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| 1. **Institution and Course Information** | |
| Name of Institution | **Navajo Technical University** |
| Department | **Science** |
| Course Number, Title, Credits | **BIO 224 Microbiology (4)** |
| Co-requisite Course Number and Title, if any |  |
| Is this application for your system (ENMU, NMSU, & UNM)? |  |
| Name and Title of Contact Person | **Thiagarajan Soundappan, Department Chairperson** |
| Email and Phone Number of Contact Person | **tsoundappan@navajotech.edu; 505-786-4100** |

**Was this course previously part of the general education curriculum?**

Yes No

**This course will fulfill general education requirements for (check all that apply):**

AA/AS/BA/BS  **AAS**

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| 1. Content Area and Essential Skills |

**To which content area should this course be added?** *Indicate “Other” if the course is not associated with one of the six NM General Education content areas.*

Communications Mathematics Science Social & Behavioral Sciences

Humanities Creative & Fine Arts Other

**Which essential skills will be addressed?**

Communication Critical Thinking Information & Digital Literacy

Quantitative Reasoning Personal & Social Responsibility

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| 1. Learning Outcomes |

**This course follows the CCNS SLOs for**

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| BIOL 2310 Microbiology. Introduction to the basic principles of microbiology, microbial pathogenesis, host defenses and infectious diseases. The course will emphasize concepts related to the structure and function of microorganisms, including their mechanisms of metabolism and growth. Host parasite interactions will also be emphasized, including mechanisms of microbial pathogenesis and mechanisms of host defenses against infectious diseases. |

**List all learning outcomes that are shared between course sections at your institution.**

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| **Common Course Student Learning Outcomes (find Common Course SLOs at:** [**http://www.hed.state.nm.us/programs/request-a-change-to-the-nmccns.aspx**](http://www.hed.state.nm.us/programs/request-a-change-to-the-nmccns.aspx)**)** |
| 1. Describe and compare the structure and function of prokaryotic and eukaryotic cells. 2. Describe and compare the techniques used for staining of and microscopic observation of bacteria including morphology. 3. Describe the nutritional requirements for bacterial growth and the impact of environmental factors on bacterial growth (temperature, pH, oxygen, etc.). 4. Describe and compare the mechanisms of aerobic respiration, anaerobic respiration, and fermentative metabolism. 5. Describe the mechanism of bacterial growth by binary fission, and laboratory methods used for observing and measuring bacterial growth. 6. Describe the mechanisms of bacterial DNA replication, RNA transcription, and translation, and compare and contrast with eukaryotic cells. 7. Describe the structure and replication strategies of viruses. 8. Describe and contrast mechanisms of innate nonspecific immunity and adaptive specific immunity. 9. Describe immune hypersensitivity reactions, autoimmune diseases, and immunodeficiency diseases. 10. Differentiate between host microbe relationships, mechanisms of microbial pathogenesis, differentiate between communicable and noncommunicable diseases and describe mechanisms of direct and indirect transmission of communicable diseases. |

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| **Institution-specific Student Learning Outcomes** |
| List institution-specific Student Learning Outcomes |

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| 1. Narrative |

**Explain what students are going to do to develop the critical skills** (selected above) **and how you will assess their learning?**

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| **Communication.** *Genre and Medium Awareness, Application and Versatility; Strategies for Understanding and Evaluating Messages; and Evaluation and Production of Arguments.* |
| In this box, provide a narrative that explains how the proposed course addresses the outcomes of the first essential skill. 200 – 300 words. |

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| **Critical Thinking.** *Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning/Conclusion* |
| Microbiology provides students with the knowledge to analyze and understand the microbial population and its role within their respective ecosystem. The students learn about the morphology and characteristics of non-pathogenic and pathogenic microorganisms. Students are taught and tested on the various applications and uses for different microorganisms with the medical and microbiological fields. Students are assessed on their knowledge of microbial metabolism, immunology, and genetics by essays, oral presentations, homework, and exams. Students are challenged to use the knowledge acquired to identify an unknown sample by administering the sample through a series of tests and procedures that were taught during lab. These tests will provide information about the morphology and characteristics of the unknown sample which will allow the students to develop a conclusion based on the results to determine the microorganism’s identity. |

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| **Quantitative Reasoning.** *Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models* |
| Microbiology provides students with the ability to learn about the qualitative and quantitative aspects of the microbial populations within each ecosystem. Students are taught about microbial growth, incubation times and temperatures, oxygen requirements for growth, optimal temperatures for growth, and disease expansion for different microorganisms. During microbiology lab, students use mathematical equations to determine how much material is needed for each procedure to provide enough product to be used for the experiment. Students use the temperatures and incubation times to grow their microorganisms that they inoculated. Students count how many colony forming units (CFUs) they inoculated onto their petri-dishes after incubation. Students will be using their quantitative data to describe their microorganisms on their unknown sample report at the end of the course. |

