## **Fall 2025 - BTEC 1010: Fundamentals of Biotechnology I**

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Lab manager and BTEC 1010 instructor Mandy Marvel: mandy.marvel@uvu.edu

**The best way to get a hold of me is email, canvas messages, or Teams!**

**Class Times**: T/Th 10-11:50pm (sec 003) and T/Th 12-1:50pm (sec 004) in SB069 lab

**Office Hours**: T/Th 8-9am, M/W 1-2pm (or by appointment) Check in SB069 or SB052b to see if I’m there. *Try to* *let me know you’re showing up!*

**Text**: None – just handouts – also, everything will be on Canvas!

**Helpful student resources:** [**https://www.uvu.edu/studentcare/**](https://www.uvu.edu/studentcare/)

**Dates you might need to know:**

* Wait list period ends Aug 26th; late fee and department approval begins - Aug 27th.
* The last date to drop with refund and without a grade showing on the transcript is Sep 10th.
* The last day to add classes (financial aid deadline too) is Sep 10th.
* W grade on transcript for withdrawn classes begins Sep 11th.
* The last date to withdraw is Oct 28th.
* Classes end on Dec 5th and finals week is Monday Dec 8th – Friday Dec 12th.

**MISSION**:

The goal of the course is to provide awareness of biotechnology-related careers, increase general scientific literacy, provide objective, critical thinking opportunities, and link biotechnology to real world scenarios. Objectives include:

1. Comprehension of basic biology concepts such as DNA replication, transcription, translation, and protein folding, gene expression, mutations and evolution, DNA and protein diagnostics, CRISPR gene editing, and plasmid manipulation in *E. coli*
2. Introduction to a myriad of biotechnological applications and associated bioethics involved
3. Providing hands-on laboratory and critical thinking experiences
4. Understanding laws and regulations for creating, testing, and manufacturing biotech products
5. Encouraging entrepreneurial creativity by providing an opportunity to “develop and market” a potential biotechnology product

**POLICIES:**

BTEC 1010 classes begin Th 8/21 & end Th 12/4

1. Holidays: Labor Day 9/1, Fall Break 10/16-18, Thanksgiving Break to 11/24-29
2. **Attendance is imperative for participation in class activities, labs, and discussion, and lack thereof will be counted against your grade** – let the instructor know if you will need to miss a class. (You may have to make it up somehow, except labs, or forfeit the points).
3. Submit assignments on time or lose 3 points for every day the assignment is past due.
4. Plagiarism, cheating, or AI violations will result in zero credit (& ruin your personal and academic reputation forever).
5. Grading and assessment: Activities, discussions, labs, etc. are designed to allow you to increase your scientific literacy, explore your potential interests in Biotech, overcome any fears of science you may harbor, help you identify the science in your everyday world, and to let me gauge what activities were beneficial (or not) to your learning.
6. **I can’t stress participation enough!**  This is a general ed, scientific intro-type class so discuss, argue, sing, do an interpretive dance, whatever to get the class thinking about science and biotech! YOU ARE GRADED HEAVILY ON PARTICIPATION. IF YOU MISS HALF THE SEMESTER (or a third even) YOU WILL **NOT** GET AN “A” NO MATTER WHAT!
7. A hackathon will be conducted where each group will design and present an invention of their own design that incorporates not only the “invention” itself but also the manufacturing and marketing of the invention. Please think about it throughout the semester!
8. If you loved the lab-work, come back for BTEC 2010!

**FORMAT:**

We will discuss history and current events in the biotechnology field, the central dogma of molecular biology, and information regarding what scientists in the biotech field do. We will explore various biotech applications (GMOs, medicine, diagnostics, laws, & manufacturing) and incorporate the bioethical implications of those technologies. Become aware of science in your everyday life! Throughout the semester you will gain experience in basic laboratory techniques, critical thinking, communication, and scientific analysis.

