

**HOLYOKE
COMMUNITY
COLLEGE**

&

**ELMS
COLLEGE**

**Associate in Arts, Biology Option
at Holyoke Community College, Holyoke, MA
and
Bachelor of Arts in Biology
at Elms College, Chicopee, MA**

ACADEMIC TRANSFER ARTICULATION AGREEMENT

*A.A. in Biology Option, at Holyoke Community College, Holyoke, MA
and B.A. in Biology at Elms College, Chicopee, MA*

The above institutions hereby enter into an agreement for the transfer of Holyoke Community College graduates from the *A.S. in Biology Option, Arts and Sciences* degree program into the Elms College *B.A. Biology* major in Chicopee, MA.

Objectives of this Agreement:

1. To attract qualified students from Holyoke Community College to full-time and part-time program options on campus and online at Elms College
2. To promote a seamless transition for students from Holyoke Community College's associate degree in Biology Option to part-time or full-time status in the Elms College Biology major.
3. To provide recommended program *course sequence grids and/or lists* and *course equivalency charts* approved by Holyoke Community College and Elms College as pathways to baccalaureate and master's degrees for students considering enrollment in Elms College.

Stipulations of this Agreement:

1. This articulation agreement will be in effect for five years and will be renewable for another five years by consent of Holyoke Community College and Elms College. This articulation agreement can be reviewed within 90 days after written notice by either party.
2. This agreement will apply to Holyoke Community College transfer students who have completed an Associate's degree. At the time of application, students must have a minimum grade point average of 2.0.
3. This agreement guarantees that students who earn an associate degree in the Biology Option at Holyoke Community College will enter Elms B.A. in Biology with at least 60 accepted transfer credits and third year status. Additional courses taken to satisfy major requirements must meet the standards set by the Division of Natural Sciences, Mathematics, and Technology at Elms College. Students must satisfy the core requirements of Elms College to earn the 120-credit bachelor's degree.
4. Students must complete a 45-credit residency requirement for on campus programs and a 42-credit residency requirement for online and/or accelerated 8-week programs. Elms College will accept 75 transferrable credits from HCC students enrolling in on campus programs and 78 transferrable credits from HCC students enrolling in online or accelerated 8-week programs.

5. Students complete the program as a combination of 15-week online courses and on-campus lab courses with some low-residency options.
6. Students under this agreement will be provided research opportunities within the Biology/Biotechnology departments. Students will work with the department faculty at the Elms to explore these research opportunities.
7. Elms College provides the opportunity for students with full-time status to complete their chosen bachelor's degree program within two years from the date of enrollment. Length of degree completion for part-time students varies.
8. Elms College enrolls interested students who successfully complete the Elms College bachelor's degree in Biology with a GPA of 3.5 in the Master of Biotechnology or Biomedical Sciences graduate degree.
9. This articulation agreement will be in force, and should be considered the entire agreement, until superseded by a formal contract between Elms College and Holyoke Community College that explicitly replaces this agreement.
10. Holyoke Community College students will be given transfer credit for satisfactorily completing Elms College core requirements, general education requirements, and any acceptable equivalent Biology program requirements, up to the maximum allowed for transfer or necessary to satisfy graduation requirements, at time of admission.

Review and Revision Procedures:

1. Review of this agreement shall take place at least every two years or as needed from the date of the signed agreement. Nina Theis of the Division of Natural Sciences, Mathematics, and Technology at Elms College and Mark Broadbent at HCC will be responsible for the review.
2. At the request of either party, a review of the contents or implementation of this agreement will be conducted by the programs.
3. Nina Theis and Mark Broadbent may make changes in the attached *course sequence grids and/or lists* and *course equivalency charts* accepted for Elms transfer credit without renegotiating the entire agreement.

Assistance Provisions:

1. Holyoke Community College and Elms College will list this articulation agreement on their websites and in appropriate print documents at their respective institutions.
2. Holyoke Community College and Elms College will collaborate in encouraging qualified students to participate in the biology program at Elms College by

providing the necessary assistance and supports to assure a seamless transition between the two institutions.