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| **Personal & Social Responsibility***. Intercultural reasoning and intercultural competence; Sustainability and the*  *natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global* |
| Microbiology provides the students with the knowledge and different applications of microorganisms to help with medical advances in human as well as animal medicine. Students learn the meaning of teamwork and collaboration while working in a laboratory setting in order to pursue research possibilities. Research in the microbiology field is needed to sustain and advance medical practices to contend with diseases that are evolving every day and prevent the outbreak of these diseases. Students in this course will learn to maintain and discover new information in the microbiological field by reading research articles and writing research papers to expand their knowledge outside of the classroom. |

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| **Information & Digital Literacy.** *Authority and Value of Information; Digital Literacy; Information Structure; and Research as Inquiry* |
| In this box, provide a narrative that explains how the proposed course addresses the outcomes of the third essential skill. 200 – 300 words. |

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| 1. Supporting Documents |

**Sample Course Rubric Attached** (recommended) **Sample Assessment Attached** (required)

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| 1. Assessment Plan (Must be on file with HED by August 1, 2019) |

**Link to Institution’s General Education Assessment Plan** Click here to enter text.

This course meets Navajo Tech's institutional standards for General Education and has been reviewed and approved by our General Education Committee and Assessment Committee. Student learning data will be gathered from the last of the course's project assignments. Data summaries from all sections of the course will be compiled on a semester-by-semester basis by the University's Offices of Assessment and Institutional Research. Departmental faculty will review the data and design course and GenEd program improvements during Assessment Days each semester. An annual summary that includes summaries of program improvement will be prepared by the Assessment Committee and included in the University's Annual Student Learning Report. Curriculum revisions as needed will be designed by the General Education Committee and reviewed and approved by the Faculty Congress.

**This course meets institutional standards for general education.**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Mar 14 2019

Signature of Chief Academic Officer Date

**HED Internal Use Only**

Presented to NMCC on\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date

Approved Denied

If denied, rationale:

Institution Notified on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date

**Sample Assessment: Unknown Microorganism Assignment-With-Rubric**

**Assignment steps:**

1. Create a nutrient broth, agar plate, agar slant, and a deep agar media.

2. Collect sample from the environment and inoculate the media using aseptic technique.

3. Incubate the media at 37 degrees Celsius for 24 to 36 hours.

4. Prepare a Gram Stain, an Acid-Fast Stain, an Endospore Stain, a Capsule Stain, and a Fungal Stain.

5. Review stains using a compound microscope.

6. Inoculate selective and differential media using aseptic technique.

7. Incubate selective and differential media at 37 degrees Celsius for 24 to 36 hours.

8. Write down your results, meaning of the results (characteristics/morphology), and your conclusion of what microorganism you have identified in a 1 to 2-page paper.

**Rubric**

Student: Date:

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| Procedures/Techniques | SCALE | | | SUBTOTALS & COMMENTS |
| Emerging (1 pts) | Developing (2 pts) | Proficient (3 pts) |
| **Nutrient Broth/Agar**  **Media Procedure** | Student poorly executes and explain some details of the procedure. | Student executes the procedure with 1 to 2 errors. Student can explain the details of the procedure. | Student executes the procedure without any errors. Student can explain the details and the reasoning why this procedure is important to Microbiology. |  |
| **Aseptic Technique** | Student executes poor aseptic technique and can explain some details of the technique. | Student executes adequate aseptic technique and can explain the details of the technique. | Student executes proper aseptic technique. Student explains the details and the reasoning why this technique is important when working with microorganisms. |  |
| **Gram, Acid-Fast, Endospore, Capsule, Fungal Staining Procedures** | Student poorly executes and can explain some details of the procedure. Student can explain some details of these procedures. | Student executes the procedures with 1 to 2 errors per procedure. Student can explain the details of the procedures. | Student executes all procedures without any errors. Student explains the details and what information each procedure provides the microbiologist when used in the field. |  |
| **Results/Conclusion Development** | Student gives the results without any details. Student does not provide the right conclusion based on the results discussed in the paper. | Student explains the results with a few details about each result. Student provides the right conclusion based on the results without explanation on how the student arrived at the conclusion. | Student explains the results of each procedure with many details and fully explains what the results mean. The right conclusion is fully developed with detailed information to provide evidence to back up the student’s conclusion. |  |
| TOTAL/COMMENTS | | | | |

Scale: 12-11 points = A; 10-9 points = B; 8-7 points = C; 6-5 points = D; less than 5 points = F