MABALACAT CITY COLLEGE

INSTITUTE OF ARTS AND SCIENCES

First Semester A.Y. 2023-2024

Outcome-Based Teaching and Learning Plan and Module Guide for *(Cell and Molecular Biology-FUNCORE 108)*

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 examines the physical and chemical organization of living organisms at the cellular and molecular level. Emphasis is on the cell as it is the fundamental unit of life. It examines the structural features of organelles; complex interactions among cells; the intricate processes and inner workings happening inside the cell; and the importance of biomolecules as they influence the control and regulation of cellular processes. Molecular techniques such as DNA and RNA sequencing, protein isolation, fractionation and analysis, knockout techniques, RNAi and others are highlighted. Current trends in genetic engineering, biotechnology and the OMICS revolution are included.

PROGRAM INTENDED LEARNING OUTCOMES (PILO) (BASED IN CMO NO. 49 S. 2017):

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; and
4. Extend knowledge and critically assess current views and theories in various areas of the biological sciences.

PRE-REQUISITE: FUNCORE101, FUNCORE102, Biomolecules

NUMBER OF UNITS: 3 units Lecture/ 2 units Laboratory units

COURSE INTENDED LEARNING OUTCOMES:

At the end of the course, students should be able to:

1. Identify and describe the different cellular organelles
2. Identify and connect the different cellular processes
3. Discuss the key concepts involved with the different cellular processes
4. Discuss the important structural features of these key components that determine their required functions
5. Discuss methods and technique used to study cellular structures and their functions
6. Design experiments that apply the fundamental properties of cell structure and function to relevant research problems

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, NATIONAL, LOCAL KNOWLEDGE					
1	**Introduction (Overview)**	**1. Lectures Notes** **2. Powerpoint presentation**	Discuss the cellular basis of life	Recitation	

	A. The Cellular Basis of Life B. Different Cell Types C. Techniques and Methods of Studying Cells	**3.Suggested Web Readings** https://www.slideshare.net/09059637270/3-cellular-basis-of-life-7404081 https://www.matrix.edu.au/beginners-guide-to-year-11-biology/cells-as-the-basis-of-life/ https://www.thoughtco.com/types-of-cells-in-the-body-373388 https://www.biologydiscussion.com/cell-biology/techniques-cell-biology/top-16-techniques-used-in-cell-biology-with-diagram/26521 **4. Suggested Videos to view** https://www.youtube.com/watch?v=qHqfvrVm24I https://www.youtube.com/watch?v=B_zD3NxSsD8	Differentiate the cell types Knowledge in different techniques and methods in studying cells	Quiz Seatwork/Group dynamics Laboratory experiment – microscopy and histologic examination (per batch) With F2F and online post-lab	**SDG No. 4** Quality Education **SDG No. 15** Life on Land

		https://www.youtube.com/watch?v=Hgxmzw44a2A			
2-3	**Biochemistry of the Cell** 1. Water, the Aqueous Environment 2. Biomolecules and their properties a. Nucleic Acids b. Protein c. Lipids Carbohydrates	**1. Lectures Notes** **2. Powerpoint presentation** **3.Suggested Web Readings** Cell Biology | Biochemistry (bu.edu) Introduction_To_Biochemistry.pdf (srmist.edu.in) The Cell | Fundamentals of Biochemistry: Medical Course & Step 1 Review | AccessPharmacy | McGraw Hill Medical (mhmedical.com) Cell biology: Structure, biochemistry and function: By Phillip Scheeler and Donald Bianchi. pp 578. John Wiley and Sons, New York. 1980 ISBN 0-471-78220-3 - Vella - 1981 - Biochemical Education - Wiley Online Library Biomolecules- Carbohydrates, Proteins, Nucleic acids and Lipids (byjus.com) Aqueous Environment - an overview | ScienceDirect Topics **4. Suggested Videos to view**	Understand the environment of the cell Explain the biomolecules and their properties	Recitation Quiz Seatwork/Group dynamics Laboratory experiment (per batch) With F2F and online post-lab	**SDG No. 4** Quality Education **SDG No. 15** Life on Land

