BIOLOGY TRANSFER PATHWAY

ASSOCIATE OF SCIENCE (AS) – 60 CREDITS

About this program

An Associate of Science-Pathway degree (AS-P) is awarded upon completion of an academic program in scientific, technological or other professional fields and is titled "Biology (Minnesota State Transfer Pathway)." Transfer pathway programs are designed to provide transfer of all courses within the AS pathway into designated baccalaureate degree programs identified by system universities. This degree is designed for students interested in the various fields of biological sciences such as cell biology, bioengineering, environmental science, fish and wildlife management, forestry, genetics and microbiology. Students majoring in biological sciences may also be interested in the following program areas: biochemistry, chemistry, pre-chiropractic, pre-dentistry, pre-medicine, pre-medical technology, pre-optometry, pre-pharmacy and pre-veterinary medicine. The curriculum should be used as a guide since required courses vary considerably among four-year institutions and professional schools. Students planning a degree in biological sciences or one of the above fields should contact the biology department and work with an advisor. A visit to the intended transfer institution by the spring of the first year is highly recommended.

Program outcomes

1. Scientific method: Science is a process of trial and error by which we hope to improve our understanding of the natural world incrementally by making predictions, testing them and improving their accuracy. The scientific method includes the ability to propose testable hypotheses and carry out experiments to test them, and relies on standardized international systems of measurement.
2. Data interpretation and statistical analysis: Students should be able to analyze simple data sets using appropriate descriptive and inferential statistics.
3. Navigating and reading scientific literature: Students should be able to use public literature databases to find appropriate published material. Students should be able to read, understand and evaluate the validity and importance of the scientific literature and to integrate new concepts into their existing knowledge frameworks.
4. Scientific communication: Students should be able to communicate their own and others' data and analysis in oral and written format, using computers where necessary to visualize data or to create clear and compelling papers, posters or presentations.
5. Science and society/civic engagement: Students should be able to analyze scientific studies in light of their ecological, social, economic, ethical and cultural implications.
6. Collaboration: Students should learn to communicate and work productively with others in designing, conducting and evaluating projects, experiments and other course-related deliverables as an essential skill in science.
7. Interdisciplinary nature of science: Science depends upon knowledge, skills and tools from other scientific and nonscientific disciplines. Students should develop their ability to utilize other disciplines as sources of context and skills to inform the learning and work they are engaged in.
8. Microscopy: The microscope is a tool used extensively in biology for observation and investigation. Skill development in basic light microscopy and exposure to more advanced forms of microscopy and digital imaging is fundamental to further study in biology.

Curriculum overview

Crds	Requirement type
32	Required courses
10	Restricted electives in courses
6	Restricted electives in MnTC Goal Areas
12	Restricted electives in course types
60	**Total**

Developmental courses note: A student may be required to enroll in developmental courses in reading, writing and math. A student's scores on the Accuplacer assessment will determine enrollment in developmental courses. The purpose of developmental courses is to prepare students for the demands of a college-level curriculum. *Credits may vary.*

Accreditation: Minnesota State Community and Technical College is accredited by the Higher Learning Commission, a regional accreditation agency recognized by the U.S. Department of Education. More information can be found at www.minnesota.edu/accreditation.

Curriculum requirement details

Required courses

Course	Crds
BIOL1122 - General Biology I	4
BIOL1123 - General Biology II	4
BIOL2240 - Genetics	4
CHEM1111 - General Inorganic Chemistry I	5
CHEM1112 - General Chemistry II	5
COMM1120 - Introduction to Public Speaking	3
ENGL1101 - College Writing	3
MATH1114 - College Algebra	4

Other requirements or restricted electives

4 credits from one or more of these Courses:

Course title	Credits
BIOL2010 - General Ecology	4
BIOL2220 - General Microbiology	4

3 credits from one or more of these Courses:

Course title	Credits
MATH1115 - Functions/Trigonometry	4
MATH1116 - College Trigonometry	3
MATH1122 - Applied Calculus	3
MATH1134 - Calculus I	5
MATH1135 - Calculus II	5
MATH1213 - Introduction to Statistics	4

3 credits from one or more of these Courses:

