

# Biotechnology (Collaborative Program)

## [A20100] Associate in Applied Science Degree (Day and Evening)

FALL 2009

The Biotechnology curriculum, which has emerged from molecular biology and chemical engineering, is designed to meet the increasing demands for skilled laboratory technicians in various fields of biological and chemical technology.

Course work emphasizes biology, chemistry, mathematics, and technical communications. The curriculum objectives are designed to prepare graduates to serve in three distinct capacities: research assistant to a biologist or chemist; laboratory technician/instrumentation technician, and quality control/quality assurance technician.

Graduates may find employment in various areas of industry and government, including research and development, manufacturing, sales, and customer service.

This program is a collaborative effort between Randolph Community College (RCC) and Alamance Community College (ACC). Alamance Community College is the "host" college. This agreement allows for students to fulfill the requirements of the first year at Randolph Community College. Students will then transfer to ACC for all second year courses and completion of the program.

## COMPETENCIES (per Alamance Community College)

These are the skills students will develop as they progress through this program.

### GENERAL LABORATORY

1. Prepare reagents using correct calculations, measurements and mixing techniques.
2. Analyze and follow a laboratory procedure.
3. Maintain accurate laboratory records.
4. Perform common laboratory mathematical calculations.
5. Work within the framework of the concepts of quality assurance and quality control.
6. Demonstrate knowledge of the concept of and the need for cGMP and GLP.
7. Demonstrate the ability to accurately follow a SOP.
8. Communicate subject matter orally and in written form in a professional manner.

### MICROBIOLOGY/IMMUNOLOGY/CELL CULTURE

1. Perform sterile and aseptic techniques.
2. Cultivation and Storage of microorganisms.
3. Identify unknown bacteria from a mixture of bacteria.
4. Demonstrate an understanding of the interaction of the various immune system components involved in the response to an antigen.
5. Perform and evaluate immunoassays.
6. Aseptically perform the procedures necessary for the successful development of an antibody producing hybridoma.
7. Maintain anchorage dependent and independent continuous cell lines through subcultivation and the techniques of cryopreservation.

### BIOLOGY/MOLECULAR BIOLOGY/BIOCHEMISTRY

1. Describe cellular organelles and their function.
2. Describe how biochemical reactions are catalyzed by enzymes.
3. Demonstrate an understanding of the concept and mechanism of plant and animal evolution.
4. Identify the major organ systems and discuss their function and physiology.
5. Perform enzyme assays.
6. Perform quantitative and qualitative analysis of biomolecules.
7. Purify and manipulate plasmid DNA.
8. Purify and characterize proteins.
9. Describe molecular mechanisms of inheritance and gene regulation.

### CHEMISTRY

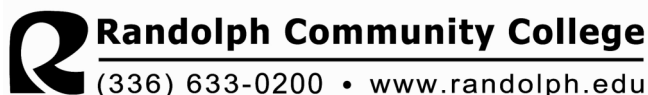
1. Describe the molecular basis for chemical reactivity.
2. Demonstrate an understanding of pH.
3. Perform quantitative and qualitative analysis of acids, bases and redox reagents.

### INSTRUMENTATION

1. Describe the underlying physical principles for measurements using common laboratory instruments.
2. Standardize, operate and interpret the results obtained from basic laboratory equipment.
3. Operate a spectrophotometer.
4. Maintain and operate various types of laboratory centrifuges.
5. Separate components of a mixture by various chromatographic methods.
6. Analyze DNA and proteins by gel electrophoresis.
7. Demonstrate computer literacy.

## FACULTY ADVISORS

The faculty advisor for Biotechnology is Dr. Donna Perry, [dmperry@randolph.edu](mailto:dmperry@randolph.edu), (336) 633-0232.



## SAFETY

1. Demonstrate the knowledge and practice of general laboratory safety procedures.
2. Demonstrate an awareness of safe laboratory practices in the performance of laboratory procedures complying with universal precautions and OSHA regulations.
3. Differentiate between biological and chemical hazards.
4. Demonstrate an understanding of the different consequences associated with biological and chemical contamination.

## GENETICS

1. Understand Mendelian patterns of inheritance.
2. Be familiar with nucleic acid and protein structure.
3. Understand the processes of DNA replication, transcription and translation.
4. Understand the basic mechanisms for regulation of gene expression in prokaryotic and eukaryotic cells.
5. Be familiar with the different types of mutations and mutagens.
6. Discuss chromosome structure.
7. Understand the mechanisms responsible for and the consequences of genetic recombination.
8. Demonstrate a knowledge of the genetics of bacteria and viruses.
9. Be familiar with the applications of molecular genetics in modern biotechnology.
10. Demonstrate an ability to isolate chromosomal and plasmid DNA from various sources.
11. Perform agarose gel electrophoresis.
12. Plan and perform PCR reactions.
13. Perform restriction endonuclease digestions.
14. Isolate and clone genes in plasmid vectors.
15. Determine expression of foreign genes in cells.
16. Transformation of prokaryotic and transfection of eukaryotic cells.
17. Perform southern blot analysis to identify DNA segments.
18. Be able to interpret sequencing gel data. Know how to access sequence databases and be familiar with the tools for their use in sequence analysis.
19. Discuss the methods used for genomic sequencing and genomic analysis.
20. Work effectively with others in performing complex laboratory procedures.

