MABALACAT CITY COLLEGE

INSTITUTE OF ARTS AND SCIENCES

First Semester A.Y. 2023-2024

Outcome-Based Teaching and Learning Plan and Module Guide for *(Plant Physiology-SPECORE 103)*

VISION: Mabalacat City College envisions itself to be the top choice in the community it serves for quality education and training by 2025.	**MISSION:** The Mission of Mabalacat City College is to meet the needs of its community as a center for learning aiming for open admission policy.

COURSE DESCRIPTION:

This course will examine the main physiological processes, how plants interact with their environment and aspects of plant biology relevant to currently active or promising research areas. Since plants are integral to agricultural production systems and the understanding of processes that drive plant growth and development are of utmost importance. A strong emphasis is placed on aspects of physiology that are relevant to crops important in agriculture and horticulture. This course is designed to provide students with comprehensive exposure to the subject of plant physiology. The laboratory exercises provide hands-on experiences with experiments and training in instrumental skills. Topics include: water relations, photosynthesis, inorganic nutrition, metabolism of organic materials, and plant growth regulation, with emphasis on environmental factors in the physiology of plants.

PROGRAM INTENDED LEARNING OUTCOMES (PILO) (Based on CMO No. 49 series of 2017 *for BS Biology*)**:**

1. Develop an in-depth understanding of the basic principles governing the science of life;
2. Utilize techniques/procedures relevant to biological research work in the laboratory or field settings;
3. Apply basic mathematical and statistical computations and use of appropriate technologies in the analysis of biological data;
4. Extend knowledge and critically assess current views and theories in the various areas of the biological sciences.

PRE-REQUISITE: None

NUMBER OF UNITS: 3 Units Lecture /2 Units Laboratory

LEARNING OUTCOMES:

1. Expose students to what plants do and what physical and chemical factors cause them to respond as they do.
2. Discuss the importance plant with other living organisms.
3. Explain the physiology of plants, i.e., their functions, from seed germination to vegetative growth, maturation, flowering and senescence.
4. Provide students with a firm foundation in the major concepts of plant physiology, in the context of traditional and contemporary biology.
5. The information derived from the course will be useful for careers in agronomy, horticulture, forestry, seed science and plant pathology.

COURSE OUTLINE

Week	Topic	Learning Materials (with references following OER plagiarism and IPR policies)	Intended Learning Outcomes (ILO)	Assessment Tasks (Requirements with schedule or time allotment)	Sustainable Development Goals (SDG) Coherence
		GLOBAL KNOWLEDGE			
1	**Plant Anatomy** a. Plant cells b. Plant tissues	**Abridged Lecture Notes:** PowerPoint lectures and Student Guides will be uploaded in MS Teams.	Recall the function of plant cell organelles	Activity sheet on plant anatomy: Essay work and Application	SDG Nos:

	c. Plant organs	Taiz, L. and Zeiger, E. (2010) Plant physiology. 6th Edition, Sinauer Associates, Inc., Sunderland. **PowerPoint Presentation:** 15-20 minutes approximately for each subtopic **Suggested Web Viewings:** **Videos** Types of Plant Cells https://www.youtube.com/watch?v=D33ZL-qKi9A Virtual Plant Cell https://www.youtube.com/watch?v=rmgf0VDDlH8 Travel Deep Inside the Leaf https://www.youtube.com/watch?v=pwymX2LxnQs Types of Plant Tissues https://www.youtube.com/watch?v=M-qDzKG3RB0 Plant Anatomy and Stucture https://www.youtube.com/watch?v=JNdfoO_HBEc Tissue Culture	Differentiate the types of plant tissues Recall the different structures and function of plants	Time allotted: 90 mins. Journal Analysis Work Time allotted: 2hrs Quiz Time allotted: 60 mins	3- Good Health and Well-being 9- Industry, Innovation, and Infrastructure 13- Climate Action 15- Life on Land

		https://www.youtube.com/watch?v=xuwV3ywCxW8			
3	**Plant-Water Relationship** a. Properties of water b. Water transport processes c. Absorption and Translocation of Water d. Transpiration	**Abridged Lecture Notes:** PowerPoint lectures and Student Guides will be uploaded in MS Teams. Taiz, L. and Zeiger, E. (2010) Plant physiology. 6th Edition, Sinauer Associates, Inc., Sunderland. **PowerPoint Presentation:** 15-20 minutes approximately for each subtopic **Suggested Web Viewings:** Transportation on Plants https://www.youtube.com/watch?v=JFb-CWlz7kE What is transpiration in plants? https://www.youtube.com/watch?v=5jJLfwTkGe8	Identify the importance of Water Describe the relations of water and plant cell Illustrate the direction of water movement and transport in plants Describe the flow of water into plant, water in soil, water absorption and process of transpiration	Essay (Case Study Analysis on Water Transport on Different Plant Types) Time allotted: 2hrs Flash Reporting Time allotted: 3hrs Laboratory Activity #1 Time allotted: 3hrs Quiz Time allotted: 60 mins	SDG Nos: 3- Good Health and Well-being 9- Industry, Innovation, and Infrastructure 13- Climate Action 15- Life on Land

