HOLYOKE COMMUNITY COLLEGE & ELMS COLLEGE

Associate in Arts, Biotechnology Option at Holyoke Community College, Holyoke, MA and Bachelor of Science in Biotechnology at Elms College, Chicopee, MA

ACADEMIC TRANFER ARTICULATION AGREEMENT

A.A in Biotechnology Option, at Holyoke Community College, Holyoke, MA and B.S. in Biotechnology at Elms College, Chicopee, MA

The above institutions hereby enter into an agreement for the transfer of Holyoke Community College graduates from the *A.A. in Biotechnology Option, Arts and Sciences* degree program into the Elms College *B.S. Biotechnology* 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 Biotechnology Option to part-time or full-time status in the Elms College Biotechnology 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 Biotechnology Option at Holyoke Community College will enter Elms B.S. in Biotechnology 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 Biotechnology with a GPA of 3.5 in the Master of Biomedical Sciences or Biotechnology 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 Biotechnology 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. Janet Williams and/or Sudad Saman 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. Janet Williams and/or Sudad Saman and Emily Rabinsky and/or her designee 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 Biotechnology 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. Emily Rabinsky at HCC with other HCC faculty will advise students enrolled in the A.S. degree in Biotechnology. 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 Biotechnology program requirements.

2. Emily Rabinsky 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 Biotechnology 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

Janet Williams, Ph.D

Professor of Biology, Director of Postbac and Master of Biomedical Sciences Programs

Sudad Saman, Ph.D.

Assistant Professor of Biology

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

Emily Rabinsky, Ph.D.

Professor of Biology

Mark Broadbent, M.Ed.

Coordinator of Transfer Affairs and Articulation

Holyoke Community College Articulation/Degree Completion Biotechnology

Semester 1

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO107	Principles of Biology 1	4	BIO1203/ BIO 1203L	General Biology 1 Lecture and Lab	3 + 1
CHM121	Chemistry for Science & Engineering Students I	4	CHE1201/1 201L	General Chemistry 1 Lecture and Lab	3 + 1
ENG101	English I	3	ENG1001	Rhetoric	3
XXX-XXX	Humanities Elective	3	XXX-XXXX	Humanities Elective	3
XXX-XXX	Social Science Elective	3	XXX-XXXX	Social Science Elective	3
	Total Credits Semester 1	**17**		**Total Credits Semester 1**	**14-17**

Semester 2

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO108	General Biology 2	4	BIO1204/ BIO 1204L	General Biology 2 Lecture and Lab	3 + 1
CHM124	Chemistry for Science & Engineering Students II	4	CHE1202/ CHE1202L	General Chemistry 2 Lecture and Lab	3 + 1
ENG102	English II	3	ENG XXXX	Literature/Reading Comprehension	3
MTH104/ 108/113	Math (College Algebra, Precalculus, Calculus)	4	MAT 1008 MAT 1301 MAT 1024	College Math Calculus Algebra/Fractions for Educators	3
	Total Credits Semester 2	**15**		**Total Credits Semester 2**	**14**

Semester 3

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO106	Introduction to Biotechnology	4	BIO2330/ BIO2330L	Introduction to Biotechnology Lecture and Lab	3 + 1
XXX-XXX	Program Elective	4	XXX-XXXX	Elective	3-4
BIO229	Microbiology	4	BIO3300/ 3300L	Microbiology Lecture and Lab	3 + 1
MTH142	Statistics	3	MAT 1009	Statistics	3
	Total Credits	**15**		**Total Credits**	**15**

Semester 4

HCC Course #	Holyoke Community College Course Name	Credits	EC Course #	Elms College Course Name	Credits
BIO240	*Cell Culture & Protein Purification Counts as a 4 credit elective	4	-	No Equivalency	-
-	Program Elective	4	BIOXXXX	Program Elective	3-4
BIO113/ CRC101	*Biotechnology Seminar/ *Career Readiness Competency Counts as a 1 credit elective	1	-	No Equivalency	-
XXX-XXX	Social Science Elective	3	XXX-XXXX	Social Science Elective	3
XXX-XXX	Humanities Elective	3	XXX-XXXX	Humanities Elective	3
	Total Credits	**15**		**Total Credits**	**15+**

62 Total Program Credits

Program Electives

Students may select 2 from the following: BIO242 (Cell Biology), BIO243 (Genetics), CHM221 (Organic Chemistry I) AND CHM222 (Organic Chemistry II), MTH108 (Pre-calculus), MTH113 (Calculus I), PHS111 (Physics I) AND PHS112 (Physics II)
*These courses will count as electives at Elms College.