**TOPICS COVERED:** *Dates and topics subject to change*

|  |  |  |
| --- | --- | --- |
| Date | **Topic** | **Assignment** |
| Th – 8/21 | Syllabus; Principles of Curiosity video; What is a scientist /scientific method worksheet done in class in groups | **Scientific method in-class worksheet**; **syllabus quiz *on Canvas*** |
| T – 8/26 | Career Review – What biotechies really do | **\* Homework:** Cracking the Code of Life video (w/ study guide) |
| Th – 1/28 | Central Dogma 1; DNA replication (replication activity) | **Cracking the Code worksheet due** |
| T – 9/2 | Central Dogma 2: Transcription – DNA to RNA -transcription activity and *cheek cell DNA extraction lab* | **Start Lab 1 worksheet on DNA extraction (due in class)** |
| Th – 9/4 | Central Dogma 3; Translation – RNA to protein (codons and translation activity) | **Canvas Syllabus quiz due** |
| T – 9/9 | Central Dogma 1, 2, 3; DNA to RNA to Protein - putting it all together with Insulin | **\* Homework: find your “In the News” article to present next class** |
| Th – 9/11 | **In the News in-class assignment** | **Present your article** |
| T – 9/16 | Pipetman practice; safety; lab layout | Read protocol before next lab |
| Th – 9/18 | Bacterial transformation with pGlo plasmid | **Start Lab 2 worksheet on transformations**  |
| T – 9/23 | Analyze transformations | **Lab 2 worksheet (due in class)** |
| Th – 9/25 | CRISPR gene editing lab – intro and digestion  | **Start lab 3 worksheet on CRISPR** |
| T – 9/30 | CRISPR gene editing lab – run DNA on agarose gels and analysis of results | **Finish lab 3 worksheet on CRISPR/gels** |
| Th – 10/2 | Single Nucleotide Polymorphisms and evolution | **Worksheet done in class** |
| T – 10/7 | Cracking Your Genetic Code/review | Study! |
| Th – 10/9 | Transgenics presentation – **personal genomics discussion questions** | **In-class discussion assignment (due in class)** |
| T – 10/14 | **Midterm!**  | **Midterm in class!****\* Homework: watch Harvest of Fear and answer the video worksheet.** |
| *Th - 10/16* | *Fall Break* | *Have fun!* |
| T – 10/21 | **GMO Discussion** | **In-class assignment on GMO discussion** |
| Th - 10/23 | GMO lab intro; start GMO lab (DNA extraction/PCR);  | **Start Lab 4 worksheet on GMO lab** |
| T – 10/28 | GMO lab / Analyze | **Continue Lab 4 worksheet on GMO lab** |
| Th– 10/30 | Food safety lab – diagnose Santa and Mrs. Claus’ vacation food poisoning | **1) Lab 4 GMO worksheet due in class****2) Start Lab 5 worksheet on food contamination**  |
| T – 11/4 | **Food safety gel analysis.****Start case study: UC Davis neurosurgeon treats glioblastoma in an unorthodox way** | **1) Lab 5 worksheet on food contamination diagnostics due in class****2) In class assignment: case study opinions and first impressions (due in class)****\* Homework: read FDA cough syrup and thalidomide papers and complete questions.** |
| Th– 11/6 | Human Experimentation – CFR 45 vol 46;**FDA empowerment: the cases of the tainted cough syrup and the thalidomide disaster** | **In-class discussions and short presentations on FDA questions/papers** |
| T – 11/11 | Biomanufacturing and CFR 21 - quality, variation, cGMP, and SOPs  | Back to case study – **discussion armed with knowledge about CFRs 45 and 21** |
| Th– 11/13 | ELISA diagnostics | **Start Lab 6 ELISA worksheet**  |
| T – 11/18 | Opioid crisis discussion | **Lab 6 ELISA worksheet due**  |
| Th– 11/20 | Opiod activity/lab | **Opioid worksheet due** |
| 11/25-27 | *Thanksgiving break* | *Eat lots!* |
| T - 12/2 | **Entrepreneurship hackathon** | **Work on project in class**  |
| Th – 12/4 | **Entrepreneurship hackathon** | **Present biotech product** |
| T - 12/9 | **FINAL’S WEEK SCHEDULE: Written final exam**  | **UVU final exam scheduled time (9 am or 11 am)** |

