Type of Request:
Renew

Subject code	Course Number	Catalog Year
BIOB	101N	2021-2022

Course Title
Discover Biology

College/School	Department
Missoula College	Applied Arts and Sciences

Level	Campus	Semesters offered
Undergraduate (U)	Missoula College	Spring, Fall, Summer

Does course require a lab?
Yes

Description & Purpose
BIOL 101N: Discover Biology introduces biology to students with little science background. The course explores foundations of the life sciences, with an emphasis on how these concepts and principles relate to their lives. Students demonstrate learning through participation in lectures, discussions, written reflections, and hands-on or interactive online laboratory investigations.

BIOL 101N: Discover Biology explores topics such as the cellular basis of life, evolution, biodiversity, and human impacts on the living world. Students examine interconnections among different levels of biological organization and how they relate to the human experience.

BIOL 101N: Discover Biology is a Natural Sciences General Education course at several campuses across MUS. Continuing to offer this course with N designation at Missoula College helps two-year college students in Missoula fulfill graduation requirements while exploring the life sciences as they relate to their daily lives and broader academic goals.

Justification / explanation
This is a 100-level course with no prerequisites.

Additional Information (For OCHE Database):

In which MUS Core Category, does this course fit?
Natural Science

Does the course include content regarding cultural heritage of American Indians?
No

Attachments

Syllabus
Biol 101N syllabus Spring 2020.doc.pdf

Other
-

Criteria

Briefly explain how this course meets the criteria for the group:
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Courses explore a discipline in the natural sciences and demonstrate how the scientific method is used within the discipline to draw scientific conclusions:
BIOB 101N guides students through a broad overview of the Life Sciences. The scientific method of inquiry is explicitly discussed in classroom lectures. More importantly, laboratory investigations ask students to apply the process of science through careful observation, experimental design, data collection, interpretation of findings, and understanding the value of collaboration with others.

Courses address the concept of analytic uncertainty and the rigorous process required to take an idea to a hypothesis and then to a validated scientific theory
The interpretation of scientific findings, including the concept of uncertainty, is explored in several classroom topics using existing literature and current research. Further study of uncertainty and data interpretation are examined in laboratory exercises. Students test and interpret results though numeric and graphic representation. The importance of critical thinking, careful observation, and interpretation of data are emphasized as essential aspects of scientific investigation.

Lab courses engage students in inquiry-based learning activities where they formulate a hypothesis, design an experiment to test the hypothesis, and collect, interpret, and present the data to support their conclusions.
Laboratory curriculum includes both instructor-guided investigations and student-driven inquiry. Students develop and test hypotheses, perform direct measurements to collect results, and communicate interpretations of these results through written analysis and reflection. Additional lab activities include aspects of this process, such as interpretation of findings from instructor-designed exercises.

Student Learning Goals

Briefly explain how this course will meet the applicable learning goals.
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Understand the general principles associated with the discipline(s) studied.
BIOB 101N explores core principles of Biology with a balance of instructor-led class lectures and student-driven lab investigations. Topics include:
The basic chemistry of life, including biological molecules
- The cellular basis of life
The core principles of genetics
- The theory of evolution
The flow of energy in living systems
The nature of interactions between organisms and living systems
Biodiversity and the impacts of humans on living systems

Understand the methodology and activities scientists use to gather, validate and interpret data related to natural process
Students demonstrate their developing understanding of biologists' methods in three main ways in this course:
a) through interpretation of scientific literature and summaries of current research, including methodology.
b) though classroom lecture and discussion of the nature of science a process of exploring the world, not simply a body of These discussions address both the value and limitations of the scientific method.
b. through direct, student-driven application of the scientific method in laboratory investigations.

Detect patterns, draw conclusions, develop conjectures and hypotheses, and test them by appropriate means and experiments.
Students in this course observe living phenomena, develop and test hypotheses, and interpret findings through structured lab activities and open, student-driven investigations with no predetermined outcome or findings.

Understand how scientific laws and theories are verified by quantitative measurement, scientific observation, and logical/critical reasoning.
This course explicitly examines core biology theories and their validity. The verification of essential principles is addressed in classroom lecture and discussions. Key concepts include the rejection of alternative hypotheses, the importance of controls in hypothesis testing, valid measurements, and sound interpretation of data.

Understand the means by which analytic uncertainty is quantified and expressed in the natural sciences.
An essential learning goal in this course student appreciation for the ongoing nature of science as a process of exploration; this includes scrutiny over how scientists communicate conclusions. Students recognize the nature of scientific uncertainty through critical examination of the data collected in their own laboratory investigations. The skills developed in lab and the critical thinking required in lecture provide students with diverse opportunities to develop deeper appreciation for the challenges involved in scientific research.

Learning Outcomes Assesments

How are the learning goals for the General Education Group measured?
Describe how you will determine that students have met each of the General Education Learning Goals. This should include specific examples of assignments, rubrics or test questions that directly measure the General Education learning goals. (See Sample Form) Please attach or provide a web link to relevant assessment materials.

Understand the general principles associated with the discipline(s) studied.
Assessment Example 1 (lab quiz):
Which of the following molecules are used (necessary inputs) in respiration (circle TWO):
a. CO2 b. O2 c. C6H12O6 d. H2O

Assessment Example 2 (objective exam question):
Assuming an over-simplified genetic control of eye color in which brown eyes are dominant and blue eyes are recessive, what are the chances that the child of two blue eyed parents will have blue eyes?