3. Elms College tuition and scholarship information can be found at this link by clicking the + sign next to Undergraduate Tuition & Financial Aid:
<https://www.elms.edu/financial-aid/undergraduate-tuition-financial-aid-2022/>
Elms received a STEM grant from the National Science Foundation awarding up to \$10,000 per year for students who transfer into STEM majors. This link provides more information: <https://www.elms.edu/academics/nsmt/elmsstem/>

Mutual Responsibilities:

1. Kevin Wentworth at HCC with other HCC faculty will advise students enrolled in the A.S. degree in Biology. The attached *course sequence grids and/or lists* and *course equivalency charts* for Elms College transfer credit assure maximum transfer of credits that meet the core requirements of Elms College and Biology program requirements.
2. Kevin Wentworth and the Transfer Counselor at HCC along with the Assistant Director of Admissions in Continuing Education at Elms College will advise and assist online and part-time transfer applicants in compiling the required credentials for transfer to the Elms College program. The Office of Admissions at Elms will advise and assist applicants who plan full-time study on the Elms campus.
3. Transfer applicants from Holyoke Community College applying under this agreement shall be eligible for Elms College financial aid and housing consideration as appropriate to the selected Biology program option based on full time or part time status on campus or online.
4. The final acceptance of part time and online applicants comes from the Assistant Director of Continuing Education Admissions. The final acceptance of full-time applicants to the traditional day program comes from the Director of Admissions at Elms College.

Date: March 30, 2023

ELMS COLLEGE

Harry Dumay, Ph.D., MBA



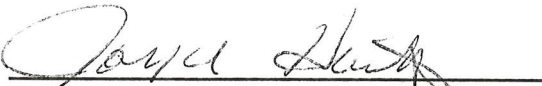
President

Walter Breau, Ph.D.



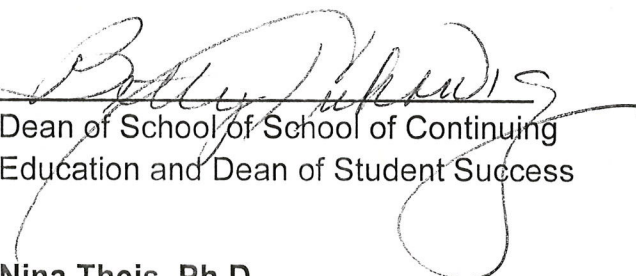
Vice President of Academic Affairs

Joyce Hampton, Ed.D.




Associate Vice President of Strategic Initiatives
Dean, School of Arts, Sciences & Prof. Studies

Elizabeth T. Hukowicz, Ed.D.



Dean of School of School of Continuing
Education and Dean of Student Success

Nina Theis, Ph.D.



Co-chair, Division of Natural Science,
Mathematics, and Technology

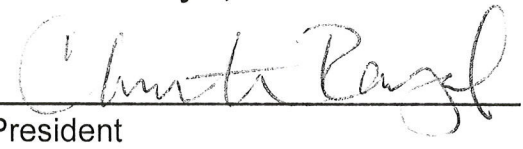
Jenna Stolarik, M.A.



Director of Admissions

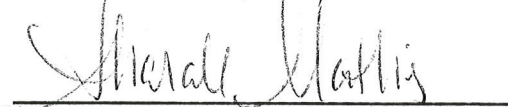
HOLYOKE COMMUNITY COLLEGE

Christina Royal, Ph.D.



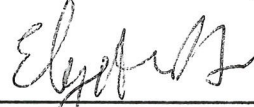
President

Sharale Mathis, Ed.D.




Vice President of Academic Affairs

Elizabeth Breton, M.S.



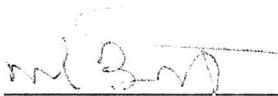
Interim Dean of Science, Technology,
Engineering, and Mathematics

Kevin Wentworth, Ph.D.



Faculty Member, Biology Department

Mark Broadbent, M.Ed.



