**COURSE OUTLINE**

**Biosciences Research Methods**

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| Course Title/Number | IST 342  Biosciences Research Methods |
| Semester/Year  Credit hours | Spring 2015  3 |
| Days/Time | Section 101 Mondays and Wednesdays 4:00 pm - 5:15 pm |
| Location | Morrow Library Room (ML)122 |
| Instructor  Textbook | Menashi Cohenford, BSc., MT, Ph.D  Basic Laboratory Methods for Biotechnology:  Textbook and Laboratory Reference 2nd Edition by Lisa Seidman and Cynthia Moore (Pearson)  ISBN:9780321570147 |
| Office | BBSC Room 241 H |
| Phone | 304-696-2697 |
| E-Mail | cohenford@marshall.edu |
| \*Office/Hours | **Tues-Thursday 3:00pm-5:00pm and Friday 3:00pm-5:00pm or by appointment** |
| University Policies | By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to [www.marshall.edu/academic-affairs](http://www.marshall.edu/academic-affairs) and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to <http://www.marshall.edu/academic-affairs/?page_id=802> Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment. |

This course focuses on laboratory calculation methods and techniques used in biosciences, to prepare students for successful internships and advanced courses in biotechnology and environmental sciences.

**Grades:** Student **grades** will be calculated as follows:

Quizzes: 25%

Exam 1: 35%

Exam II: 35%

Project 5%

**Total Points:**  100%

**Final grade** in the class will be based on the following criteria:

A: 90-100

B: 80-89

C: 70-79

D: 60-70

F: Below 60

**Exams:** The exams in this course focus on materials presented in class. All PowerPoint presentations will be made available on WebCT. Each exam will be based on multiple choice questions, problem solving, and descriptive essays. These essays will be thought provoking, requiring you to apply learned concepts in simulated situations. There will be **no** final exam for the course.

**Make-up Exams and Penalty***:* Make-up exams will be granted only in cases recognized by the University through an excused absence; the policy on excused absences can be found on pages. 79–81 of the 2010–2011 undergraduate catalog: <http://www.marshall.edu/catalog/undergraduate/ug_10-11_published.pdf>. Students without a valid excuse will receive zero for the exam.

**Quizzes:** There will be two quizzes during the semester. The quiz dates will be announced in advance to allow for adequate preparation. The quizzes may vary in format and may include multiple choice questions and/or short answer problems. Quizzes *may not be made up for any reason.*

**Project**: Students will be engaged in a lab activity involving the isolation and characterization of an enzyme from a marine organism. The objectives of this project are to allow students gain hands on experience with UV/visible spectrometry and enzyme characterization techniques. Following the completion of the project, each student must provide the instructor a written report of his/her findings. The format for the written report will be discussed in class.

**Attendance**: Student attendance and participation will be required. Punctual attendance to lectures and labs will be considered in the final grade. For example, if a student with a 68 average has a full attendance record and has actively participated, that student may receive a grade of C for the course.

**Students Requiring Special Needs**: Students with disabilities who require special accommodations should refer to this link <http://www.marshall.edu/disabled> which provides information for the educational and physical accessibility support at the university.

**Other Policies:** The use of cell phones is prohibited in class. Any student using a cell phone will be asked to leave the lecture room or the lab.

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| **Course Student Learning Outcomes** | **How Practiced in this Course** | **How Assessed in this Course** |
| Students will gain an understanding of:   * Units of measurement and conversions; * Mathematical calculations employed in biotechnology laboratories; * Buffers solutions and their preparation; * Dilutions and dilution calculations; * Analysis and the plotting of data by different graphing techniques; * Measurements Involving UV and visible spectrometry; * Beer’s law and its applications | In-class examples, discussions, problem solving and reading assignments. | By Quiz 1 and Exam 1 covering PowerPoint presentations: 1A,1B, 2, 3, 4, 5A, 5B, 5C,6,7,8 and 9 |
| Students will get introduced to:   * Various chromatographic techniques and their application for protein purification; * Methods for characterizing and analyzing enzymes and their kinetic constants; * DNA and RNA purification techniques and PCR. * Methods for calculating sensitivity, specificity, positive and negative predictive values for an assay. | In-class lectures, lab activity, videos, problem solving and reading materials recommended by instructor. | By Quiz II and Exam II covering PowerPoint presentations 1A,1B, 2, 3, 4, 5A, 5B,5C,6,7,8.9.10, 11,12,13,14,15,16  Lab report. |

