Biol 390- Molecular Techniques, fall, 2020  
Friday 1:00- 4:50 pm (ISC 302)

Instructor and Office Hours:
Dr. Ming-Mei Chang, ISC 352 (office)/ 346 (lab), Phone: 245-5416, E-mail: chang@geneseo.edu  
M (1:30- 3 pm), Zoom Meeting (ID: 939 3346 1825)  
https://geneseo.zoom.us/j/93933461825?pwd=RktKS0F2aE51T2VXdmFGZDJZOGl0Zz09  
T (10:30- 12), Face-to-Face/ Zoom Meeting (ID: 926 6383 1170), or e-mail for appointments  
https://geneseo.zoom.us/j/92663831170?pwd=RW4rTkJMMW9LcJnVTJudVZwbzZsUT09

Learning Outcomes:
Techniques for studying molecular biology have advanced rapidly and continued to evolve. From previous courses, you might have learned about various molecular techniques without hands-on experience. This lab course will provide you with opportunities to practice some common molecular techniques used in research. Since this is a 2-credit lab course, each lab consists of a pre-laboratory lecture on background information, which will be conducted through zoom meetings, immediately followed by the hands-on lab exercise. Three major course-learning outcomes are:

To practice and understand basic molecular techniques commonly used in research
You will learn techniques in DNA isolations and quantifications degenerate PCR cloning, associated microbial culture, restriction digest, agarose gel electrophoresis, DNA isolation from agarose gel, synthesis of Dig-labeled DNA probe, Southern blot analysis, web-based sequence analysis, RNA isolation and quantification, reverse transcription, and realtime PCR. Your understanding of the background information and the efforts you put into the course are as important as the experimental results. After completing this course, you should understand each topic covered and be able to carry out the associated technique independently. Most important, you can apply what you learn to perform similar experiments in molecular biology research if needed.

To gain skills in designing experiment, and collecting, analyzing, interpreting and communicating experimental data with others
You are required to keep a well-written weekly lab note that includes all the information and data of each lab. You will use the content to write up three lab reports following the format of 1st scientific research papers. In addition, you will develop a detailed procedure to clone a gene using one of current molecular cloning techniques.

To be able to work as a team
Most if not all biological studies, particularly in the field of molecular biology, are done through teamwork. In this lab, you will work as a group of two. The joint effort between you and your partner is required for the successful completion of each lab. Thus, this might also affect your participation grade. Make sure that you are a good team player.

Course Materials and Supplies:
A 3-ring binder, notebook or loose-leaf notepaper (can be entered in computer but submitted in paper copy), Sharpie fine point permanent marker, lab coat and a pair of UV-resistant glasses/goggles are required. I will post lab protocols in Canvas every week. Please PRINT, READ, and PLACE it in the 3-ring binder and BRING to the lab. Searching and following protocols on your electronic devices while carrying out the steps are prohibited because that often results in experimental errors. It is also a good practice to make a physical mark as you complete each step in a multi-step procedure. Due to the current COVID-19 pandemic, in addition to keeping social distance, we need to protect ourselves and minimize the risk of spreading illness by wearing masks all the time.

Grading:
Organized Lab Note 20%  
Individual Homework and In-class Data Analysis 20%  
Three Group Lab Reports and DNA Cloning 30%
Three Quizzes 25%
Lab Performance 5%

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\begin{array}{cccc}
A (100-93\%) & A (92.9-90\%) & B^* (89.9-87\%) & B (86.9-83\%) \\
C^* (79.9-77\%) & C (76.9-73\%) & C (72.9-70\%) & D (69.9-60\%)
\end{array}
\]

Organized Lab Note (LN)
You should keep an **electronic copy of lab note** containing detailed information about each lab, which will be needed for lab write-up later. Keeping up your lab note writing should be an on-going activity throughout the semester. You need to i) write clearly and show obvious care taken to make it easy to understand; ii) have each lab note in **A PROPER ORDER** as specified below:

- **DATE, TITLE, NAME and LAB PARTNER on the top of the FIRST page if not every page.**
- **PURPOSE/OBJECTIVES at the BEGINNING of each lab exercise.**
- **RESULTS:**
  a. Record the RAW DATA during the lab and organize them into **TABLES** with TITLES on the TOP and/or FOOTNOTES at the BOTTOM, or **FIGURES** labeled properly with LEGENDS containing TITLES followed by brief DESCRIPTIONS at the BOTTOM or on ONE SIDE.
  b. Show all your CALCULATIONS.
  c. Briefly describe what you did when you recorded an OBSERVATION in your note. You may also just record the step number in the procedure followed by your observation.
- **INTERPRETATION and DISCUSSION**
  You should interpret/discuss your results but NOT repeat them. For examples, what do the results mean? Do you get the expected results? Why? Why NOT? This part is as important as the **RESULTS** because it shows your understanding of the lab exercise.

Individual Homework (IH) and In-class Data Analysis (DA)
At the end of each lab protocol, there are individual homework questions to help you to understand the content of each lab. There will also be in-class data analysis that is due at the end of the lab period.

Three Group Laboratory Reports (LR)
Lab reports should be written according to the format of PRIMARY scientific research papers, which includes TITLE, ABSTRACT, INTRODUCTION*, RESULTS, DISCUSSION, and REFERENCES.

