Tulsa Community College

BIOTECHNOLOGY

LEARNING EXTRAVAGANZA

03.05.10

Tulsa Community College SEEDBEd
Stimulating Enthusiasm, Exploration and Discovery through Biotechnology Education

Tulsa Community College BIOTECHNOLOGY
BETTER LIVING THROUGH SCIENCE INNOVATION

NSF

Biotechnology Learning Extravaganza
Schedule of Events

8:30 to 9:00 a.m.
Arrival and Packet Distribution
Submit Talent Release Forms
Students Take Pre-Survey

9:00 to 9:05 a.m.
Dr. Carol Messer, Southeast Campus Provost
Welcome to Tulsa Community College

9:05 to 9:15 a.m.
Dr. Diana Spencer, Biotechnology Instructor/Coordinator
Introduction to TCC Biotechnology

9:15 to 10:00 a.m.
Janice Joslin, OSBI Senior Criminalist, ***Forensic DNA Analysis***
J.D. Lindstrom, OSBI Criminalist Supervisor, **CODIS (Combined DNA Index System)**

10:00 to 10:10 a.m.
Break

10:15 to 11:00 p.m.
Dr. Valerie Fuller, Former Senior Forensic Scientist for the Biology Unit of the Tulsa Police Department
Teaching DNA Analysis to Iraqi Police Officers

11:00 to 12:50 p.m.
Rotation: Lunch and Learn ***OR*** Biotechnology Activities

Lunch and Learn
Dr. Joe Parli, Associate Dean, Mathematics and Science
Welcome and Introduction to TCC Student Services
TCC Admissions and Academic and Financial Aid Counselors will present during lunch (prepared by Bill & Ruth's *The Hub*)
Charlie Bean, Enrollment Services
Tracy Ballinger, Academic Advisement
Joanne Tayrien, Financial Aid
Aaron Ballinger, Student Recruiter

Biotechnology Activities
Student explorations will include DNA extraction, gel-loading, DNA banding-pattern analysis, Genomics to Proteomics, and polyacrylamide gel analysis

Group A: Green Genomes
Lunch and Learn: 11:10 a.m. to 12:00 p.m.
Biotechnology Activities: 12:00 p.m. to 12:50 p.m.

Group B: Purple Proteomes
Biotechnology Activities: 11:10 a.m. to 12:00 p.m.
Lunch and Learn: 12:00 p.m. to 12:50 p.m.

12:50 to 1:10 p.m.
High School Faculty and Students Complete Evaluations
Load Buses

Presenters

J. Janice Joslin, Senior Criminalist
Oklahoma State Bureau of Investigation, Northeast Regional Laboratory - Forensic Biology Unit

Janice Joslin earned a Bachelor of Science Degree in Biology from East Central University in 2002, and a Master of Science Degree in Forensic Science from Oklahoma State University Center for Health Sciences in 2004. During graduate school at OSU-CHS, Janice co-developed a technique to recover DNA from spent bullet casings, work which was published in the Journal of Forensic Identification. In 2004, Janice began employment with the Oklahoma State Bureau of Investigation (OSBI) at the Central Laboratory located in Oklahoma City, Oklahoma, and in 2005 transferred to the OSBI Northeast Regional Laboratory in Tahlequah, where she is a Senior Criminalist in the Forensic Biology Unit. Her duties as a Criminalist include analyzing evidence submitted in cases, like sexual assaults, homicides, and burglaries. She generates reports of her findings and testifies to the results in court cases. She can also assist at crime scenes if the need arises. Janice attended the Council on Law Enforcement Education and Training (CLEET) Academy and earned certification as a commissioned Peace Officer for the State of Oklahoma. In addition to her work in the OSBI Laboratory, Janice also conducts various training sessions, including specialized training for Sexual Assault Nurse Examiners. In 2008, Janice was named Criminalist of the Year by the OSBI.