Coordinator of Transfer Affairs and
Articulation

Holyoke Community College Articulation/Degree Completion - Biology

General Education Required Courses - 26 credits

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
ENG 101A	Composition I	3	ENG 1001	Rhetoric	3
ENG 102A	*Composition II Transfer Credit Provided	3	-	No Equivalency	-
ANT, CRJ, ECN, EDU, GEO, HON, HSV, HTH, POL, PSY, SOC, SSN, WST	Various Courses in the Social Sciences	6	SOC, ECN, PSY, SWK	Various Courses in the Social Sciences	6
ART, ASL, COM, DFS, ENG, FRH, HIS, LAX, MUS, PHI, SPA, THE	Various Courses in the Humanities	6	ENG (Literature), HIS, ART, MUS, DAN, THE, REL, PHI	3 credits in Literature 3 credits in History 3 credits in Fine or Performing Arts **3 credits in Religion 3 credits in Philosophy	15
	General Education Requirements	18		General Education Requirements	24

Program Requirements

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO 107	General Biology 1	4	BIO 1203/1203L	General Biology 1 Lecture and Lab	3 + 1
BIO 108	General Biology 2	4	BIO 1204/1204L	General Biology 2 Lecture and Lab	3 + 1
CHM 121	Chemistry for Science and Engineering I	4	CHE 1201/201L	General Chemistry 1 Lecture and Lab	3 + 1
CHM 124	Chemistry for Science and Engineering II	4	CHE 1202/1202L	General Chemistry 2 Lecture and Lab	3 + 1

MTH 142	Statistics	3	MAT 1009	Elementary Statistics	3
MTH 104, MTH 108, MTH 113	College Algebra or Precalculus or Calculus I	4	MAT 1008, MAT 1200, MAT 1301	College Math or Precalculus or Calculus 1	3
	Program Requirements Including General Biology 1 & 2	15 + 8 23		Program Requirements	22

Program Electives

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO229 or BIO 230 or *BIO 240 or BIO 242 or BIO 243	Microbiology Ecology *Cell Culture and Protein Purification Cell Biology Genetics	8	BIO 3300/3300L BIO 3101 No Equivalency BIO 3106 BIO 3201/3201L	Microbiology and Lab Ecology Transfer Credit Cell Biology Genetics and Lab	8
BIO 106 BIO 110 BIO 111 *BIO 120 BIO 130 BIO 217 BIO 218 BIO 229 BIO 230 *BIO 240 BIO 242 CHM 221 CHM 222 MTH 113 MTH 114 PHS 111 PHS 112	Introduction to Biotechnology General Botany Human Biology *General Zoology Conservation Biology Human Anatomy & Physiology 1 Human Anatomy & Physiology 2 Microbiology Ecology *Cell Culture & Protein Purification Cell Biology Organic Chemistry 1 Organic Chemistry 2 Calculus 1 Calculus 2 Physics for Engineers & Sciences 1 Physics for Engineers & Sciences 2	12	BIO 2330 BIO 2202 BIO 1005 - BIO 1100/1100L BIO 3103/3103L BIO 3104/3104L BIO 3300/3300L BIO 3101 - BIO 3106 CHE 2101/2101L CHE 2102/2102L MAT 1301 MAT 1302 PHY 1005/1005L PHY 1006/1006	Introduction to Biotechnology Plant Biology Human Applications No Equivalency/Transfer Credit Environmental Biology Anatomy & Physiology 1 & Lab Anatomy & Physiology 2 & Lab Microbiology & Lab Ecology No Equivalency/Transfer Credit Cell Biology Organic Chemistry 1 and Lab Organic Chemistry 2 and Lab Calculus 1 Calculus 2 General Physics 1 and Lab General Physics 2 and Lab	12+

Program Schedule

Semester 1 - Fall

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO 107	General Biology 1	4	BIO 1203/1203L	General Biology 1 Lecture and Lab	3 + 1
CHE 121	Chemistry for Science and Engineering 1	4	CHE 1201/1201L	General Chemistry 1 Lecture and Lab	3 + 1
ENG 101A	Composition 1	3	ENG 1001	Rhetoric	3

MTH 113	Statistics	3	MAT 1009	Elementary Statistics	3
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14 credits

