Texas Tech University
Center for Biotechnology and Genomics

Fall 2020 Course Syllabus

Course Number:	BTEC 5338-001(Lecture) BTEC 5338-501(Lab)
Course Name:	Methods in Biotechnology
Course Coordinator:	J. N. Tripathy
Title:	Research Associate Professor
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Course Schedule:

Lecture	Section 001	T	1:00-1:50	MATH 108
Laboratory	Section 501	TR	2:00-4:50	ESB 105

Instructors:

Lecture

Dr. Jatindra N. Tripathy	jatindra.n.tripathy@ttu.edu	(806)8341837

Lab (Hybrid)

Dr. Xiaomei Shu	Xiaomei.shu@ttu.edu	(806)834 8760
Miss Kourtney Davis, TA	Kourtney.davis@ttu.edu	

Office hours are by appointment only.

Guidance and Ongoing Conduct of Classes in the Context of COVID-19:

If Texas Tech University campus operations are required to change because of health concerns related to the COVID-19 pandemic, it is possible that this course will move to a fully online delivery format. Should that be necessary, students will be advised of technical and/or equipment requirements, like computer with webcam and microphone including remote proctoring software. Additionally, students need to have access to Zoom video conferencing software.

I would like to outline a few expectations for everyone to have as they come to the first-class period. Some expectations to note:

A. **Face coverings are required**: Texas Tech University requires that students wear face coverings while in classes, while otherwise in campus buildings, and when social distancing cannot be maintained outdoors on campus. This requirement is consistent with the current (as of July 2, 2020) State mandate to wear face coverings in public. **If you are unable to wear face covering, you should report it Student Disability Services (SDS) and produce me a note from SDS in this regard. Please note there is no exception of this policy.** Students should bring their own facemasks. There are sanitization stations or kiosks located in academic buildings where students may obtain temporary facemasks.

B. **Signage and markers:** Students are required to be attentive to signage posted at external and some classroom doorways that indicates entry and exit ways, gathering and queuing spaces, and availability of masks and hand sanitizer. Use hand sanitizer or wash your hands in a restroom as you walk through the building**.** Please pay attention to the following guidelines.

1. Wear face coverings.
2. Entry and exit pathways.
3. How to congregate and queue before entering a classroom.
4. Social distancing guidance for using tables and chairs in gathering spaces.
5. Instructions specific to elevators and stairwells.
6. Locations of sanitation stations and hand sanitizer dispensers.

C. **Guidance waiting for their classes to begin:** Students are required not to queue for classes until at least 10 minutes before start time. Once in line, social distancing, and use of face coverings should be observed.

D. **Seating assignments:** Students are expected to sit at a minimum of six feet apart. A required seating chart will be created once everyone is positioned with appropriate social distancing. The purpose of assigned seating is to assist in contact tracing, if necessary, and to augment social distancing. In a hybrid course with alternating attendance days, a seating chart will be needed for each group of students meeting face-to-face. For studios, performance venues, and labs in which students might not have specified seats, a location chart will be needed.

E. **Queuing to exit the class**: There will also be an orderly procedure, designed to ensure social distancing, for exiting the classroom. Class will be dismissed row-by-row starting from the back while keeping face coverings on and maintaining social distancing. Please wipe down your desks/table spaces with sanitizing wipes.

F. **In the event a class member has a positive case**: **See attached PDF file.**

G. Policy on absences resulting from illness: See Attachment A.

H. Requesting accommodations because of personal health concerns: See Attachment B.

I. Guidance for students who want to stay on campus and use TTU's internet services:

a. The Library and campus computer labs will have usage guidelines available on their websites and in their physical spaces;
b. IT is working (in conjunction with Traffic and Parking) to increase wi-fi signal within parking lots:
    1. R21 – North of Law School, spaces closest to Law School building;
    2. Z4 – Directly east of Law School, spaces closest to Law School building;
    3. R31 – West of Administrative Support Center.

A. Illness-Based Absence Policy

If at any time during this semester you feel ill, in the interest of your own health and safety as well as the health and safety of your instructors and classmates, you are **encouraged *not* to attend face-to-face class meetings or events.** Please review the steps outlined below that you should follow to ensure your absence for illness will be excused. These steps also apply to not participating in synchronous online class meetings if you feel too ill to do so and missing specified assignment due dates in asynchronous online classes because of illness.

1. If you are ill and think the symptoms might be COVID-19-related:
    a. Call Student Health Services at 806.743.2848 or your health care provider. After hours and on weekends contact TTU COVID-19 Helpline at [TBA].
    b. Self-report as soon as possible using the Dean of Students COVID-19 webpage. This website has specific directions about how to upload documentation from a medical provider and what will happen if your illness renders you unable to participate in classes for more than one week.
    c. If your illness is determined to be COVID-19-related, all remaining documentation and communication will be handled through the Office of the Dean of Students, including notification of your instructors of the period of time you may be absent from and may return to classes.
    d. If your illness is determined not to be COVID-19-related, please follow steps 2.a-d below.

