**BIOL 1414 (BITC 1411) Introduction to Biotechnology**

**Fall 2016**

**SECTION I: COURSE INFORMATION**

**Section:**

**Lecture:** AHS 104

**Lab:** AHS 104

**Instructor**: **Jennifer Lazare, M.S.**, Professor, Biotechnology

**Office** **Phone**: 512-841-1572

**Office** **Location**: AHS 104

**Office** **Hours**: M-Th 8-9am

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***Course Description:***

An introduction to the field of biotechnology including applications of biotechnology in molecular biology, biochemistry, research, bioethics, and laboratory safe practices in a regulated environment. The course is supplemented with exciting hands-on laboratory exercises, and real-world research and industry applications which enable the student to master basic skills in working in a biotechnology lab; solution preparation, safe handling of hazardous material, nucleic acid isolation, recombinant DNA cloning, PCR and ELISA. The course concludes with a bioscience career exploration including applied research, biomanufacturing, biomedical devices, and clinical trials.

***Enrollment:***

* Everyone will receive a 4th year Science Credit- Honors
* You may enroll for dual credit as BIOL 1414. You must enroll by September 15th. See your counselor for more information.
* BIOL 1415 will be offered in Spring

***Prerequisites:***

Skills: O Prerequisites: One year of high school biology and one year of high school chemistry or co-requisite of BIOL 1406 or BIOL 1408. Course Type: T

***Instructional Methodology****:*

There is both a laboratory and lecture component to this course, which must be taken together. There will be required readings from the textbooks, as well as occasional additional reading assignments from the literature. Both the lecture and laboratory components will require the use of the Internet and Blackboard which is made available to the student in the Austin Community College computer labs or learning center. ***An emphasis is placed on active learning strategies for content mastery***.

***Course Rationale***

This course is designed to provide a fun, practical and hands-on exploration into the field of biotechnology. In support of Austin Community College’s Mission Statement to support skills for “life-long learning”, this course will challenge students to apply critical thinking skills to their readings, class activities, laboratory exercises, and classroom discussions about current topics in biotechnology. Although an emphasis is placed on each student’s personal responsibility for constructing their new knowledge, opportunities for working collaboratively with groups will also be provided. This course is the first course in the Biotechnology Program and also a biology science elective.

***Common Course Objectives***

The Common Course Objectives for this course can be found here: <http://www.austincc.edu/biology/ccos/biol-1414cco.pdf>

***Academic Student Learning Outcomes:***

1. Students will demonstrate verbally and in writing knowledge of the field of biotechnology (including the historical development of the field) and applications of genomics. (Interpersonal skills and Personal Responsibility)
2. Utilizing the S.I. system of units, students will use a variety of laboratory tools, and equipment to learn about and develop basic lab skills such as pipetting, preparing solutions, and weighing and measuring. (Empirical and Quantitative Skills)
3. Students will demonstrate verbally, and in writing, knowledge of DNA, RNA, and protein structures.(Critical Thinking Skills)
4. Students will use technology to isolate, amplify, and detect DNA and proteins.
5. Students will demonstrate, both verbally and in writing, knowledge of scientific theory related to biotechnology techniques.
6. Students will be able to demonstrate their understanding of and to utilize proper laboratory procedures within a regulated environment.
7. Students will consider, discuss and debate current ethical and legal issues in biotechnology.(Communication Skills)

***Course Student Learning Outcomes***

The competency outcomes for this course reflect skills necessary in the biotechnology workforce which emphasize communication skills, punctuality, and teamwork in addition to molecular biology skills. The Biotechnology Program is accredited by The Texas Skill Standards System administered by the Texas Workforce Investment Council for integrated Skill Standards into the curricula: [www.tssb.org/ctc/acc](http://www.tssb.org/ctc/acc%22%20%5Ct%20%22_blank).