Semester 2 - Spring

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO 108	General Biology 2	4	BIO 1204/1204L	General Biology 2 Lecture and Lab	3 + 1
CHM 124	Chemistry for Science and Engineering 2	4	CHE 1202/1202L	General Chemistry 2 Lecture and Lab	3 + 1
Social Science Elective	Various options (see above)	3	Social Science Elective	Various options (see above)	3
ENG 102A	*Composition II Transfer Credit Provided	3	ENG XXXX	Literature	3

14 credits

Semester 3 - Fall

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO Elective	Various options (see above)	4	BIO Elective	Various options (see above)	3 or 3 + 1
CHM 221	Organic Chemistry 1	4	CHE 2201/2201L	Organic Chemistry 1 and Lab	3 + 1
Social Science Elective	Various options (see above)	3	Social Science Elective	Various options (see above)	3
Humanities Elective	Various options (see above)	3	Humanities Elective	Various options (see above)	3

14 credits

Semester 4 - Spring

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO Elective	Various options (see above)	4	BIO Elective	Various options (see above)	3 or 3 + 1
CHM 222	Organic Chemistry 2	4	CHE 2102/2102L	Organic Chemistry 2 and Lab	3 + 1
MTH 104, MTH 108, MTH 113	College Algebra or Pre-calculus or Calculus I	4	MAT 1008, MAT 1200, MAT 1301	College Math or Pre-calculus or Calculus 1	3
Humanities Elective	Various options (see above)	3	Humanities Elective	Various options (see above)	3

15 credits

Transfer Credits = 61

Semester 5 - Fall Bachelor's Degree Completion in Biology at Elms College

Course #	Course Name	Credits
PHY 1005/1005L	General Physics 1 Lecture and Lab	3 + 1
BIO 3201/3201L	Genetics Lecture and Lab	3 + 1
BIO 4004 or BIO 3001/3001L	Biology Seminar or Developmental Biology	3 or 3 + 1
REL-XXXX	Religion Course	3

15 credits

Semester 6 - Spring Bachelor's Degree Completion in Biology at Elms College

Course #	Course Name	Credits
PHY 1006/1006L	General Physics 2 Lecture and Lab	3 + 1
BIO 3101/3101L	Ecology Lecture and Lab	3 + 1

BIO-XXXX	Biology Elective	3 + 1
HIS-XXXX	History or another Humanities Elective	3

15 credits

Semester 7 - Fall Bachelor's Degree Completion in Biology at Elms College

Course #	Course Name	Credits
BIO-XXXX	Biology Elective	3 + 1
BIO-XXXX	Biology Elective	3 + 1
BIO-XXXX	Biology Elective	3 + 1
XXX-XXXX	Fulfillment of other college required courses	3

15 credits

Semester 8 - Fall Bachelor's Degree Completion in Biology at Elms College

Course #	Course Name	Credits
BIO-XXXX	Biology Elective	3 + 1
BIO-XXXX	Biology Elective	3 + 1
BIO-XXXX	Biology Elective	3 + 1
XXX-XXXX	Fulfillment of other college required courses	3

15 credits

Total Credits = 121

Biology Courses

Required Lecture (Labs are elective credits)

BIO2210 Genetics 3 credits or BIO3201/3201L Genetics Lecture and Lab, 3 + 1 credits

BIO3101/3101L Ecology Lecture and Lab, 3 + 1 credits

BIO3001/3001L Developmental Biology Lecture and Lab, 3 + 1 credits

BIO4004 Biology Seminar, 3 credits

Elective Courses (13 credits required)

