BIOLOGY TRANSFER PATHWAY (AS) - 60 CREDITS

OVERVIEW

WHY CHOOSE BIOLOGY?

The Biology Transfer Pathway A.A.S offers students a powerful option: the opportunity to complete an Associate of Science degree with course credits that directly transfer to designated Biology bachelor’s degree programs at Minnesota State universities. The curriculum has been specifically designed so that students completing this pathway degree and transferring to one of the seven Minnesota State universities enter the university with junior-year status. All courses in the Transfer Pathway Associate degree will directly transfer and apply to the designated bachelor’s degree programs in a related field. Universities within the Minnesota State system include Bemidji State University, Metropolitan State University, Minnesota State University, Mankato; Minnesota State University Moorhead; Southwest Minnesota State University; St. Cloud State University; and Winona State University.

SKILLS ACQUIRED

(iseek.org)

Biology programs include topics such as:

- Evolution of organisms
- Cell biology
- Biochemistry
- Laboratory science
- Ecology
- Human biology

CAREERS IN BIOLOGY

Projected Job Growth

Here is the projected job growth for a variety of professions that use skills from bioscience (according to the Bureau of Labor Statistics):

- Employment of biochemists and biophysicists is projected to grow 19% from 2012 to 2022, faster than the average for all occupations.
- Employment of environmental scientists and specialists is projected to grow 10% from 2012 to 2022, faster than the average for all occupations.
- Employment of medical scientists is projected to grow 13% between 2012 and 2022.
- Employment of biological technicians is projected to grow 10% from 2012 to 2022.
- Employment of microbiologists is projected to grow 7% from 2012 to 2022.
- Employment of zoologists and wildlife biologists is projected to grow 5% from 2012 to 2022.
- Employment of conservation scientists and foresters is projected to grow 3% from 2012 to 2022.

Types of Jobs

(iseek.org)

Individuals who are interested in biology have options for many different professions. Here is a list of some of those professions:

- Zoologists and Wildlife Biologists
- Biological Technicians
- Biochemists and Biophysicists
- Conservation Scientists and Foresters
- Medical Scientists
- Environmental Scientists and Specialists
- Microbiologists

Average Pay

According to the Bureau of Labor Statistics, the average median national pay for the following positions are:

- Zoologists and Wildlife Biologists - $57,710 annually ($27.70 per hour)
- Biological Technicians - $39,700 annually ($19.11 per hour)
- Biochemists and Biophysicists - $81,480 ($39.17 per hour)
- Conservation Scientists and Foresters - $61,100 ($29.36 per hour)
- Medical Scientist - $76,950 ($37.00 per hour)
- Environmental Scientists and Specialists - $63,070 ($30.56 per hour)
- Microbiologists - $66,260 ($31.86 per hour)
DEGREES IN BIOLOGY

The Biology A.S offers students an opportunity to focus on gaining course credits that directly transfer to a biology bachelor's degree program at Minnesota State Universities. The entire curriculum has been carefully designed to meet bachelor's degree program requirements for transfer students planning initial study at a Minnesota State college. Students planning to transfer to nonMinnesota State universities are advised to consult with their intended transfer institution to determine transferability of the courses in this curriculum.

Normandale offers coursework typically required for majors in:
- Biology
- Biochemistry
- Ecology
- Evolution and behavior
- Genetics and cell biology
- Microbiology
- Neuroscience
- Plant biology

REQUIREMENTS

The Biology Transfer Pathway AS offers students a powerful option: the opportunity to complete an Associate of Science degree with course credits that directly transfer to designated Biology bachelor's degree programs at Minnesota State universities.

* The curriculum has been specifically designed so that students completing this pathway degree and transferring to one of the seven Minnesota State universities enter the university with junior-year status. All courses in the Transfer Pathway associate degree will directly transfer and apply to the designated bachelor's degree programs in a related field.

*Universities within the Minnesota State system include Bemidji State University; Metropolitan State University; Minnesota State University, Moorhead; Minnesota State University, Mankato; Minnesota State University, Moorhead; Southwest Minnesota State University; St. Cloud State University; and Winona State University.

CORE COURSES - 17 CREDITS

Each of the following courses must be completed with a grade of C or higher:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 1501</td>
<td>Principles of Biology I</td>
<td>5</td>
</tr>
<tr>
<td>BIOL 1502</td>
<td>Principles of Biology II</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 2205</td>
<td>Genetics</td>
<td>4</td>
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</tbody>
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COMPLETE ONE OF THE FOLLOWING COURSES:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL 2206</td>
<td>Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 2207</td>
<td>Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 2208</td>
<td>Biology of Microorganisms</td>
<td>4</td>
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</tbody>
</table>

ADDITIONAL REQUIRED COURSES - 43 CREDITS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGC 1101</td>
<td>Freshman Composition</td>
<td>4</td>
</tr>
<tr>
<td>COMM 1101</td>
<td>Fundamentals of Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>or COMM 1111</td>
<td>Interpersonal Communication</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1061</td>
<td>Principles of Chemistry 1</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 1062</td>
<td>Principles of Chemistry 2</td>
<td>5</td>
</tr>
</tbody>
</table>