The Texas Skill Standards System is composed of skill standards and credentials for sub-baccalaureate occupations with strong employment and earnings opportunity. For more information see the Texas Skill Standards here: [www.tssb.org/community-and-technical-colleges](http://www.tssb.org/community-and-technical-colleges%22%20%5Ct%20%22_blank) and our website: <http://sites.austincc.edu/biotech/accreditation/>

**R&D Skill Standards**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| A3 Operate equipment | B2 Perform assays and experiments | B3 Troubleshoot experiments and equipment | B4 Perform data analysis | B5 Communicate results | C1 Participate in employer-sponsored safety training | C3 Identify unsafe conditions and take corrective action |
| C4 Suggest continuous improvements | C5 Coordinate with work team | C7 Handle and dispose of hazardous materials | C8 Maintain security | D1 Maintain lab notebook | D Create documents |  |

**Biomanufacturing Skill Standards**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1.1 Follow Standard Operating Procedures (SOPs) | 1.3 Document and analyze data | 2.1 Clean laboratory environment | 2.2 Attend company safety and security training | 2.3 Report unsafe conditions | 2.4 Maintain laboratory security |  |

***Materials***

**Textbooks:** Required: Ellyn Daugherty, Biotechnology: Science for the New Millennium. 2012. EMCParadigm Publications. ISBN: 978-0-76384-284-0

**Lab Workbook:** Jack O’Grady. 2016. “*BIOL1414 Introduction to Biotechnology Laboratory Manual & Exercise Workbook*”.

**\***One copy of the lab manual will be supplied free as well as provided electronically\*

**Supplies:** 3-ring binder, fine tip black Sharpie, earphones and optional scientific calculator.

**Lab Safety:** Safety glasses with a rating of Z87, long pants, and comfortable shoes that cover the entire foot area. A disposable lab coat will be provided.

**Email:** You are ***required*** to communicate with your instructors using your ACCmail account ONLY. To obtain your email: [***http://www.austincc.edu/accmail/***](http://www.austincc.edu/accmail/) Instructions on forwarding your email to a more regularly monitored email address can be found there.

**Blackboard:** You are ***required*** to utilize Canvas for this course.

**SECTION II: GRADING SCHEME AND MISSED EXAM POLICY:**

1. **Lecture & Lab Exams.** (300 points) The course is set up in three modules (one each 6 weeks); Each exam will cover topics and concepts covered by lecture, lab and other assigned reading materials. The format of these exams will be diverse, and may include short answer, definitions, problems, discussions, and analysis, graphing and multiple choice questions. The hands-on portion format may require the student to identify or use equipment or interpret results.
2. **Homework & Class Participation Exercises.** (100 points)
3. **Class Project.** (100 pts) The class will participate in a team project to be determined by the class. This project will have short assignments throughout the semester totaling 100pts. Project format will include a project outline, research ideas & development, and a final short presentation and summary. Details on the assignment will be given in class.
4. **Soft Skills Evaluation.** (50 points). You will be graded on preparing for class, participation in class, team work, attendance, and safe behavior in the lab. This evaluation will cover areas such as technical skills, resourcefulness, prioritization, organization, problem solving, and quality of work. There will be an evaluation after each module to allow an opportunity to respond to feedback.
5. **Lab Workbook Exercises.** (350 points) Students will turn in lab workbook assignments each week. Format and assignments differs based on the exercise but may include creating lab protocols, internet research, data analysis, creating figures and diagrams from lab experiments and filling in forms. Lab workbook exercises are due one week after all the data has been collected for that lab.
6. **Bonus Assignments**. (20 points). There will be opportunities for bonus points offered throughout the semester. They will total no more than 2% of your final grade. Instructions for bonus points will be given in class and posted to Blackboard; they will be due no later than the last class day.