J.D. Lindstrom
CODIS State Administrator
Oklahoma State Bureau of Investigation, Northeast Regional Laboratory

J.D. is a husband, father of two children, and a former Marine. He graduated from Northeastern State University with a Bachelor of Science in Biology. J.D. has been employed with the Oklahoma State Bureau of Investigation (OSBI) for 8 years, 4 years as a DNA case working analyst and 4 years as the state CODIS Administrator. J.D enjoys working for the OSBI because it gives him the opportunity every day to make a difference in the life of another person.

Valerie Mattimore Fuller, Ph.D.

Dr. Valerie Fuller has an extensive background in DNA analysis. Her research career began in 1990 at Louisiana State University. While earning her PhD in microbiology, she published three highly cited articles concerning the genetic mechanisms behind the extreme radiation resistance of Deinococcus radiodurans. In 1997, she began her criminal forensic DNA testing career in Tulsa, Oklahoma, where she was hired to establish DNA-testing capability for the Tulsa Police Department Forensic Laboratory. During her eleven-and a half year tenure there, she implemented several cutting-edge technologies, and introduced procedural changes to increase DNA testing efficiency at that agency. Before Dr. Fuller left the Tulsa Police Department to help set up national DNA testing capability in Iraq in October of 2008, she co-invented, patented, and implemented a new method for DNA screening, quantitation, and efficient DNA profiling at the Tulsa Police Department. This new method has been online at the Tulsa Police Department since February of 2008 and was officially given the stamp of approval for use by CODIS-participating criminal DNA testing laboratories in an FBI audit of the Tulsa lab in August of 2008.

Dr. Fuller then worked in Baghdad, Iraq. As a subject matter expert and mentor/advisor in forensic DNA analysis for the Criminal Evidence Laboratory Project at the High Institute for Security and Administrative Development at the Baghdad Police College, she helped train eighteen Iraqi police officer/forensic scientists in DNA screening, collection and analysis until their training was completed in July 2009. While in Iraq, Dr. Fuller formed a group to help turn her novel DNA screening and quantitation method into a commercially available kit. Dr. Fuller is now part of the ownership group of Maven Analytical, LLC. Her role includes responsibility for the scientific and technical research and development of innovative technologies marketed and sold by Maven Analytical. Her company introduced the newest commercially available DNA quantitation kit, MavenQST, on December 10th, 2009. MavenQST is now one of only three commercially available kits specifically designed to quantify DNA within forensic evidence samples. As of January 2010, Dr. Fuller has been working with the Ministry of Justice on the Caribbean island nation of St. Lucia to establish a DNA testing lab there, an endeavor made possible by the cost-savings of running a DNA testing lab based upon the new MavenQST technology.

Biotechnology Programs at Tulsa Community College

Biotechnology can be defined as the use or manipulation of living systems for the manufacture of products beneficial to the public. Right now, biotechnology is all around us. A recent boom in the field is responsible for products utilized in health care, agriculture and for protecting the environment.

At doctors' offices, hospitals and laboratories, biotech breakthroughs have provided more efficient and more accurate tests for diagnosing disease, and new and improved drugs for the treatment of disease. Agriculture has also greatly benefited from biotechnology. The grocery store shelves are literally stocked with products developed by biotechnological processes. New varieties of plants have been created that greatly increase crop yield and quality. And in the future, more nutritious crops will be available for the prevention of nutritional deficiencies worldwide. Awareness about environmental issues has fostered the development of biotech products that protect the environment. New plant varieties have been created that reduce the amount of fertilizers, pesticides and herbicides applied to crops. Decomposition and detoxification of harmful wastes and chemicals is being achieved through biotechnology.

Biotechnology benefits our society in many ways. The success of biotech breakthroughs has paved the way for continued expansion in the industry. Because biotechnology encompasses many disciplines, and because the industry and job market will continue to expand, there is likely a career for you. So you might be asking, "What can I do with a background in the field of biotechnology?"