Program Completion at Elms College

Bachelor's Degree Completion in Biotechnology at Elms College

Semester 5 Fall 3rd Year - 15-16 credits

Course #	Course Name	Credits
CIT 3100	Data Analytics	3
CHE 2101/ CHE 2101L	Organic Chemistry 1 Lecture and Lab (adjusted for program electives taken at HCC)	3 + 1
REL XXXX	Religion	3
XXX XXXX	Electives - Please refer to the list of elective courses for the biotechnology major	5 - 6

Semester 6 Spring 3rd Year - 15-16 credits

Course #	Course Name	Credits
BIO 3330/ BIO 3330L	Advanced Biotechnology Lecture and Lab	3 + 1
CHE 2102/ CHE 2102L	Organic Chemistry 2 Lecture and Lab (adjusted for program electives taken at HCC)	3 + 1
XXX XXXX	Electives - Please refer to the list of elective courses for the biotechnology major	6-8

Semester 7 Fall 4th Year - 15-16 credits

Course #	Course Name	Credits
PHY 1005/ PHY 1005L	General Physics 1 Lecture and Lab (adjusted for program electives taken at HCC)	3 + 1
ART/DAN/ MUS	Please choose an elective in Art, Dance, or Music	3
XXX XXXX	Electives - Please refer to the list of elective courses for the biotechnology major	8-9

Semester 8 Spring 4th Year - 15-16 credits

Course #	Course Name	Credits
PHY 1006/ PHY 1006L	General Physics 2 Lecture and Lab (adjusted for program electives taken at HCC)	3 + 1
XXX XXX	Electives - Please refer to the list of elective courses for the biotechnology major	11 - 12

Total 3rd/4th Year Credits = 60-64

Total Degree Completion Credits = 122-126

Electives

Elective Courses (minimum of 20 credits including 4 laboratory credits)

BIO3300/3300L Microbiology Lecture and Lab, 3 + 1 credits
BIO4306/4306L Biochemistry Lecture and Lab, 3 + 1 credits
BIO3206/3206L Molecular Biology Lecture and Lab, 3 + 1 credits
BIO3101/3101L Ecology Lecture and Lab, 3 + 1 credits
BIO3106 Cell Biology, 3 credits
BIO3400 Immunology
BIO4010 Research Methods 1-2 credits
BIO4011 Research Experience 1-2 credits
BMH3010 Clinical Research Ethics, 3 credits (and/or ETH 3101)
CHE3307/3307L Analytical Chemistry Lecture and Lab, 3 + 1 credits
ENT2XXX Lean LaunchPad for the Life Sciences, 3 credits
ETH3101 Ethics of Artificial Intelligence, 3 credits (and/or BMH 3010)
MAT1200 Pre-Calculus 3 credits
MAT1301 Calculus I 3 credits
BMS5009 Epidemiology & Biostatistics, 3 credits
BMS5100 Endocrinology, 3 credits
BMS5202 Pharmacology, 3 credits
BMS5207 Pathology, 3 credits
BMS6300 Neuroscience, 3 credits
BMS6402 Biology of Cancer 3 credits
BMS5700/5700L Histology Lecture and Lab, 3 + 1 credits

Course Descriptions

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 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 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 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 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.

BMH 3010 Clinical Research Ethics, 3 credits (and/or ETH 3101)
This course examines historical controversies and contemporary ethical issues that arise in clinical research. Frameworks for making justified moral decisions are explored and case studies are presented for practice in the application of moral theory.

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.

ETH 3101 Ethics of Artificial Intelligence, 3 credits (and/or BMH 3010)
This course examines historical and contemporary ethical questions and controversies that arise and persist in the utilization of artificial intelligence (AI). Frameworks for making justified moral decisions are explored and case studies are presented for practice in the application of interdisciplinary AI theory.

ENT 2XXX Lean LaunchPad for Life Sciences, 3 credits
Description to follow.

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.

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 physic 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.*