**SUMMARY GRADING SCHEME:**

1. Content Knowledge:

Exams 350

Homework 100

1. Employability Skills

Employee Skills Evaluation 50

Class Project 100

1. Lab Skills

Lab Notebook 50

Lab Reports 350

**Total Lecture Points** **1000** (**Divide total points by 10 = Grade %)**

**Grading Scale: 90‑100% = A; 80‑89% = B; 70‑79% = C; 60‑69% = D; < 60% = F**

**SECTION III - ACC & CLASS POLICIES**

1. **Graded Assignments**: All assignments, including exams will be graded and returned one week after they are submitted for grading. Grades will be posted to Blackboard. If you find a discrepancy in your graded assignment and the grade posted to Blackboard, please notify me by email immediately so that it can be addressed.
2. **Use of ACC Email Communication:** All College e-mail communication to students will be sent solely to the student’s ACCmail account, with the expectation that such communications will be read in a timely fashion. ACC will send important information and will notify you of any college related emergencies using this account. Students should only expect to receive email communication from their instructor using this account. Likewise, students should use their ACCmail account when communicating with instructors and staff. Instructions for activating an ACCmail account can be found at <http://www.austincc.edu/accmail>
3. **Instructor Communication**: Per ACC policy, you must use only your ACCmail account when communicating with your instructor. You should check your email daily for time-sensitive communication from your instructor. You are expected to return communication within 72hrs. Emails from your instructor will be returned within 24-48hours during normal business hours M-F. On weekends there may be a delay in communication until the following Monday.
4. **Lecture:**  This classroom will be an active learning experience, sometimes referred to as a ‘flipped classroom’. Short lectures will be given as outlined on the schedule, however, most classes will have videos, animations, practice exercises, and laboratory exercises to learn about new topics in biotechnology. ***Classroom topics will closely follow the schedule so please complete the pre-class assignment \*prior\* to class to make the most of your classroom experience!***
5. **Lab:** The lab exercises are part of the ‘flipped classroom’ and there is a lab exercise performed most classes as outlined in the schedule and in the ‘Lab Manual & Exercise Workbook’. Lab exercises will be performed in groups; however, each student should take complete, accurate, and clear notes into their own exercise workbook during the lab as they will be handing in their own workbook. All members of the group are expected to participate in the exercise and to work together.
6. **Expectations:** The purpose of this class is to explore the exciting world of biotechnology! For some of you this is your future career and is the first course in the Biotechnology Program, and for others this may be a general interest course or a science elective in a degree in a completely different field! It is important students understand that science courses require active participation and attendance in every class. *To successfully complete this course, regular class attendance, active participation and an additional 6-8 hrs of study time outside of class is needed to be successful in this course.*

1. **Attendance/Class Participation:** Regular and punctual class attendance is expected of all students. As with all math and science courses, topics build from each other and a missed class may result in a gap in knowledge that will prevent the student from understanding concepts being covered. *Class activities provide a significant component by which grades are assessed, and students must attend classes in order to earn these points*.  Attendance will be taken at each class period, and students who are more than 15 minutes late for class will be marked as absent for that day. ***Students with excessive absences may be withdrawn from the course by the instructor.***
2. **Lecture & Lab Exams:** Exams are approximately 2.5 hours long and will be given in class during the regularly scheduled class time. If you are late to an exam, no extra time will be given. While taking an exam, students may not leave the room until they have completed their exam and turned it in for grading. ***If you have a medical condition that would require you to leave the room during the exam, you are responsible for arranging with the office of student disabilities, to take the written portion of the exam before the rest of the class takes it.***
3. **Missed Exam Policy:** Make-up exams will only be offered to students who provide the instructor with a written request along with documentation of an emergency. This is up to the discretion of the instructor.
4. **Late Work Policy:** Lab workbook exercises are due one week after the exercise is complete. Late work is accepted at the discretion of the instructor. ***I rarely accept late work so students don’t fall behind in current/future work, however, there will one workbook exercise amnesty accepted on the last class where a student may submit one workbook for regrading for any reason.***
5. **Safety Statement:** Austin Community College is committed to providing a safe and healthy environment for study and work. You are expected to learn and comply with ACC environmental, health and safety procedures and agree to follow ACC safety policies. Additional information on these can be found at <http://www.austincc.edu/ehs>. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the Emergency Procedures poster and Campus Safety Plan map in each classroom. Additional information about emergency procedures and how to sign up for ACC Emergency Alerts to be notified in the event of a serious emergency can be found at: <http://www.austincc.edu/emergency-notifications>

Please note, you are expected to conduct yourself professionally with respect and courtesy to all. Anyone who thoughtlessly or intentionally jeopardizes the health or safety of another individual will be immediately dismissed from the day’s activity, may be withdrawn from the class, and/or barred from attending future activities.

**Laboratory Safety:** Health and safety are paramount values in science classrooms, laboratories, and field activities. Students are expected to learn, understand and comply with environmental, health and safety (EHS) procedures and protocols, and must agree to abide by the ACC science safety policy. Specific safety information for each activity will be discussed at the beginning of the class activity. For those activities that require specific safety training, a student who is late and misses the safety training will not be able to participate in the activity. The comprehensive science safety policy can be found at: [**www.austincc.edu/sci\_safe/**](http://www.austincc.edu/sci_safe/). ***Before students may attend the laboratory classes, they must complete all of the following:***

1. Watch the ACC Science Safety video
2. Review the ACC Biology Lab Safety Policy and fill out the safety guide for your campus
3. Sign the ACC Biology Safety Contract.