BIO1103/1103L Forensic Science Lecture and Lab, 4 credits

BIO2204/2204L Potions, Poisons, and Perfumes Lecture and Lab, 3 + 1

BIO2330/2330L Introduction to Biotechnology Lecture and Lab, 3 + 1 credits

BIO3006 Medical Terminology 3 credits

BIO3103/3103L Anatomy & Physiology 1 Lecture and Lab, 3 + 1 credits

BIO3104/3104L Anatomy & Physiology 2 Lecture and Lab, 3 + 1 credits

BIO3106 Cell Biology, 3 credits

BIO3206/3206L Molecular Biology Lecture and Lab, 3 + 1 credits

BIO3300/3300L Microbiology Lecture and Lab, 3 + 1 credits

BIO3330/3330L Advanced Biotechnology Lecture and Lab, 3 + 1 credits

BIO3305 Nutrition

BIO3400 Immunology 3 credits

BIO4306/4306L Biochemistry Lecture and Lab, 3 + 1 credits

BIO4010 Research Methods 1-2 credits

BIO4011 Research Experience 1-2 credits

Other supportive courses

CIT3100 Data Analytics, 3 credits

ENT1002 Lean LaunchPad, 3 credits

MAT1200 Pre-Calculus 3 credits

MAT1301 Calculus I 3 credits

MAT1302 Calculus II 3 credits

CHE3307/3307L Analytical Chemistry Lecture and Lab, 3 + 1 credits

BMH XXXX Courses in Bioethics and Medical Humanities, 3 credits

BMS courses (6 credit maximum count towards Masters degree)

BMS5700/5700L Histology Lecture and Lab, 3 + 1 credits

BMS 5202 Pharmacology, 3 credits

BMS 5207 Pathology, 3 credits

BMS 5009 Epidemiology & Biostatistics, 3 credits

BMS 5100 Endocrinology, 3 credits

BMS 5700 Histology, 3 credits

BMS 6300 Neuroscience, 3 credits

BMS 6402 Biology of Cancer 3 credits

COURSE DESCRIPTIONS

BIO 1103 Forensic Science Lecture and Lab, 4 credits

Forensic science by definition is the application of science to the law; the science aids law enforcement in solving crimes. Students will use documented crimes as case studies to examine the link between science and the law. Evidence will be tracked from the crime scene through the laboratory and into the courtroom. Lecture topics include the collection, preservation and analysis of biological, chemical, and trace evidence. Current issues as well as various forensic science disciplines will be explored.

BIO 2204 Potions, Poisons and Perfumes, 3 + 1 credits

The secret life of plants—plants produce an astonishing array of toxic, enticing, useful products. This course will introduce the biology of plants and explore the discovery and human use of plant products for treating diseases (such as cancer and malaria) while covering a range of topics from chemistry to biosynthesis, to interactions with other organisms. This course fulfills the Global Awareness and Communication Intensive requirements and can be taken as a chemistry elective.

From plant identification, to creating salves, to complex experiments that span the semester, this class will explore plants from a variety of vantage points. We will read original literature and plan independent projects. This course may include learning how to analyze volatile organic compounds using a GC-MS.

BIO 2210 Genetics, 3 credits

This is an introductory course in Genetics. It is designed to follow the course outline of BIO3201 at a slower pace with less complexity. It will cover classical genetics such as inheritance, Mendelian genetics, and population genetics. Molecular genetics will be mentioned but not studied.

BIO 3001/3001L Developmental Biology Lecture and Lab, 3 +1 credits

A presentation of embryonic development and differentiation in higher animals, including the human, with emphasis on underlying mechanisms, experimental and molecular aspects, and current concerns such as fetal research, cloning, genetic engineering, and stem cells. Laboratory work includes the study of normal development in live embryos, and an introduction to techniques of experimental embryology and tissue culture. From the single gametic cell to fertilization, cleavage, gastrulation up till the early formation of the nervous system, this lab will be a study of the molecular, cellular and genetic basis of early development in vertebrates and invertebrates.

BIO 3006, Medical Terminology, 3 credits

This course is an online only course in medical terminology. Students will be expected to learn terminology for all systems of the body and medical terms for pathological situations as well. There are case studies for further investigation and application of terminology. This course fulfills most programs' requirement for medical terminology.

BIO 3101/3101L Ecology Lecture and Lab, 3 + 1 credits

Ecology is the study of the patterns of distribution and abundance of organisms in space and time. We will take a hierarchical approach first looking at species then populations and communities and finally ecosystems. Special topics will include biodiversity and extinction, the human population explosion, invasive species, and monocultures. Throughout the course the impacts of climate change on each of these topics will be discussed. Field ecology and data analysis using spreadsheets is the focus of this laboratory which closely matches and reinforces the concepts covered in the lecture.

