Course Title: Applied Microbiology
Credits: 3.0

Course Description: This course provides a survey of microbiology, covering bacteria, viruses, fungi, and protozoa. Students are introduced to cellular structure, growth, protein synthesis, and replication, and learn the role of microorganisms in human disease, the stages of infection, and diagnosis. The role and action of antibiotics, sterilization, and antimicrobials are also covered.

NARM Skills
(21)-II A. Demonstrates Universal Precautions
(22)-II B. Demonstrates the application of OSHA regulations as they relate to midwifery workplace
(23)-II C. Demonstrates the application of aseptic technique

Learning Activities:

A. Student reads appropriate sections from the Learning Materials/Resources.

B. Student answers the questions listed in the Learning Objectives by researching the Learning Materials/Resources for the course and correctly cites the sources and page numbers for each of their answers.

C. Student presents answers the questions listed in the Learning Objectives for review by preceptor.

D. Student participates in preceptor elaboration/discussion of Learning Objectives.

E. The student must research, prepare & present a summary of current best midwifery care/practices appropriate to a topic covered in this course from a current journal article/study, less than 5 years old.

F. Recommended Role-playing and/or Clinical Interactions

Note: The clinical requirement of NARM/Clinical Skills is completed at any time throughout the ASM apprenticeship during actual clinical practice and is NOT a requirement to complete this academic course.

Activities specific to NARM skills learned in this section:
1. Practice looking at cells and bacteria under a microscope. With help, make identifications of various bacteria, fungi, and cells.
2. Prepare 3 agar plates. On one plate, touch your unwashed fingers. On the second plate, touch normally washed fingers. Do a surgical scrub. Touch the third plate immediately afterward. Grow the agar plates and look at the difference in bacterial growth in each one after several days.
3. Practice sterile technique in opening sterilized packages and instruments.
4. Demonstrate to your instructor or to another student how you would sterilize instruments used in a midwifery practice.

**Learning Materials / Resources:**

*Please use textbooks less than 5 years old or most recent edition.*


3. American Society for Microbiology Website. 2017. [www.asm.org](http://www.asm.org)


7. Students must find 1 article/study less than 5 years old. Recommended internet links as needed for latest developments in midwifery care: [https://www.midwiferycollege.edu/resources-national-college-of-midwi](https://www.midwiferycollege.edu/resources-national-college-of-midwi)

**Evaluation Tools / Methods:**

*Minimum passing grade for each course is a cumulative 80% / B-. Students and preceptors are encouraged to work together until the student masters the information.*

Final grade for the course is based on preceptor evaluation of the following:

A. Learning Objectives count for 50% of the final grade.
   The preceptor evaluates each answer based on three elements:
   
   1. Answers should reflect a thorough review of current literature regarding best current practices in midwifery care.
   2. Each answer should be formed in the student’s own words or paraphrased from the text. The answer should be minimal, not a re-write of the entire text, but enough to show appropriate comprehension of the learning objective.
   3. Student identification of sources and page numbers for each of the Learning Objectives. (Preceptor should do a random check to determine that sources cited are correctly identified.)

B. Enrichment Activities, including research essays and summaries of articles: 20%
C. Discussions: 15%
D. Tests and Exams: 15%
Course credit:
One Academic credit equals approximately 15 hours of formal time plus 30 hours of additional study or homework. Formal time is defined as the amount of time taken to answer the Learning Objectives to the level of 80% and to complete any learning activities to the preceptor’s satisfaction, including any time spent face to face with the preceptor. Informal time includes any time spent actively reading relevant sources and textbook/s, researching Learning Objectives, and studying for examinations.

Learning Objectives:

A. The student must research, prepare & present a summary of an aspect of current best midwifery care/practices appropriate a topic from this course from a current journal article/study.

B. Student answers the questions below and cites the sources and page numbers.

1. What is the difference between eukaryotic cells and prokaryotic cells?

2. Are bacteria eukaryotes or prokaryotes?

3. Name five characteristics upon which bacteria are classified.

4. What does it mean for an organism to be anaerobic?

5. Name the four functions all bacteria must be able to carry out.

6. Name the basic cell structures of bacteria.

7. What is the function of the cell capsule?

8. What is the function of the flagella?

9. What is the function of slime secreted by some bacteria?

10. How is DNA stored in most bacteria?

11. Name five groups of medically important bacteria.

12. What is meant by the normal flora of the body?

13. Give an example flora of the eye

14. Give an example of flora that live in the intestines.

15. How does intestinal flora aid in the function of the intestines?

16. How does flora aid in urogenital tract health?

17. Give an example of the function of flora on the skin.
18. How does the skin help to protect the body against infection?