5	**Mineral Nutrition and Absorption** a. Essential Nutrients, Deficiencies, and Plant Disorders b. Treating Nutritional Deficiencies , Roots, and Microbes	**Abridged Lecture Notes:** PowerPoint lectures and Student Guides will be uploaded in MS Teams. Taiz, L. and Zeiger, E. (2010) Plant physiology. 6th Edition, Sinauer Associates, Inc., Sunderland. **PowerPoint Presentation:** 20-30 minutes approximately for each subtopic **Suggested Web Viewings:** Mineral uptake in plants part1-3 https://www.youtube.com/watch?v=iphOwk3yn10 https://www.youtube.com/watch?v=s5PtgptP1yc https://www.youtube.com/watch?v=aHEEAFFBA6Q How fungi help plants communicate https://www.youtube.com/watch?v=_tjt8WT5mRs Mineral Nutrients in Plants https://www.youtube.com/watch?v=w_x-WDdQdxI	Name the mycorrhizal fungi and essential elements Explain the interaction of roots and soil, functions of mineral elements and symptoms and deficiencies Name the passive, facilitated, diffusion and active transport Describe process of transport biological membranes, phloem translocation, loading and unloading, and mechanism of sieve tube	Activity sheet on Mineral nutrition and absorption: Essay work and fill-in-the-tables Time allotted: 90 mins. Laboratory Activity #2 Time allotted: 3hrs Problem Solving Task Time allotted: 2hrs	SDG Nos: 3- Good Health and Well-being 9- Industry, Innovation, and Infrastructure 13- Climate Action 15- Life on Land

NATIONAL KNOWLEDGE					
7	**Photosynthesis** a. Concept of photosynthesis b. The Light Reaction Dark Reactions c. Photorespiration d. Factors Affecting Photosynthesis	**Abridged Lecture Notes:** PowerPoint lectures and Student Guides will be uploaded in MS Teams. **PowerPoint Presentation**: 30 minutes approximately for each subtopic. Taiz, L. and Zeiger, E. (2010) Plant physiology. 6th Edition, Sinauer Associates, Inc., Sunderland. **Suggested Web Viewings:** What is photosynthesis https://www.youtube.com/watch?v=38HvoBIIXrM Photosynthesis: Light Reaction, Calvin Cycle, and Electron Transport https://www.youtube.com/watch?v=KfvYQgT2M-k Light and Dark Reactions https://www.youtube.com/watch?v=v-G-d27C1TU Types of photosynthesis in plants: C3, C4 and CAM	Explain the process of food and energy production via photosynthesis of the plant, process of photophosphorylation, NADP and process of photolysis of water. Draw the carbon pathways Describe c3 cycle c4 pathway and crassulacean acid metabolism. Name the factors in chemical reactions of plants	Journal Analysis and report writing Time allotted: 5hrs Laboratory Activity #2 Time allotted: 3hrs Quiz Time allotted: 60 mins	SDG Nos: 3- Good Health and Well-being 9- Industry, Innovation, and Infrastructure 13- Climate Action 15- Life on Land

		https://www.youtube.com/watch?v=8oodcy8SEBk Factors affecting photosynthesis https://www.youtube.com/watch?v=1curtzL8rUM	Discuss the process of photorespiration and physiological and ecological consideration in chemical basis of the plant.		
MIDTERM EXAM					
10	**Respiration** a. Overview of Metabolism b. Carbohydrate, Lipid and Nitrogen metabolism c. Assimilation of Inorganic Nutrients d. Factors Affecting Respiration	**Abridged Lecture Notes:** PowerPoint lectures and Student Guides will be uploaded in MS Teams. Taiz, L. and Zeiger, E. (2010) Plant physiology. 6th Edition, Sinauer Associates, Inc., Sunderland. **PowerPoint Presentation:** 30-45 minutes approximately for each subtopic **Suggested Web Viewings:** What is metabolism https://www.youtube.com/watch?v=nRq6N5NGD1U Introduction to Metabolic pathways https://www.youtube.com/watch?v=RtN7KA30-B0	Enumerate the different plant hormones that influence growth and development in plants Describe the function of each plant hormones	Activity sheet on Respiration: Essay work Time allotted: 90 mins. Journal Analysis Work Time allotted: 2hrs Quiz	SDG Nos: 3- Good Health and Well-being 9- Industry, Innovation, and Infrastructure 13- Climate Action

