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BMAN 1110
Introduction to Biomanufacturing
1 semester (1 period), 0.5 credit

Granite Technical Institute
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Consultation: A Days 2:15- 3:15
B Days 1:45 - 3:15

General Course Information

PREREQUISITE Helpful but not required: Biology 1-2, Algebra I, Exploring Technology or Gateway to Technology, Manufacturing, Chemistry.

FEES $20.00 for lab notebook, lab supplies and field trips.

REQUIRED MATERIALS: flash drive, scientific calculator (about $15.00), **permanent marker** (fine point is best), paper**, pens, pencils**

TEXTBOOK is not required. Some course material discussed will be from High-performance Manufacturing Portable Production Skills, McGraw-Hill, ISBN-10: 0078614872, ISBN-13: 978-0078614873

HIGH SCHOOL GRADUATION CREDIT: Introduction to Biomanufacturing gives 0.5 credit toward the high school graduation requirement for either Career Technology Education or as a 3rd Science course.

DELIVERY FORMATS: This course will introduce biomanufacturing through lectures, class discussions, student presentations, research, assignments, guest speakers, tours of local companies, laboratory experiments and relevant hands-on activities.

SAFETY: Lab safety is of primary importance. Instructions on using the equipment will always be given in the pre-lab activities. Because of the dangerous and expensive nature of the equipment and supplies, any deliberate unsafe or disobedient behavior is grounds for expulsion.

COURSE DESCRIPTION: This foundational interdisciplinary course offers an introduction to the manufacture of biotechnology products including medical devices, pharmaceuticals, nutriceuticals, biofuels and other products. Emphasis will be on the history and present state of the industry, an introduction to the science and interdisciplinary principles and skills necessary in biomanufacturing, the biomanufacturing process, and the legal, social, and ethical issues surrounding this industry. Students will visit local biomanufacturing companies and explore possible career paths.

This course offers students the unique opportunity of working in the same state of the art facility as college students and industry professionals. For this reason, students are expected to behave with maturity and professionalism. Students are expected to show an increased level of maturity, level of discussion and self-management. Safety in the lab and with equipment is extremely important. Disruptive, disrespectful or dangerous behavior is not permitted; you will simply be dropped from the class.

ACCOMMODATIONS: I am sensitive to the need for special accommodations and want to help however I can. Please let me know if any special accommodations will help you succeed.

POLICIES:

1) Attendance: Timely attendance is crucial to participation in class activities and discussion, and will be counted toward your grade – let the instructor know before the absence when possible if you will need to miss a class.
2) Homework assignments: Must be submitted in a timely manner. You will receive ONE exemption for a late assignment. After that, you will incur a 10% penalty for every day the assignment is past due.
3) If an exam is missed due to an excused absence, arrangements must be made to take a make-up exam. This will usually be scheduled outside of class time. Students have one week to complete the make-up exam.
4) Electronic devices: To minimize disruptions, all electronic devices (Cell phones, games, MP3 players or videos, etc) must be turned off during class. Cell phones or pagers may only be used in case of emergency.
5) Classroom conduct: All students are expected to display professional behavior that is conducive to a safe, productive learning environment.
6) Safety Procedures are part of this course. Safety is a priority and the appropriate rules and practices must be followed at all times. No food or drink is allowed in the laboratory, and appropriate personal safety attire is required. In addition to the Granite Technical Institute Dress Code, no open-toe shoes are allowed in the laboratory and long hair must be tied back during lab experiments. Safety goggles and gloves must also be worn when instructed.
7) Academic dishonesty / plagiarism/cheating will result in zero credit for the applicable assignment(s) or exam.

LEARNING OUTCOMES:

Upon completion of this course, students will be able to:

1. Demonstrate competencies in biomanufacturing by:
   - explaining various biotechnological applications, their manufacture, and associated legal, social, and ethical issues related to their use and manufacturing
   - describing the local biomanufacturing industry and its career opportunities.
   - demonstrating the biomanufacturing process and describing job/departmental roles and equipment involved.
   - explaining basic components of the quality management system and its impact on product quality.
   - discussing examples and consequences of historical product failures.

2. Communicate biomanufacturing topics effectively (through reading, writing, speaking, and listening) by:
   - defining biotechnology and biomanufacturing.
   - describe the multidisciplinary approach required for the manufactured product to be successful in the biotechnology market.

3. Demonstrate critical thinking by applying scientific methods as a first inquiry step in trouble shooting

- use reasoning, analysis, evaluation and creative thinking for effective problem solving in biomanufacturing-related and other real world issues
- identifying the critical factors that affect product quality and methods to improve/maximize quality.
- Demonstrate quantitative literacies necessary to effectively interpret data and to support this interpretation.

4. Demonstrate civic engagement in a professional and constructive manner by:
   - expressing an opinion on any aspect of biomanufacturing while showing appreciation of varied perspectives/backgrounds.
   - discussing biomanufacturing history and the relevant legal, social, political, and ethical issues impacting this field

GRADING SCALE AND CRITERIA

A = 93-100 %	B- = 80–82%	D+ = 67-69%
A- = 90-93 %	C+ = 77-79%	D = 60-66%
B+ = 86-89 %	C = 73-76%	D- = 55-59%
B = 83-85 %	C- = 70-72%	E = 0-54%

TOPICS COVERED:

1 Biomanufacturing industry and applications
- *Communicate effectively about the biomanufacturing industry, terminology, abbreviations and skills (reading, writing, listening, discussing, reports using basic word processing, language and grammar skills, basic presentation software, public speaking skills)*
- Describe applications of past and present technology
- Field Trips to three local biomanufacturing companies

2 Become familiar with the phases in biomanufacturing process & production (design & development, production planning, production, resource management, production control, packaging and distribution, continuous improvement).
- Become familiar with critical functions and equipment.
- Consider the similarities & differences between traditional and biomanufacturing processes.
- Apply the basic steps in design/problem solving and mass production to develop a medical product.
- Use design specifications and requirements for product quality.

3 Understand the nature of biomanufacturing and its inter-relatedness to other disciplines
- Explore the various science and non-science careers associated with biomanufacturing.
- Identify the scientific fields relevant to biomanufacturing.
- Understand the role of biomanufacturing in society.

4 Demonstrate biomanufacturing, science, math and personal skills that are critical to success
- Demonstrate critical thinking, problem solving and scientific principles.
- Demonstrate precision measurement skills.
- Develop and demonstrate positive work ethics and leadership skills which include: responsibility, cooperation, dependability, delegation, team work, and integrity.
- Material properties & processes (biochemistry & microbiology): describe the properties of molecules, prepare lab reagents, culture bacteria.
- Quantitative literacy: data & analysis. Exhibit proper data handling and analysis skills.

5 Quality assurance: Identify and demonstrate Good Manufacturing Practices for personal & team safety.
- Exhibit appropriate safety and documentation procedures in the laboratory.

- Demonstrate appropriate use of personal protective devices
- Use resources, tools, materials, and processes safely and efficiently including turning off when not in us.
- Incorporate quality management system standards in a lab setting to comply with proper documentation policies and requirements.

6 Identify and demonstrate good manufacturing practice: product quality & public safety

- Quality control and product quality: investigate and explain the consequences of quality approvals and failures
- Describe the need and basic regulatory requirements that us & international biomanufacturing companies must follow in order to be compliant with us and global laws

Please return the disclosure statement signature, internet use agreement and media release forms to Ms. Jensen at Granite Technical Institute. A separate form is required by each high school a student attends.