Biomedical Sciences Laboratory Techniques, MEDS2030C
Syllabus for Spring Semester 2022
Tuesday or Thursday 2:20-5:00 (1 credit hour)

Instructors: Stephan W. Glasser Ph.D., Thomas Whitlow, Allison Mezzel, Nihar Rama

Student Instructors: Neal Sarkar, Charlotte Kirchhoff & Maggie Niemeier

Expectations:

Before coming to lab: Read the lab manual and familiarize yourself with all the material relevant to the day’s lab. Write out a protocol for what you plan on doing that day and include any prior calculation that you will need for the activity. All notebooks will be checked by instructors prior to entering the lab and are required for participation points (except the first day of class).

Leaving the lab: All notebooks will be checked (for credit) by instructors before leaving the lab for sufficient recorded data, observations, changes to protocol, and discussion. You can never include too much in your lab notebook, but you can be too brief. Clean up your lab space and leave it in the condition you found it.

Worksheets: The lab worksheet is meant to serve as a polished final report of the data you record in your lab notebook throughout the entire module. Worksheets are to be turned in at the beginning of class before each module practical.

Practical exams:
For the exams, 10-20 test stations will be set up throughout the lab where each student will be asked to complete hands-on tasks or to answer knowledge-based questions relevant to the module material.

Exam 1: Module 1 January 25/27
Exam 2: Modules 2 & 3 March 8/10
Exam 3: Modules 4 & 5 April 26/28

The BLT laboratory manual is essential for participation. It is available directly from the publisher not the bookstore. To purchase course manual:

Module One: Laboratory Basics & Instrumentation

Week 1: Instrumentation I (1.1 and 1.6 Part One)
Jan 11/13 Orientation-students form lab teams
Analytical balance, micropipette-use & calibration
Light Microscopy: oral cell harvest & staining

Week 2: Instrumentation II (1.4, 1.5 and 1.6 Part Two)
Jan 18/21 Spectrophotometer; serial dilutions & BCA protein determination
Light Microscopy: Mammalian development stained mouse sections, Amscope imaging

MODULE 1 PRACTICAL - Jan 25/27 (Beginning of Lab)
MODULE 1 WORKSHEET DUE - Jan 25/27 (Beginning of Lab)

Module Two: Microbiology Techniques

Week 3: Intro to Microbiology (2.1, 2.2 and 2.3)
Jan 25/27 Aseptic technique and pouring plates
Streak plates of mixed cultures onto different nutrient media
Environmental sampling & culturing

Week 4: Bacterial identification (2.4, 2.5, 2.6, 2.7 and 2.8)
Feb 1/3 Colony morphology, Gram stain & image capture,
Streak differential selective media
Antibiotic sensitivity

Week 5: Inflammation & Infection (2.9, 2.10, 2.11 and 2.12)
Feb 8/10 Record results of antibiotic sensitivity & selective media growth
Catalase Assay
Slide study of infection, tissue injury & immune response

MODULE 2 WORKSHEET DUE - Feb 15/17 (Beginning of Lab)

Module Three: Manipulation and Analysis of DNA

Week 6: DNA isolation (Day One Part A and Part C)
Feb 15/17 Affinity column isolation & purification of plasmid DNA
Nanodrop spectrophotometer quantification of DNA

Week 7: Gel electrophoresis and DNA amplification (Day One Part B, Day Two Parts A, B and C)
Feb 22/24 Agarose gel electrophoresis of plasmid DNA,
Prepare dilutions of plasmid DNA (GFP)
Set up polymerase chain reaction (PCR) DNA amplification,
Bacterial transformation

Week 8: Analysis of PCR reactions and DNA ligation (Day Three Part A, Ligations on page 96)
Mar 1/3 DNA ligation reactions
Gel of PCR reaction and ligations
Calculate plasmid transformation efficiency

MODULE 2&3 PRACTICAL - Mar 8/10 (Beginning of Lab)
**MODULE 3 WORKSHEET DUE - Mar 8/10 (Beginning of Lab)**