Opportunities for careers in research and development include laboratory technician, research associate, and with continued education you could become a research scientist or clinical researcher. Upon the development of biotech products there is a need for a workforce involved in quality and safety control and in wide-scale manufacturing and production. In addition, with knowledge about the biotech industry, you can be effective in the marketing and sales of new products. Career opportunities available to individuals with a background in biotechnology range from research at the laboratory to administration.

With the approval of "Vision 2025," Tulsa Community College Southeast Campus witnessed the construction of a state-of-the-art biotechnology learning facility. In addition, the College implemented a biotech curriculum for the fulfillment of the Biotechnology Associate in Science and the Biotechnology Associate in Applied Science degrees. Upon the completion of these degrees, students will have learned more than 40 laboratory techniques widely used in the biotech industry.

DNA Extraction

SEEDBEd

Materials

- Strawberries (2)
- Funnel
- Ziploc Bag
- 50 mL test tube
- 10 mL graduated cylinder
- Ice cold 91% isopropyl alcohol
- DNA Extraction Buffer
  (500 mL H_2O, 20 mL liquid detergent, 1/8 tsp salt)
- Wooden skewer

Procedure

1. Place 2 strawberries in a Ziploc bag. Using a graduated cylinder, measure 10 mL of **DNA Extraction Buffer** and add to your bag. Remove the air from the bag and seal it tightly. Mash the contents of the bag.
   - The DNA Extraction Buffer is used to break up the fruit cell membranes, giving us access to the DNA.

2. Using the funnel, pour your mashed contents into a 50 mL tube.

3. Being careful not to disturb the mixture in the test tube, carefully transfer 10 mL of alcohol down the side of your test tube. Do not mix.
   - Adding the alcohol will cause the DNA to clump together, making the DNA easier to see.

4. The alcohol will form a layer on top of your fruit mixture. In this top layer, a white and stringy substance should begin to form. ***This is DNA!***

5. Try to spool your DNA onto a wooden skewer by carefully inserting the skewer into the top alcohol layer and gently rotating the skewer in one direction.

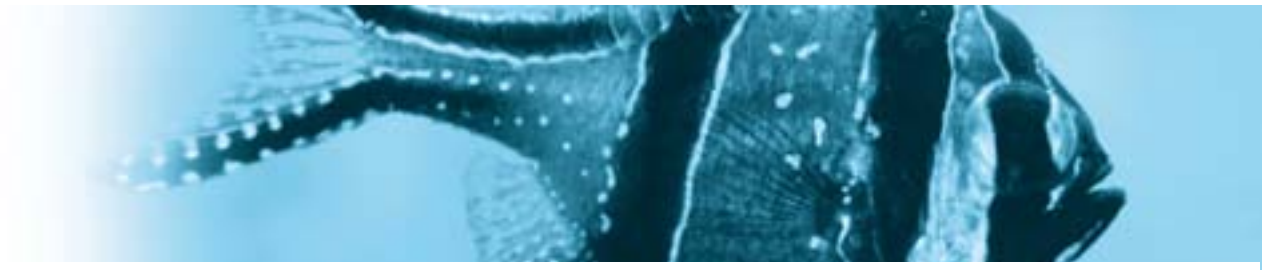
Works Cited

Harrell, Pamela Esprivalo, Debbie Richards, James Collins and Sarah Taylor. "Using Concrete and Repre sentational Experiences to Understand the Structure of DNA: A Four-Step Instructional Frame work." The American Biology Teacher 67.2 (2005): 77-85. ProQuest Nursing Journals. Proquest. Tulsa Community College. 29 January 2007 <http://proquest.umi.com>.

Visit the following link (from above cited source) for information about extracting DNA at home

www.coe.unt.edu/harrell/strawberryDNAextraction.htm

Fish Muscle Protein Gel Analysis*



Look at the Fish Protein Electrophoresis picture provided. This is a picture of a polyacrylamide gel.

Seven organisms had their muscle tissue processed for this lab. We simply bought these fish at the market and processed them.

Notice also the two lanes marked "Kaleidoscope Standard." These multi-colored lanes are filled with proteins of known sizes. We have typed the size in kilodaltons at the right of the gel.

