MABALACAT CITY COLLEGE

INSTITUTE OF ARTS AND SCIENCES

First Semester A.Y. 2023-2024

Outcome-Based Teaching and Learning Plan and Module Guide for *(Microbiology-FUNCORE 104)*

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:

The lectures of this course cover the anatomy, physiology, and genetics of microorganisms, such as bacteria, algae, fungi, and protozoans. It also involves the study of the roles of microorganisms in the environment and their applications in industry and in medicine. Discussions on viruses, viroids, and prion particles are also included.

The laboratory course provides the students with practical experience in the study of microorganisms. Experiments are designed to include techniques for the identification of microorganisms based on their physical characteristics. Students will also be trained in the use of aseptic techniques for basic microbial application.

PROGRAM INTENDED LEARNING OUTCOMES (PILO) (BASED ON CMO):

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 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 various areas of the biological sciences.

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PRE-REQUISITE: **FUNCORE 101 and 102**

NUMBER OF UNITS: **3 Units Lecture and 2 Units Laboratory**

COURSE INTENDED LEARNING OUTCOMES:

1. Identify the basic structural features of microorganisms and discuss how these relate to their classification.
2. Identify the roles played by different microorganisms in relation to man and his environment.
3. Discuss the physiology and genetic mechanisms of microorganisms and their applications in industry and medicine
4. Formulate applications of microorganisms in industry and medicine based on their characteristics.
5. Perform basic techniques used in microbiology.
6. Apply the concepts of Microbiology to the community of Mabalacat City

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					
1-2	Microorganisms and Microbiology and Aseptic technique Microbial Cell Structure and Function	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp. 2-19)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** https://www.tmcc.edu/microbiology-resource-center/lab-protocols/aseptic-technique https://pubmed.ncbi.nlm.nih.gov/15209075/#:~:text=Abstract,a%20microganism%2C%20the%20microfungus%20Mucor. **Suggested Online Videos:** Aseptic Technique https://www.youtube.com/watch?v=v0G8Hd6R-14 History of Microbiology https://www.youtube.com/watch?v=sbPaHZQ3rq4	Discuss the major focus of the microbiology and its importance. Highlight the development and history of microbiology as time progresses.	Drawing task. (Primitive Earth – Present – Future) 60 minutes Essay work. Scoring rubric will be given to the students. 60 minutes	SDG Nos. SDG 13: Climate Action SDG 14: Life Below Water SDG 15: Life on Land

			Explain the cell structures of microorganisms and their functions and importance to the cell. Differentiate bacteria and Archaea in terms of morphology, size, and such.	Due date: September 25-30, 2023	
3-4	Microbial Metabolism	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp. 74; 79-84; 96-100)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic	Explain the concepts of metabolisms	Short-Answer Essay.	SDG Nos. SDG 13:

	Molecular Microbiology	**Suggested Web Readings:** https://www.ncbi.nlm.nih.gov/books/NBK7919/ **Suggested Online Video:** Microbial Metabolism https://www.youtube.com/watch?v=NYMTeqpr6JI&t=3s	involved in the biochemistry of microorganisms and how it affects living cells. Discuss the mechanisms of molecular microbiology vis-a-vis central dogma	60 minutes. Scoring rubric will be given to the students. Due Date: October 9-14, 2023	Climate Action SDG 14: Life Below Water SDG 15: Life on Land
5-6	Microbial Growth and Control Microbial	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp. 143-176)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** Shttps://www.cliffsnotes.com/study-guides/biology/microbiology/control-of-microbial-growth/introduction-to-controlling-microbial-growth#:~:text=The%20control%20of%20microbial%20growth,particular%20attention%20to%20bacterial%20spores.	Discuss the concepts of microbial growth and their requirements.	Essay work. Scoring rubric will be given to the students.	SDG Nos. SDG 3: Good Health and Wellbeing