CHOOSE TWO OF THE FOLLOWING:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1100</td>
<td>College Algebra</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1150</td>
<td>Trigonometry</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1000</td>
<td>Pre-Calculus</td>
<td>5</td>
</tr>
<tr>
<td>MATH 1510</td>
<td>Calculus 1</td>
<td>5</td>
</tr>
</tbody>
</table>

- Complete one course from MnTC Goal 5
- Complete one course from MnTC Goal 6
- Complete one course from MnTC Goal 7, 8, 9 or 10
- With careful planning, courses used to satisfy Goal 5 and 6 may also be counted for Goals 7, 8, 9 or 10.
- Complete additional courses to reach 60 credits total.

OTHER DEGREE REQUIREMENTS

- If needed, complete additional courses to reach 60 credits total.
- Earn a minimum cumulative grade point average (GPA) of 2.0 for college-level coursework (courses numbered 1000 and above) completed at Normandale.
- Earn a minimum of 20 college-level credits at Normandale.

Coursework in this degree program satisfies a portion of the Minnesota Transfer Curriculum (MnTC)

COURSES

BIOL 1501 PRINCIPLES OF BIOLOGY I | 5 CR

Prereq: MATH 1050, or MATH 1050, or Eligible for MATH 1100, and READ 1106 MnTC Goals: 9

This course is designed for students majoring in biology and other science related fields, including the health professions. Students will explore major biological processes occurring at the cellular level, with emphasis on cell structure and function, metabolism, reproduction, development, genetics and gene expression, and evolution. Students will engage in techniques appropriate to the study of biological processes and gain experience in experimental design, data analysis and interpretation, and the communication of results. This course meets a requirement for the Biology (Minnesota State Transfer Pathway) AS-P degree and is a prerequisite for BIOL 1502. It is strongly recommended that students have successfully completed (C or higher) a college level biology lab course or a high school biology course within the past three
years before enrolling in this course. Lecture 4 hours per week, lab 3 hours per week.

Credits: 5 Semesters: Fall, Spring

BIOL 1502 PRINCIPLES OF BIOLOGY II | 4 CR
Prereq: BIOL 1501, (C or higher), Eligible for MATH 1150 or READ 1106 MnTC Goals: 3

This course is the second in a sequence designed for students majoring in biology and other science related fields, including the health professions. Students will explore the evolution and diversity of organisms and their interactions with each other and the environment. Students will engage in techniques appropriate to the study of diverse organisms and their interactions and gain experience in experimental design, data analysis and interpretation, and the communication of results. This course meets a requirement for the Biology (Minnesota State Transfer Pathway) AS-P degree and is the prerequisite for BIOL 2202, 2203, 2205, 2206, 2207, and 2208. Lecture 3 hours per week, lab 3 hours per week.

Credits: 4 Semesters: Fall, Spring

BIOL 2205 GENETICS | 4 CR
Prereq: BIOL 1502, (C or higher), MnTC Goals: 3

This course is designed for students majoring in biology. Students will explore major concepts in Mendelian, molecular, and population genetics, with emphasis on prokaryotic and eukaryotic gene expression, recombination, gene mapping, and chromosome analysis. Students will engage in techniques appropriate to genetic analysis and gain experience in experimental design, data analysis and interpretation, and the communication of results. This course meets a requirement for the Biology (Minnesota State Transfer Pathway) AS-P degree. Lecture 3 hours per week, lab 3 hours per week.

Credits: 4 Semesters: Spring

BIOL 2206 ECOLOGY | 4 CR
Prereq: BIOL 1502, (C or higher), MnTC Goals: 3, 10

This course is designed for students majoring in biology. Students will explore ecological concepts and the scientific research that has built understanding of interactions in nature at the organismal, population, community, ecosystem, and global levels. Students will acquire an understanding of how the different levels of ecology are studied, how these levels relate to each other, and what properties are important at increasing levels of complexity. Additional topics include evolutionary ecology and contemporary environmental changes and its consequences. Students will engage in techniques appropriate to ecological study and gain experience in experimental design, data analysis and interpretation, and the communication of results. This course meets a requirement for the Biology (Minnesota State Transfer Pathway) AS-P degree. Lab requires field trips on and off campus which might include field trips on prescribed dates. Lecture 3 hours per week, lab 3 hours per week.

Credits: 4 Semesters: Fall

BIOL 2207 CELL BIOLOGY | 4 CR
Prereq: BIOL 1502, (C or higher), MnTC Goals: 3

This course is designed for students majoring in biology. Students will explore major concepts in cell biology, including eukaryotic cell structure and function, the cellular use of biomolecules, membranes, signal transduction, motility, and the extracellular matrix. Students will engage in techniques appropriate to the study of cells and cellular processes and gain experience in experimental design, data analysis and interpretation, and the communication of results. This course meets a requirement for the Biology (Minnesota State Transfer Pathway) AS-P degree. It is strongly recommended that students have successfully completed (C or higher) BIOL 2200 before enrolling in this course. Lecture 3 hours per week, lab 3 hours per week.

