MONTGOMERY COLLEGE

A North Harris Montgomery Community College

COURSE SYLLABUS

FOR

MOLECULAR BIOLOGY TECHNIQUES – BITC 2441

DESCRIPTION: In depth coverage of the theory and laboratory techniques in molecular biology with an emphasis on proteins, gene expression and regulation, recombinant DNA, and nucleic acids. This course continues the study of the theory of molecular biology and important related laboratory techniques started in BIOL 2416 (Genetics).

CREDIT: 4 credits

PREREQUISITES:

BITC 2411, BIOL 2416 and BIOL 2420 or 2421; or instructor's approval.

NHMCCD is dedicated to providing the least restrictive learning environment for all students. The college district promotes equity in academic access through the implementation of reasonable reasonable accommodations as required by The Vocational Rehabilitation Act of 1973, Title V, V, Section 504 and the Americans with Disabilities Act of 1990 (ADA) which will enable students with disabilities to participate in and benefit from all post-secondary educational programs and activities. *Students with disabilities who believe that they need accommodations in this course are encouraged to contact the Disability Services Office at 936-273-7239; located in Building E, Office 103H as soon as possible to better ensure that such accommodations are implemented in a timely fashion.* If you require reasonable accommodations because of a physical, mental or learning disability, please notify the instructor of this course within the first 2 weeks of the term.

COURSE OUTCOMES

Upon completion of this course, you will:

- Gain an historical perspective on molecular biology and describe the major theories in DNA and protein science.
- Understand, utilize, and perform basic laboratory techniques in molecular biology, including recombinant DNA technology.
- Demonstrate mastery of aseptic technique and safe laboratory practices in a laboratory setting.
- Apply fundamental knowledge of cellular biology and chemistry as it applies to molecular biology.
- Demonstrate an understanding of the processes of gene regulation, gene expression and genetic mutations in both the natural environment and the laboratory setting.
- Utilize the scientific method in designing a series of experiments to optimize conditions for an experiment.

COURSE COMPETENCIES

Upon completion of this course, you must be able to:

- Use and understand correct laboratory safety procedures.
- Demonstrate working knowledge of the scientific method and experimental design.
- Make careful observations and record data accurately using standard practices for laboratory notebooks.
- Further develop analytical reasoning skills.
- Correctly use, clean, maintain, and store basic laboratory glassware, supplies, and equipment.
- Accurately perform laboratory procedures given appropriate protocols.
- Show good time management in performing laboratory operations in parallel.
- Perform purification and electrophoresis of biomolecules such as DNA and RNA and correctly analyze such gels.
- Perform advanced techniques with biomolecules, including blotting and pcr.
- Use internet-based biotechnology databases and common bioinformatics tools
- Demonstrate ability to follow instructions and be a responsible lab member.

REQUIRED MATERIALS

Text: Russell, Peter, J. and Chase, Bruce, *2006 iGenetics: A Mendelian Approach*; Benjamin Cummings Publishing Co., San Francisco.
Lab Manual: Bloom, M., Freyer, G., Micklos, D. 1996. *Laboratory DNA Science*. Benjamin/Cummings Publishing Co., Inc, Menlo Park, CA.
Other laboratories will also be included in the course, and will be supplied by the instructor.
Calculator.
Computer/Printer. You will need access to word-processing, spreadsheet, and presentation software such as those available in the Microsoft Office suite.
Lab coat, gloves, safety goggles or glasses.

PROFESSOR

Lecture and Lab:
Larry Loomis-Price, Ph.D. Office: B210B

PHONE

Work 936-273-7060 Metro 936-321-5161, ext. 7060
Fax 936-273-7362 Email lloomisprice@nhmccd.edu

SEMESTER / LOCATION / TIME

Spring 2008
Lecture: TTh, 11:30 am – 12:50 am, A221
Lab: TTh, 1:00 pm – 2:20 pm, A222

OFFICE HOURS

Will be announced in class

PROPOSED CALENDAR

See attached. The calendar is *subject to change*. I will give you as much notice as possible when changes are anticipated or occur.

ATTENDANCE EXPECTATIONS

- Attendance is necessary to perform well in this course. In addition, since this course is designed to prepare students for employment in the laboratory environment, attendance will be taken and students who are absent or tardy will be penalized. If you are unable to attend a class, you are responsible for the material presented during that session as well as any activity or assignment.