**Student use of Organisms policy is found here:** <http://www.austincc.edu/biology/labanimalpolicy.html> In the Biotechnology Program you may work with many different types of organisms, some of which may include human and animal cell culture, stem cells, plants, bacteria, yeast, fungi and algae.

1. **Student Insurance:** Students enrolled in lab and field courses are covered by student insurance if they are injured as a result of the lab or field activity. If you are injured during class, please notify your instructor immediately and fill out the designated injury forms.
2. **Electronic Devices:** Although the use of electronic devices such as calculators, notepads, laptops and smart phone applications is highly encouraged, we ask students not use class time to talk on their cell phone, text message or check email. ***Unapproved electronic devices are not permitted on your person while writing exams.***
3. **Withdrawal Policy:** It is the responsibility of each student to ensure that his or her name is removed from the roll should he or she decides to withdraw from the class. The instructor does, however, reserve the right to drop a student should they feel it is necessary. If a student decides to withdraw, they should also verify that the withdrawal is submitted before the Final Withdrawal Date. The student is also strongly encouraged to retain their copy of the withdrawal form for their records. Students who enroll for the third or subsequent time in a course taken since fall, 2002, may be charged a higher tuition rate, for that course. State law permits students to withdraw from no more than six courses during their entire undergraduate career at Texas public colleges or universities. With certain exceptions, all course withdrawals automatically count towards this limit. Details regarding this policy can be found in the ACC college catalog. **Withdraw Dates: Are posted on the ACC academic calendar:** <http://www.austincc.edu/calendars/academic-calendar>
4. **Incomplete Award Policy:** An instructor may award a grade of “I” (Incomplete) if a student was unable to complete all of the objectives for the passing grade in a course. An incomplete grade cannot be carried beyond the established date in the following semester. The completion date is determined by the instructor but may not be later than the final deadline for withdrawal in the subsequent semester. In order to get an incomplete grade (“I”) in this course you must do all of the following **before the last class meeting**:
5. Present a valid and well-documented reason, submitted in writing, for the instructor to give an incomplete grade. This should include the reason that the student has missed the official drop deadline for that semester.
6. Complete at least 70% of the course, and ***have at least a 70% grade average in the course***.
7. Meet with your instructor to discuss what is involved in getting and finishing an incomplete. Incomplete grades must be completed by deadline on academic calendar. If not completed by that time, the incomplete grade becomes a failing grade (F).
8. Sign an Incomplete Grade Form, and give it to your lecture instructor prior to the last day of class.

**Reinstatement Procedures:** Reinstatement procedures will follow those outlined in the current ACC General catalog.

1. **Scholastic Dishonesty:** A student attending ACC assumes responsibility for conduct compatible with the mission of the college as an educational institution. Students have the responsibility to submit coursework that is the result of their own thought, research, or self-expression. Students must follow all instructions given by faculty or designated college representatives when taking examinations, placement assessments, tests, quizzes, and evaluations. Actions constituting scholastic dishonesty include, but are not limited to, plagiarism, cheating, fabrication, collusion, and falsifying documents. Penalties for scholastic dishonesty will depend upon the nature of the violation and may range from lowering a grade on one assignment to an “F” in the course and/or expulsion from the college. See the Student Standards of Conduct and Disciplinary Process and other policies at: <http://www.austincc.edu/handbook>
2. **Student Rights and Responsibilities:** Students at the college have the rights accorded by the U.S. Constitution to freedom of speech, peaceful assembly, petition, and association. These rights carry with them the responsibility to accord the same rights to others in the college community and not to interfere with or disrupt the educational process. Opportunity for students to examine and question pertinent data and assumptions of a given discipline, guided by the evidence of scholarly research, is appropriate in a learning environment. This concept is accompanied by an equally demanding concept of responsibility on the part of the student. As willing partners in learning, students must comply with college rules and procedures.
3. **Statement on Students with Disabilities:** Each ACC campus offers support services for students with documented disabilities. Students with disabilities who need classroom, academic or other accommodations must request them through the office of Student Accessibility Services (SAS). Students are encouraged to request accommodations when they register for courses or at least three weeks before the start of the semester, otherwise the provision of accommodations may be delayed.