**Dates: Lectures and Reading Assignments**

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| January 12th -16th  Week 1 | Units of Measurement, Conversions  Math in Biotech Labs  Reading Assignment: Chapters 13 and 14 in Basic Laboratory Methods for Biotechnology  PowerPoint Presentations 1A and 1B |
| Jan 19th | **Martin Luther King’s Day** |
| January 19rh -23th  Week 2 | Biochemical Calculations: A Review of Basic Concepts in Chemistry  (Preparation of Solutions)  Reading Assignment Chapter 26 in ‘Basic Laboratory Methods for Biotechnology’  PowerPoint Presentations 2 and 3 |
| Jan 26th-Jan 30th  Week 3 | Powerpoint Presentation 4**:**Significant Figures  Powerpoint Presentation 5A, 5B & 5C: A Short Review of Acids, Bases and Buffers  Reading Assignments: Chapter 17 pages 308-310 and  Chapter 27 in ‘Basic Laboratory Methods for Biotechnology’ |
| Feb 2nd -Feb 6th  **Feb 4th**  Week 4 | Powerpoint Point Presentations 5A, 5B and 5C (continued)  Preparation of Buffers: A Practical Approach  **Quiz No. 1** |
| February 9th -13th  Week 5 | Powerpoint Presentation 6: Dilution and Buffer Preparation  Powerpoint Presentation 7: Basic Techniques of Graphing Data  Reading Assignments: Chapter 14 pages 241-250 and Chapter 15 pages 254-270 in ‘Basic Laboratory Methods for Biotechnology’  Reading Assignment: Calculating the Line of Best Fit pages 490-491 Chapter 23 in ‘Basic Laboratory Methods for Biotechnology’ |
| February 16th -20th  **Feb 18th**  Week 6 | PowerPoint Presentation 8: A Review of Basic Statistical Methods  PowerPoint Presentation 9: Measurement Involving Light  **Quiz No. 2**  Description of Data: Descriptive Statistics  Reading Assignment: Chapters 16 in ‘Basic Laboratory Methods for Biotechnology’. |
| Feb 23rd -Feb 27th      **Feb 25th**      Week 7 | PowerPoint Presentation 9: Measurements Involving Light *(continued)* PowerPoint Presentation 10: Protein and Protein Separation Techniques  **Exam 1:** PowerPoint Presentations 1A,1B, 2, 3, 4, 5A, 5B, 5C,6,7,8 and 9  An Introduction to enzyme characterization and protein purification  Reading Assignment: Chapters 25 and 31-33 in ‘Basic Laboratory Methods for Biotechnology’ |
| March 2nd -March 6th  Week 8 | PowerPoint Presentations 11 and 12: Protein Purification Methods Part II and Part III, respectively.  PowerPoint Presentation 13: An Introduction to Enzymes  Enzyme Properties and Characterization: Reading materials will be provided by instructor. |
| March 9th -March 13th    Week 9 | **Lab I**  **Title of Project:** Isolation and Characterization of Hexosaminidase from Mercenaria mercenaria:  **Objectives**: To prepare buffers of various pH and to isolate hexosaminidase from M. mercenaria. |
| **Mar16th –Mar 20th**  Week 10 | **Spring Vacation** |
| March 23rd–March 27th  Week 11 | **Lab II**  **Title of Project:** Isolation and Characterization of Hexosaminadase from Mercenaria mercenaria:  **Objectives**:To develop hands on experience with UV/Visible Spectrophotometry, and to determine the extinction coefficient of p-nitrophenol by Beers Law. |
| Mar 30th –April 3rd  Week 12 | **Lab III**  **Title of Project:** Characterization of hexosamindase from M. *mercenria (continued)*  **Objectives**: To characterize the physical and kinetic properties of hexosaminidase from M. Mercenaria. |
| April 6th-April 10th  Week 13 | PowerPoint Presentations 14 and 15  Introduction to RNA and DNA Purification  Introduction to Electrophoresis and PCR |
| April 13th –April 17th  Week 14 | PowerPoint Presentations 15 and 16:  Introduction to Electrophoresis and PCR (15 continued)  Statistical Parameters of An Assay (16)  **Submission of Lab Reports** |
| April 20th - April 24th  **April 22nd**  Week 15  April 27th-April 30  **April 29th**  **Dead Week**  Week 16 | **Exam II**  PowerPoint Presentations 1A,1B, 2, 3, 4, 5A, 5B,5C,6,7,8.9.10,11,12,13,14,15,16  **Last Day of Class**  Review of Exam II |

\* This syllabus is presented as a guide only and may be subject to change at the instructor’s discretion.