# Applications in Agricultural Biotechnology Course No. 18320 Credit: 1.0

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| --- | --- | --- | --- |
| **Student name:**  |  | **Graduation Date:** |  |

Pathways and CIP Codes:

Course Description:

Directions:The following competencies are required for full approval of this course. Check the appropriate number to indicate the level of competency reached for learner evaluation.

**RATING SCALE:**

4. Exemplary Achievement: Student possesses outstanding knowledge, skills or professional attitude.

3. Proficient Achievement:Student demonstrates good knowledge, skills or professional attitude. Requires limited supervision.

2. Limited Achievement:Student demonstrates fragmented knowledge, skills or professional attitude. Requires close supervision.

1. Inadequate Achievement:Student lacks knowledge, skills or professional attitude.

0. No Instruction/Training:Student has not received instruction or training in this area.

## Benchmark 1.1: Biotechnology in Agriculture

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 1.1.1 | Create a timeline and use it to explain the developmental progression of biotechnology.  |  |
| 1.1.2 | Research and report on current work being done in agricultural biotechnology. |  |
| 1.1.3 | Analyze the scope and impact of agricultural biotechnology in today’s global society.  |  |
| 1.1.4 | Research and report on emerging problems and issues associated with agricultural biotechnology. |  |
| 1.1.5 | Assess the future impact agricultural biotechnology could have on world populations.  |  |

## Benchmark 1.2: Regulatory Issues & Agencies

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 1.2.1 | Interpret the major regulatory issues related to biotechnology.  |  |

## Benchmark 1.3: Ethical, Legal, Social & Cultural Issues

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 1.3.1 | Evaluate the benefits and risks associated with biotechnology.  |  |
| 1.3.2 | Examine an ethical dilemma associated with biotechnology by identifying its components.  |  |
| 1.3.3 | Research and debate an ethical issue associated with biotechnology.  |  |
| 1.3.4 | Examine intellectual properties associated with biotechnology by defining their components.  |  |

## Benchmark 2.1: Biotechnology Laboratory Records

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 2.1.1 | Analyze strengths of the research based on data and procedures, and propose future investigation.  |  |

## Benchmark 2.2:Operate Laboratory Equipment

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 2.2.1 | Operate advanced laboratory equipment and measurement devices.  |  |

## Benchmark 2.3: Procedure Using Biological Materials

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 2.3.1 | Demonstrate advanced aseptic techniques in the biotechnology laboratory.  |  |
| 2.3.2 | Select an appropriate standard operating procedure for working with biological materials.  |  |

## Benchmark 2.4: Safely Manage Biological Materials

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 2.4.1 | Prepare buffers, reagents, solutions, and media.  |  |
| 2.4.2 | Inventory biological and chemical materials and maintain accurate records of supplies and expiration dates.  |  |
| 2.4.3 | Diagram the flow of waste after it leaves the laboratory.  |  |

## Benchmark 2.5: Perform a Variety of Procedures

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 2.5.1 | Isolate, maintain, quantify, and store cell cultures. |  |
| 2.5.2 | Characterize the physical, chemical, and biological properties of microbes.  |  |
| 2.5.3 | Explain the molecular basis for heredity and the tools and techniques used in DNA and RNA manipulations. |  |
| 2.5.4 | Perform electrophoretic techniques and interpret electrophoresis fragmentation patterns.  |  |
| 2.5.5 | Perform protein separation techniques and interpret the results.  |  |
| 2.5.6 | Conduct an Enzyme-Linked Immunosorbent Assay (ELISA).  |  |
| 2.5.7 | Research and describe the use of biotechnology to detect microbes.  |  |
| 2.5.8 | Design and perform an assay to detect a target microorganism in food, water or the environment |  |

## Benchmark 3.1: Genetic Engineering Improve Products

### Competencies

| **#** | **Description** | **Rating** |
| --- | --- | --- |
| 3.1.1 | Diagram the processes and describe the techniques used to produce transgenic eukaryotes. |  |
| 3.1.2 | Describe processes by which enzymes are produced through biotechnology.  |  |
| 3.1.3 | Diagram the process by which organisms are genetically engineered for waste treatment.  |  |
| 3.1.4 | Investigate and report on genetic engineering procedures used in the production of aquatic species.  |  |

## Benchmark 3.2: Perform Biotechnology Processes

### Competencies

| **#** | **Description** | **rating** |
| --- | --- | --- |
| 3.2.1 | Describe the processes used to produce animal hormones from transgenic organisms. |  |
| 3.2.2 | Compare and contrast bioengineering and conventional pathways used in food processing. |  |
| 3.2.3 | Processing food using biotechnology. |  |
| 3.2.4 | Describe the process used in producing alcohol from biomass. |  |
| 3.2.5 | Produce alcohol and co-products from biomass. |  |
| 3.2.6 | Diagram the process used in producing biodiesel from biomass. |  |
| 3.2.7 | Produce biodiesel and co- products from biomass. |  |
| 3.2.8 | Illustrate the process used in producing methane from biomass. |  |

## Benchmark 3.3: Monitor & Evaluate Procedures

### Competencies

| **#** | **Description** | **Rating** |
| --- | --- | --- |
| 3.3.1 | Select biotechnology tools used to monitor and direct plant breeding.  |  |
| 3.3.2 | Design and conduct an experiment using biotechnology tools to evaluate selectively bred plants. |  |
| 3.3.3 | Assess the benefits, risks and opportunities associated with using biotechnology to promote animal health. |  |
| 3.3.4 | Describe the use of biotechnology in bioremediation.  |  |
| 3.3.5 | Monitor and evaluate the effectiveness of bioremediation efforts by participating in a bioremediation project. |  |
| 3.3.6 | Describe the processes involved in biotreatment of biological chemical wastes. |  |
| 3.3.7 | Interpret the processes involved in biotreatment of industrial chemical wastes. |  |
| 3.3.8 | Select biotechnology tools used to measure biodiversity. |  |
| 3.3.9 | Explain how biotechnology tools can be used to monitor the effects of agricultural practices on wild populations. |  |
| 3.3.10 | Assess the characteristics of biomass that make it useful for biofuels production |  |
| 3.3.11 | Describe the processes used in the production of molecules for use in industrial applications. |  |

I certify that the student has received training in the areas indicated.

Instructor Signature:

For more information, contact:

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