Northern Marianas College
CURRICULUM ACTION REQUEST

Effective Semester / Session: Fall 2021

Type of Action:

- X New
- ___ Modification
- ___ Move to Inactive (Stop Out)
- ___ Cancellation

Course Alpha and Number: AG215

Course Title: Introduction to Micropropagation

Reason for initiating, revising, or canceling:
This course is being created as a new course requirement for the Associate of Science in Agriculture degree for students who may choose a career in agriculture and related sectors. The Cooperative Research, Extension, and Education Services program has secured multiple grants to build a plant biotechnology lab at the college for research, education, and extension purposes; the lab will offer multiple job opportunities as well as internships related with plant tissue culture and micropropagation.

Dr. Virendra M. Verma — 05/24/2021

Proposer — Date

Dr. Alfredo De Torres — 05/26/21

Program Coordinator — Date

Adam Walsh — 05.24.21

Language & Format Review Specialist — Date

Ajani Burrell — 5.24.2021

Academic Council Chair — Date

Charlotte Cepeda — 6/4/2021

Dean of Learning & Student Success — Date

1. **Department**
   Natural Resource Management

2. **Purpose**
   This course introduces the basic principles and skills regarding techniques, practices, and procedures of plant tissue culture—particularly micropropagation, asepsis, laboratory design, equipment and facilities, media components and greenhouse acclimatization. Students will engage in micropropagation techniques and hands-on activities. This course will also be useful to students who are in the field of agriculture, science, and related sectors.

3. **Description**

   A. **Required/Recommended Textbook(s) and Related Materials**
      Required:
      Kyte, L., Kleyn, J., Scoggins, H. and Bridgen, M. (2013). *Plants from Test Tubes: An Introduction to Micropropagation*, 4th edition, Timber Press.

      Recommended: None

   B. **Contact Hours**
      1. **Lecture:** 3 per week / 45 per semester
      2. **Lab:** 3 per week / 45 per semester
      3. **Other:** None

   C. **Credits**
      1. **Number:** 5
      2. **Type:** Regular Degree Credits

   D. **Catalogue Course Description**
      This course examines and discusses the principles, protocols, and utilization of plant cell tissue techniques such as micropropagation and acclimatization. Students will learn plant biotechnological techniques like plant tissue culture and micropropagation, which will enable them to culture plants in vitro from various plant parts such as tissues, organs, embryos, single cells, protoplasts, etc. on nutrient media under aseptic and controlled conditions to produce large numbers of genetically identical plantlets. Prerequisite: A grade of "C" or better in BI101 or BI106. Prerequisite: MA132 and EN095. (Offered Fall and Spring)

   E. **Degree or Certificate Requirements Met by Course**
      This is a required course for the Associate of Science in Agriculture degree. A grade of "C" or higher earned in this course also fulfills an elective requirement for any Associate of Science degree with a science major and satisfies the science elective option for non-majors.

F. **Course Activities and Design**
Course activities include: lectures, group work, discussions, laboratory activities, homework, web-based assignments, audio-visual materials, periodic quizzes, tests, field trips, comprehensive final exam, and research projects including presentations.

4. **Course Prerequisite(s); Concurrent Course Enrollment**
Prerequisites: MA132 and EN095
Concurrent Course Enrollment: None

Required English/Mathematics Proficiency Level(s)
English Placement Level: EN101
Mathematics Placement Level: MA161

5. **Estimated Cost of Course; Instructional Resources Needed**
Cost to the Student: Tuition for a 5-credit course, cost of the textbooks, lab fee and instructional materials fee.

Cost to the College: Instructor's salary

Instructional resources needed for this course include: classroom and laboratory-equipped space, whiteboard and markers, audio-visual programs/software, multimedia projectors, various laboratory materials, chemicals and other related equipment.

6. **Method of Evaluation**
Student learning will be assessed on: the basis of class attendance and participation, homework completion, in-class and online quizzes, final exam and presentations. For laboratory activities, students will be evaluated on the basis of attendance, laboratory exercise completion and laboratory reports. NMC's grading and attendance policies will be followed.

7. Course Outline

This is a topical outline and does not necessarily indicate the sequence in which the material will be presented.

1.0 Introduction of Plant Tissue Culture
- 1.1 Development of plant tissue culture
- 1.2 Practical applications in agriculture, horticulture, and chemical industries
- 1.3 Prerequisite for plant genetic engineering
- 1.4 Advantages and disadvantages of tissue culture

2.0 History of Plant Tissue Culture
- 2.1 Cell culture
- 2.2 Organ culture
- 2.3 Tissue of callus culture
- 2.4 Types of various stages of tissue culture

3.0 Applied Aspect of Plant tissue Culture
- 3.1 Plant breeding
- 3.2 Cloning
- 3.3 In vitro cultivation
- 3.4 Industrial production of natural plant products

4.0 Plant Nutrients and Growth Regulators
- 4.1 Formulation of the nutrient media
- 4.2 Components of plant tissue culture media
- 4.3 Vitamins and plant growth regulators
- 4.4 Gelling agents

5.0 Tissue Culture Laboratory
- 5.1 General design and requirements
- 5.2 Glassware and equipment
- 5.3 Plant materials
- 5.4 Media room
- 5.5 Sterilization room
- 5.6 Inoculation room
- 5.7 Growth room
- 5.8 Greenhouse

6.0 Micropropagation Techniques
- 6.1 Establishment
- 6.2 Initiation
- 6.3 Multiplication
- 6.4 Rooting
- 6.5 Acclimatization

7.0 Plant Growth Regulators
- 7.1 Auxins
- 7.2 Gibberellins
- 7.3 Cytokinins
- 7.4 Abscisic acid
- 7.5 Ethylene

8.0 Tissue Culture Environment
- 8.1 Aseptic condition
- 8.2 Controlled temperature, light, and humidity
- 8.3 Equipment
- 8.4 Nutrient medium

8. **Instructional Goals**
The course will introduce students to:

1.0 Plant Tissue Culture Terminology;

2.0 Micropropagation Methods and Techniques;

3.0 Plant Growth Regulators;

4.0 Plant Nutrients and Nutrition;

5.0 Tissue Culture Environment;

6.0 Commercial Applications of Tissue Culture;

7.0 Tissue Culture Multiplication of Selected Plant Species; and

8.0 Acclimatization and Nursery Practices.

9. Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1.0 Define and explain the concept of micropropagation and its importance in agriculture;

2.0 Explain various plant growth stages in tissue culture;

3.0 Determine various components of growth media for tissue culture;

4.0 Specify appropriate micropropagation procedures for different plant species;

5.0 Explain the management of environmental control equipment used in tissue culture;

6.0 Design a layout for a commercial plant tissue culture facility;

7.0 Determine appropriate commercial applications for plant tissue culture; and

8.0 Demonstrate basic skills of micropropagation and nursery techniques.

10. Assessment Measures of Student Learning Outcomes

Assessment of student learning may include, but not be limited to, the following:

1.0 Tests and Quizzes;

2.0 Lab Work and Reports;

3.0 Homework;

4.0 Presentation;

5.0 Project work and report; and

6.0 Final Exam.