		(329) Introduction to Biochemistry Lecture; Biochemical Aspects of the Cell - YouTube (329) Biological Molecules - You Are What You Eat: Crash Course Biology #3 - YouTube (329) Biomolecules | Classification of Biomolecules | Carbohydrates, Proteins, Lipids and Nucleic Acids - YouTube (329) VIDEO ON CELL AND ITS ENVIRONMENT - YouTube			
4-6	**The Cell Surface and the Extracellular Matrix** A. Nature and Composition of Plasma Membrane B. Functions and Activities of Cell Membrane 1. Cell Adhesion 2. Signal Transduction 3. Vacuole formation C. The Extracellular Environment	**1. Lectures Notes** **2. Powerpoint presentation** **3.Suggested Web Readings** https://courses.lumenlearning.com/boundless-biology/chapter/components-and-structure/ https://www.ncbi.nlm.nih.gov/books/NBK26937/ http://courses.washington.edu/bioen326/lectures/lecture_27_2014Bioen326Adhesion.pdf	Understand the different composition and structure of cell surface and the extracellular Matrix	Recitation Quiz Seatwork/Group dynamics	**SDG No. 4** Quality Education **SDG No. 15** Life on Land

	1. Extracellular Matrix 2. Adhesion Molecules 3. Signalling Complexes	https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/signal-transduction https://www.cureffi.org/2013/04/16/cell-biology-09-signal-transduction/ https://microbenotes.com/vacuoles-structure-types-and-functions https://byjus.com/neet/food-vacuole/ https://www.open.edu/openlearn/science-maths-technology/science/tour-the-cell/content-section-5.1#:~:text=The%20extracellular%20matrix%20is%20composed,extracellular%20matrix%20perform%20different%20functions http://www.cryst.bbk.ac.uk/pps97/assignments/projects/emilia/Adh_mol.HTM https://courses.lumenlearning.com/boundless-biology/chapter/signaling-molecules-and-cellular-receptors/ **4. Suggested Videos to view**			

		https://www.youtube.com/watch?v=dDiogdOiC24 https://www.youtube.com/watch?v=vnWMlcN8Kz0 https://www.youtube.com/watch?v=FtVb7r8aHco https://www.youtube.com/watch?v=cMNx17H3dRU https://www.youtube.com/watch?v=vnWMlcN8Kz0 https://www.youtube.com/watch?v=-dbRterutHY			
7-8	**The Nucleus** A. Chromosome Structure and Genes B. Cell Cycle and DNA Replication C. Transcription and RNA Processing	**1. Lectures Notes** **2. Powerpoint presentation** **3.Suggested Web Readings** https://ghr.nlm.nih.gov/primer Genes and Chromosomes - Fundamentals - MSD Manual Consumer Version (msdmanuals.com) Chromosomes | Learn Science at Scitable (nature.com) What is the 'Central Dogma'? – YourGenome 4.1: Central Dogma of Molecular Biology - Biology LibreTexts	Discuss/Understand the central dogma of molecular biology	Recitation Quiz Seatwork/Group dynamics	**SDG No. 4** Quality Education **SDG No. 15** Life on Land

	D. Organizing and Evolution of Nuclear Genome E. Regulation of Gene Expression	Central Dogma - Steps Involved in Central Dogma (byjus.com) **4. Suggested Videos to view** https://www.youtube.com/watch?v=PRy4rRdDbk&list=PL6Vcmf HmQezhET7JAJm5QrxORbQ PtCHf9&index=1 https://www.youtube.com/watch?v=o_-6JXLYS-k https://www.youtube.com/watch?v=koudmJdil60 https://www.youtube.com/watch?v=DRBREvFL19g&list=PL6Vc mfHmQezhET7JAJm5QrxOR bQPtCHf9&index=3 https://www.youtube.com/watch?v=TweBOe3DlfY https://www.youtube.com/watch?v=sxedBRA18Ro https://www.youtube.c om/watch?v=0Ha9np pnwOc https://www.youtube.co		Laboratory experiment (per batch) With F2F and online post-lab	

		m/watch?v=QMX7IpME 7X8 https://www.youtube.co m/watch?v=tMr9XH64rt M&list=PL6VcmfHmQez hET7JAJm5QrxORb QPtCHf9&index=5 https://www.youtube.com/watch?v=uBRdfsz_YB4&list=PL6Vcm fHmQezhET7JAJm5QrxORb QPtCHf9&index=6 https://www.youtube.com/watch?v=7EZ87bIvCOM https://www.youtube.co m/watch?v=XzVXhemtw mA https://www.youtub e.com/watch?v=Gs3			