Assessment Example 3 (short written exam question):
Please describe two ways that bacteria benefit your life:

Understand the methodology and activities scientists use to gather, validate and interpret data related to natural process.
Assessment Example 4 (objective exam question):
Which of the following is the best summary of the scientific method of investigation?
a) scientists seek evidence for the conclusions they already know to be true
b) scientists seek evidence to prove the conclusions they think are true
c) scientists study textbooks and articles to amass knowledge
d) scientists observe the world, propose hypotheses, test them, and reject the ones that fail

Assessment Example 5 (objective exam question):
A good hypothesis is:
a) repeatedly tested and supported by evidence b) deductive and inductive
c) testable and falsifiable d) naturalistic and experimental

Detect patterns, draw conclusions, develop conjectures and hypotheses, and test them by appropriate means and experiments.
Assessment Example 6 (lab manual reflections):
Students are asked to state an independently developed hypothesis, identify variables, describe methods used, report findings, and interpret results in short-answer format in individual lab manuals. Assessment is based upon clear demonstration of student understanding of the key components of their scientific investigation.

Assessment Example 7 (lab quiz):
Please describe what happened to the plant cells immersed in salty water under the microscope in last week's lab? Why did this happen?

Understand how scientific laws and theories are verified by quantitative measurement, scientific observation, and logical/critical reasoning.
Assessment Example 8 (exam question):
Which of the following statements best describes science?
a. Science has stopped changing because everything about the world is now understood.
b. Science reliably results in one true answer that never changes
c. science is a method of seeking answers, and is open to revision and questioning
d. The best scientist is the one who knows the most facts

Assessment Example 9 (exam question):
Why is a control important in a scientific investigation?
a. the control differs only in the variable being investigated, it is not subjected to the experimental treatment
b. a control is a group that the scientist can manipulate in many ways, allowing for a more precise investigation.
c. a control keeps the experiment from getting "out of hand," like brakes on unreasonable ideas
d. a control helps the researcher explore multiple variables simultaneously

Understand the means by which analytic uncertainty is quantified and expressed in the natural sciences.
Assessment Example 10 (research paper):
Students are expected to express and analyze uncertainty in summary and synthesis of multiple sources of scientific literature. Assessment is based upon inclusion and demonstrated understanding of these components in student written work.

Assessment Example 11: (lab manual reflections)
After completing a graph of data collected through small group investigations, students are asked to explain its pattern, meaning, and reliability through writing. Assessment is based upon student recognition of what data suggest and uncertainty in conclusions.

General Education Assessment Report

If this information is not yet available, this section must be completed after the next offering (re-submit the entire form with these sections completed by the curriculum deadline). Your course will be granted provisional status until the report is received. Report not required for one-time-only general education offerings.

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Achievement Targets

The desirable level of success is always 100%. However, expected performance on objective questions is from 75-85% successful. Performance on written work is expected to show 75-85% success in quantifiable results and reflect college-level writing and thinking skills.

Given the high rate of attrition of freshman at Missoula College, the data reported are from students who complete the class, not enroll. Typically, 10% of enrolled students do not meet learning objectives simply from failure to complete the course.

Assessment Findings (This section is optional. Assessment findings can be reported if they are available.)

Success rate for assessment examples in group VI A:

Example 1: 70%
Example 2: 76%
Example 3: 100%
Example 4: 100%
Example 5: 94%
Example 6: roughly 80% across separate lab sections, with 20-25% meaningful misunderstanding of at least one feature
Example 7: 72%
Example 8: 100%
Example 9: 52%
Example 10: 65% (roughly 20% of which related to incomplete work), with most failure to meet targets related to quantitative uncertainty
Example 11: 70%, with most failure to meet targets related to quantitative uncertainty

Assessment Feedback
The assessment data reflect that the course, as taught, generally meets or exceeds expected student learning targets in content areas and fails to meet expected learning targets in some areas related to the process and interpretation of science. Of particular note is the lower-than-expected accomplishment rate in questions and reflections related to experimental design and quantitative uncertainty. This mirrors a broader cultural pattern in which Americans, in general, display scientific literacy that is higher in areas of content and lower in areas of process (as seen in Pew Research Center analyses, for example).

The clear opportunity for growth in this course lies with mild-moderate restructuring of activities, assignments, and assessment to better guide students toward deeper understanding of the mechanisms of scientific investigation and interpretation of findings. I propose to begin addressing this through reframed repetition and application of existing activities aligned with these goals and the addition of new experiences such as peer-group analysis of findings (to focus on uncertainty and interpretation) and the addition of a feedback & rewrite component in the written research paper.

Learning Outcomes

-

Credits

Credit Hours

Min
-

Max
-

Value
-

Operator
-

Contact Hours

Min
-

Max
-

Value
-

Operator
-

Billing Hours

Min
-

Max
-

Value
-

Operator
-

Lecture Hours

Min
-

Max
-

Value
-

Operator
-

Lab Hours

Min
-

Max
-

Value
-

Operator
-

Other Hours

Min
-

Max
-

Value
-

Operator
-

Academic Progress Hours

Min
-

Max
-

Value
-

Operator
-

Financial Aid Hours

Min
-

Max
-

Value
-

Operator
-

Course Count
-

Repeatable
No

Number Of Repeats
-

Number Of Credits
-

Topics

-

Requisites

No Requisites

Components