BIO 3103 Anatomy and Physiology I, 3 credits

Anatomy and Physiology I is a study of the correlation and function in the organ systems of the human body with an emphasis on homeostasis. The organ systems covered in this course include the skeletal, muscular, nervous, and integumentary systems. Developmental aspects of each system along with various pathological conditions and current clinical applications will be explored through the use of journal articles and case studies.

BIO 3103L Anatomy and Physiology 1 Lab, 1 credit

This is an introductory laboratory course for Anatomy & Physiology 1. This course assumes that the student does not have any background in Anatomy & Physiology but has had at least 1 year of biology at the college level. This course examines the cells and tissues of the body at the gross anatomical level as well as the microscopic anatomy (histology). This course integrates clinical components as the majority of students who are enrolled plan to go onto medical programs.

BIO 3104 Anatomy and Physiology II, 3 credits

Anatomy and Physiology 2 is an introductory course that builds upon the material presented in Anatomy and Physiology 1. It is designed to help the student recognize the importance of structure and function for health and normal processes of the body. This course is meant to provide a strong foundation of normal and healthy anatomy and physiology such that students will be able to better understand the disease. Topics and organ systems that will be studied include Endocrine, Cardiovascular, Digestive, Respiratory, Urinary, Metabolism, Reproductive, Pregnancy, and Human Development. There will be some discussion of pathology throughout the course.

BIO 3104L Anatomy and Physiology II Lab, 1 credit

This is an introductory laboratory course for Anatomy & Physiology 2. This course assumes that the student has taken the Anatomy & Physiology I laboratory and has had at least 1 year of biology at the college level. This course examines the cells and tissues of the body at the gross anatomical level as well as the microscopic anatomy (histology). This course does integrate clinical components as the majority of students who are enrolled plan to go onto medical programs. Students are expected to come to the laboratory prepared to study and memorize structures and their specific functions.

BIO 3106 Cell Biology, 3 credits

This course is a detailed study of the structure and function of the eukaryotic cell, with an emphasis on the cell membrane and the cytoplasmic organelles. Current concepts in cell communication, molecular targeting within cells and between cells are included in the topics of study. The laboratory will cover several techniques vital to the study of cells including histology and cell culture techniques. This course fulfills a Communication Intensive requirement. This course is offered in the fall.

BIO 2330 Introduction to Biotechnology Lecture and Lab, 3 + 1 credits

This course is an introduction to the field of biotechnology. A background in basic biotechnology concepts and disciplines. A wide range of topics will be discussed such as an introduction to genes and genomes, recombinant DNA technology, transgenic animals, and gene therapy, Proteomics and the use of protein databases and ethical issues in this area will be discussed. Students will review employment and careers in the biotechnology and biopharmaceutical industries. Introduction to Biotechnology is designed to give students the working knowledge of techniques used in the biotechnology field, emphasis will be on solution measurements, preparation, and dilution. Students will learn gel electrophoresis, sample preparation, western blots, and protein isolation.

BIO 3201/3201L Genetics Lecture and Lab, 3 + 1 credits

This is an introductory course in genetics. All aspects of genetics will be introduced including the areas of classical, population, biochemical, and molecular genetics. Transmission genetics and inheritance will be the primary focus of the course. The laboratory will carry the concepts developed in the course to the bench. Students will develop and run their own research experiment, from experimental design to data collection, and culmination of their research in a formal presentation as a research paper and PowerPoint presentation.

BIO 3206/3206L Molecular Biology Lecture and Lab, 3 + 1 credits

This is an introductory course in Molecular Biology with a focus on nucleic acid molecular biology. The course studies the physical aspects of DNA and RNA and how that affects the expression of genes and the ability for us to manipulate DNA and RNA. This introductory course in Molecular Biology focuses on manipulation of DNA for cloning, sequencing, PCR, and CRISPR experiments.