		IlepaaB0 https://www.youtube.com/watch?v=6gUY5NoX1Lk			
9	**MIDTERM EXAMINATION**				
10-12	**Membrane-bound Organelles** A. The ER and its Derivatives B. The Golgi Complex C. Lysosomes and Peroxisomes D. Membrane-bound organelle functions	**. Lectures Notes** **2. Powerpoint presentation** **3.Suggested Web Readings** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4700099/ https://biologydictionary.net/endoplasmic-reticulum/ https://teachmephysiology.com/histology/cell-structures/golgi-apparatus/ https://biologydictionary.net/golgi-apparatus/ http://cytochemistry.net/cell-biology/lysosomes.htm	Describe the composition and structure of membrane-bound organelles	Recitation Quiz Seatwork/Group dynamics	**SDG No. 4** Quality Education **SDG No. 15** Life on Land

	1. Translation 2. Post-Translational Modification 3. Protein Transport 4. Membrane Flow and Sorting (Trafficking)	https://openoregon.pressbooks.pub/mhccmajorsbio/chapter/4-11-vesicles-and-vacuoles-lysosomes-and-peroxisomes/ http://medcell.med.yale.edu/lectures/cellular_organization.php#:~:text=Membrane%2Dbound%20organelles%20offer%20several,and%20efficiency%20of%20chemical%20reactions. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3927147/ **4. Suggested Videos to view** https://www.youtube.com/watch?v=yX6p750dIAY https://www.youtube.com/watch?v=hQEUFmOPdAs https://www.youtube.com/watch?v=OZdmaf2R9ys https://www.youtube.com/watch?v=FaU7E6wYkG4			
13	**The Cytoskeleton and Cell Motility** 1. Microtubules	**1. Lectures Notes** **2. Powerpoint presentation** **3.Suggested Web Readings**	Explain the structure and function of cytoskeleton and cell motility	Recitation Quiz	**SDG No. 4** Quality Education **SDG No. 15**

	2. Microfilament 3. Intermediate Filaments 4. Cell Motility	https://www.nature.com/scitable/content/microtubules-the-basics-14673338/#:~:text=Microtubules%20are%20major%20components%20of,subunits%20assembled%20into%20linear%20protofilaments. https://www.ncbi.nlm.nih.gov/books/NBK9932/ https://micro.magnet.fsu.edu/cells/microfilaments/microfilaments.html https://biologydictionary.net/microfilament/ https://courses.lumenlearning.com/boundless-biology/chapter/the-cytoskeleton/ http://cytochemistry.net/cell-biology/intermediate_filaments.htm#:~:text=Intermediate%20filaments%20are%20important%20components,thin%20filaments%20are%20obviously%20motile.		Seatwork/Group dynamics	Life on Land

		https://www.ncbi.nlm.nih.gov/books/NBK9834/ https://www.nature.com/articles/nrm2197 https://www.nature.com/subjects/cellular-motility#:~:text=Definition,%2C%20crawling%2C%20gliding%20and%20swarming. https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/cell-motility https://www.ncbi.nlm.nih.gov/books/NBK21530/. **4. Suggested Videos to view** https://www.youtube.com/watch?v=5DKZiSJeoV4 (329) Cytoskeleton Structure and Function | Role in Motility - YouTube (329) Cytoskeleton and intracellular motility - YouTube (329) THE CYTOSKELETON - MICROTUBULES, INTERMEDIATE FILAMENTS, MICROFILAMENTS - YouTube			

