Republic of the Philippines
**CAMIGUIN POLYTECHNIC STATE COLLEGE**
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## Institute of Arts and Sciences

# COURSE SYLLABUS

**VISION**

Camiguin Polytechnic State College is a dynamic institution of higher learning which is accessible, globally competitive, culturally and morally sensitive towards sustainable ecotourism and natural resource development.

**MISSION**

Camiguin Polytechnic State College exists to provide higher professional, technical and special instructions for special purposes and to promote research and extension services, advanced studies and progressive leadership in agriculture, forestry, engineering, arts and other relevant studies.

**PROGRAM OUTCOMES:**
A graduate of Bachelor of Science in Agriculture should be able to:

a. Articulate the latest developments in their specific field of practice;
b. Effectively communicate orally and in writing using both

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| **COURSE CODE** | **Chem2a** |
| **COURSE TITLE** | **BIOCHEMISTRY** |
| **COURSE CREDIT** | 3 Units Lecture |
| **CONTACT HOURS/WEEK** | 3 hours lecture |
| **EFFECTIVITY** | Second Semester AY 2024-2025 |
| **PRE-REQUISITE(S)** | None |
| **CO-REQUISITE(S)** | None |
| **COURSE** | This course provides an introduction to the fundamental principles of biochemistry, with a focus on their applications in agriculture. Students will explore the biochemical composition and functions of essential biomolecules, including carbohydrates, proteins, lipids, and nucleic acids. Key topics include the role of water, pH, and buffers in biological systems, as well as the biochemical processes involved in energy metabolism, such as carbohydrate, lipid, and protein metabolism. Special emphasis is placed on how biochemistry impacts agricultural practices, including crop productivity, soil health, livestock nutrition, and sustainable agriculture. The course integrates theoretical knowledge with practical applications, equipping students with the biochemical foundation needed to address contemporary agricultural challenges. |

**COURSE OUTCOMES AND RELATIONSHIP TO PROGRAM OUTCOMES**

| **COURSE OUTCOMES** | **PROGRAM OUTCOMES** | | | | | | | | | | | | |
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| After completing this course, the students should be able to: | a | b | c | d | f | g | h | i | j | k | l | m | n |

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| English and Filipino languages;<br>c. Work effectively and independently in multi-disciplinary and multi-cultural teams;<br>d. Act in recognition of professional, social, and ethical responsibilities;<br>e. Preserve and promote "Filipino historical and cultural heritage"<br>f. Generate and share knowledge relevant to specific fields in the study of agriculture;<br>g. Formulate and implement agricultural development plans and programs;<br>h. Apply the scientific methods in knowledge generation and knowledge application;<br>i. Understand the concepts of agricultural productivity and sustainability in the context of national, regional, and global developments;<br>j. Engage in agricultural production and post-production activities; | 1. Explain the fundamental biochemical processes relevant to agricultural systems, including plant and animal physiology, metabolism, and nutrient cycles; | O | P | P | P | L | P | P | L | P | P | O | P | P |
| | 2. Relate biochemical principles to key agricultural challenges, such as soil fertility, crop productivity, and livestock health; | O | P | P | P | L | P | P | L | P | P | O | P | P |
| | 3. Analyze the biochemical composition of agricultural inputs and products, such as fertilizers, pesticides, and food crops, to enhance quality and sustainability; | O | P | P | P | L | P | P | L | P | P | O | P | P |
| | 4. Apply biochemical concepts to design or optimize sustainable practices in agriculture, focusing on resource | O | P | P | P | L | P | P | L | P | P | O | P | P |

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| k. Promote sound agricultural technologies to various clients and in the manpower development for agriculture;<br>l. Employ relevant tools in information technology in solving agriculture-related problems; | management and environmental impact; | | | | | | | | | | | | | |
| | 5. Integrate biochemical knowledge in understanding emerging technologies, such as biotechnology and genetic engineering, for improving agricultural production; | O | P | P | P | L | P | P | L | P | P | O | P | P |