- Because of the difficulty of making up complex laboratories spanning multiple class periods, it is extremely difficult to make up missed laboratories. However, if documentation of extenuating circumstances is present, the student will be responsible for inquiring about alternate arrangements that may be possible.
- The professor will have the option to **drop** a student from the class after the student has been absent without an appropriately documented excuse for **3** or more lab periods.
- Participation in class discussions and activities is crucial since this course emphasizes the development of technical skills, communication skills, the ability to work responsibly in a group, and the honing of critical thinking skills. This participation will be graded.
- MAKE-UP EXAMS WILL BE GIVEN ONLY FOR AUTHORIZED ABSENSES; WRITTEN PROOF (FROM A DOCTOR, FOR EXAMPLE) WILL BE REQUIRED.

NO LONGER ATTENDING CLASS DOES NOT CONSTITUTE WITHDRAWAL FROM THIS CLASS, NOR DOES A STUDENT'S NOTIFICATION TO THE INSTRUCTOR THAT THE STUDENT WISHES TO BE DROPPED. FAILURE OF A STUDENT TO FILL OUT A "SCHEDULE CHANGE FORM" TO OFFICIALLY DROP THIS CLASS MAY RESULT IN A GRADE OF "F."

THE LAST DAY TO DROP THIS CLASS AND RECEIVE "W" IS TUESDAY, APRIL 8, 2006, BY 4:00 P.M. AFTER THIS DATE, NO WITHDRAWALS WILL BE ISSUED.

ADDITIONAL NOTES

Professional behavior is required in all lectures and laboratories in this course. This includes observation of safety procedures, courtesy to your peers, respect for the equipment and reagents and cooperation in group projects. Students will be expected to maintain appropriate decorum in the classroom and may be dropped from the class for unruly or disruptive behavior.

EVALUATION

1) Two in-classroom examinations (each worth **100** points). Exams will include a closed book section (multiple choice and short answer) and an open book section (essays and problem solving). You will be expected to bring a 50-question scantron, a scientific calculator, your textbooks and notes to each exam.

2) Final exam (**200** points).Half of the exam will be on section 3 of the course and the other half will be comprehensive.

NOTE: At the instructor's discretion, students may do test corrections on the two exams to raise their scores by up to one grade. No corrections will be allowed on the final exam.

3) Individual assignment (**50** pts). Participate in a community event related to biotechnology. Write a short paper (1-2 pages) summarizing your experience. Here are suggestions for this assignment:

- Be a judge for the Science Fair or the Biotechnology Competition (Feb 23, 24).
- Help mentor a biotech club lab at a local high school or here on campus.
- Set up a field trip for the class.
- Other opportunities as they come up over the course of the semester.

4) Classroom participation (**50** points). Attendance and preparation for classroom activities. By definition, you must be in class to be graded for this. An unexcused absence will result in a 50 point penalty. A tardy will result in a grade of 0 for the daily activity.

5) Laboratory Write-Ups:

Flow charts and notebook (about **90** points);
Lab reports (30-60 pts per lab, about **230** points);
Writing assignments (**80** points – see attached).

6) Practicals (**40** pts). Refer to skills checklist.

7) Presentation of the results from two labs to the class (**60** points total). Each group of 2 students will do this twice during the semester. You must use visual presentation software such as PowerPoint.
8) Bio-informatics projects (about **120** points). Six computer projects relating computational and molecular biology

NOTE: Late assignments. An assignment is late if it is not turned in at the beginning of class on the day it is due. Late assignments lose 10% credit per school day that they are late. After 1 week, an assignment can be turned in for 50% credit until the last day of class.

GRADING SCHEME:

Exam 1	100
Exam 2	100
Final	200
Participation	50
Project	50
Labs	400
Lab competencies	40
Presentations	60
TOTAL*	1000*

*Minor variations may occur in any score. The total variation should be less than 50 points.

Approximately 1000 points will determine your grade according to the following schedule:

90-100% =	A
80-90% =	B
70-80% =	C
Below 70% =	F

Note that a grade of "C" or higher is required in BITC courses in order to obtain the AAS degree or ATC certificate.

LABORATORY SAFETY

Safe participation in the laboratory activities is one of the most important standards for this class. Instruction in appropriate behavior will be given and the student's signature on a safety contract is required. Violations of safety regulations will be noted on skills checklists and can result in loss of credit or forced withdrawal from the laboratory. You are responsible for learning and observing safety procedures. Be sure that you check the MSDS (copy in the lab) before using any chemical. All students must wear approved personal protective equipment, including: lab coat, safety goggles or glasses, and gloves in the laboratory at all times, unless told to do otherwise. If you fail to bring your PPE, you will be asked to leave the lab. Hooks to hang your lab coats on are available in the lab. You may bring a combination lock to put on one drawer in the lab to store goggles, gloves etc.