1. Using the Kaleidoscope Standard lane and the sizes in kDa, what is the approximate size (in kilodaltons) of the top blue band (myosin) in the "Actin and Myosin Standard" lane? What is the approximate size of the second distinct band (actin)?

2. Look at the protein bands from the Cod lane. What other two lanes seem to have similar protein bands? Look closely.

3. Look at the protein bands from the Shrimp lane. What other lane looks very similar in banding?

4. Now that you have studied the gel, look at the evolution tree. Are the similarities and differences in gel banding reflected in the evolutionary tree? (Look at the placement of the Shrimp, Crab, Cod, Salmon and Pollock on the evolu tionary tree provided). Complete this statement:

   Based upon our protein gel study, it appears that the organisms found closer together on the tree have proteins which are more _____.

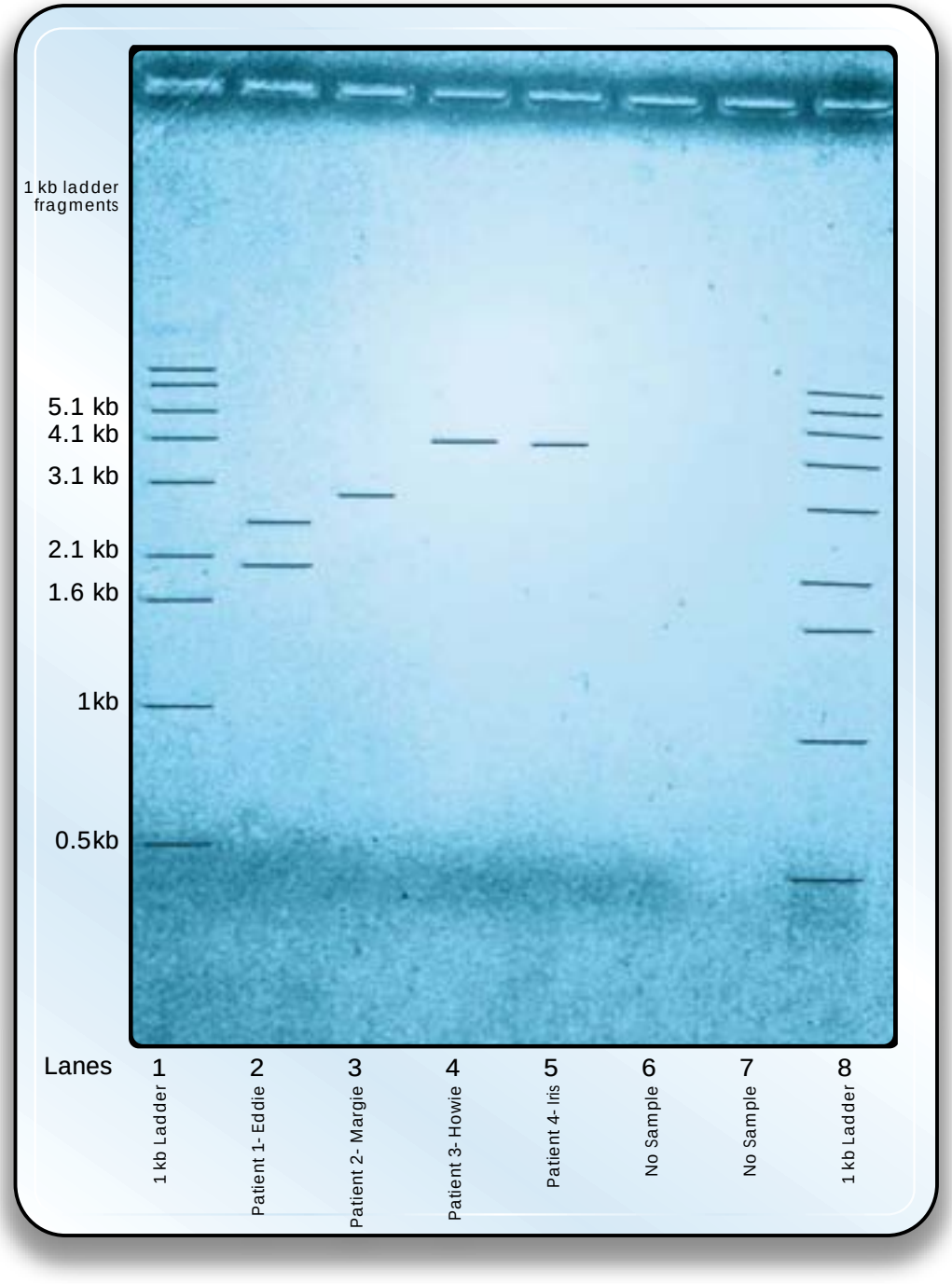
Extensions

5. Imagine a protein band that has migrated down to 100 kDa, and the fact that an average amino acid weighs ~110 daltons (not kilodaltons). How many amino acids make up the protein in the 100kDa band? Hint: First determine how many daltons in 100kDa.

6. Predict the number of DNA base pairs in the gene that encodes that particular protein band. (Remember that it takes 3 pairs of DNA bases to code for one amino acid.)

*Adapted from Comparative Proteomics Kit I: Protein Profiler Module (Catalog #166-2700EDU), Biotechnology Explorer™ instruction manual, Rv.B. Copyright 2001 by Bio-Rad Laboratories, Life Science Education. 1-800-4-BIORAD (1-800-424-6723), www.explorer.bio-rad.com

identification of Viral DNA Fragment Analysis



Objective: Your laboratory is in charge of identifying patients that have been infected by a virus. Each patient submitted a blood sample for the analysis. The virus can be identified by the presence of a DNA fragment that is approximately 2.8 kb in size.

Procedure: Lanes 1 and 8 contain 1 kb ladder that is a size standard for identifying known sizes of DNA fragments. Using lane 1 as a reference for fragment size, analyze the patient samples in lanes 2-5. Your viral DNA is 2.8 kb in size.

Which patient is infected with the virus?_____

BIOTECHNOLOGY

ASSOCIATE IN SCIENCE

PROGRAM DESCRIPTION

