

**Career-Technical Credit Transfer (CT)²
Biotechnology for Food, Plant and Animal Science Career-Technical Assurance Guide (CTAG)
November 16, 2016**

The following courses, indicated by the Career-Technical Articulation Numbers (CTANs) are eligible for post-secondary credit and transfer among Ohio's public secondary career-technical institutions and state institutions of higher education. The SCTAI alignment document with ODE competencies and post-secondary learning outcomes can be found on the ODHE website at <https://www.ohiohighered.org/transfer/ct2/ctags>.

CTBTC001 - Biotechnology Principles	Credits: 3 Semester Hours
<p>Advising Notes: In order to access post-secondary college credit for this CTAN, the student must:</p> <ul style="list-style-type: none"> • Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program • Successfully complete <u>ODE secondary course Animal and Plant Biotechnology (012010)</u> and earn a qualifying score of 60 or higher on corresponding End of Course examination 	<p>Secondary institutions must have pathway approval from the Ohio Department of Education. Certificate of Affirmation assurances are now incorporated into the CTE-26 application process.</p>
CTBTC002 - Bioinformatics	Credits: 3 Semester Hours
<p>Advising Notes: In order to access post-secondary college credit for this CTAN, the student must:</p> <ul style="list-style-type: none"> • Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program • Successfully complete <u>ODE secondary course Bioresearch (012025)</u> and earn a qualifying score of 48 or higher on corresponding End of Course examination 	<p>Secondary institutions must have pathway approval from the Ohio Department of Education. Certificate of Affirmation assurances are now incorporated into the CTE-26 application process.</p>

Each CTAN identifies the learning outcomes that are equivalent or common in introductory technical courses. In order for students to receive credit under these agreements, the career-technical programs and the state institutions of higher education must document that their course content matches the learning outcomes in the CTANs.

Requirements and Credit Conditions:

1. The receiving institution must have a comparable program, major, or course that has been approved through submission to the Ohio Department of Higher Education (CT)² approval process for the CTAN listed in this document.
2. Credits apply to courses in the specified technical area at Ohio's public institutions of higher education, if the institution offers courses in the specific technical area. In the absence of an equivalent course, and when the institution offers the technical program, the receiving institution will guarantee to grant and apply an equivalent credit value of the Career-Technical Articulation Number (CTAN) toward the technical requirements of the specific degree/certificate program.
3. The applicant must provide proof to the receiving institution that she/he completed a course that has been approved through the (CT)² approval process and that she/he holds the appropriate credential or has passed the end-of-course assessment(s).
4. A career-technical student seeking credit under the terms of this CTAG must apply and be accepted to the college within three years of completing a career-technical education program.
5. A career-technical student who meets all eligibility criteria will receive the credit hour value for the comparable course(s) as offered at the receiving state institution of higher education.
6. The admission requirements of individual institutions and/or programs are unaffected by the implementation of (CT)² outcomes.
7. The transfer of credit, through this CTAG, will not exempt a student from the residency requirements at the receiving institution.
8. Public/State-assisted institutions seeking participation in these statewide articulations must document course equivalency. Review will be conducted by the Biotechnology for Food, Plant and Animal Science CTAG Faculty Review Panel. All submissions for approval must be submitted electronically through the Course Equivalency Management System (CEMS).

Secondary Career-Technical students must complete the Biotechnology for Food, Plant and Animal Science Pathway to be eligible for credit under this CTAG. This pathway is outlined in the Ohio Department of Education's *Agriculture and Environmental Systems Career Field Technical Content Standards*.

General Course Description: This course covers the foundation of modern biotechnology. It reviews the history and foundational principles of the science. Students will learn the theoretical basis of DNA, RNA, and protein detection, analysis, manipulation, and engineering. Present and future applications of Biotechnology as they relate to areas such as industrial applications, medicine, environment, and agriculture will be explored.

Credits: 3 Semester Hours

Learning Outcomes:

1. * Describe the history of and evaluate the implications of biotechnology in society, e.g., ethics, medicine, agriculture, environment and industry.
2. * Demonstrate an understanding of the process of DNA replication, transcription, translation, and gene regulation mechanisms
3. * Explain the theoretical basis of genome analysis, including Sanger sequencing and current sequencing technologies
4. * Explain the theoretical basis of recombinant DNA technologies and its application
5. * Explain the theoretical basis of gene expression analysis and its application
6. * Explain the theoretical basis of PCR and basic chromatography techniques for separating and identifying nucleic acids, carbohydrates, proteins, and biological metabolites
7. Explore biotechnology fields and career opportunities within each

****Asterisk Indicates Essential Learning Outcomes***

General Course Description: The last decade has seen an explosion in the amount of genomic data due to the availability of high-throughput sequencing technologies. This course will provide instruction on the databases commonly used to by scientists to mine these data, the terminology used, and the software used. Students will learn how to generate hypotheses and then use the databases and software to test them.

Credits: 3 Semester Hours

Learning Outcomes:

1. * Explain the theoretical basis of Sanger sequencing and current sequencing technologies
2. * Locate the primary databases used for genome, transcriptome, and proteome data
3. * Demonstrate use of commonly used software for gene identification, homology searches, alignments, clustering, and phylogenetics
4. * Generate a hypothesis and test it using available databases and software
5. Explore biotechnology fields and the career opportunities within each

****Asterisk Indicates Essential Learning Outcomes***

**Biotechnology for Food, Plant and Animal Science Panel Participants
2013-2015**

Thomas Mitchell	The Ohio State University	SCTAI Lead Panel Expert / Item Writer
Douglas Kline	Kent State University	SCTAI Panel Expert
Rebecca Lamb	The Ohio State University	SCTAI Panel Expert
Sarah Hill	Stark State College	SCTAI Panel Expert
David Garippa	Southern State Community College	Item Writer
Diane Vorbroker	Cincinnati State Technical and Community College	Item Writer
Jake Wenger	The Ohio State University	Item Writer
Cathy Chudzinski	Terra Community College	Item Writer
Pratibha Phadke-Gupta	Central State University	Item Writer
Kent Douglas	Kent State University	Item Writer
Cyndi Brill	Ohio Department of Education	Program Specialist
E. Craig Wiget	Ohio Department of Higher Education	SCTAI Special Coach
Anne Skuce	Ohio Department of Higher Education	Senior Associate Director SCTAI
Misty McKee	Ohio Department of Higher Education	Assistant Director, SCTAI