



Program Title: Certificate in Biotechnology/Biomanufacturing

Catalog Description: Biotechnology and biomanufacturing industries are among the most rapidly expanding fields in Massachusetts. The Biotechnology/Biomanufacturing Certificate Program is designed for the student who wishes to learn about the field of biotechnology or who may already have a scientific background but desires to study the details of this burgeoning field in the hope of gaining an entry level position at one of the many biotechnology companies, hospitals, clinics or labs in the greater Boston areas: research assistants, lab technicians, manufacturing technicians, quality control technicians, documentation coordinators, and instrumentation calibration coordinators are examples of such careers.

Courses included in Biomanufacturing Certificate

SCI 103 Biology I	4 credits
SCI 123 Principles of Chemistry I	4 credits
SCI 204 Microbiology	4 credits
ENG 101 English Composition I	3 credits
SCI 206 Introduction to Biomanufacturing I	4 credits
SCI 207 Introduction to Biomanufacturing II	4 credits
MA 111 Mathematics for Technology	3 credits
SCI 298 Biotechnology Internship	<u>3 credits</u>
	29 credits

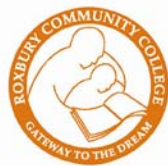
<u>Semester 1</u>	<u>Semester 2</u>	<u>Semester 3</u>
Biology I Principles of Chemistry I English Composition I	Microbiology* Intro to Biomanufacturing I Mathematics for Technology*	Biotech. Internship Intro to Biomanufacturing II
11 credits	11 credits	7 credits

*Microbiology and Mathematics for Technology should be taken prior to or concurrent with Intro to Biomanufacturing I.

Narrative Rationale and Justification

Biotechnology is the application of biological techniques to produce products that range from improved diagnostic tests and therapeutic agents for both established as well as emerging illnesses, to more nutritious and plentiful sources of food, to novel methods in remedying environmental ills. In short, biotechnology has revolutionized the way we understand and view living systems. In addition, the potential for further advances appears limitless.

Biotechnology and bioscience-related industries are among the most rapidly expanding fields today in Massachusetts. The Biotechnology/Biomanufacturing Certificate Program at Roxbury Community College is designed for the student who wishes to learn more about the field of biotechnology or who may already have a scientific background but desires to study the details of this burgeoning field in the hope of gaining an entry level position at one of the many biotechnology companies in the Boston area.



Program Title: Associate of Science Degree in Biotechnology

Catalog Description: The purpose of the Associate of Science degree program in biotechnology is two-fold. All students will obtain a broad-based science background focusing on courses in the life and chemical sciences. In addition, students will develop specific laboratory skills applicable to procedures commonly performed in research, hospital and industrial laboratories all over the United States. Students successfully completing the program will be able to transfer to a four-year university to further their studies in the sciences at the baccalaureate level or, if they prefer, directly enter the workforce as entry-level research or laboratory assistants.

Narrative Rationale and Justification

The Biotechnology Associate of Science (AS) Degree Program, like all other AS programs at RCC, parallels the first two years of study in most public and private four-year colleges and institutions. This makes the Biotechnology AS Program useful for both students wishing to transfer to a four-year college as well as those who desire to directly enter the job market. The Program is specifically designed for the student who wishes to learn more about the field of biotechnology, or who may already have a scientific background but would like to study the details of this burgeoning field in the hope of gaining an entry level position at one of the many biotechnology companies, hospitals, or research institutions in the Boston area.

**BIOTECHNOLOGY
A.S. DEGREE**

Year 1	Semester I	Semester II
	SCI 103 Biology I	SCI 104 Biology II
	MAT 101 College Math	SCI 124 Principles of Chemistry II
	SCI 123 Principles of Chemistry	ENG 102 English Composition II
	ENG 101 English Composition I	CIS 141 Microcomputer Applications
	ACS 100/ACS 102 College Survival/College Experience	
Year 2	Semester I	Semester II
	SCI 204 Microbiology	SCI 207 Introduction to Biomanufacturing II
	SCI 206 Introduction to Biomanufacturing	Social Science/ Humanities Elective
	MAT 111 Math for Technology	Social Science/Humanities Elective
	Social Science/Humanities Elective	Social Science/Humanities Elective
Year 3	Semester I	
	SCI 208 Techniques in Molecular Biology	
	SCI 298 Internship in Biotechnology	
	Social Science/ Humanities Elective	



BIOTECHNOLOGY COURSE OUTCOMES

Upon completion of the certificate in biotechnology students have demonstrated a proficiency in the following areas:

Laboratory Practices:

1. Follow standard operating procedure (SOP) protocol
2. Follow safety procedures and use laboratory equipment properly
3. Follow Good Manufacturing Practices (GMP), including complete documentation of all procedures
4. Maintain a clean environment and equipment
5. Use computers to gather and process data and use computerized instrumentation
6. Exhibit appropriate workplace behaviors, like teamwork, time management, effective communication and presentation skills, and integrity in work

Laboratory Procedures:

1. Weigh materials accurately
2. Measure volumes accurately
3. Assess temperatures accurately
4. Obtain the correct pH of a solution
5. Prepare solutions, media and buffers correctly. (Probably 1-4 could be included as sub-bullets here)
6. Use a spectrophotometer to measure light absorbance of a solution
7. Transfect various microbes (*E.coli*, yeast) and cells
8. Assess production of protein from transfected cells via various protein assays (biuret, Lowry, etc.)
9. Maintain cultures of bacterial, yeast and mammalian cells
10. Enumerate the number of cells in a solution
11. Preserve cells
12. Isolate protein from mammalian cells
13. Perform chromatographic techniques (gel filtration, ion exchange, etc.)
14. Perform SDS/PAGE electrophoresis
15. Perform ELISA/EIA