BIO 3300/3300L Microbiology Lecture and Lab, 3 + 1 credits

This is an introductory survey course in the field of microbiology, with an emphasis on clinical microbiology. Topics include the diagnosis and treatment of infectious disease caused by microbes and biological agents. Many different diseases are used to study the diagnosis, treatment, and prevention of infectious disease. Through the study of pathogens, an understanding of microbial structure and function is attained. The laboratory is reflective of the lecture. This is an introductory laboratory in Microbiology.

BIO 3305 Nutrition, 3 credits

This is an introductory course in Nutrition. This course will focus on human nutrition. This course will provide an integrated overview of the physiological requirements and functions of protein, energy, and the major vitamins and minerals that are determinants of health and diseases in human populations. The role of nutrition in growth and health through the life cycle will also be studied.

BIO 3330/3330L Advanced Biotechnology Lecture and Lab, 3 + 1 credits

This course address advanced topics in biotechnology such as Stem Cell Research, Human Genome Project, Targeted Cancer Therapies, 3D visualization and augmented reality for surgery, vaccine technology, transplant organ development, CRISPR, 3D Printed Organs.

BIO 3400 Immunology, 3 credits

This is an introductory course in Immunology. This is the study of immunological structures and functions in mammalian systems. The study of immunological organs as well as the structures of non-specific defense will be studied. The course will cover cell mediated and humoral defense mechanisms both non-specific (complement system) and specific.

BIO 4004 Biology Seminar, 3 credits

This communication-intensive course is a capstone experience for biology majors. Through student research, writing, presentations, and discussions, the course will explore in depth an important contemporary biological topic that has interdisciplinary aspects.

BIO 4010 Research Methods, 1 – 2 credits

This course will give students an introduction to independent lab research. Students will learn lab techniques and will read the literature and perform literature searches to understand the context of their work in the lab. They will also attend research seminars off campus and/or online webinars. The semester will culminate in a written research proposal.

BIO 4011 Research Experience, 1 – 2 credits

This course will give students an independent research experience. Students will read from the primary literature to understand the context of their work in the lab. They will also attend research talks. The independent research will be statistically analyzed and written up in a poster format which will be presented to the public.

BIO 4306/4306L Biochemistry Lecture and Lab, 3 + 1 credits

This course will focus on the study of chemical reactions that occur in living organisms with special emphasis on proteins, enzymes, lipids, carbohydrates, energy metabolism, acid base balance, and maintenance of homeostasis in the body. This course is vital for students planning to take standardized tests such as the MCAT. The lab focuses on protein biochemistry, specifically protein purification and analysis and enzyme function.

CHE 2101/2101L Organic Chemistry I Lecture and Lab, 3 + 1 credits

A theoretical and practical study of the chemistry of carbon compounds with particular stress on molecular structure, synthesis, and reaction mechanism. The laboratory course will focus on teaching fundamental techniques in the organic chemistry laboratory: methods to separate components of a mixture, methods to purify an impure compound and techniques for synthesizing organic compounds. The laboratory will engage students in using laboratory methods as a tool for learning about reaction mechanisms.

Prerequisites: CHE 1201-1202.

CHE 2102/2102L Organic Chemistry II Lecture and Lab, 3 + 1 credits

A study of the fundamental facts and theories of chemistry. Topics include thermochemistry, gases, liquids and solids, solutions, gas equilibria, kinetics, acids and bases, solution and precipitation equilibria, complex ions, thermodynamics. The basic techniques that were taught in CHE 2101L will be applied to more advanced applications: multi-step synthesis, mechanism studies, etc. A good portion of the lab will be devoted to a study of spectroscopic methods: IR, NMR, UV/VIS spectroscopy.

Prerequisites: CHE 1201, CHE 1202; CHE 1201L, CHE 1202L; CHE 2101 & CHE 2101L

CHE 3307, CHE 3307L Analytical Chemistry Lecture and Lab, 3 + 1 credits

An introduction to the principles and practice of inorganic quantitative analysis. CHE3307L is a laboratory course designed to accompany and reinforce the concepts covered in CHE3307 analytical chemistry lecture. This course covers analytical techniques in gravimetric analysis, titration, and spectrometry among others.

Prerequisites: CHE 1201 & 1202

CIT 3100 Data Analytics, 3 credits

This course introduces the field of Data Science and Analytics including data extraction, modeling, and visualization using Python and R programming, Tableau, and other tools.

