# Biology, B.S. *major*
# Medical Sciences Emphasis (Optional)

A total of 120 semester credits are needed for the **Biology, Medical Science emphasis (optional) B.S.** degree and include the following:

- Completion of a minimum of 40 upper division credits (level 3000/4000)
- Completion of all required major credits
- Completion of Core Curriculum credits (Minnesota Transfer Curriculum [MnTC] Goal Areas 1-10 with a minimum of 40 credits) required for all baccalaureate degrees
- Completion of BSU Focus and Nisidotaading Course Requirements

Dual Degrees
Students wishing to complete two degrees concurrently, (example: Bachelor of Science and Bachelor of Arts) must complete a minimum of an additional 30 credits above the required 120 credits.

Multiple Credentials
Any additional major, minor or certificate in a degree must have at least 6 credits of course work not used to meet the requirements of another major, minor or certificate in the degree.

Required Credits: 73
Required GPA: 2.25

**I REQUIRED BIOLOGY CORE COURSES**

Complete the following courses:

- BIOL 1400 Cellular Principles (4 credits)
- BIOL 1500 Diversity of Life (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

**II REQUIRED MEDICAL SCIENCES CORE COURSES**

Complete the following courses:

- BIOL 3250 Human Anatomy (4 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 3710 Microbiology (4 credits)

**III CAPSTONE PROJECT**

The Biology capstone project, completed in the senior year, provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity. Examples of capstone projects may include original research projects, internships with state or federal agencies or shadowing experiences with professionals.

The capstone project must be designed or chosen by the student in consultation with a faculty mentor or advisor, who must approve the project before work begins. Students should consult with their faculty mentor or advisor before their senior year commences. All capstone projects will include a written and oral component.

The capstone project may be completed in one of the following ways (2-4 credits):

1. Complete BIOL 4894 OR BIOL 4895 (2 credits):

- BIOL 4894 Advanced Research Project I (2 credits)
- BIOL 4895 Advanced Research Project II (2 credits)

2. Complete BIOL 4894 AND BIOL 4895 (2 credits each):

- BIOL 4894 Advanced Research Project I (2 credits)
- BIOL 4895 Advanced Research Project II (2 credits)

3. Complete BIOL 4449 (4 credits):

- BIOL 4449 Gene Expression (4 credits)

**IV REQUIRED MEDICAL SCIENCES ELECTIVES**

Select 16 credits of electives from the following:

- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3337 Science Communication (3 credits)
- BIOL 3338 Science Communication Lab (1 credit)
- BIOL 3339 Bioethics (3 credits)
- BIOL 3380 Molecular Genetics (3 credits)
- BIOL 3580 Immunology (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

**V REQUIRED COURSES IN RELATED FIELDS**

A. Select 1 of the following groups:

*GROUP 1:*

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

*GROUP 2:*

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)

B. Select 1 of the following courses:

- MATH 2471 Calculus I (5 credits)
- STAT 2610 Applied Statistics (4 credits)
- PSY 3401 Basic Statistics for Research (4 credits)

C. Complete 2 courses from the following:

- PHYS 1101 General Physics I (4 credits)
  *or* PHYS 2101 Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)
  *or* PHYS 2102 Physics II (4 credits)

D. Complete the following courses:

- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)

- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)

**Program Learning Outcomes | Biology, B.S.**

1. Communicate: Effectively present research using common, professional formats (written and/or verbal). This includes using figures, graphs, tables, and illustrations to promote dissemination and clarity of knowledge.

2. Create Purpose or Hypothesis: Provide justification for the importance of pursuing a project or construct a testable hypothesis (or hypotheses).

3. Observe and Question: Integrate information or observations to promote curiosity and question generation.

4. Recognize Larger Implications: Demonstrate understanding of the ethical/social dimensions or societal implications of science, recognize inherent biases, and communicate scientific ideas to non-science audiences.

5. Re-engage: Demonstrate an ability to re-engage with the research process by identifying sources of error, possible limitations of their research, next steps in a project, or re-designing more appropriate experimental methods/controls.

6. Research: Plan and execute research, experiments, data collection, analysis of the results, and/or synthesis of new or coalesced knowledge.

7. Review Research Literature: Search and review appropriate sources with a goal of independent information discovery or critically identifying knowledge gaps.