**Grading:**

A = ≥ 93% B = 83-86% C = 73-76 % D = 63-66%

A- = 90-92% B- = 80-82% C- = 70-72% D- = 60-62%

B+ = 87-89% C+ = 77-79% D+ = 67-69% E = Below 60

**ASSIGNMENTS, WORKSHEETS, AND QUIZZES**

|  |  |  |
| --- | --- | --- |
| **Activity** | **Description** | **Points**  |
| **Class Participation** |
|  | This is a student-centered classroom requiring participation in activities and discussions. This style of teaching helps you become more engaged and **responsible for your own learning**. Lab analyses and discussions help you think critically, express ideas, troubleshoot, and give and receive feedback.  | Points lost with absences and/or low participation, (no points gained) |
| **Assignments – discussions, ACTIVITIES, and homework** | **70 points total** |
| *Science identity* | What is a scientist? How do you apply the scientific method in your everyday life? What did you learn from Principles of Curiosity video? | 5 points – group assignment in class |
| *Cracking the Code video* | Watch the video and answer the questions about your DNA, mutations, the encoded proteins, and the Human Genome Project. | 5 points - homework |
| *Science in the News* | Become aware of the biotech around you. Identifying relevant news articles about biotech will keep you informed about cutting edge science and how it is changing our world today. (submit reference and title in canvas) | 5 points - very short, in-class presentation  |
| *Evolution and mutations worksheet* | Learn about the Rock Pocket mouse and its adaptation to its environment. Discuss whether mutations or natural selection are random. Describe evolution going on around you today! | 5 points – movie and group assignment in class |
| *Genetic engineering (Transgenics) & Personal genomics* | Group discussion about Cracking Your Genetic Code video and the Transgenics PowerPoint. What are the medical and ethical issues involved in knowing your (or your family’s) genetic code? What are the implications of the widespread availability of genetic testing? What are gene drives and gene editing technologies? | 5 points – movie and group assignment in class |
| *GMO Discussion* | Discuss the video and the ethical debate about GMOs. What are your opinions and are they based on science or society? | 5 points – group assignment in class |
| *Case studies –research or innovative treatment?* | 1. Write up your initial impression of the papers. Do you feel like there were violations? If yes, why? If no, why?2. The second write-up will be after you learn about CFRs 45 and 21 – clinical trials and good manufacturing practices. | 5 points each (10 total) – 2 group assignments in class |
| *The FDA: the tainted cough syrup and thalidomide cases* | Read and discuss the case studies on tainted cough syrup and early pharmaceutical regulations and the thalidomide case study and increased FDA regulations. How do these cases relate to CFR45 and CFR21? How are these regulations holding up in the modern, opioid-addicted U.S.? | 10 points - group assignment in class |
| *Opioid crisis dependency* | Learn about the genetic and environmental factors that lead to drug dependency. Also read articles and discuss questions about the failures that led to the opioid crisis we are still suffering from today. | 10 points each (20 total) – 2 group assignments in class |
| **ASSIGNMENTS – Lab worksheets** | **110 points total** |
| Lab 1 | Chromosomal (cheek cell) DNA extraction | 10 points |
| Lab 2 | Bacterial transformation with pGLO plasmid | 20 points |
| Lab 3 | CRISPR gene editing – how does CRISPR target and cut DNA? | 20 points |
| Lab 4 | GMO DNA diagnostic – is your food genetically modified? | 20 points |
| Lab 5 | Food contamination diagnostics – what did the Claus’ catch on vacation? | 20 points |
| Lab 6 | ELISA diagnostics – disease outbreak in class | 20 points |
| **Quizzes and EXAMS** | **100 points total** |
| *1* | Quiz 1 - Policies/syllabus questions/scientific method | 20 - Canvas |
| *2* | Midterm - Central Dogma, pipetting, and DNA manipulation (bacterial transformations and CRISPR) | 40 – in class |
| *3* | Final – mutations, GMO identification, transgenics, regulations, biomanufacturing, ELISA | 40 – in class |
| **ATTENDANCE SELFIES (on Canvas)** | **1 point total** |
|  | Take a pic in class of your work or yourself to show your attendance | .1 each |
| **Final Project: HACKathon – In CLASS** | **25** |
|  | A hackathon is an event where people come together to detect and solve a problem or to identify innovative opportunities. It is a fun way to collaborate with, and compete against, your peers on an interesting topic. As a group, you will determine the issue to be addressed and come up with possible solutions. You need to investigate your ideas and make sure they are original. You should be able to organize your problem/solution to present to the class as a group. There is a rubric on Canvas for you to follow. **IMPORTANT: someone else’s innovation (like from an existing company) is NOT YOUR INNOVATION. IT MUST BE YOUR OWN CREATION/SOLUTION.**The scientific background should be thoughtful and include scientific rationale and a scientific explanation. You should describe your ideas on how you would do the science behind the solution. Defend why this would be a worthwhile venture and how this could impact the community. |  |
| **TOTAL POINTS POSSIBLE** | **306** |

**Accommodations**

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU [Accessibility Services](https://www.uvu.edu/accessibility-services/) at accessibilityservices@uvu.edu or 801-863-8747. Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services is located on the Orem Campus in BA 112 and can be contacted at DHHservices@uvu.edu

**A WORD ABOUT AI IN CLASS:**

AI programs are not a replacement for your human creativity, originality, and critical thinking. Writing, thinking, and researching are crafts that you must develop over time to develop your own individual voice.  At the same time, you should learn how to use AI and in what instances AI can be helpful to you.

The use of generative AI tools (e.g. ChatGPT, Google Bard, etc.) is permitted in this course for the following activities:

* Brainstorming ideas;
* Fine tuning your research questions (not answers);
* Finding references for your topic;
* Drafting an outline to organize your thoughts; and
* Checking grammar and style.

The use of generative AI tools is not permitted in this course for the following activities:

* Impersonating you in classroom contexts, such as by using the tool to compose discussion board prompts/responses assigned to you or content that you put into a Teams/Canvas chat.
* Completing group work that your group has assigned to you, unless it is mutually agreed upon that you may utilize the tool.
* Writing a draft of a writing assignment.
* Writing entire sentences, paragraphs or papers to complete class assignments.

You are responsible for the information you submit based on an AI query (for instance, that it does not violate intellectual property laws, or contain misinformation or unethical content). Your use of AI tools must be properly documented and cited in order to stay within university policies on academic honesty.

Any student work submitted using AI tools should clearly indicate what work is the student’s work and what part is generated by the AI. In such cases, no more than 25% of the student work should be generated by AI. If any part of this is confusing or uncertain, please reach out to me for a conversation before submitting your work.

**Title IX** states that no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.  Students who believe they have been excluded from participation in, denied the benefits of, or discriminated against because of their sex may contact the EO/AA office to make a report, ask questions, or share concerns by email at: titleix@uvu.edu, in-person at BA-203, or by phone at: (801) 863-7999. To learn more about the Equity and Title IX office please visit us online at: <https://www.uvu.edu/equityandtitleix/>.