		Gluconeogenesis https://www.youtube.com/watch?v=UUryv7amArU		Time allotted: 60 mins	15- Life on Land
13	Growth and Development a. Dormancy, Germination and Flowering b. Plant Photoreceptors, Hormones and Signal Transduction c. Ripening, Senescence and Cell Death	**Abridged Lecture Notes:** PowerPoint lectures and Student Guides will be uploaded in MS Teams. Taiz, L. and Zeiger, E. (2010) Plant physiology. 6th Edition, Sinauer Associates, Inc., Sunderland. **PowerPoint Presentation:** 30-45 minutes approximately for each subtopic **Suggested Web Viewings:** Seed dormancy and germination https://www.youtube.com/watch?v=rmgIhgI2NK0 Time lapse of a bean https://www.youtube.com/watch?v=w77zPAtVTuI Plant hormones https://www.youtube.com/watch?v=8Ji3g4yp4VE https://www.youtube.com/watch?v=HR9KHW-e0pY https://www.youtube.com/watch?v=rKHIfsHX1aA	Enumerate the different plant hormones that influence growth and development in plants Describe the function of each plant hormones	Journal Analysis and report writing Time allotted: 5hrs Laboratory Activity #2 Time allotted: 3hrs Quiz Time allotted: 60 mins	SDG Nos: 3- Good Health and Well-being 9- Industry, Innovation, and Infrastructure 13- Climate Action 15- Life on Land

LOCAL KNOWLEDGE					
15	Plant Stress and Secondary Metabolites: Role in Plant Metabolism a. Abiotic and Biotic Stress b. Secondary Plant Metabolites	**Abridged Lecture Notes:** PowerPoint lectures and Student Guides will be uploaded in MS Teams. Taiz, L. and Zeiger, E. (2010) Plant physiology. 6th Edition, Sinauer Associates, Inc., Sunderland. **PowerPoint Presentation:** 30-45 minutes approximately for each subtopic **Suggested Web Viewings:** https://www.youtube.com/watch?v=Hja0SLs2kus https://www.youtube.com/watch?v=7rI-Lyftpd0 How do plants handle stress https://www.youtube.com/watch?v=TYsnveEHqec https://www.youtube.com/watch?v=Vl8FFuAGwgo	Enumerate and describe the different abiotic and biotic stress that plants may encounter Identify and compare the different secondary plant metabolites	Case Study Analysis Time allotted:180 mins Activity sheet on Secondary metabolites: Essay work and fill-in-the-tables Time allotted: 90 mins. Problem Solving Task Time allotted: 2hrs	SDG Nos: 3- Good Health and Well-being 9- Industry, Innovation, and Infrastructure 13- Climate Action 15- Life on Land
FINAL EXAM/ OUTPUT					

SUMMARY OF REVISIONS:

Revision	Date	Updated by	Short Description of Changes
1.0	August 1, 2023	Frienchie Ann B. Yamauchi (Original work by Glen S. Nolasco, M.Sc.)	• Inclusion of Sustainable Development Goals Statement and additional lessons involving the national and local applications of topics (August, 2023). • Modified hybrid laboratory activities

GENERAL GUIDELINES AND POLICIES:

As the College currently follows Hybrid Delivery of Learning on its instruction, the following general guidelines and policies are set by the School to be followed by the faculty-in-charge and the students of the course.

Attendance

Checking of attendance during face-to-face classes is a requirement and will be strictly observed.

Academic Integrity

Observance of the outmost academic integrity shall be observed by the students of the course. Plagiarism, cheating, and other forms of academic dishonesty shall not be tolerated by the faculty-in-charge nor the Institute.

Accomplishment of Requirements

All requirements given by the instructor/faculty-in-charge of the course to the students shall be called/referred to/addressed as "work output". Each work output must be accomplished by the students until the schedule set by the instructor/faculty-in-charge. Final student's output must also be accomplished by the schedule set by the instructor of the course.

Line of Communication

The course's official line of communication shall be through the following:

Name: Frienchie Ann B. Yamauchi
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Email Add/ MS Teams Acc: frienchie.yamauchi@mcc.edu.ph
Messenger Account: Frienchie Ann Yamauchi

The outmost respect and courtesy must be observed by students in communicating to their instructor/faculty-in-charge of the course and to their classmates and vice versa. Any form of disrespectful and discourteous way of communication shall not be tolerated by the School.

Instructional Materials (IMs)

Working students may avail of the modular type of teaching (for seminar type General Education Courses). MS Teams on-line platform may be utilized by the instructor/faculty-in-charge of the course to the students – adapting the flexible learning scheme.

Grading System:

Midterm/ Final

Class Standing	60%
• Attendance	10%
• Quizzes	40%
• Seatwork/Recitation	30%
• Assignment/ Project	20%
• Midterm/Final Examination	40%
Laboratory	40%
• Performance	60%
• Report	40%
Total	100%

References:

- Hopkins, W.G. (2008). Introduction to Plant Physiology. William G. Hopkins and Norman P. A. H¨uner., 4th ed. ISBN 978-0-470-24766-2
- Pessarakli, M. (2002). Handbook of Plant and Crop Physiology. Marcel Dekker, Inc., Second Edition. ISBN: 0-8247-0546-7
- Schooley, J. (1996). Introduction to Botany. Delmar Publishers. ISBN 0-8273-7378-3
- Stern, Jansky and Bidlack. (2003). Introduction to Plant Biology. McGraw Hills Publishing Comp.9th Edition. ISBN 0-09-256393-1
- Taiz, L. and Zeiger, E. (2002). Plant Physiology. Sinauer Associates, 3rd edition. ISBN: 0878938230

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