19. How is the respiratory tract protected from bacteria and debris?

20. Explain how the excretion of urine helps to prevent bacterial infection of the urogenital tract.

21. Briefly describe how a phagocyte acts in the body to protect it.

22. Define bacterial colonization.

23. Briefly define infection.

24. What is an endogenous infection?

25. Are obligate pathogens always dangerous?

26. What is the term for animal pathogens that can be spread to humans?

27. Describe three pathways through which pathogens are transmitted.

28. Explain how the physical environment and nutritional factors influence the growth of microorganisms.

29. Describe the process by which pathogens are “cultured” as a means of identifying them as the source of infection.

30. Explain how bacteria are tested for susceptibility to different antimicrobial medicines.

31. Briefly describe the process of nucleic acid amplification typing method for identifying bacteria.

32. Give an example of an enzyme test that identifies bacteria.

33. List the four phases of bacterial growth.

34. What occurs during the lag phase?

35. What occurs during the log phase?

36. What occurs during the stationary phase?

37. What occurs during the death phase?

38. Why are infections often acquired in hospitals?

39. Define sporulation.

40. Define what is meant by the "generation time" or "doubling" in the growth of bacteria.

41. Explain when during the growth curve bacteria are most susceptible to penicillin: lag, log, stationary, death, or equally susceptible in all stages.
42. Describe aerobic respiration of bacteria.

43. Describe anaerobic respiration of bacteria.

44. Is fermentation an aerobic or anaerobic process?

45. Briefly list the steps in cell-wall formation of bacteria.

46. Define what is meant by the bacterial genome.

47. List the three ways that genes can be transferred between bacteria.

48. Explain how some antibiotics interfere with protein synthesis.

49. Describe a way by which changes can occur in the DNA of bacteria.

50. Define bacteriophage.

51. Explain some of the mechanisms by which antimicrobial medicines work.

52. Briefly describe the action of a bacteriostatic drug.

53. Briefly describe the action of a bactericidal drug.

54. Give an example of a powerful antibiotic that is often effective on organisms that are resistant to other antibiotics.

55. Define MRSA.

56. Give two examples of mechanisms of acquired antibiotic resistance.

57. Name two sources of antimicrobial medicines.

58. Give six families of clinically useful antibiotics.

59. How do penicillins selectively interfere with bacterial cell function?

60. What cell structure does the tetracycline class of antibiotics attack?

61. What class of drugs does erythromycin belong to?

62. Explain why antibiotics have a limited usefulness.

63. What organism causes typhoid fever?

64. Give two examples of spiral bacteria.

65. How is lyme disease commonly transmitted?

66. How is syphilis commonly transmitted?
67. Explain the difference between normal host defenses and specific acquired immunity.

68. Describe the different between active and passive immunity.

69. Give an example of a vaccine against a bacterial pathogen.

70. Name the phases in bacterial pathogenesis.

71. Give an example of how a bacterium adheres to the surface of a host cell.

72. Give an example of how a bacterium invades a host cell.

73. Define bacterial toxin.

74. Briefly explain the difference between an endotoxin and exotoxin.

75. Give an example of how medical staff attempts to reduce the transmission of infection from one patient to another.

76. Explain the distinction between sterilization and disinfection.

77. Describe the difference between a disinfectant and an antiseptic.

78. Explain how much time it will take to achieve sterility of an object.

79. Explain why heat is so effective as an antimicrobial agent.

80. Describe how some bacteria such as those responsible for certain strains of food poisoning resist boiling for hours.

81. Describe how modern autoclaves overcome the resistance of the most heat-resistant microorganisms.

82. Explain the action of alcohol against microorganisms. Describe its effectiveness against spores, viruses such as hepatitis, etc.

83. Explain the action of chlorine on microorganisms.

84. Explain the action of iodine against microorganisms.

85. Describe the concern about using hexachlorophene for antisepsis.

86. Describe the properties of the cells that are Gram-positive.

87. Describe the properties of cells that are Gram-negative.

88. Identify whether staphylococcus is gram positive or negative.

89. Describe two sites on the human body where staphylococcus is often found.
90. What antibiotics is staphylococcus often susceptible to?

91. Describe how staphylococcus is most commonly transmitted.

92. Identify streptococcus pathogens as gram-positive or negative.

93. Give an example of two infections that are often caused by streptococcal bacteria.

94. Identify corynebacterium spp. as gram positive or negative.

95. What types of infection are often caused by Corynebacterium spp.?

96. Identify Listeria as gram-positive or negative.

97. Where is the Listeria bacteria most often found?

98. How are human most often contaminated by the Listeria organism?

99. Identify Bacillus as gram-positive or negative.

100. How does this organism survive adverse environments?

101. Mycobacterium tuberculosis is responsible for what type of human infection?

102. How does Mycobacterium tuberculosis spread from person to person?

103. How is infection as a result of Mycobacterium tuberculosis most commonly treated?

104. Give several qualities of the Clostridium species.

105. Briefly discuss Clostridium botulinum.

106. How are people most commonly exposed to Clostridium botulinum?

107. Where are non-sporing anaerobic bacteria most commonly found?

108. How does endogenous infection with non-sporing anaerobic bacteria most commonly occur?

109. What is the infection caused by Neisseria Gonorrhea commonly called?

110. Where does the Neisseria gonorrhea infection most often occur?

111. How is Neisseria gonorrhea often transmitted?

112. Give two examples of a small gram-negative coco-bacilli organism.

113. How is each of the above small gram-negative coco-bacilli organisms transmitted?

114. Discuss the structure of the E. coli organism.
115. Describe the genus Chlamydia.

116. What tests are normally used to identify Chlamydia trachomatis?

117. What classes of antibiotics are effective against Chlamydiae?

118. Briefly discuss how E. coli can integrate DNA from other organisms into their own.

119. Explain why viruses are not considered to be living cells.

120. Briefly describe how a virus reproduces.

121. Describe the basic structures of a virus.

122. Describe the difference between a DNA and RNA virus.

123. Give an example of a DNA virus.

124. Give an example of an RNA virus.

125. Name the steps of viral pathogenesis.

126. How do virus attach to a host cell?

127. How can a virus kill a cell directly?

128. How can a virus transform a healthy cell into a malignant one?

129. Briefly explain how a virus can cause cells to fuse.

130. What is meant by the cytopathic effects of a virus?

131. Explain viral shedding.

132. Describe three modes of viral transmission between a mother and baby.

133. Briefly describe how the immune system forms a cell-mediated response to viral infection.

134. Briefly describe how the immune system forms a humoral response to viral infection.

135. Describe how antibody testing is used to identify viral infection.

136. Briefly describe how the Enzyme-linked immunosorbent assay (ELISA) test is performed.

137. Explain why it has been difficult to find safe anti-viral medicines.

138. Name two anti-viral therapy methods.

139. Describe how a vaccine acts to prevent a viral infection.
140. Describe the dangers of a live-pathogen vaccine over a dead-pathogen vaccine.

141. Give three examples of herpes I virus.

142. How is cytomegalovirus usually transmitted?

143. Give two examples of herpes II virus.

144. Where is the varicella virus stored in the body after primary infection?

145. Give two examples of a poxvirus.

146. Describe the measles virus.

147. Describe how the mumps virus is transmitted.

148. Describe the Rubella virus.

149. How are the measles, mumps and rubella often prevented?

150. Describe the structure of the common influenza virus

151. Briefly define a retrovirus.

152. Briefly describe how the HIV virus makes its host susceptible to disease.

153. Name four modes of transmission for the HIV virus.

154. Briefly summarize how anti-viral therapy has improved prognosis for people with HIV infection.

155. Are fungi prokaryotes or eukaryotes?

156. Discuss whether or not fungi are susceptible to antibiotics.

157. Name the two basic forms that fungi take on.

158. Briefly describe asexual sporulation of fungi.

159. Briefly describe sexual sporulation of fungi.

160. How are fungi generally identified as the cause of infection?

161. Give an example of a cutaneous mycosis.

162. Give an example of a systemic mycosis.

163. Are protozoa eukaryotes or prokaryotes?

164. Give three examples of clinically important protozoa.
165. What type of organism is toxoplasmosis?
166. How does toxoplasmosis infect the human body?
167. How is toxoplasmosis most commonly acquired?
168. How is toxoplasmosis treated?
169. Give an example of a cestode.
170. How does a tapeworm acquire nutrients?
171. What species does the fluke belong to?
172. What type of organism is the common pinworm?