## COURSE SYLLABUS

| COURSE OUTLINE/PLAN | | | | | |
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| **LEARNING OUTCOMES** | **TOPICS** | **TIME FRAME** | **METHODOLOGY** | **ASSESSMENT** | **REFERENCES** |
| At the end of the unit, the student must have:<br>1. Joined Facebook group that was purposely created for the course;<br>2. Demonstrated understanding of CPSC's Vision and Mission, Quality Policy, Goals and Objectives of the Institute;<br>3. Be oriented with the classroom policies, requirements and grading system to be imposed on the taken course;<br>4. Demonstrate proficiency in video editing techniques to effectively communicate scientific concepts and data; | **Preliminaries**<br><br>Dissemination of CPSC VMGO and Quality Policy<br><br>Familiarizing Facebook Group Etiquette<br><br>Orientation of Course Syllabus<br><br>How to Make a Video Report<br><br>How to Make a Speech | 3 hours (Week 1) | Lecture (F2F):<br>Orient students about CPSC's Vision and Mission, Quality Policy, Goals and Objectives of the Institute, classroom policies, requirements and grading system to be imposed on the taken course.<br><br>Students practice singing the school hymn.<br><br>Students are instructed to join the Facebook group for the class.<br><br>Guide students through the step-by-step process of writing an essay.<br><br>Provide constructive feedback on the students' essay. | Students make a 250-word essay entitled "*Building Foundations: How Organic Chemistry Prepares Students for Biochemistry and Enhances Agricultural Expertise*"<br><br>Students post a video of them reading their essay<br><br>*Assignment*: The instructor will share a reading assignment covering the next relevant topics on the Facebook group and students are required to submit their concept maps on the designated next meeting. | |

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| 5. Explain the significance of biochemistry in agricultural sciences.<br>6. Describe the chemical composition of living organisms and its relevance to biological processes.<br>7. Analyze the properties of water and its role in maintaining biochemical stability in plants, animals, and soils.<br>8. Illustrate the concept of pH and buffer systems. | **Introduction to Biochemistry**<br><br>**Water, pH, and Buffers** | 3 hours (Week 2) | Lecture (F2F):<br>The topic will be presented by the instructor through interactive discussions guided by the Socratic method, encouraging critical thinking and active student participation. | Students will complete an online quiz to assess their understanding of the material. Following the instructor's discussion, each group will be assigned a topic to explore, focusing on how the current lesson applies to agricultural practices, and will present their findings to the class. | 1, 2, 3, 4, 5 |
| 9. Relate organic water, pH and buffers to agricultural applications; | **Agricultural Applications of Biochemistry, Water, pH, and Buffers** | 3 hours (Week 3) | Lecture (Online):<br>Students by group will create a video report of a specific agricultural study that demonstrates the current topic. | Students post their video in the Facebook group and submit their individual speech entitled "*Agricultural Applications of Biochemistry, Water, pH, and Buffers*". | 1, 2, 3, 4, 5 |

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| | | | Individually, they will prepare a speech on the implications of the topic on agricultural research.<br><br>A reading assignment covering the next relevant topics will be shared on the Facebook group. | *Assignment*: Students are required to promptly comment their concept maps on the designated post within the given time frame | |
| 10. Identify the structure, classification, and biological functions of carbohydrates.<br>11. Relate the role of carbohydrates to energy storage and structural functions in plants.<br>12. Describe the structure and classification of proteins and their role in plant and animal metabolism.<br>13. Explain the mechanism of enzyme action and its agricultural | **Carbohydrates and Proteins** | 2 hours (Week 4) | Lecture (F2F):<br>The topic will be discussed and sample problems will be solved. Problem sets and online quizzes will be assigned to students. | Students will answer the problem sets and online quizzes. | 1, 2, 3, 4, 5 |

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| applications, such as improving soil nutrient cycles or livestock digestion. | | | | | |
| 14. Relate the importance of carbohydrates and proteins to agricultural practices; | **Agricultural Applications of Carbohydrates and Proteins** | 2 hours (Week 5) | Lecture (Online):<br>Students by group will create a video report of a specific agricultural study that demonstrates the current topic.<br><br>Individually, they will write their essay on the implications of the topic on agricultural research.<br><br>A reading assignment covering the next relevant topics will be shared on the Facebook group. | Students post their video in the Facebook group and submit their individual essay entitled "*Agricultural Applications of Alkanes and Alkenes*".<br><br>*Assignment*: Students are required to promptly comment their concept maps on the designated post within the given time frame | 1, 2, 3, 4, 5 |
| 15. Classify lipids and describe their chemical properties and functions.<br><br>16. Explain the role of lipids in energy storage, membrane structure, and | **Lipids** | 2 hours (Week 6) | Lecture (F2F):<br>The topic will be discussed and sample problems will be solved. Problem sets and online quizzes will be assigned to students. | Students will answer the problem sets and online quizzes. | 1, 2, 3, 4, 5 |