This suggested curriculum includes TCC degree requirements and courses generally completed in the first two years of a four-year curriculum. Students will be educated in the fundamentals of biology, chemistry and biochemistry with heavy emphasis on a wide range of laboratory procedures. The topics of lab safety, protein isolation and separation techniques, cell culture, molecular biology and recombinant DNA, and quality control as they apply to both a manufacturing or research environment will be addressed. Students considering this major should consult the catalog of the college or university to which they are planning to transfer and carefully select courses that will meet requirements for both the baccalaureate and associate degree programs.

CURRICULUM

GENERAL EDUCATION REQUIREMENTS
CREDIT HOURS: 24

Science and recommended general elective requirements are satisfied in the Specialized Course Requirements section for this degree.

English 6 hours
*ENG 1113 Freshman Composition I
*ENG 1213 Freshman Composition II

Social Sciences 6 hours
POS 1113 American Federal Government
and select 3 credit hours from the following:
HIS 1483 US History 1492 to Civil War Era
HIS 1493 US History Civil War Era to Present

Humanities 6 hours
See General Education page in the catalog for complete list of available courses.
PHI 2153 Medical Ethics recommended.

Mathematics 3 hours
*MTH 1513 College Algebra

Required Electives 3 hours
Select one 3-hour course from one of the following: Psychology, Social Sciences, Foreign Language, or Fine Arts. (Art, Music, Theatre)

SPECIALIZED COURSE REQUIREMENTS
CREDIT HOURS: 43

Biology 4 hours
*BIO 2164 Microbiology

Biotechnology 24 hours
BTC 1113 Introduction to Biotechnology
*BTC 1315 Biotechnology Laboratory Methods & Techniques
*BTC 1534 Cell Culture Techniques
*BTC 2246 Molecular Biology
*BTC 2335 Proteomics & Instrumentation
*BTC 2101 Biotechnology Quality Assurance

Chemistry 15 hours
*CHE 1315 General Chemistry I
*CHE 1415 General Chemistry II
*CHE 2145 Organic Chemistry I

Additional Recommended Courses
ENG 2333 Technical Writing
*MTH 2193 Elementary Statistics
*CHE 2353 Introduction to Biochemistry
*CHE 2245 Organic Chemistry II

Total Credit Hours: 67

*Course has prerequisite (See course description section of catalog). Physical Education activity classes do not count toward the associate degree requirements in this curriculum at TCC. To receive an A.A. or A.S. degree, students must demonstrate computer proficiency.