LABORATORY GROUPS

Every person will do every part of each lab. Every person is expected to understand each operation in the laboratory and the safe use of each instrument. Every person is expected to maintain a complete notebook and to write up their own results. If no results are obtained in a given lab (for any reason), the instructor may assign "test results" so that the laboratory can be written up. But in this class, as in real life, results matter. *Significant penalties* can be expected in such a case.

PROFESSIONAL ETHICS

I regard high professional standards as one of the most important lessons you can take from this class. My expectation for this class is that each of you will act in a responsible and ethical manner. Please take a look at the sections in our course catalog on Academic Integrity and Appeals (pp. 49-50) for details on your responsibilities as a student.

You as individuals are responsible for completing all assignments in this course. You may consult with other members of the class on homework, laboratories and projects, but I expect each of you to do your own work. *If you work with another student, please note whom you worked with on the assignment. Note that this means your lab partner should be acknowledged in every lab you do.*

The laboratory reports are the responsibility of each individual student. The background, in particular, requires that you do background research. Such research must be reported **IN YOUR OWN WORDS** and **REFERENCED APPROPRIATELY**. Inappropriate use of other work or citation will result in a grade of "0" for the exercise. There will be *no warnings*. If you have any questions at all about this policy, or how standards of plagiarism are defined at Montgomery College, I encourage you to consult with the reference librarian before turning in your work. Ignorance will not be accepted as an excuse.

If you have any questions about my expectations, please ask me. If you need help in writing your laboratory reports, please consult me or a reference librarian. If there is reason to believe you are not meeting those standards, you may expect appropriate disciplinary actions to be taken, as described in the catalog.

THE LABORATORY NOTEBOOK

Our partner companies have emphasized repeatedly how important good notebook skills are for their employees. To help you meet their standards we will follow a specific set of guidelines for keeping lab notebooks.

1) The notebook must be bound, with numbered pages.
2) You will write only in ink. You will not remove pages, erase or deface any entries. You can make changes by using a single strikeout ~~like this~~ and dating the change.
3) Pages 1-3 will be reserved for the Table of Contents.
4) Before you walk into the lab for an experiment, the following must be in your notebook:
    a. Title of the experiment
    b. Description of the experiment (3-5 sentences per day)
    c. Appropriate safety warnings
    d. Flow diagram for the experiment, including anticipated time AND steps that will be taken simultaneously.
    e. Changes to the protocol, if any have been announced.
    f. Calculations, tables, loading diagrams etc.
    g. Date
    h. Entry in the Table of Contents.
    i. YOU WILL BE GRADED IMMEDIATELY ON THESE ENTRIES.
5) Modifications and safety notices from the instructor will be written down in the notebook.
6) All data, all observations, changes, problems etc will be made directly in the notebook. If you are observed writing any of this information anywhere but your notebook, it will cost you points on the spot.
7) At the end of EVERY LAB PERIOD, you AND the instructor will sign and date every new page of data entry.

8) Leave one page blank at the end of each experiment. Your lab write-up and answers to assigned questions will be written up SEPARATELY and turned in for grading. The returned, graded write-up will be incorporated into the notebook by stapling them onto that blank page.

NAME: _____ **SPRING 2008**

SKILLS CHECKLIST – ATTACH TO THE FRONT COVER OF YOUR LAB NOTEBOOK

40 POINTS POSSIBLE – FINAL GRADE:

GENERAL

- ☐ Follows all safety precautions at all times yes no
- ☐ Completes work in normal time allotted yes no
- ☐ Effectively sets up and cleans up yes no
- ☐ Demonstrates proper precautions in use of reagents yes no
- ☐ Interacts appropriately with colleagues and staff yes no

SPECIFIC

- ☐ Uses micropipette accurately yes no
- ☐ Uses centrifuge appropriately yes no
- ☐ Uses UV camera set-up appropriately yes no
- ☐ Successfully performs digestion of DNA yes no
- ☐ Successfully performs DNA electrophoresis yes no
- ☐ Successfully transforms cells yes no
- ☐ Successfully performs replica plating of DNA yes no
- ☐ Successfully purifies DNA via miniprep yes no
- ☐ Successfully searches databases via the internet yes no
- ☐ Successfully performs digestion of DNA yes no

- ☐ Successfully performs DNA electrophoresis yes no
- ☐ Successfully performs a Southern blot yes no
- ☐ Successfully performs pcr yes no
- ☐ Successfully applies internet-based bioinformatics tools, Such as those at the NCBI website, including BLAST yes no
- ☐ Successfully extracts RNA from tissue yes no
- ☐ Successfully performs RNA electrophoresis yes no
- ☐ Successfully performs RT-PCR yes no
- ☐ Demonstrates understanding of automated DNA sequencing yes no
- ☐ Successfully applies internet-based bioinformatics tools, including design of primers for pcr and RT-pcr yes no