Group Project on DNA Cloning (GP)
To investigate methods on DNA cloning, you and your group partner are required to design and write up a detailed protocol on cloning a gene using one of molecular cloning techniques, i.e. Restriction, Golden Gate, Gateway cloning, Gibson Assembly, Sequence and Ligation Independent, or others.

Three Quizzes
Each lab unit includes several exercises extending over multiple weeks with each exercise building on the foundation established in the previous week. Before coming to the lab, you need to review what you learned from the previous week and read the materials for that week. At the end of each lab unit, there will be a quiz to cover its content.

All assignments except DA are due at the **BEGINNING** of the lab. There will be a **10% penalty per day** for each late report. **No late assignment is accepted.**

Accommodations:
SUNY Geneseo is dedicated to providing an equitable and inclusive educational experience for all students. The Office of Accessibility (Erwin Hall 22, (585) 245-5112, access@geneseo.edu) will coordinate reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities, as well as medical conditions related to pregnancy or parenting. Students with letters of accommodation should submit a letter to each faculty member at the beginning of the semester and discuss specific arrangements.
Academic Policies of the Biology Department-ACADEMIC DISHONESTY:
You should be aware of and obey the College policies concerning academic dishonesty. Any alleged cheating and/or plagiarism may be dealt with by the School as a disciplinary problem in accord with College policies as stated in the Bulletin. Be especially aware that academic dishonesty includes putting your name on a group project that you did not contribute to and turning in lab reports where material is copied from reports from previous semesters’ classes. Beware- if your name is on a project, you need to be sure that the work is authentic and properly referenced; you are responsible if your partner has plagiarized material. The faculty of the School will take all necessary steps to deter academic dishonesty, all cases of which will be reported to the Dean of the School for possible disposition as a College disciplinary matter.

Tentative Schedule*:

<table>
<thead>
<tr>
<th>DATE</th>
<th>LAB EXERCISE</th>
<th>MATERIAL DUE</th>
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</thead>
<tbody>
<tr>
<td>9/4</td>
<td>Welcome and Introduction to Unit 1 (Zoom meeting)</td>
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<tr>
<td></td>
<td>Unit 1 Cloning Genomic nbs-Containing Sequences by Degenerate PCR</td>
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<tr>
<td>9/11</td>
<td>1-1 Genomic DNA Isolation and Degenerate PCR</td>
<td></td>
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<tr>
<td>9/18</td>
<td>1-2 Agarose Gel Electrophoresis and PCR product Purification</td>
<td>LN: 1-1; IH: 1-1</td>
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<tr>
<td>9/25</td>
<td>1-3 DNA Ligation and Bacterial Transformation (return next day)</td>
<td>LN: 1-2; IH: 1-2</td>
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<tr>
<td>10/2</td>
<td>1-4 Streak Cloned nbs-containing Bacterial Colonies (return next day)</td>
<td>IH:1-3</td>
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<td></td>
<td>Data Analysis of Bacterial Transformation and Discussion on Lab Write-up</td>
<td>DA</td>
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<td></td>
<td>Unit 2 Analysis of cloned Recombinant Plasmid</td>
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<tr>
<td>10/9</td>
<td>2-1 Plasmid DNA Isolation and Quantification; Start the night before</td>
<td>LR: Unit 1</td>
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<tr>
<td></td>
<td>Quiz 1: Unit 1 ; Restriction Digest; Molecular Cloning Tech.</td>
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<tr>
<td>10/16</td>
<td>2-2 Agarose Gel Electrophoresis and Southern Transfer (return next day)</td>
<td>LN: 2-1; IH: 2-1</td>
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<tr>
<td>10/23</td>
<td>2-3 Isolation and Quantification of nbs-containing Insert from Agarose Gel</td>
<td>LN: 2-2; IH: 2-2</td>
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<td></td>
<td>Synthesis of Dig-labeled Probe by PCR</td>
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<td>10/30</td>
<td>2-4 Southern Hybridization and Detection (start the night before)</td>
<td>IH: 2-3</td>
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<tr>
<td>11/6</td>
<td>2-5 Web-based Sequence Analysis and Discussion on Lab Report Write-up</td>
<td>LN: 2-4, GP</td>
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<td>Unit 3 Studying Gene Expressions by Realtime RT-PCR</td>
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<tr>
<td>11/13</td>
<td>3-1 Total RNA Isolation and Purification;</td>
<td>LR: Unit 2</td>
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<td></td>
<td>Quiz 2: Unit 2</td>
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<tr>
<td>11/20</td>
<td>3-2 Reverse Transcription and Realtime PCR</td>
<td>LN: 3-1; IH 3-1</td>
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<td>11/27</td>
<td>Thanksgiving break- No lab</td>
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<tr>
<td>12/4</td>
<td>3-3 Data Analysis of Unit 3 and Discussion on Lab Write-up</td>
<td>IH 3-2</td>
</tr>
<tr>
<td>12/11</td>
<td>Quiz 3: Unit 3</td>
<td>LR: Unit 3</td>
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*Due to the COVID pandemic, the schedule is tentative and subjected to change. In addition, you are strongly discouraged to attend the in-person lab meetings if you are feeling unwell physically and there is no penalty for the non-attendance.

Zoom Meeting Information for Prelab Lecture
Join Zoom Meeting
https://geneseo.zoom.us/j/94331217635?pwd=REJMU0JlaEllak9KcGRpbE16UEtHdz09
Meeting ID: 943 3121 7635
Passcode: 984727

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