**Module Four: Protein Biochemistry**

**Week 9:**  
**Mar 8/10**  
Protein Characterization I (Day One)  
Cell lysis and affinity purification- collect fractions  
UV image for enrichment of fluorescent protein

**Week 10:**  
**Mar 15/17**  
OFF for Spring Break

**Week 11:**  
**Mar 22/24**  
Protein Characterization II (Day Two)  
Polyacrylamide gel electrophoresis of fractions,  
staining, imaging, protein size determination

**MODULE 4 WORKSHEET DUE - Mar 29/Mar 31 (Beginning of Lab)**

**Module Five: Cell Biology**

**Week 12:**  
**Mar 29/Mar 31**  
Cell Culture I (Day One Part A, Part B, Day Two Activity One)  
Sterile technique in hoods, media prep, cell trypsin release-plating  
Hemocytometer counting, cell passaging  
EVOS-XL inverted microscopy  
Fluorescent cell viability assay  
Use of fluorescent cell imager

**Week 13:**  
**Apr 5/7**  
Cell Culture II (Day Two Activity 1, Activity 3, Day Three Activity 1, Activity 4)  
Convert fluorescence viability assay/imaging  
Wound healing assay or C2/C12 myocyte cell differentiation assay  
Gene expression: Set up transient cell transfection using GFP reporter gene

**Week 14:**  
**Apr 12/14**  
Cell Culture III (Day Three Activity 2)  
Floid imaging of GFP reporter gene expression  
Quantify GFP expression, capture images

**MODULE 5 WORKSHEET DUE - Apr 19/21 (Beginning of Lab)**

**Week 15:**  
**Apr 19/21**  
Cell Culture III (Day Three Activity 2)  
Floid imaging of GFP reporter gene expression  
Quantify GFP expression, capture images

**MODULE 4 & 5 PRACTICAL - Apr 26/28 Final Exam Week**

**GRADING:** 100 points per module

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<thead>
<tr>
<th>Pre-lab Notebook Checks (1/lab)</th>
<th>Module 1</th>
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<tr>
<td>Pre-Module Quiz (1/module)</td>
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University Grade Scale

93-100 A
90-92 A-
87-89 B+
83-86 B
80-82 B-
77-79 C+
71-76 C
67-70 C-

Grades are based on 4 metrics during each of the 5 modules and 3 practical exams. The final grade is a composite of these cumulative assessments. We understand that by using the extended grade scale that includes +/- designations the grade ranges are narrow. Grades will not be adjusted (rounded up etc.) to shift a student's grade to a higher mark.

*Please do not ask us to modify your grade at the end of semester or to create additional extra credit activities.*

LATE WORK/ATTENDANCE:

Excused absences and an opportunity to make up a missed lab session will only be offered with documentation of a medical or family emergency.

Regarding pre-lab and end of module worksheets
- For proven illness with a doctor's note, 0% off as long as the instructors are notified of the absence in a timely manner.
- For family emergency: 25% off unless instructors are notified ahead of the due date or in a reasonably short time frame following the event
- For unexcused tardiness: 50% off

LAB INQUIRIES: It is preferable that you ask questions in class, as demonstrations are often the best way for instructors to answer questions. If you need to ask a question outside of lab/class, email any of the instructors or SI's. However, Dr. Glasser MUST be Cc-ed on these emails.

ACADEMIC INTEGRITY: In this lab you will be working in teams of two. Although you will be doing the lab work as a team, it is very important that both team members contribute equally to the experiments. This will also ensure that both lab members are prepared to perform each task during the practical exams. The worksheets, therefore, will be very similar in terms of purpose, methods and results. However, the discussion is to be done individually. Answers to work sheet pre and post lab questions must be in the student's own words – not copied from the manual. We want to evaluate your understanding of the laboratories. Cheating, sharing of answers/test questions, etc. will result in an immediate loss of all points for that assignment.