2. If you are ill and can attribute your symptoms to something other than COVID-19:
    a. If your illness renders you unable to attend face-to-face classes, participate in synchronous online classes, or miss specified assignment due dates in asynchronous online classes, you are encouraged to visit with either Student Health Services at 806.743.2848 or your health care provider. Note that Student Health Services and your own and other health care providers may arrange virtual visits.
    b. During the health provider visit, request a "return to school" note;
    c. E-mail the instructor a picture of that note;
    d. Return to class by the next class period after the date indicated on your note.

Following the steps outlined above helps to keep your instructors informed about your absences and ensures your absence or missing an assignment due date because of illness will be marked excused. **You will still be responsible to complete within a week of returning to class any assignments, quizzes, or exams you miss because of illness.**

B. Addressing Accommodation Requests from High-Risk Students Returning to Campus

Texas Tech University is taking considerable measures to provide effective social distancing and sanitation protocols as we prepare to return to campus in the Fall. We need to be mindful that, because of underlying health conditions, some students will be at higher risk for COVID-19. Other students, although healthy themselves, might live with someone who has compromising health conditions. Students in one or both of these two categories might request accommodations or alternatives to fulfill course requirements to avoid potential exposure to the virus.

The Office of the Provost authorizes instructors of record (IoRs), in coordination with their department chairs, academic advisors, and academic associate deans, with the flexibility necessary to make instructional accommodations for students to avoid exposure to COVID-19. Accommodations might include, as examples, alternatives to face-to-face group assignments, remote learning such as online instruction or off-site activities, changing to an online section of the same course or to an independent study with the same learning objectives as the original course, or approval of a substitute course that is offered online and can fulfill the same degree requirements of the original course.

Keep in mind the following criteria when considering making an accommodation for a student: (1) whether the requested accommodation would make a substantive alteration of the course material or objectives; (2) whether the accommodation provides an equally effective alternative to the original objectives or activities of the class; and (3) whether the accommodation can be uniformly applied should more than one student request it. If the IoR can satisfactorily address these three requirements for accommodation, and is comfortable providing it, then it is appropriate to do so. If the IOR feels unable to provide accommodation that satisfies these three criteria or is unsure how the requested accommodation can be provided, the IoR is encouraged to contact their academic associate dean's office for guidance. Students should also be advised to follow the steps for reporting illness-related absences outlined on the Dean of Students COVID-19 webpage.

If a high-risk student asks for a substantial alteration to the essential elements of the class, then the IoR, advisor, or associate dean should suggest that the student work with SDS to provide a Letter of Accommodation (LOA).

Course Description:

This course is designed as an introductory lab course for biotechnology majors. The overall goal of this course is to equip student with a strong foundation in recombinant DNA technology including recombinant protein expression and characterization. The course is broadly divided into two parts: (1) Gene cloning and (2) Recombinant protein expression and characterization. Four experimental modules cover the entire course. Module I introduces the strategy and procedures to clone gene, Module II covers sub cloning, Module III covers over-expression of foreign gene in *Escherichia coli*, purification of recombinant protein from *E.coli*, and Module IV covers recombinant protein characterization.

Required Texts:

Ninfa, A.J., Ballou, D.P., and Benore, M**.** *Fundamental Laboratory Approaches for Biochemistry and Biotechnology*, Second Edition, 2010, John Wiley and Sons.

Brown, T.A. *Gene Cloning & DNA Analysis, An Introduction*, Sixth Edition, 2010, Wiley- Blackwell

Literature:

Mobus, E. and E. Maser. (1998). Molecular cloning, overexpression, and characterization of steroid- inducible 3□□-hydroxysteroid dehydrogenase/carbonyl reductase from *Comamonas testosteronii.* J. Biol. Chem. 273(47): 30888-30896. (full text available at http://www.jbc.org/content/273/47/30888.full.pdf+html)

Additional reading assignments, experimental protocols and home-work assignments will be provided by instructors as deemed proper to enhance students learning.

Students are expected to complete homework and lab notebook before coming to the lecture and the lab (see mor about maintenance of lab notebook below).

Learning Outcome:

The fully prepared student will be able to:

- ✓ Describe the various strategies used to clone and subclone a gene.
- ✓ Use various bioinformatic tools to carry out *in silico* analysis-
  - to design the gene construct.
  - to locate gene of interest in the genome.
  - to do restriction analysis in a DNA sequence to locate restriction site.
  - to find out the right ORF for cloning.
  - to analyze DNA sequencing data (chromatogram).
  - to translate gene sequence to amino acid sequence.
- ✓ Isolate ORF from the genome and clone it into a cloning vector.