	Genomics	**Suggested Online Videos:** Microbial growth https://www.youtube.com/watch?v=BxjhCpH8jcw	Investigate the function of genomes and their evolutionary implication to microorganisms.	60 minutes Due date: October 2-7, 2022	SDG 13: Climate Action SDG 14: Life Below Water SDG 15: Life on Land
7	Metabolic Regulation	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp. 291-342)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** https://www.sciencedirect.com/topics/immunology-and-microbiology/metabolic-regulation#:~:text=Introduction-,Metabolic%20regulation%20is%20a%20term%20used%20to%20describe%20the%20process,maintain%20cellular%20processes%20and%20functions. **Suggested Online Videos:**	Design the mechanisms in metabolic regulation vis-a-vis sensing, transduction, transcription and such.	problem-solving work. 120 minutes Scoring rubric will be given to the students. Due Date: October	SDG Nos. SDG 3: Good Health and Wellbeing SDG 13: Climate Action

		Metabolic Regulation https://www.youtube.com/watch?v=GRkL2WToSCo		16-21, 2023	SDG 14: Life Below Water SDG 15: Life on Land
NATIONAL KNOWLEDGE					
8	Viruses and Virology	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp. 183-209)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** https://www.ncbi.nlm.nih.gov/books/NBK8098/ **Suggested Online Videos:** Viruses https://www.youtube.com/watch?v=O1TetEto1Is	Distinguish the evolution of viral genomes and their implication to viral evolution.	Essay work. Scoring rubric will be given to the students. 60 minutes Due date: October 23-28, 2023	SDG Nos. SDG 3: Good Health and Wellbeing SDG 13: Climate Action SDG 14: Life

					Below Water SDG 15: Life on Land
MIDTERM EXAM					
9-10	Genetics of *Bacteria* and *Archaea*	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp.265-277)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2588523/#:~:text=In%20terms%20of%20the%20characteristic,that%20span%20a%20much%20larger **Suggested Online Videos:** Archaea and Bacteria https://www.youtube.com/watch?v=vAR47-g6tlA&t=26s	Differentiate the genetics the bacteria and archaea. Explicit the mechanisms of gene transfer in bacteria and archaea.	Drawing/Problem-solving work. 120 minutes Scoring rubric will be given to the students. Due Date: November 27, 2023	SDG Nos. SDG 3: Good Health and Wellbeing SDG 6: Clean Water and Sanitation SDG 13: Climate Action

					SDG 14: Life Below Water SDG 15: Life on Land
11-12	Microbial Evolution and Systematics Metabolic Diversity of Microorganisms	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp.285-286)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** http://robleto.faculty.unlv.edu//Bio351/bio351%20lectures%20-%20syllabus%20-%20midterm/Bio351lec12spr07.pdf **Suggested Online Videos:** Microbial Evolution https://www.youtube.com/watch?v=FJ5k-tc178c	Familiarize the the primitive earth, the origin of diversification of life. Discuss the Records of history of life and microbial systematics. Differentiate and discuss	Problem-solving work. 120 minutes Scoring rubric will be given to the students. Due Date: December 4-9, 2023	SDG Nos. SDG 3: Good Health and Wellbeing SDG 6: Clean Water and Sanitation SDG 13: Climate Action

			the different metabolism in microorganism: Phototrophy, Chemolithtrophy. Fermentations, Hydrocarbon, and Anaerobic Respiration.		SDG 14: Life Below Water SDG 15: Life on Land
LOCAL KNOWLEDGE					
13-14	Diversity of *Bacteria and Archea* Diversity of Eukaryotic	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp. 597-625)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** https://www.google.com/search?q=Diversity+of+Bacteria+and+Archea&oq=Diversity+of+Bacteria+and+Archea&aqs=chrome..69i57j0i22i30j0i5i13i15i30j0i390i650l2.622j0j4&sourceid=chrome&ie=UTF-8	Discuss the diversity of bacteria and archaea in terms of metabolism, morpholo	Problem-solving work. 120 minutes Scoring rubric will be given to the students.	SDG Nos. SDG 3: Good Health and Wellbeing

	Microorganisms	**Suggested Online Videos:** Diversity of bacteria and Archea https://www.youtube.com/watch?v=vAR47-g6tlA&t=30s	gy and nitrogen cycle. Differentiate the characters present in eukaryotic microorganisms such as protist, fungi, and algae.	Due Date: December 11-16, 2023	SDG 6: Clean Water and Sanitation SDG 9: Industry, Innovation, and Infrastructure SDG 11: Sustainable Cities and Communities SDG 13: Climate Action