For More Information Contact:
Science & Mathematics Division, Southeast Campus 918.595.7742
Counseling Centers: Metro 918.595.7151, Northeast 918.595.7451, Southeast 918.595.7651, West 918.595.8176
Please contact the Science & Mathematics Division or see an advisor for recommended course sequence.

Tulsa Community College

BIOTECHNOLOGY

ASSOCIATE IN APPLIED SCIENCE

PROGRAM DESCRIPTION

This program is designed for students who wish to acquire the skills necessary to work in the field of biotechnology. Students will be educated in the fundamentals of biology, chemistry, and biochemistry with a heavy emphasis on a wide range of laboratory procedures. The topics of lab safety, protein isolation and separation techniques, cell culture, molecular biology and recombinant DNA will be included. The topics of technical writing, medical ethics and quality control as they apply to both manufacturing and research environments also will be addressed.

CURRICULUM

GENERAL EDUCATION REQUIREMENTS
CREDIT HOURS: 21

Science and recommended general elective requirements are satisfied in the Specialized Course Requirements section for this degree.

English 6 hours
ENG 1113 Freshman Composition I
*ENG 2333 Technical Writing

Social Sciences 6 hours
POS 1113 American Federal Government
and select 3 credit hours from the following:
HIS 1483 US History 1492 to Civil War Era
HIS 1493 US History Civil War Era to Present

Humanities 3 hours
PHI 2153 Medical

Mathematics 6 hours
*MTH 1513 College Algebra
*MTH 2193 Statistics

SPECIALIZED COURSE REQUIREMENTS
CREDIT HOURS: 42

Biology 8 hours
BIO 1224 Introduction to Biology for Majors
*BIO 2164 Microbiology

Biotechnology 26 hours
BTC 1113 Introduction to Biotechnology
*BTC 1315 Biotechnology Laboratory Methods & Techniques
*BTC 1534 Cell Culture Techniques
*BTC 2246 Molecular Biology and Techniques
*BTC 2335 Proteomics & Instrumentation
*BTC 2101 Biotechnology Quality Assurance
*BTC 2512 Biotechnology Apprenticeship

Chemistry 8 hours
CHE 1114 Principles of Chemistry
* **CHE 1224 Introductory Organic & Biochemistry

Total Credit Hours: 63

*Course has prerequisite (See course description section of catalog).
** Admissions to Biotechnology program or permission of instructor.

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Tulsa Community College

BIOTECHNOLOGY

CERTIFICATE OF ACHIEVEMENT**

PROGRAM DESCRIPTION

This program is for students who desire to acquire or upgrade their skills in the area of biotechnology. It is assumed that students will have the required background in the biological sciences and chemistry prior to entering this program. Students will be trained in the practices and procedures so that they will be prepared to extrapolate present knowledge to solve problems faced in the future. There will be a heavy emphasis on a wide range of laboratory procedures. The topics of lab safety, protein isolation and seperation techniques, cell culture, molecular biology and recombinant DNA, and quality control as they apply to both a manufacturing or research environments will be addressed.