- ✓ Subclone (transfer from one vector to another) the ORF to an expression vector.
- ✓ Isolate and purify plasmids and carry out restriction-digest analysis of the plasmids.
- ✓ Transform bacterial cells and screen transformed cells using antibiotic resistance.
- ✓ Screen the recombinant colony from a non-recombinant one.
- ✓ Conduct agarose gel electrophoresis to analyze DNA purity and size.
- ✓ Isolate recombinant proteins from bacterial cells.
- ✓ Describe different analytical techniques in use to purify protein.
- ✓ Purify proteins using nickel affinity chromatography.
- ✓ Prepare, interpret, and derive information from protein purification table.
- ✓ Describe the importance of purification table during protein purification.
- ✓ Describe protocols to estimate DNA and protein concentration.
- ✓ Conduct SDS-PAGE to analyze protein purity and size.
- ✓ Assay enzyme activity.
- ✓ Estimate specific activity, purification fold, and yield of the protein.
- ✓ Write and maintain a lab notebook.

Lecture/Laboratory Schedule:

Module 1: Gene Cloning (Week 1 to Week 5)

From gene to protein: An overview to the cloning, overexpression, and characterization of 3-alpha-HDR from *Comamonas testosteroni*.

Introduction to bioinformatics (*in silico* analysis of DNA sequence) Lab safety training and lab notebook maintenance, Preparation of different solutions (concentrated, percentage, molar).

Cloning strategies, T/A cloning, Polymerase Chain Reaction (PCR), Agarose Gel Electrophoresis, Transformation of *E. coli*, Blue-white screening of recombinants Plasmid miniprep and DNA quantitation DNA Sequencing.

Module II: Sub Cloning (Week 6 to Week 10)

Sub cloning strategies, expression vector selection, vector design and modification, Restriction digestion and analysis, colony PCR, recombinant screening.

Module III: Recombinant Protein Overexpression and Purification (Week 11 to 13)

Selection of expression host, mechanism of recombinant protein expression in *E.coli.*
Cell lysis methods, epitope tagging.

Module IV: Recombinant Protein Characterization (Week 14, 15)

Immobilized Metal Affinity Chromatography, SDS-PAGE, Western blot Protein quantitation, enzyme activity assay and enzyme kinetics.

Attendance:

Lectures and labs will include information that is not in the assigned text or handouts. **It is therefore necessary and expected that you will attend and participate in every scheduled class and assigned lab. There are no makeup classes or labs.** If there is a reason for missing

a class or a lab you must contact your instructor as soon as possible to make necessary arrangements to discuss the outcome of the absence. **You may need to provide a note from your physician excusing your absence if you are absent from a class or a lab more than a day due to an illness.**

Assessments and Grading:
There will be four criteria used to determine your final grade in this course. No other forms of assessment will be used and no "extra credit" will be considered. All assignments, exams, quizzes and notebook collections will be considered late if they are not submitted on the assigned date that they are due and may receive a grade of "0."

Exams: **Two-hour exams** and a **comprehensive final** will constitute **10%, 15%** and **25%** of the course grade, respectively. These are tentatively scheduled for October 6 and November 3 and the final on December 5 (1:30-4:00 p.m.).

Lab Notebooks: You must keep a notebook. Each experiment (or tutorial) should be present in the notebook and **all data and observations must be recorded during the lab- not copied over afterwards.** Each should have a Title, a description of the Purpose of the experiment, a Description or Flow Diagram of the experimental procedures, a section for recording Results and a Summary and Discussion of the results. The Notebooks should be well-organized, and should reflect an understanding of the background principles, the purpose for the experimental techniques being used, and how the experimental procedures are linked to each other and the overall "flow" of the laboratory topic and project goals. The notebook will account for **30% of** the final grade. Recording results on a piece of scrap paper while doing an experiment is completely unacceptable.

Quizzes: There will be unannounced quizzes during the semester, which will constitute **10% of the total grade**. These will cover past material as well as expected reading prior to class.

Lab Participation: Active participation such as in-class and lab discussions, suggestions, and answering questions is strongly encouraged. Bench work in the lab is done in a group setting with two students in a group. Both members of the group should take equal responsibility to successfully complete lab experiments. Each person should be courteous and considerate of his/her lab partner and need to provide equal opportunity to follow lab protocols. Orderly conduct during the lab is always expected. Once the experiments are completed the chemicals, reagents, biological agents, and enzymes needed to be stored appropriately. All lab ware and bench surfaces should be cleaned before leaving the lab. **Lab participation grade will be 10% of the total grade**.