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| protection in plants and animals.<br>17. Relate the biochemical properties of lipids to their applications in agriculture, such as plant waxes and animal feed formulations. | | | | | |
| 18. Relate the importance of lipids to agricultural practices | **Agricultural Applications of Lipids** | 2 hours (Week 7) | Lecture (Online):<br>Students by group will create a video report of a specific agricultural study that demonstrates the current topic.<br><br>Individually, they will write their essay on the implications of the topic on agricultural research.<br><br>A reading assignment covering the next relevant topics will be shared on the Facebook group. | Students post their video in the Facebook group and submit their individual essay entitled "*Agricultural Applications of Alkanes and Alkenes*".<br><br>*Assignment*: Students are required to promptly comment their concept maps on the designated post within the given time frame | 1, 2, 3, 4, 5 |
| 19. Review the topics covered | **Hydrocarbons and Functional Groups** | 5 hours (Week 8) | Lecture (F2F):<br>Review the topics that have been discussed. | Students take a 50-item multiple choice question | |

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| | | | | covering the topics discussed in optics. | |
| Week 9 **LEARNING ASSESSMENT (MIDTERM EXAMINATION)** | | | | | |
| 20. Identify weak areas for improvement; | **Post Assessment Activities** | 5 hours (Week 10) | Lecture (F2F):<br>Provide feedback on student performance.<br><br>Assign learning objectives for reporting. | Students submit requirements needed for their weak areas. | |
| 21. Describe the structure and functions of DNA and RNA in living organisms.<br>22. Explain the biochemical role of nucleic acids in genetic inheritance and cellular processes.<br>23. Analyze the application of nucleic acids in agricultural biotechnology, such as genetic engineering and crop improvement. | **Nucleic Acid** | 2 hours (Week 11) | Lecture (F2F):<br>The topic will be discussed and sample problems will be solved. Problem sets and online quizzes will be assigned to students. | Students will answer the problem sets and online quizzes. | 1, 2, 3, 4, 5 |

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| 24. Relate the importance of nucleic acids to agricultural practices; | **Agricultural Applications of Nucleic Acids** | 2 hours (Week 12) | Lecture (Online):<br>Students by group will create a video report of a specific agricultural study that demonstrates the current topic.<br><br>Individually, they will write their essay on the implications of the topic on agricultural research.<br><br>A reading assignment covering the next relevant topics will be shared on the Facebook group. | Students post their video in the Facebook group and submit their individual essay entitled "*Agricultural Applications of Amines, Amides, Phosphates, Sulfones and Sulfonates*".<br><br>*Assignment*: Students are required to promptly comment their concept maps on the designated post within the given time frame | 1, 2, 3, 4, 5 |
| 25. Illustrate the biochemical pathways of carbohydrate metabolism, including glycolysis, the Krebs cycle, and photosynthesis.<br>26. Relate the processes of carbohydrate metabolism to energy | **Carbohydrate Metabolism** | 2 hours (Week 13) | Lecture (F2F):<br>The topic will be discussed and sample problems will be solved. Problem sets and online quizzes will be assigned to students. | Students will answer the problem sets and online quizzes. | 1, 2, 3, 4, 5 |

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| production and growth in plants and animals.<br>27. Evaluate the impact of carbohydrate metabolism on crop yield and quality.<br>28. Apply knowledge of carbohydrate metabolism to agricultural practices, such as optimizing fertilizer use and crop management. | | | | | |
| 29. Relate the importance of carbohydrates metabolism to agricultural practices; | **Agricultural Applications of Carbohydrate Metabolism** | 2 hours (Week 14) | Lecture (Online):<br>Students by group will create a video report of a specific agricultural study that demonstrates the current topic.<br><br>Individually, they will write their essay on the implications of the topic on agricultural research.<br><br>A reading assignment covering the next relevant | Students post their video in the Facebook group and submit their individual essay entitled "*Agricultural Applications of Carbohydrates and Proteins*".<br><br>*Assignment*: Students are required to promptly comment their concept maps on the designated post | 1, 2, 3, 4, 5 |