ENT 1002 Lean LaunchPad, 3 credits

Unlike traditional lectures and case studies, Lean LaunchPad promotes experiential learning through the search and discovery process that cultivates entrepreneurial thinking. The Lean LaunchPad curriculum uses the scientific method of testing a hypothesis and applies this to a “startup” business. The goals can change depending on the audience, but overall the goal is to create an entrepreneurial experience with all of the pressures and demands of an actual early-stage startup. You will work in teams to talk to customers, partners and competitors as you encounter chaos and uncertainty of how a startup works. The best part is that before you invest significant

funds, you can find out what the customers really want and 'pivot' if necessary. This is essential for a startup. This course can also be adapted for social entrepreneurship as well.

MAT 1200 Pre-Calculus, 3 credits

A course designed to provide the student with the mathematical background needed for calculus, physics, chemistry, and biology. The course begins with a review of important algebraic concepts followed with a structured study of functions emphasizing trigonometric, exponential, and logarithmic functions.

MAT 1301 Differential Calculus, 3 credits

A study of theory of limits, continuity of a function; derivative of function; applications of derivatives. Pre-Calculus recommended prior to taking this course, but is not required.

MAT 1302 Integral Calculus, 3 credits

A study of antiderivative and definite integrals of a function, applications. Prerequisite: MAT 1301 or the consent of the instructor.

Perquisite: MAT 1301 or the consent of the instructor.

PHY 1005 General Physics 1 Lecture and Lab, 3 + 1 credits

A survey of mechanics, heat, wave motion, electricity, and modern physics. Required for all students majoring in biology, chemistry, or natural science. The exploration and application of general physics concepts, laws, theories, and principles through laboratory experimentations and analysis

PHY 1006 General Physics II Lecture and Lab, 3 +1 credits

A survey of mechanics, heat, wave motion, electricity, and modern physics. Required for all students majoring in biology, chemistry, or natural science.

Biomedical Science (BMS) courses

(6-credit maximum count towards Master's degree)

BMS 5009 Epidemiology & Biostatistics, 3 credits

This course is designed as an introductory course in epidemiology and biostatistics. The instructor might use examples from their own research work to help demonstrate the application of the epidemiology and biostatistics to actual research in the field.

BMS 5100 Endocrinology, 3 credits

A general study of the vertebrate endocrine system, including the structure of the glands, the nature and properties of hormones and hormonal secretion, and the mechanisms of hormone action.

BMS 5202 Pharmacology, 3 credits

This is an introductory course in pharmacology. It is the study of how drugs are assimilated into the body, how they are metabolized, their effects on the body, and how they are excreted. Various aspects of different drugs and their effects on different systems will be investigated. Biochemistry is a prerequisite.

BMS 5207 Pathology, 3 credits

This is an introductory course in pathology. It is a study of how various diseases affect various cells, tissues, organs, and systems of the body.

BMS 5700/5700L Histology Lecture and Lab, 3 + 1 credits

This is a lecture course in histology. It will begin at the light microscopic level of human tissues and cells and delve into the fine, ultrastructure of tissues that are studied through the electron microscope. Fluorescent microscopy will also be studied to better understand the structure and function of tissues and cells.

This is an optional laboratory course in Histology. The laboratory is where students learn the requisite ability to recognize tissues under the light microscope with additional electron microscope examples. The laboratory will also provide the opportunity for students to prepare tissues for identification and examination under the light microscope.

BMS 6300 Neuroscience, 3 credits

This is an introductory course in Neuroscience. The class is designed to cover structure and function of the brain and the nervous system, followed by more advanced aspects of neuroscience.

BMS 6402 Biology of Cancer, 3 credits

This is an online course in the biology of cancer. This course examines cancer in the human body, how cancer develops, how it is diagnosed, and how it is treated. Students should be comfortable with genetics, molecular biology, cell biology and biochemistry in order to take this course. The course is evaluated by students writing topical essays and one exam.

Prerequisites: Cell Biology, Molecular Biology and Biochemistry.