A final letter grade will be determined by performance on the above criteria, with consideration given to performance of the class. In prior years, the A/B cutoff for final grades has been around 90%, the B/C cutoff around 80%, the C/D cutoff around 70%, and the D/F cutoff around 65%. A grade of "I" (Incomplete) will be awarded by the instructor prior to the end of the semester only when failure to complete the work has been due to causes beyond the student's control and when class performance has been satisfactory. Texas Tech regulations require that a form explaining the reason for the Incomplete and the method to be used to make up the missed work be

submitted, after being signed by both the student and instructor, to the Registrar. Incomplete grades that are not replaced by an A, B or C grade within one year are automatically replaced by an F.

Student Accessibility (ADA Statement): OP 34.22: Any student who, because of a disability, may require special arrangements to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

Academic Integrity: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. "Scholastic dishonesty" includes, but not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student or the attempt to commit such and act.

Cheating: Dishonesty in examinations, quizzes, or homework assignments, illegal possession of examinations, the use of unauthorized notes during an examination or quiz, obtaining information during an examination from the examination paper or otherwise from another student, assisting others to cheat, alteration of grade records, illegal entry to or unauthorized presence in an office are instances of cheating.

Plagiarism: Offering the work of another as one's own, without proper acknowledgement, is plagiarism; therefore any student who fails to give credit for quotations or an essentially identical expression of material taken from books, encyclopedias, magazines, internet web sites, and other reference works, or from the themes, reports or other writings of a fellow student is guilty of plagiarism.

Civility in the Classroom : Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university (www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php).
Students are expected to assist in maintaining a classroom environment that is conducive to learning. To ensure that all students have an opportunity to gain from time spent in class, unless otherwise approved by the instructor students are prohibited from using cellular phones or

beepers or engage in any other form of distraction. Inappropriate behavior in the classroom will result in a request to leave the class.

Religious Holy Day: "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

TTU Resources for Discrimination, Harassment, and Sexual Violence

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the *Office for Student Rights & Resolution*, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: **TTU Student Counseling Center,** 806-742-3674, https://www.depts.ttu.edu/scc/ *(Provides confidential support on campus.)* **TTU Student Counseling Center 24-hour Helpline**, 806-742-5555, *(Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.)* **Voice of Hope Lubbock Rape Crisis Center**, 806-763-7273, voiceofhopelubbock.org *(24-hour hotline that provides support for survivors of sexual violence.)* **The Risk, Intervention, Safety and Education (RISE) Office**, 806-742-2110, rise.ttu.edu *(Provides a range of resources and support options focused on prevention education and student wellness.)* **Texas Tech Police Department**, 806-742-3931, http://www.depts.ttu.edu/ttpd/ *(To report criminal activity that occurs on or near Texas Tech campus*).

Proctorio Online Proctoring Tool: (If the class move online due to Covid-19)

All students must review the syllabus and the requirements including the online terms and video testing requirements to determine if they wish to remain in the course. Enrollment in the course is an agreement to abide by and accept all terms. Any student may elect to drop or withdraw from this course before the end of the drop/add period.

Online exams and quizzes within this course may require online proctoring. Therefore, students will be required to have a webcam (USB or internal) with a microphone when taking an exam or quiz. Students understand that this remote recording device is purchased and controlled by the student and that recordings from any private residence must be done with the permission of any person residing in the residence. To avoid any concerns in this regard, students should select private spaces for the testing. The University library and other academic sites at the University

offer secure private settings for recordings and students with concerns may discuss location of an appropriate space for the recordings with their instructor or advisor. Students must ensure that any recordings do not invade any third party privacy rights and accept all responsibility and liability for violations of any third party privacy concerns. Setup information will be provided prior to taking the proctored exam. For additional information about online proctoring, you can visit the online proctoring student FAQ *at-*
http://www.depts.ttu.edu/elearning/blackboard/proctorio/proctorio-student-faq.php

Additional Information:

This exam is remotely proctored using Proctorio.

- The only browser that you may use with this proctored quiz is the most recent version of Chrome.
- To ensure a stable testing environment, take the exam on a desktop/laptop as opposed to a mobile device. Note the technical requirements for Proctorio minimum system requirements for testing.
- You must have the Proctorio extension to take this quiz.
- Make sure your internal or external webcam and microphone are enabled and working properly.
- Have a valid ID ready to present at the start of the quiz
- NO ACCESS CODE is necessary to complete this quiz.
- If you cannot access the quiz, please contact Proctorio Technical Support by clicking on the Proctorio extension (a gray shield) in the upper right corner of your browser.
- For further questions, please visit the Proctorio Student FAQ.