Students who have received approval for accommodations from SAS for this course must provide the instructor with the ‘Notice of Approved Accommodations’ from SAS before accommodations will be provided. Arrangements for academic accommodations can only be made after the instructor receives the ‘Notice of Approved Accommodations’ from the student.

Students with approved accommodations are encouraged to submit the ‘Notice of Approved Accommodations’ to the instructor at the beginning of the semester because a reasonable amount of time may be needed to prepare and arrange for the accommodations. Additional information about Student Accessibility Services is available at <http://www.austincc.edu/sas>

1. **ACC Policy Concerning Copyrighted Materials:** All class materials provided on the instructor's web page, Blackboard, CD, and/or in printed form (labs, objectives, assignments, etc.) may be copyrighted and may not be reproduced without the written consent of the copyright holder (this may be the instructor, ACC, or a separate third party entity or publisher). Reproduction consists of photocopying, scanning, copying, or posting files on a server or web site. Students currently registered for this section have permission to print one copy of course materials for their own personal use. No permission is given for posting any course materials on web sites or sharing with anyone not enrolled in this class.
2. **Testing Center Policy:** Under certain circumstances, an instructor may have students take an examination in a testing center. Students using the Academic Testing Center must govern themselves according to the Student Guide for Use of ACC Testing Centers and should read the entire guide before going to take the exam. To request an exam, one must have:

[ACC Photo ID](http://www.austincc.edu/support/admissions/student_id.php), Course Abbreviation (e.g., BIOL), Course Number (e.g. 1414), Course Synonym (e.g., 10123), Course Section (e.g., 005) and Instructor's Name.

Do NOT bring cell phones to the Testing Center. Having your cell phone in the testing room, regardless of whether it is on or off, will revoke your testing privileges for the remainder of the semester. ACC Testing Center policies can be found at <http://www.austincc.edu/support-and-services/services-for-students/testing-services/instructional-testing>

1. **Student Support & Success Resources (Student & Instructional Services):** ACC strives to provide exemplary support to its students and offers a broad variety of opportunities and services. Information on these services and support systems is available at:  [http://www.austincc.edu/support-and-services](%20http%3A//www.austincc.edu/support-and-services%20%20)
* For help setting up your ACCeID, ACC Gmail, or ACC Blackboard, see a Learning Lab Technician at any ACC Learning Lab.
* Links to many student services: <http://www.austincc.edu/current-students>
* ACC Learning Labs provide free tutoring services to all ACC students currently enrolled in the course to be tutored. The tutor schedule for each Learning Lab may be found at: <http://www.austincc.edu/support-and-services/tutoring-and-academic-help>
* The Biotechnology Department offers Open Labs for tutoring and assistance with mastering laboratory skills. Information on open labs and other Biotechnology Department student success initiatives are found at: <http://www.austincc.edu/biotech>
* For help setting up your ACCeID, ACC Gmail, or ACC Blackboard, see a Learning Lab Technician at any ACC Learning Lab. Or contact the helpdesk: <http://www.austincc.edu/helpdesk/>
* The ACC student handbook can be found here: <http://www.austincc.edu/handbook>
* For feedback to the Biotechnology program we have provided an anonymous feedback online form. You can find this at our website here: <http://sites.austincc.edu/biotech/student-suggestion-form/>

Course Schedule

1st 6 weeks:

* Intro to Biotechnology
* Lab: Safety and orientation
* Lab: Micropipetting
* Lab: Ancient Biotech (Root beer/cheese)
* Lab: Solutions

2nd 6 weeks:

* CSI
* Lab: DNA Extraction
* Lab: Dilutions
* Lab: Dye electrophoresis
* Lab: Restriction Digest

3rd 6 weeks

* Forensics
* Lab: PCR
* Final Exam project

4th 6 weeks

* Biomanufacturing
* Lab: pGlo transformation
* Lab: Plasmid Purification
* Lab: pGLO purification
* Lab: pGlo SDS gel

5th 6 weeks

* Medical and Ag Biotech
* ELISA
* Got Protein
* Biofuels
* Fish barcoding

6th 6weeks

* Industry Quality BITC 1340
* Career Exploration and Resume Building
* Spring Projects