Core Curriculum Course Submission
Criteria: Science

1. General Information

a. Originating Person	b. Contact Person's E-mail	c. Contact Phone	d. Date
John Bush	jmbush@ualr.edu	5693270	10/2/2014

e. College/School	f. Department/Program
College of Arts, Letters, Sciences	Biology

☒ **Submission Statement**
By submitting this form, we acknowledge our understanding that the Core Council has the authority to review approved courses to ensure they continue to meet the established goals and outcomes of that category of the core; that the Council has authority to develop a core assessment program; and that the Council will be developing review and assessment policies by the end of 2014. Further, we agree that if this course is approved, we will participate in the university-wide assessment of the core.

☒ **Chair and Dean Awareness**
A separate statement from the chair must be included that states that the department faculty have approved this course for submission to the core and that the chair takes responsibility for informing the Dean about the submission of the course.

2. Course Information

a. Course ID	b. Current Title
BIOL 2401	Microbiology

c. Catalog Description

BIOL 2401 Microbiology: Prerequisites: BIOL 1400 or 1401, or 1411 and 1412, AND CHEM 1400 or 1402, or their equivalents. The morphology, physiology, and classification of microorganisms; the relationship of microorganisms to biotechnology, medicine, and nursing. Two hours lecture, four hours laboratory per week. Four credit hours. (ACTS Course Number BIOL 2004)

d. How will your department ensure a level of consistency among sections of this course? Who will be responsible for this?

All Faculty are required to cover a common syllabus of Lab topics as well as given Lecture topics. The Chair for consistency will review all syllabi.

Educational Goals	Learning Outcomes: students will	Learning Objectives: At the end of the course students will be able to	Assignments	Explanation
Knowledge 1 – Concepts, methodologies, findings, and applications of mathematics and the social and natural sciences, engineering and technology.	1. understand the theoretical perspective used in one or more science discipline;	**Learning Objectives 1.1** Understand major microbiological concepts, focusing on evolutionary genetic changes and interactions between organisms and humans.; Identify the key concepts and principles in Microbiology and understand these concepts in terms and human health and disease. These concepts will include current theories concerning Microbiology, methodology of microbiological studies, sterilization and antimicrobial therapy practices, classification of microbial species, epidemiology of microbial diseases and human immunological responses to microbial infections.	**Assignments 1.1** Reading assignments from the textbook, online supporting materials and lectures will be provided to students. In class quizzes and exams will be conducted to demonstrate student's mastering of these concepts.	**Explanation 1.1** The theoretical and historical under-pinnings of microbiology and the science methodology are fundamental to understanding Microbiology. Assignments are designed to enforce student's understanding of the basic concepts of microbiology.
	2. understand observational and experimental methods	**Learning Objectives 1.2**	**Assignments 1.2**	**Explanation 1.2**

	used in one or more of the sciences;	Examine correlational (observational) and experimental (manipulated) approaches to common microbiological scientific questions and make conclusions on the basis of data; Employ observational and experimental methods to understand safe handling of microbes, epidemiology, disease prevention, microbial identification and treatment of microbial-based diseases.	At the end of this course students will be able to examine correlational (observational) and experimental (manipulated) approaches to common microbiological scientific questions and make conclusions on the basis of data. During this journey they will employ observational and experimental methods learned in both the lecture and laboratory portion of the course to understand safe handling of microbes, epidemiology, disease prevention, microbial identification and treatment of microbial-based diseases.	Each student will be assigned to one microbial strain (unknown to students). With the observational methods (staining, microscopy, etc.) and experimental perturbations (drug treatments, mutations, etc.), students are required to identify the species name of their assigned microbial strains. Moreover, students are also required to restate clinical relationships, epidemiology, and the disease process of their assigned microbial strains.
	3. understand applications and limitations of the sciences;	**Learning Objectives 1.3** Explain what ideas can be tested through scientific approaches and what are the limits to our current knowledge in microbiology.; Examine the current state of microbial knowledge and understand how these ideas evolved from a historical perspective and how we have improved our knowledge base as technology has improved, and they will understand the need to continue our advancements to insure a sustainable and safe use of microbes in biotechnology and	**Assignments 1.3** Reading and lectures as well as laboratory work is used to understand limitations of science. Examples of re-classification of microbial strains based on the advancement of DNA analyzing and other technologies will be stressed in lectures. Students are required to give explanations for why some microbial strains are elusive to classify.	**Explanation 1.3** In microbiology, the dependency of microbial classification on technologies exemplifies limitations of our current knowledge. Thus, exercises on these aspects will be stressed in the lecture and laboratory portion of the course.