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| | | | topics will be shared on the Facebook group. | within the given time frame | |
| 30. Explain the biochemical pathways of lipid metabolism, including β-oxidation and lipid synthesis.<br>31. Analyze the role of protein metabolism in nitrogen cycling and plant and animal health.<br>32. Relate lipid and protein metabolism to the production and quality of agricultural products, such as seeds, oils, and animal feed.<br>33. Propose strategies for using lipid and protein metabolism knowledge to improve agricultural sustainability and efficiency. | **Lipids and Protein Metabolism** | 2 hours (Week 15) | Lecture (F2F):<br>The instructor will model the application of concepts in problem-solving and assign five practice problems per topic. Students will also be tasked with submitting a report on applying these concepts in marine biology, and the instructor will share current research with the class. | Students will work on the assigned problems and prepare their report due next week. | 1, 2, 3, 4, 5 |
| 34. Relate the importance of lipid and protein metabolism to agricultural practices; | **Agricultural Applications of Lipid and Protein Metabolism** | 2 hours (Week 16) | Lecture (Online):<br>Students by group will create a video report of a specific agricultural study | Students post their video in the Facebook group and submit their individual essay entitled "*Agricultural* | 1, 2, 3, 4, 5 |

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| | | | that demonstrates the current topic.<br><br>Individually, they will write their essay on the implications of the topic on agricultural research.<br><br>A reading assignment covering the next relevant topics will be shared on the Facebook group. | *Applications of Alkanes and Alkenes*".<br><br>*Assignment*: Students are required to promptly comment their concept maps on the designated post within the given time frame | |
| 35. Review the topics covered | **Functional Groups, Biomolecules, Natural Products and Synthetic Compounds** | 5 hours (Week 17) | Review the topics that have been discussed. | Students take a 50-item multiple choice question covering the topics discussed in thermodynamics. | |
| Week 18 **LEARNING ASSESSMENT (FINAL EXAMINATION)** | | | | | |

## COURSE SYLLABUS

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| **COURSE REQUIREMENTS** | This course is to be directed in blended learning modality. Students will join a private hidden group on Facebook where learning resources, reminders and other instructions will be posted.<br>Technology requirements for online mode:<br>1. A smart gadget like a computer/laptop or a smart phone with an internet browser<br>2. A media player<br>3. Headset with microphone<br>4. Internet connection (capable of watching videos)<br>5. Active FB/FB messenger Account<br>6. A scientific calculator<br><br>Each student is expected to:<br>1. Attend 90% of classes<br>2. Deliver their assigned reports (three each term)<br>3. Submit outputs of essays, laboratory reports, quizzes and term examinations (midterm & final)<br>4. Respond to communications through the Facebook group. |
| **GRADING SYSTEM** | **Lecture:**<br><br>Attendance and Quizzes 30%<br>Report/Speech/Peer Review 30%<br>Term Examinations 40%<br>Total 100%<br><br>**Final Grade = 1/3 Midterm Grade + 2/3 Final Term Grade** |

## COURSE SYLLABUS

**References**

1. Abesmo, M. D. (2024). *Moira's STEM classroom*. Retrieved from https://moirasstemclassroom.blogspot.com/
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3. Encyclopaedia Britannica. (2024). Organic chemistry. Retrieved August 4, 2024, from https://www.britannica.com/science/organic-chemistry
4. McMurry, J. (2023). Organic chemistry: A tenth edition. OpenStax. https://openstax.org/details/books/organic-chemistry
5. Morsch, Layne; Farmer, Steven; Cunningham, Krista; Sharrett, Zachery; and Shea, Kevin M., "Organic Chemistry II" (2023). Open Educational Resources: Textbooks, Smith College, Northampton, MA. https://scholarworks.smith.edu/textbooks/6
6. Brooklyn Technical High School. (2008). Organic chemistry laboratory manual. Retrieved August 4, 2024, from https://www.bths.edu/ourpages/auto/2014/1/5/47316574/orgo-labs.pdf

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| **Date:** | **Date:** | **Date:** | **Date:** |