					SDG 14: Life Below Water SDG 15: Life on Land
15	Microbial Ecosystems Nutrient Cycles	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp.73-100)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** https://www.google.com/search?q=Microbial+Ecosystems+Nutrient+Cycles&oq=Microbial+Ecosystems+Nutrient+Cycles&aqs=chrome..69i57j33i22i29i30l2.479j0j4&sourceid=chrome&ie=UTF-8 **Suggested Online Videos:** Biochemical Cycles https://www.youtube.com/watch?v=Bn41lXKyVWQ	Demonstrate knowledge of microbial ecology both terrestrial and aquatic environments. Elucidate the different processes of nutrient cycles namely	Household / Laboratory activities Laboratory Report. 120 minutes Scoring rubric will be given to the students.	SDG 3: Good Health and Wellbeing SDG 6: Clean Water and Sanitation SDG 9: Industry, Innovation, and

			carbon, nitrogen, hydrologic, and sulfur.	Due Date: December 18-19, 2023	Infrastructure SDG 11: Sustainable Cities and Communities
16-17	Microbiology of the Built Environment Microbial Symbioses Pathogenicity and Immunology	**Lecture Notes:** PDF/Word format lectures that can be read for approximately 30-60 minutes. Mandigan, M.T., Martinko, J.M., Bender, K.S., Buckely, D.H., & Stahl, D.A. (2015). *Brock Biology of Microorganisms (14th ed, pp.86-95)*. Pearson. ISBN 978-0-321-89739-8. **PowerPoint Presentation**: 30-60 minutes approximately for each subtopic **Suggested Web Readings:** https://journals.asm.org/doi/10.1128/msystems.00127-19#:~:text=Microbial%20symbionts%20create%20organic%20material,environments%20(1%2C%202). **Suggested Online Videos:** Microbial Symbiosis https://www.youtube.com/watch?v=4lk2x3GF6wc	Familiarize and Understand the importance of bioremediation, and water treatment. Discuss the mechanism of different symbiotic	Household / Laboratory activities Laboratory Report. 120 minutes Scoring rubric will be given	SDG 3: Good Health and Wellbeing SDG 6: Clean Water and Sanitation SDG 9: Industry,

			relationship of microorganisms. Explicit the concepts of pathogenicity and immunology.	to the students. Due Date: January 3-6, 2023	Innovation, and Infrastructure SDG 11: Sustainable Cities and Communities SDG 13: Climate Action SDG 14: Life Below Water SDG 15: Life on Land
FINAL EXAM/ OUTPUT					

SUMMARY OF REVISIONS: SDGs were incorporated in the weekly topics.

Revision	Date	Updated by	Short Description of Changes
1.0	August, 2022	Frienchie Ann B. Yamauchi	Enhancing the Topics related to the needs of the community.
2.0	August, 2023	Glen S. Nolasco, MSc.	Incorporated the related SDGs and alignment of the topics to the community and target of the Institution

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:

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. 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	**50%**	**Attendance/Quizzes/Assignment/Projects/Exam (60%)**
		Laboratory Activity and Reports (40%)
Final	**50%**	**Attendance/Quizzes/Assignment/Projects/Exam (60%)**
		Laboratory Activity and Reports (40%)

Total: 100%

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Books

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Online Videos

- “Aerobic Respiration in Bacteria”- https://www.youtube.com/watch?v=Y_zOixuOLoY
- “Aseptic Technique”- https://www.youtube.com/watch?v=bRadiLXkqoU
- “Aseptic techniques in the biology lab”- https://www.youtube.com/watch?v=cuCSELaQ_Go
- “Biodegradation and Bioremediation of Organic Compounds by Lawrence Wackett, PhD”- https://www.youtube.com/watch?v=H4PFpQLy1F8
- “Carbon Cycle with Microorganisms”- https://www.youtube.com/watch?v=B62isC4Szq4
- “Cell culture and growth media for Microbiology”- https://www.youtube.com/watch?v=EjnQ3peWRek
- “Chapter 6 Microbial Growth”- https://www.youtube.com/watch?v=tAyRGOxBCa4 Microbial Metabolism

- "Difference among virus, virion, viroids, virusoids and prions"- https://www.youtube.com/watch?v=chTU792DWas
- "DNA replication and RNA transcription and translation | Khan Academy"- https://www.youtube.com/watch?v=6gUY5NoX1Lk
- "Fermentation"- https://www.youtube.com/watch?v=YbdkbCU20_M
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