Course title	Credits
ENGL1205 - Writing About Literature	3
ENGL1210 - Writing About Current Issues	3
ENGL1215 - Professional and Technical Writing	3

3 credits from these Goal Areas:

- 5. History and the Social and Behavioral Sciences

3 credits from these Goal Areas:

- 6. The Humanities and Fine Arts

12 credits from these Course Types:

- General Education w/MnTC Goals

Course summaries

BIOL1122 - General Biology I ..... ***(4 credits)***
Meets MnTC Goal Areas 2 and 3. This course is an introduction to the structure and function of living systems with an emphasis on cellular and molecular biology. Fundamental concepts include the chemical basis of life, cell structure and function, cell division, metabolism, classical and molecular genetics, and biotechnology. This course includes a laboratory component incorporating experimental design, microscopic work, and cellular and molecular biology techniques. Along with BIOL1123, this course is part of a two-semester sequence of general biology that can be taken in any order.

Prerequisites:

- Assessment into ENGL 1101 or college level writing equivalent.

BIOL1123 - General Biology II ..... ***(4 credits)***
Meets MnTC Goal Areas 3 and 10. This course is an introduction to living organisms, emphasizing evolution, biological diversity and ecology. Topics will include mechanisms of evolution, classification and diversity of life, structure and function of organisms, and interaction of organisms at all levels of an ecosystem. This course includes a laboratory component incorporating field activities, microscopic work, dissection and plant systems. Along with BIOL1122, this course is part of a two-semester sequence of general biology that can be taken in any order.

Prerequisites:

- Assessment into ENGL 1101 or college level writing equivalent.

BIOL2240 - Genetics ..... ***(4 credits)***
Meets MnTC Goal Area 3. This course is a study of the basis of heredity with emphasis on modern molecular and classical Mendelian genetics. It is open to all students but is recommended for students majoring in biology and health-related areas. This course includes a laboratory which explores molecular and classical genetic techniques.

Prerequisites:

- BIOL1122

CHEM1111 - General Inorganic Chemistry I ..... ***(5 credits)***
Meets MnTC Goal Areas 2 and 3. This course is the first of a two-course series (CHEM1111 and CHEM1112). Students will learn the general chemistry principles: atomic structure, stoichiometry, solutions, bonding, thermochemistry, electronic structure, periodic properties of the elements, intermolecular forces and properties of solids, liquids and gases. The course includes a lab.

Prerequisites:

- MATH1020

OR

- Instructor permission for students who do not score high enough on the placement exam for placement into Chem1111 but wish to enroll in Chem1111. Students with this permission must co-register for Chem 0095.

CHEM1112 - General Chemistry II ..... ***(5 credits)***
Meets MnTC Goal Areas 2 and 3. This course is the second of a two-course series (CHEM1111 and CHEM1112) intended for science majors. Students will learn the general chemistry principles: intermolecular forces, properties of solids and liquids, solution chemistry, kinetics, chemical equilibrium, acid-base equilibrium, solubility equilibrium, thermodynamics, electrochemistry, nuclear chemistry, and possibly coordination chemistry and an introduction to environmental chemistry. The course includes a lab. Students completing the two-semester sequence will be competent in all the areas listed in General Chemistry I & II of the Minnesota State Chemistry Transfer Pathway.

Prerequisites:

- CHEM1111
- MATH1114

COMM1120 - Introduction to Public Speaking ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course clarifies the process of oral communication, clarifies the basic principles of public speaking and allows the student to increase the application of these principles while both speaking and listening.

Prerequisites:

- Assessment into ENGL 1101

ENGL1101 - College Writing ..... ***(3 credits)***
Meets MnTC Goal Area 1. This is an introductory writing course designed to prepare students for later college and career writing. The course focuses on developing fluency through a process approach, with particular emphasis on revision. Students will consider purpose and audience, read and discuss writing and further develop their own writing processes through successive revisions to produce polished drafts. Course work will include an introduction to argumentative writing, writing from academic sources and a short research project.

Prerequisites:

- Completion of ELL1080, ENGL0096, or ENGL0097 with a grade of C or higher OR placement into college-level English.