		the development of new antibiotics.		
Educational Goals	**Learning Outcomes students will**	**Learning Objectives: At the end of the course students will be able to**	**Assignments**	**Explanation**
Skills 1 – Communication	1. develop an understanding of how to communicate scientific procedures, results from the inquiry and conclusions resulting from applying the scientific method;	**Learning Objectives 1.1** Read and interpret data tables, the Bergey's manual of determinative bacteriology for microbial identification, data based graphs, draw their own graphs and interpret (make conclusions from) graphs, data tables and the data tables from Bergey's manual; Communicate theories; develop experimental methods, and data collection and analysis resulting from their inquiries based on Microbiology lectures and laboratory experiments.	**Assignments 1.1** Students in the form of lab reports will present their analysis and discussions.	**Explanation 1.1** Students are exposed to the ways of science communication by use of the science methods, stats, and peer-review process.
Educational Goals	**Learning Outcomes students will**	**Learning Objectives: At the end of the course students will be able to**	**Assignments**	**Explanation**
Skills 2 – Critical Thinking, Quantitative Reasoning, and Solving Problems Individually and Collaboratively	1. develop basic skills from the scientific method including inquiry, data collection, analysis, and interpretation in order to explore a scientific problem from hypothesis testing to formulating a conclusion based on the inquiry;	**Learning Objectives 2.1** Propose testable microbiology-based questions and hypotheses, collect and analyze data from their lab work and testing, and draw conclusions about the questions and hypotheses from the data to identify the unknown microbes; Perform laboratory assignments individually and	**Assignments 2.1** All of the 20 or more labs will result students going through the process of critical analyses using both experimental observations and student-derived data.	**Explanation 2.1** Lecture topics will present the current state of the knowledge on how to use science methodology in microbiology. The lab exercises will result in inquiry guided data collection followed by student analysis and interpretation. Students are given an unknown organism and are expected to

		also work in teams to propose experiments, collect data and analyze that data.		apply the science method and inquiry to determine the nature and name of the microbial agent.
	2. learn about the world through observation and experimentation, through modeling and interpretation, and through analysis and evaluation;	**Learning Objectives 2.2** Explain the methodology of various genetic adaptations of different microbes and their impacts and treatment in human health and disease; Derive and confirm understanding of scientific processes in microbiology.	**Assignments 2.2** All of the 20 or more labs will result in students going through the process of using the common methodology of science.	**Explanation 2.2** The labs will result in inquiry, data collection, analysis and interpretation. In the lab, students are given an unknown organism and are expected to apply science method and inquiry to determine the nature and name of the microbe.

Educational Goals	Learning Outcomes students will	Learning Objectives: At the end of the course students will be able to	Assignments	Explanation
Skills 3 – Information Technology	1. develop and apply technological tools for inquiry, analysis, and presentation of scientific information and data;	**Learning Objectives 3.1** Use word processing (e.g., Word), spreadsheet and graphing programs (e.g., Excel), and presentation software (e.g., PowerPoint); Use graphs, tables, models, and animations to learn, document and present theories of microbiology and student's own able to add their observations in the microbiology laboratory.	**Assignments 3.1** Students will determine the nature of an unknown microbe and present their results in lab reports.	**Explanation 3.1** The lab course takes students through a series of experiments of common microbial testing to identify the bacteria. They will have to apply inquiry-based analysis to present their data on an identification sheet. Bergery Manuals are the common tool for microbial identification. Students will be required to use the Bergery Manual data tables for their analysis.
Educational Goals	**Learning Outcomes students will**	**Learning Objectives: At the end of the course students will be able to**	**Assignments**	**Explanation**
Values 1 – Personal Responsibility and Ethical Behavior	1. take responsibility for completing assignments in an ethical manner, working on one's own when required and acknowledging resources when used;	**Learning Objectives 1.1** Cite correctly from reference sources, and follow the UALR policies on academic integrity; Understand the ethics of self guided work and use of appropriate resources	**Assignments 1.1** Lab Safety, ethics of data collection and presentation will be presented in student's lab reports.	**Explanation 1.1** Students in determining the unknown bacteria identification are instructed in the procedures and ethics of self guided work.
	2. develop an understanding of the ethical obligations in conducting research, and of being precise and accurate with data, including how this obligation applies to communication of information;	**Learning Objectives 1.2** Develop an understanding of ethical obligations in conducting microbiological research and their obligation for precision, truthfulness and accuracy in microbial data collection and in their communication of this information and analytical conclusions contained in their	**Assignments 1.2** Various Lecture topics have a discussion of ethics of data collections and its accuracy. Labs concerning the unknown bacteria identification are based on these ethics	**Explanation 1.2** Students in determining the unknown bacteria identification are instructed in the procedures and ethics of self guided work.

		lab reports and presentations.		
Educational Goals	**Learning Outcomes students will**	**Learning Objectives: At the end of the course students will be able to**	**Assignments**	**Explanation**
Values 2 – Civic Responsibility	1. develop an understanding of the ethical issues that may result when applying scientific knowledge that is incomplete.	**Learning Objectives 2.1** Understand that scientific "knowledge" is always incomplete but that new technology and observations concerning understanding of microbial involvement in human health and disease is always being generated and report in the clinical and scientific journals; Understand that medical and political members of society may have to act to change policy and procedures before microbial phenomena in disease and health are fully understood.; Evaluate historical examples illustrating the potential for harm that results from use of incomplete or inaccurate scientific information such as incorrect classification of microbes in clinical diagnoses and common medical practices.	**Assignments 2.1** Students are presented case studies involving laboratory safety and the impact of microbes in the environment.	**Explanation 2.1** Students will be exposed to historical and current analysis of treatment and vaccines to disease as well as failures in treatments. The 1918 Flu Outbreak occurred before viruses were discovered and the treatment for it was using reagents against bacteria - sulfa drugs. These were not effective. Today's Ebola outbreak is a modern illustration and warning of our incomplete knowledge. First responders (Doctors and Nurses) are in extreme danger because the host, epidemiology, and methods of Ebola transfer are unclear

Additional Comments:

Belinda de Blecourt-Treadwell — Approved by Core Curriculum Committee

10-14-14 — Date

Approved by Provost

10/27/2014 — Date

Approved by Chancellor

10-22-14
Date