CURRICULUM

CERTIFICATE REQUIREMENTS
CREDIT HOURS: 21

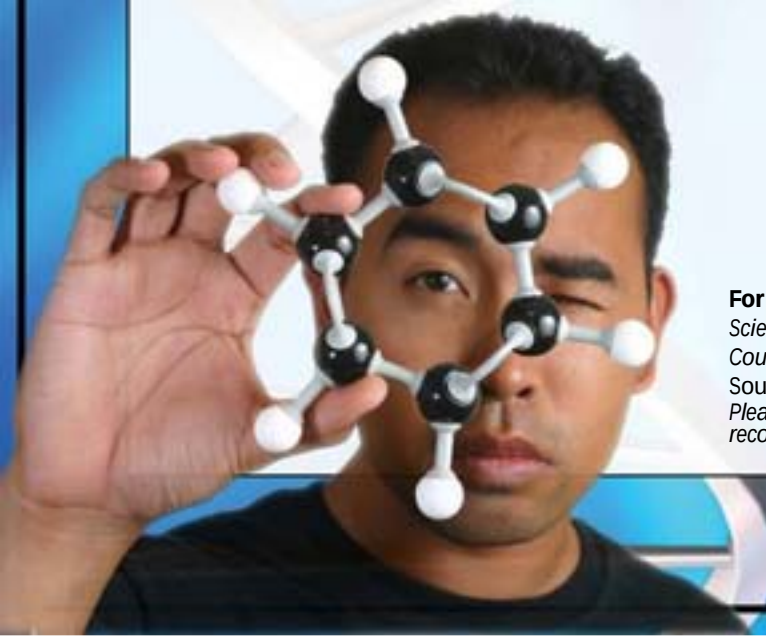
Biotechnology 26 hours

BTC 1113 Introduction to Biotechnology
*BTC 1315 Biotechnology Laboratory Methods & Techniques
*BTC 1534 Cell Culture Techniques
*BTC 2246 Molecular Biology & Techniques
*BTC 2335 Proteomics & Instrumentation
*BTC 2101 Biotechnology Quality Assurance
*BTC 2512 Biotechnology Apprenticeship

Total Credit Hours: 26

*Course has prerequisite (See course description section of catalog).

**Pending approval of the Oklahoma State Regents for Higher Education.



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Please contact the Science & Mathematics Division or see an advisor for recommended course sequence.

Tulsa Community College

NOTES

NOTES

Biotechnology Programs at Tulsa Community College

For information about the Biotechnology Program contact:

Dr. Diana Spencer
Biotechnology Asistant Professor/Coordinator
Tulsa Community College
10300 E. 81st Street S.
Tulsa, Oklahoma 74133
918-595-8605
dspencer@tulsacc.edu
Or
Dr. Joe Parli
Associate Dean of Science and Mathematics
Tulsa Community College
10300 E. 81st Street S.
Tulsa, Oklahoma 74133
918-595-7742

For course sequence information, please contact:
Counseling Centers

Metro Campus	918-595-7151
Northeast Campus	918-595-7451
Southeast Campus	918-595-7651
West Campus	918-595-8176

Easy access to TCC Biotechnology and the NSF-ATE SEEDBEd Program:
TCCBiotech.org
For Information about the Tulsa Community College Biotechnology Program, including degree information, course requirements and descriptions, and faculty information please visit:
http://www.tulsacc.edu/biotech
Catalog:
Associate of Science
Associate of Applied Science
Biotechnology Certificate
http://www.tulsacc.edu/archive/catalog08/2.pdf#page=145

National Science Foundation Advanced Technology Education: Stimulating Enthusiasm, Exploration and Discovery through Biotechnology Education (SEEDBEd):
Due #0602744

Your SEEDBEd Extravaganza Team:

Diana Spencer, Ph.D.	Dusti Sloan, M.S.	Victoria Prevatt, Ph.D.
Mary Phillips, M.S.	Paulette Ramsey, M.A.	Bill Briscoe, Ph.D.
Adrienne Elder, M.S.	Harrington Wells, Ph.D.	Joe Parli, Ph.D.
Ivan Lurz, M.S.	Donita Gray, B.S.	Donna Kline, M.Ed.
Susan Limekiller, A.S., B.S.	Paulette Ramsey, M.Ed.	Michelle DeGear, B.S.
Matt Jostes, B.A.		