MATH1114 - College Algebra ..... ***(4 credits)***
Meets MnTC Goal Areas 2 and 4. This course includes rational, polynomial, exponential, logarithmic, inverse and quadratic functions. The course also includes equations, inequalities, complex numbers and systems of linear equations. Additional topics may include matrices and determinants.

Prerequisites:

- MATH1020

OR

- Placement Exam

BIOL2010 - General Ecology ..... ***(4 credits)***
Meets MnTC Goal Areas 3 and 10. This course provides a study of the structure and function of ecological systems, including an application of ecological principles to local and global environmental issues. Topics covered include energy flow, nutrient cycling, organization, ecological succession, population dynamics (including the ecology of species interactions and factors that influence and regulate population numbers) and linkages among species and ecosystem functions. Lecture is accompanied by laboratory and field exercises.

BIOL2220 - General Microbiology ..... ***(4 credits)***
Meets MnTC Goal Area 3. This course provides an overview of the structure and function of microorganisms, including archaea, bacteria, viruses, fungi and parasites. Students will examine the molecular diversity, genetics, physiology and ecology of these organisms in relation to microbial evolution, industrial and applied applications, and host-pathogen interactions. Lecture is accompanied by laboratory experiences, including aseptic technique, differential staining procedures, cultural and physical characteristics, biochemical testing, microbial control, microbiology of water and soil, and identification of unknown cultures.

MATH1115 - Functions/Trigonometry ..... ***(4 credits)***
Meets MnTC Goal Areas 2 and 4. This course includes trigonometric functions, right triangle trigonometry, radian measure and circular functions, identities, equations, inverse functions, oblique triangles, complex numbers, vectors, polar coordinates and conic sections.

MATH1116 - College Trigonometry ..... ***(3 credits)***
Meets MnTC Goal Areas 2 and 4. Topics include trigonometric functions, right triangle trigonometry, radian measure and circular functions, identities, equations, inverse functions, laws of cosines and sines. Optional topics may include complex numbers, vectors and polar coordinates.

MATH1122 - Applied Calculus ..... ***(3 credits)***
Meets MnTC Goal Areas 2 and 4. This course is an introduction to optimization, differential and integral calculus with an emphasis on application in the areas of business and the life and social sciences. This course is intended for all liberal arts and science students but is highly recommended for students pursuing business careers.

MATH1134 - Calculus I ..... ***(5 credits)***
Meets MnTC Goal Areas 2 and 4. This course includes limits and continuity, derivatives, definite and indefinite integrals of algebraic, trigonometric, exponential and logarithmic functions, and applications of the derivative and definite integral.

MATH1135 - Calculus II ..... ***(5 credits)***
Meets MnTC Goal Areas 2 and 4. This course includes integration of logarithmic, exponential, trigonometric and hyperbolic functions and their inverses. Students will apply techniques of integration. Polar coordinates, conic sections, indeterminate forms, improper integrals and infinite series are also included.

MATH1213 - Introduction to Statistics ..... ***(4 credits)***
Meets MnTC Goal Areas 2 and 4. Topics include data summary, frequency distributions, plots, graphs, measures of central tendency, variation, probabilities, probability distributions and confidence intervals. Hypothesis testing of means, proportions and variances will be conducted using the z-test, t-test, chi-square test, f-test and ANOVA. Optional topics may include nonparametric statistics, sampling and simulation.

ENGL1205 - Writing About Literature ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course builds on the foundations of College Writing and provides students with additional opportunities to develop fluency in their writing through a process approach. Students will read critically from a variety of literary genres, explore meaning through academic research and respond through discussion and writing.

ENGL1210 - Writing About Current Issues ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course builds on the foundations of College Writing and provides students with additional opportunities to develop and refine their writing through a process approach. Students will explore current issues by critically reading a variety of texts, conducting academic research and responding through discussion and writing.

ENGL1215 - Professional and Technical Writing ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course provides instruction in writing and designing professional and technical documents, including print and non-print correspondence, descriptions, instructions, reports and proposals, along with promotional material. Analysis, critical thinking and synthesis of sources will be covered, along with the development of presentation skills. Coursework also includes a formally documented, multi-source professional project.

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Program Plan — ""

Locations: