RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

MLTC 201 Clinical Microbiology I

I. Basic Course Information

A. Course Number and Title: MLTC 201 Clinical Microbiology I

B. New or Modified Course: Modified

C. Date of Proposal: Semester: Fall Year: 2024

D. Effective Term: Fall 2025

E. Sponsoring Department: Science & Engineering

F. Semester Credit Hours: 4 credit

G. Weekly Contact Hours: 6 Lecture: 3
Laboratory: 3
Out of class student work per week: 7.5

H. Prerequisites: MLTC 100 with a grade of C or higher and BIOL 111 with a grade of C or higher; or permission of the instructor

I. Laboratory Fees: No

II. Catalog Description

Prerequisites: MLTC 100 with a grade of C or higher and BIOL 111 with a grade of C or higher; or permission of the instructor. This course is a comprehensive study of microorganisms of importance in human health and disease. The fundamental concepts of microbial evolution, genetics, and metabolism will be covered. Emphasis is placed on the causative agents of disease and their identification, pathogenesis, transmission, and control in laboratory, clinical and residential settings. Fundamental microbiological methods such as aseptic technique, culture methods, microscopy, metabolic and physiological tests, bacterial isolation and identification, and molecular analysis will be covered. Bacteriology is emphasized in this class.

III. Statement of Course Need

A. Microbiology techniques and skills are needed for competent MLTs. This course is required for the Medical Laboratory Technology program.

B. There is a lab component in this course so that the theory can be practiced.

C. This course generally transfers as a Free Elective, but dependent on the transfer institution it may transfer as a Program Elective to schools that offer a B.S. degree in Clinical Laboratory Science.

IV. Place of Course in College Curriculum

A. Free Elective
B. This course meets a program requirement for the Associate of Applied Science degree program in Medical Laboratory Technology
C. To see course transferability: a) for New Jersey schools, go to the NJ Transfer website, www.njtransfer.org; b) for all other colleges and universities, go to the individual websites.

V. Outline of Course Content

I. PREANALYTIC PROCEDURES
- A. Specimen Collection and Transport
  1. Patient identification and specimen labeling
  2. Specimen collection
  3. Specimen transport systems and conditions for all organisms
- B. Specimen Processing
  1. Specimen prioritization and rejection criteria
  2. Biosafety cabinet and personal protective equipment
  3. Specimen preparation methods and applications
  4. Media
  5. Inoculation of media
  6. Incubation conditions (e.g., temperature, atmosphere, duration)
  7. Preparation methods for slides used for stains
- C. Stains: Procedure, Principle, and Interpretation
  1. Gram
  2. Acid-fast
  3. Modified acid-fast
- D. Stains: Procedure and Principle
  1. KOH and calcofluor-white
  2. Trichrome
  3. Giemsa

II. ANALYTIC PROCEDURES FOR BACTERIOLOGY

A. Blood and Bone Marrow
    1. Specimen sources (e.g., peripheral, intravenous catheters)
    2. Continuous monitoring systems
    3. Rapid identification/resistance detection methods
    4. Species comprising skin flora and clinical significance
    5. Colony morphology and identification of major pathogens (e.g., *Staphylococcus aureus*, coagulase-negative staphylococci, beta-hemolytic streptococci, *Enterococcus* spp., *Candida* spp*., Streptococcus pneumoniae, Acinetobacter baumannii, Enterobacteriaceae, Pseudomonas* spp.)
    6. Common agents of endocarditis
    7. Organism pathogenicity (e.g., etiology, transmission)
B. Cerebrospinal Fluid
    1. Specimen sources (e.g., lumbar puncture, shunt, reservoir)
    2. Colony morphology and identification of major pathogens associated with acute meningitis (e.g., *Streptococcus pneumoniae, Haemophilus influenzae*, *Neisseria meningitidis*, *Escherichia coli*, *Listeria monocytogenes*, *Enterobacteriaceae*, *Staphylococcus aureus*, beta-hemolytic streptococci)
    3. Common agents of shunt infections (e.g., coagulase-negative staphylococci, *Corynebacterium* spp., *Propionibacterium* spp.)
    4. Correlation with other lab results (e.g., glucose, protein, cell count)
    5. Direct detection and molecular methods
    6. Organism pathogenicity (e.g., etiology, transmission)
C. Body Fluids from Normally Sterile Sites
    1. Specimen sources (e.g., pleural, peritoneal, pericardial, vitreous and aqueous humor, synovial, amniotic)
    2. Indigenous organisms associated with mucosal surfaces and skin
    3. Colony morphology and identification of major pathogens (e.g., *S. pneumoniae*, *H. influenzae, Neisseria* spp*., E. coli, Listeria monocytogenes, Enterobacteriaceae, S. aureus,* beta-hemolytic streptococci, *Enterococcus* spp., *Pseudomonas aeruginosa*, *Acinetobacter, Clostridium perfringens, Bacteroides fragilis* group)
    4. Molecular methods
    5. Organism pathogenicity (e.g., etiology, transmission)
D. Lower Respiratory
    1. Specimen sources (e.g., sputum, endotracheal aspirate, bronchoalveolar lavage, bronchial wash, bronchial brush)
    2. Significance of quantitative and semiquantitative reporting of results
    3. Species comprising oral flora colony and Gram stain morphology
    4. Colony morphology and identification of major pathogens
    5. Direct detection and molecular methods (e.g., *Streptococcus pyogenes*, *Bordetella pertussis*)
    6. Organism pathogenicity (e.g., etiology, transmission)
E. Upper Respiratory
    1. Specimen sources (e.g., throat, nasopharynx, middle ear, sinus)
    2. Indigenous flora colony and Gram stain morphology

3. Colony morphology and identification of major pathogens
4. Direct detection and molecular methods (e.g., *Streptococcus pyogenes*, *Bordetella pertussis*)
5. Organism pathogenicity (e.g., etiology, transmission)

F. Gastrointestinal
1. Colony morphology and identification of major pathogens (e.g., *Salmonella* spp., *Shigella* spp., toxigenic *E. coli, Campylobacter* spp., *Vibrio* spp., *Yersinia enterocolitica, Aeromonas* spp., *Plesiomonas shigelloides*)
2. Direct detection and molecular methods (e.g., *Clostridium difficile,* Shiga toxin)
3. Serotyping of *E. coli, Salmonella, Shigella*
4. Organism pathogenicity (e.g., etiology, transmission, virulence mechanisms)

G. Skin, Soft Tissue, and Bone
1. Specimen sources (e.g., wound, abscess, biopsy)
2. Indigenous flora colony and Gram stain morphology
3. Colony morphology and identification of major pathogens
4. Organism pathogenicity (e.g., etiology, transmission)

H. Genital Tract
1. Specimen sources (e.g., vaginal, cervical, urethral, endocervical)
2. Indigenous organisms colony and Gram stain morphology
3. Methods for detection of pathogens associated with vaginitis (e.g., *Trichomonas, Candida*, bacterial vaginosis)
4. Culture and/or molecular detection (e.g., *N. gonorrhoeae*, *C. trachomatis*, and *Streptococcus agalactiae*)
5. Organism pathogenicity (e.g., etiology, transmission)

I. Urine
1. Specimen source (e.g., mid-stream clean catch, catheterized, suprapubic, nephrostomy)
2. Colony morphology and identification of major urinary pathogens (e.g., *Enterobacteriaceae, Enterococcus*, *Streptococcus agalactiae*, *Candida* spp., *Staphylococcus saprophyticus*)
3. Correlation of colony counts with clinical significance
4. Correlation of culture with urinalysis results

J. Identification Methods (Theory, Interpretation, and Application)
1. Colony morphology
2. Rapid tests used for presumptive identification (e.g., coagulase, catalase, oxidase, indole, PYR)
3. Conventional biochemical identification (e.g., TSI, decarboxylases, carbohydrate utilization, motility, urease, XV factors)
4. Commercial kits
5. Automated methods
6. MALDI-TOF MS
7. Multiplex molecular methods

K. Antimicrobial Susceptibility Testing and Antibiotic Resistance

1. Method, theory, interpretation, and application
2. Phenotypic detection of resistance (e.g., beta-lactamase, ESBL, inducible clindamycin resistance, carbapenamases)
3. Detection of genetic determinants of resistance (e.g., *mecA*, *vanA*, blaKPC)
4. Intrinsic resistance patterns for common species

L. MRSA/MSSA, VRE, ESBL/CRE Screening
1. Specimen sources
2. Culture methods M. BSL-3 Pathogens and Select Agents (Bioterrorism)
1. Specimen source (e.g., blood, sputum, tissue, lymph node)
2. Colony morphology and rapid tests used for presumptive identification (e.g., Bacillus anthracis, Yersinia pestis, Brucella spp., Francisella tularensis)
3. Role of regional laboratory and Laboratory Response Network
4. Organism pathogenicity (e.g., etiology, transmission)

VI. A. Course Learning Outcomes:

At the completion of the course, students will be able to:

1. Explain the principles and significance of clinical microbiology tests and results (GE-1).
2. Use appropriate mathematical applications to interpret data (GE-2*).
3. Explain the principles of and demonstrate correct use of clinical microbiology instrumentation and technology (GE-1, 3, 4).

(*Embedded critical thinking)

4. Describe and demonstrate pre- and post-examination procedures applicable to diagnostic microbiology.
5. Describe and perform standard microbiological staining procedures.
6. Describe and demonstrate the correct culture set up and incubation of microbial specimens.
7. Interpret the results of microbial cultures, stains and tests.
8. Explain the principles for different media for growth, isolation and identification of microbes.
9. Use standard microbial techniques and procedures to identify unknown microbes.
10. Demonstrate aseptic techniques for working with microbes.
11. Describe quality assessment practices for diagnostic microbiology.
12. Develop professionalism, communication skills, and interpersonal relationships by working cooperatively with instructors, preceptors and fellow students

C. Assessment Instruments

1. laboratory products
2. art work
3. research papers
4. demonstrations
5. essays
6. journals
7. portfolios
8. computer programs
9. other (please describe)

VII. Grade Determinants

A. essays
B. projects
C. tests
D. presentations

The primary formats, modes, and methods for teaching and learning that may be used in the course:

A. lecture/discussion
B. small-group work
C. computer-assisted instruction
D. guest speakers
E. laboratory
F. student oral presentations
G. simulation/role playing
H. student collaboration
I. independent study
J. other (please describe)

VIII. Texts and Materials

A. Textbooks

Sample of specific texts which may be featured:

- Introduction to Diagnostic Microbiology for the Laboratory Sciences, by Maria Dannessa Delost.
- A Photographic Atlas for the Microbiology Laboratory, 4th edition, by Michael Leboffe and Burton Pierce.

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

IX. Resources

A. Laboratory
B. Computers with internet access.
C. RVCC library databases.

X. Honors Options

An Honors Option is not available for this course.