Credits: 4 Semesters: Spring

BIOL 2208 BIOLOGY OF MICROORGANISMS | 4 CR
Prereq: BIOL 1502, (C or higher), MnTC Goals: 3

This course is designed for students majoring in biology. Students will explore major concepts in microbiology, including taxonomy, structure and function, biochemistry, metabolism, pathogenesis, immunology, and ecology of microbes. Students will engage in techniques appropriate to the study of microorganisms and gain experience in experimental design, data analysis and interpretation, and the communication of results. This course meets a requirement for the Biology (Minnesota State Transfer Pathway) AS-P degree. It is strongly recommended that students have successfully completed (C or higher) BIOL 2205 before enrolling in this course. Lecture 3 hours per week, lab 3 hours per week.

Credits: 4 Semesters: Fall

CHEM 1061 PRINCIPLES OF CHEMISTRY 1 | 5 CR
Prereq: CHEM 1020, or high school chemistry within the past 2 years and MATH 0700 proficiency or concurrent registration or high school equivalent MnTC Goals: 3

Basic concepts of chemistry: atomic theory, stoichiometry, thermochemistry, chemical bonding, molecular structure, properties and behavior of the physical states, properties of aqueous solutions. Lecture 4 hours; lab 3 hours.

Credits: 5 Semesters: Fall, Spring

CHEM 1062 PRINCIPLES OF CHEMISTRY 2 | 5 CR
Prereq: CHEM 1061, (C or higher), MnTC Goals: 3
### COMM 1101 FUNDAMENTALS OF PUBLIC SPEAKING | 3 CR

Recommended: Eligible for ENGC 1101, and READ 1106. MTT Goals: 1

The primary purpose of this course is to provide instruction and practical experience in the basic fundamentals of effective public speaking. Students will prepare, perform, and evaluate a variety of speeches throughout the semester.

Credits: 3 Semesters: Fall, Spring

### COMM 1111 INTERPERSONAL COMMUNICATION | 3 CR

Recommended: ENGC 1101, and READ 1106. MTT Goals: 1

The primary purpose of this course is to assist the student in examining and developing competence as an interpersonal communicator. Students will practice skills and learn strategies to develop and manage relationships more effectively in a variety of contexts.

Credits: 3 Semesters: Fall, Spring

### ENGC 1101 FRESHMAN COMPOSITION | 4 CR

Prereq: ENGC 0900, (C or higher) and eligible for READ 1106, or eligible for ENGC 1101 and READ 1106. MTT Goals: 1

In this essential college-level writing course, students will practice the skills necessary for success in college and professional writing. Students will develop and apply critical reading and thinking skills in a variety of research and writing assignments, including analysis and argument, with some essays based on literary texts and other sources.

Credits: 4 Semesters: Fall, Spring

### MATH 1100 COLLEGE ALGEBRA | 4 CR

Prereq: MATH 0700, or eligible for MATH 1100. MTT Goals: 4

This is a college-level algebra course that emphasizes properties of functions and their graphs. Linear, quadratic, polynomial, rational, exponential and logarithmic functions are covered. Other topics include solving equations and inequalities, and systems of equations and inequalities. This course also includes a basic introduction to right triangle trigonometry.

Credits: 4 Semesters: Fall, Spring

### MATH 1150 TRIGONOMETRY | 4 CR

Prereq: MATH 1100, (C or higher) MTT Goals: 4

This course will include a thorough treatment of trigonometry. Other topics include polar coordinates and equations, complex numbers, DeMoivre's Theorem, vectors and their applications, the conic sections, parametric equations, sequences, and series. Note that a student wishing to take MATH 1510 (Calculus) may prepare for it by taking MATH 1150 or by taking MATH 1500.

Credits: 4 Semesters: Fall, Spring

### MATH 1500 PRE-CALCULUS | 5 CR

Prereq: MATH 1100, (C or higher) and high school geometry or eligible for MATH 1500. MTT Goals: 4

Preparation for student success in a multiple-term calculus sequence. This is an accelerated treatment of functions and trigonometry. All elementary functions are covered and trigonometry is developed completely. Emphasis on graphing and problem solving parallels algebraic skill development.

Credits: 5 Semesters: Fall, Spring

### MATH 1510 CALCULUS I | 5 CR

Prereq: MATH 1150, (C or higher), MATH 1500, (C or higher) or eligible for MATH 1510. MTT Goals: 4

Topics include functions, limits, derivatives, and an introduction to integration. Applications include but are not limited to science, engineering, economics, and ecology.

Credits: 5 Semesters: Fall, Spring

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