Experimental Techniques in Biology	3.00
BIOL 404	Techniques in Molecular Biology	3.00
BIOL 430	Molecular Genetics of Development	3.00
BIOL 441	Molecular Genetics	3.00
CHEM at the 200-level		
HLTH 323	Epidemiology	3.00
HSCI 270	Fundamentals of Health Research Methodology	3.00
HSCI 383	Advanced Research Methodologies	3.00
HSCI 483	Applied Qualitative Methods for Health Research	3.00
MATH at the 200-level		
MATH 300	Modeling Techniques in Biology	3.00
PHYS at the 200-level		
PSYC 271	Brain and Behaviour I	3.00
PSYC 305	Introduction to Comparative Cognition	3.00
PSYC 323	Laboratory in Attention	3.00
PSYC 360	The Neurobiology and Psychology of Sleep	3.00
PSYC 370	Brain and Behaviour II	3.00

PSYC 470	Advanced Topics in Behavioural Neuroscience	3.00
PSYC 471	Behavioural Pharmacology	3.00
PSYC 501	Honours Thesis	9.00

STAT at the 200-level

¹ The following courses cannot be used towards an Option requirement: ANAT 270, BCHM 270, MICR 270, PHAR 270/3.0*.

LISC_List_D

Code	Title	Units
Options in the Biomedical Sciences Sub-Plan (BMSS-O)		
ANAT, BCHM, CANC, CRSS, DDHT, EPID, LISC, MICR, NSCI, PATH, PHAR, PHGY, and REPD ¹		
BIOL 205	Mendelian and Molecular Genetics	3.00
BIOL 321	Animal Behaviour	3.00
BIOL 330	Cell Biology	3.00
BIOL 331	Analytical Genomics	3.00
BIOL 334	Comparative Biochemistry	3.00
BIOL 339	Animal Physiology	3.00
BIOL 350	Evolution and Human Affairs	3.00
BIOL 401	Experimental Approaches to Animal Physiology	3.00
BIOL 403	Experimental Techniques in Biology	3.00
BIOL 404	Techniques in Molecular Biology	3.00
BIOL 430	Molecular Genetics of Development	3.00
BIOL 431	Cellular Basis of Adaptation	3.00
BIOL 433	History and Philosophy of Biology	3.00
BIOL 441	Molecular Genetics	3.00
HSCI 270	Fundamentals of Health Research Methodology	3.00
HSCI 383	Advanced Research Methodologies	3.00
HSCI 483	Applied Qualitative Methods for Health Research	3.00
MATH 300	Modeling Techniques in Biology	3.00
PSYC 470	Advanced Topics in Behavioural Neuroscience	3.00
PSYC 471	Behavioural Pharmacology	3.00
PSYC 473	Neurobiology of Psychiatric Disorders	3.00
STAT 361	Applied Methods in Statistics I	3.00

¹ The following courses cannot be used towards an Option requirement: ANAT 270, BCHM 270, MICR 270, PHAR 270/3.0*.

LISC_Labs_E

Code	Title	Units
Laboratory Options in the Biomedical Sciences Sub-Plan (BMSS-O)		
ANAT 312	Functional Neuroanatomy	3.00
ANAT 315	The Human Musculoskeletal System	3.00
ANAT 316	The Human Visceral Systems	3.00
ANAT 391	Introduction to Cadaveric Dissection	3.00
ANAT 409	Selected Topics in Histology	3.00
ANAT 499	Research Project in Anatomy and Cell Biology	12.00
BCHM 311	General Biochemistry Laboratory	3.00
BIOL 205	Mendelian and Molecular Genetics	3.00
BIOL 212	Scientific Methods in Biology	3.00
BIOL 321	Animal Behaviour	3.00
BIOL 322	Environmental Physiology of Animals	3.00
BIOL 330	Cell Biology	3.00
BIOL 331	Analytical Genomics	3.00
BIOL 334	Comparative Biochemistry	3.00
BIOL 339	Animal Physiology	3.00
BIOL 401	Experimental Approaches to Animal Physiology	3.00
BIOL 403	Experimental Techniques in Biology	3.00
BIOL 404	Techniques in Molecular Biology	3.00
BIOL 441	Molecular Genetics	3.00
CANC 499	Research Project in Cancer Biology and Genetics	12.00
EPID 401	Biostatistical Data Analysis	3.00
EPID 499	Research Project in Epidemiology	12.00
LISC 390	Integrated Life Science Laboratory I	3.00
LISC 391	Integrated Life Sciences Laboratory	3.00
MICR 290	Antibiotic Resistance Lab	3.00
MICR 435	Advanced Prokaryotic Structure and Function	3.00
MICR 436	Microbial Genetics	3.00
MICR 499	Research Project in Microbiology and Immunology	12.00
NSCI 433	Cellular Elements of the Nervous System: Responses to Injury and Disease	3.00
NSCI 499	Research Project in Neuroscience	12.00
PATH 499	Research Project in Pathology	12.00
PHAR 499	Research Project in Pharmacology and Toxicology	12.00
PHGY 290	Investigation of Human Physiological Responses	3.00
PHGY 499	Research Project in Physiology	12.00

PSYC 305	Introduction to Comparative Cognition	3.00
PSYC 323	Laboratory in Attention	3.00
PSYC 360	The Neurobiology and Psychology of Sleep	3.00
REPD 499	Research Project in Reproduction and Development	12.00

LISC_List_F

Code	Title	Units
Options in the Cancer Research Sub-Plan (CANC-O)		
BCHM 410	Protein Structure and Function	3.00
BCHM 411	Advanced Molecular Biology	3.00
BCHM 432	The Molecular Basis of Cellular Function	3.00
BIOL 205	Mendelian and Molecular Genetics	3.00
BIOL 330	Cell Biology	3.00
BIOL 331	Analytical Genomics	3.00
BIOL 430	Molecular Genetics of Development	3.00
BIOL 441	Molecular Genetics	3.00
CANC 380	Evolutionary Biology of Cancer	3.00
CHEM 311	Mechanistic Organic Chemistry	3.00
EPID 301	Principles of Epidemiology	3.00
HSCI 270	Fundamentals of Health Research Methodology	3.00
MICR 360	Immunology	3.00
MICR 386	Fundamentals of Immunology in Health and Disease	3.00
MICR 436	Microbial Genetics	3.00
MICR 450	Principles of Molecular Virology	3.00
MICR 451	Viral Pathogenesis	3.00
MICR 461	Advanced Immunology	3.00
PATH 310	Introduction to Pathology and Molecular Medicine	3.00
PATH 411	Applied Data Science in Molecular Medicine	3.00
PATH 425	Current Topics in Human Genetics	3.00
PHAR 380	Toxicological Inquiry	3.00
PHAR 416	Xenobiotic Disposition and Toxicity	3.00
PHAR 450	Principles of General Pharmacology II	3.00
PHGY 350	Pathophysiology	3.00
PSYC 332	Health Psychology	3.00

LISC_List_G

Code	Title	Units
Options in the Cardiorespiratory Sub-Plan (CRSS-O)		
CRSS 453	Principles in Cardiorespiratory Science I	3.00
CRSS 454	Cardiovascular Sciences	3.00
CRSS 456	Molecular and Cellular Basis of Cardiovascular Disease	3.00



EPID 301	Principles of Epidemiology	3.00
HLTH 323	Epidemiology	3.00
HSCI 270	Fundamentals of Health Research Methodology	3.00
LISC 391	Integrated Life Sciences Laboratory	3.00
PHGY 350	Pathophysiology	3.00

LISC_List_J

Some of these courses may also appear on LISC_List_K. They may only be used to fulfill requirements from one list.

Code	Title	Units
Options in the Drug Development and Human Toxicology Sub-Plan (DDHT-O)		
CANC 440	Cancer Biology and Therapeutics	3.00
CHEM 213	Introduction to Chemical Analysis	3.00
CHEM 222	Methods of Structure Determination	3.00
CRSS 454	Cardiovascular Sciences	3.00
CRSS 456	Molecular and Cellular Basis of Cardiovascular Disease	3.00
EPID 301	Principles of Epidemiology	3.00
HSCI 270	Fundamentals of Health Research Methodology	3.00
HSCI 383	Advanced Research Methodologies	3.00
NSCI 414	Progress in Neuroanatomy and Neuropharmacology	3.00
PATH 310	Introduction to Pathology and Molecular Medicine	3.00
PATH 430	The Molecular Basis of Disease	3.00
PHAR 380	Toxicological Inquiry	3.00

LISC_List_K

Some of these courses may also appear on LISC_List_J. They may only be used to fulfill requirements from one list.

Code	Title	Units
Options in the Drug Discovery and Human Toxicology Sub-Plan (DDHT-O)		
ANAT, BCHM, EPID, MICR, PATH, PHAR, and PHGY ¹		
BIOL 205	Mendelian and Molecular Genetics	3.00
BIOL 321	Animal Behaviour	3.00
BIOL 322	Environmental Physiology of Animals	3.00
BIOL 330	Cell Biology	3.00
BIOL 331	Analytical Genomics	3.00
BIOL 334	Comparative Biochemistry	3.00
BIOL 339	Animal Physiology	3.00
BIOL 350	Evolution and Human Affairs	3.00

BIOL 401	Experimental Approaches to Animal Physiology	3.00
BIOL 403	Experimental Techniques in Biology	3.00
BIOL 404	Techniques in Molecular Biology	3.00
BIOL 430	Molecular Genetics of Development	3.00
BIOL 441	Molecular Genetics	3.00
CHEM 213	Introduction to Chemical Analysis	3.00
CHEM 221	Material, Solutions, and Interfaces	3.00
CHEM 222	Methods of Structure Determination	3.00
HSCI 270	Fundamentals of Health Research Methodology	3.00
HSCI 383	Advanced Research Methodologies	3.00
MATH 221	Vector Calculus	3.00
MATH 225	Ordinary Differential Equations	3.00
MATH 228	Complex Analysis	3.00
MATH 300	Modeling Techniques in Biology	3.00
NSCI 323	Foundational Neuroscience	3.00
NSCI 324	Systems Neuroscience	3.00
NSCI 422	Cellular and Molecular Neuroscience	3.00
PHYS 206	Dynamics	3.00
PHYS 216	Introduction to Astrophysics	3.00
PHYS 242	Relativity and Quanta	3.00
PSYC 271	Brain and Behaviour I	3.00
PSYC 370	Brain and Behaviour II	3.00
PSYC 375	Comparative Cognition: Animal Learning Laboratory	3.00
PSYC 470	Advanced Topics in Behavioural Neuroscience	3.00
PSYC 471	Behavioural Pharmacology	3.00
PSYC 501	Honours Thesis	9.00
STAT 268	Statistics and Probability I	3.00

¹ The following courses cannot be used towards an Option requirement: ANAT 270, BCHM 270, MICR 270, PHAR 270/3.0*, PHGY 170.

LISC_List_L

Code	Title	Units
Options in the Neuroscience Sub-Plan (NSCI-O)		
ANAT 312	Functional Neuroanatomy	3.00
LISC 300	The Process of Discovery in the Biomedical Sciences	3.00
LISC 400	Neuro-Immune Interactions in Health and Disease	3.00
LISC 426	Current Concepts in Sensorimotor Neuroscience	3.00
NSCI 323	Foundational Neuroscience	3.00

or NSCI 324	Systems Neuroscience	
NSCI 325	The Science of Psychedelics	3.00
NSCI 401	Introduction to Theoretical Neuroscience	3.00
NSCI 403	Introduction to Neuroimaging	3.00
NSCI 414	Progress in Neuroanatomy and Neuropharmacology	3.00
NSCI 422	Cellular and Molecular Neuroscience	3.00
NSCI 424	Neurodegeneration and Brain Health	3.00
NSCI 429	Disorders of the Nervous System	3.00
NSCI 433	Cellular Elements of the Nervous System: Responses to Injury and Disease	3.00
NSCI 444	Controversies in Neuroscience	3.00
NSCI 483	Neurobiology of Learning and Memory	3.00
PHGY 424	Ion Channels of Excitable Cells	3.00
PHGY 494	Neuroendocrinology	3.00
PSYC 271	Brain and Behaviour I	3.00
PSYC 370	Brain and Behaviour II	3.00
PSYC 398	Selected Topics in Psychology I	3.00
PSYC 470	Advanced Topics in Behavioural Neuroscience	3.00
PSYC 471	Behavioural Pharmacology	3.00
PSYC 473	Neurobiology of Psychiatric Disorders	3.00

LISC_List_M

Code	Title	Units
Options in the BMDS, CANC, CRSS, DDHT, and NSCI Sub-Plans		
ANAT 312	Functional Neuroanatomy	3.00
ANAT 391	Introduction to Cadaveric Dissection	3.00
ANAT 409	Selected Topics in Histology	3.00
BCHM 311	General Biochemistry Laboratory	3.00
LISC 391	Integrated Life Sciences Laboratory	3.00
MICR 290	Antibiotic Resistance Lab	3.00
PHGY 290	Investigation of Human Physiological Responses	3.00