## BIOPROCESSING

1. Understand the principles of electrophoresis.
2. Perform protein analysis by SDS-PAGE.
3. Perform western blots and immunoassays for protein identification.
4. Be able to operate benchtop fermentation units.
5. Understand the techniques and problems associated with scaling up growth to commercial production levels.
6. Optimize growth conditions.
7. Know the various methods for harvesting cells and separating them from the culture media.
8. Be familiar with the various techniques for isolation of products from cell extracts and culture media.
9. Understand the principles of and be able to perform the following chromatography procedures;
  - a) thin layer chromatography
  - b) low pressure liquid chromatography
    - size exclusion
    - ion exchange
  - c) high performance liquid chromatography
    - sample preparation techniques
    - isocratic and gradient analysis using reverse phase
    - basic method development and data analysis
    - basic maintenance and troubleshooting
10. Be able to set up, use and analyze a purification table.

## GENERAL ADMISSIONS REQUIREMENTS FOR CURRICULUM PROGRAMS

Applicants for admission to Randolph Community College must be 18 years of age or high school graduates. The College will accept students with a high school equivalency diploma. A high school diploma or the equivalent is required of all applicants enrolling in curriculum courses. Persons intending to enroll in a specific curriculum are encouraged to submit their applications at least two months prior to the term in which they wish to enroll. Applicants are not admitted into specific curriculum programs, and thus, not eligible for financial aid until admission requirements are met (i.e. transcripts, testing, etc.). Applications can be obtained from high school counselors and from Student Services.

## IN ORDER TO ENROLL, THE STUDENT SHOULD

- complete an RCC application,
- provide official copies of high school transcript and/or GED test scores and all college transcripts,\*
- call (336) 633-0224 to discuss placement testing,
- meet with someone in RCC's financial aid office if necessary, (336) 633-0205,
- meet with your faculty advisor (during specified registration period),
- register and pay for classes (during specified registration period).

\*Applicants who are high school graduates should request a copy of their high school transcript. In cases where the last six weeks' work is not completed, a supplemental transcript should be forwarded to the College after the student's graduation. GED graduates must submit official copies of their GED test scores. Students transferring from other colleges or post-high school institutions must submit official transcripts from all such institutions attended. For transcript release forms, call Student Services, (336) 633-0224. Transcripts are not official unless they are sent directly from the high school or college attended.

## BIOTECHNOLOGY CURRICULUM BY SEMESTERS

These courses are to be taken at  
Randolph Community College

		Hours/Week			Sem. Hrs
		Class	Lab	Wk. Exp.	Credit
<b>First Year: Fall Semester</b>					
BIO 111	General Biology I	3	3	0	4
ENG 111	Expository Writing	3	0	0	3
CHM 131	Intro. to Chemistry	3	0	0	3
CHM 131A	Intro. to Chemistry Lab	0	3	0	1
CIS 110	Intro. to Computers	<u>2</u>	<u>2</u>	<u>0</u>	<u>3</u>
		<b>11</b>	<b>8</b>	<b>0</b>	<b>14</b>

### First Year: Spring Semester

BIO 112	General Biology II	3	3	0	4
BTC 181	Basic Lab Techniques	3	3	0	4
CHM 132	Organic/Biochem	3	3	0	4
MAT 151	Statistics I	<u>3</u>	<u>0</u>	<u>0</u>	<u>3</u>
		<b>12</b>	<b>9</b>	<b>0</b>	<b>15</b>

**TOTAL SEMESTER HOURS CREDIT  
TO BE TAKEN AT RCC: 29**

## BIOTECHNOLOGY CURRICULUM BY SEMESTERS

These courses are to be taken at Alamance  
Community College to fulfill the requirements  
of the collaborative program

		Hours/Week			Sem. Hrs
		Class	Lab	Wk. Exp.	Credit
<b>First Year: Summer Session</b>					
---	Humanities/Fine Arts	3	0	0	3
---	Social/Behavioral Science	<u>3</u>	<u>0</u>	<u>0</u>	<u>3</u>
		<b>6</b>	<b>0</b>	<b>0</b>	<b>6</b>

### Second Year: Fall Semester

BIO 250	Genetics	3	3	0	4
BIO 275	Microbiology	3	3	0	4
BTC 285	Cell Culture	2	3	0	3
ENG 114	Prof. Research & Reporting	<u>3</u>	<u>0</u>	<u>0</u>	<u>3</u>
		<b>11</b>	<b>9</b>	<b>0</b>	<b>14</b>

### Second Year: Spring Semester

BTC 281	Bioprocess Technique	2	6	0	4
BTC 286	Immunological Techniques	3	3	0	4
PHY 121	Applied Physics I	3	2	0	4
HFA/SBA	Major Elective	<u>3</u>	<u>0</u>	<u>0</u>	<u>3</u>
		<b>11</b>	<b>11</b>	<b>0</b>	<b>15</b>

### Second Year: Summer Session

COE 112	Co-Op Work Experience I	0	0	20	2
---------	-------------------------	---	---	----	---

\*COE 112 may be substituted by BTC 288

**TOTAL SEMESTER HOURS CREDIT  
TO BE TAKEN AT ACC: 37**

**TOTAL SEMESTERS HOURS CREDIT : 66**

**At least 33 semester hours credit must be completed at Alamance Community College.**



**“This project received support from The Golden LEAF Foundation.”**

**Visit RCC’s website: [www.randolph.edu](http://www.randolph.edu)  
An application for admission is available to be downloaded from the web**