14-15	**Cellular Metabolism** 1. Mitochondria and cellular respiration Chloroplast and photosynthesis	**. Lectures Notes** **2. Powerpoint presentation** **3.Suggested Web Readings** Steps of cellular respiration | Biology (article) | Khan Academy Cellular Respiration | Biology for Majors I (lumenlearning.com) Cellular Respiration - an overview | ScienceDirect Topics Intro to photosynthesis (article) | Khan Academy Photosynthesis, Chloroplast | Learn Science at Scitable (nature.com) **4. Suggested Videos to view** (329) ATP & Respiration: Crash Course Biology #7 - YouTube (329) Cellular Respiration (UPDATED) - YouTube (329) Photosynthesis: Crash Course Biology #8 - YouTube (329) Photosynthesis (UPDATED) - YouTube	Understand and explain the cellular metabolism of the cell	Recitation Quiz Seatwork/Group dynamics Laboratory experiment (per batch) With F2F and online post-lab	**SDG No. 4** Quality Education **SDG No. 15** Life on Land
16-17	**Current Trends in Cellular and Molecular Biology** 1. Recombinant DNA Technology 2. RNA interference	**1. Lectures Notes** **2. Powerpoint presentation**	Understand the molecular processes and technique in cell and molecular biology	Recitation Quiz	**SDG No. 4** Quality Education

	Nanotechnology	**3.Suggested Web Readings** Recombinant DNA Technology (genome.gov) An Introduction to Recombinant DNA (rpi.edu) Recombinant DNA - an overview | ScienceDirect Topics RNA Interference (RNAi) (nih.gov) RNA Interference - an overview | ScienceDirect Topics Nanotechnology | NIOSH | CDC What Is Nanotechnology? | National Nanotechnology Initiative **4. Suggested Videos to view** (329) Animation 27.1 Basic principle of recombinant DNA technology - YouTube (329) The Events Of Recombinant DNA Technology - YouTube (329) RNA interference (RNAi): by Nature Video - YouTube (329) RNA Interference [HD Animation] - YouTube (329) Nanotechnology: A New Frontier - YouTube		Seatwork/Group dynamics	**SDG No. 15** Life on Land
18	**Final Examination**				

SUMMARY OF REVISIONS:

Revision	Date	Updated by	Short Description of Changes
1.0	January 25, 2021	Lourdes Fatima S. David, Instructor	• Online/virtual platform with Learning Management System (LMS), synchronous and asynchronous teaching/learning activities, and assessment method/task. • Modified home-base laboratory activity
2.0	August 17, 2022	Lourdes Fatima S. David, Instructor	• Revision to hybrid learning – online learning and limited face-to-face with online/virtual Learning Management System (LMS), and assessment method/task. • Inclusion of Sustainable Development Goals • Inclusion of face-to-face laboratory activities/experiments

			• Inclusion of the topics biochemistry of the cell, cellular metabolism and current trends in cellular and molecular biology
3.0	August 21, 2023	Lourdes Fatima S. David, Instructor	• Addition of National and Local Knowledge sections. • Modified hybrid laboratory activities

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: Lourdes Fatima S. David
Mobile Number: +63-928 503 9608
Email Add/ MS Teams Acc: lourdes.david@mcc.edu.ph
Messenger Account: Fhat Sula-David

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

Class Standing		60%
➢ Classwork	30%	
➢ Class Participation (Recitation and Participation in discussion forum)	20%	
➢ Attendance	10%	
Midterm Examination		40%

Final

Class Standing		60%
➢ Classwork	30%	
➢ Class Participation (Recitation and Participation in discussion forum)	20%	
➢ Attendance	10%	
Final Examination		40%

REFERENCES:

Books

Books

1. Alberts, B; Johnson, A; Lewis, J; Raff, M; Roberts, K; and Walter, P. Molecular Biology of the Cell. 5th Edition. 2007. Garland Science.
2. Lodish, M; Molecular Cell Biology. 7th Edition. 2012. W. H. Freeman.

Prepared by:	Reviewed by:	Approved:	cc:
Lourdes Fatima S. David, MSc.	**Glen S. Nolasco, MSc.**	**Marilyn S. Arcilla, LPT, RN, MAN**	**Romeo D. Erese III, LPT, Ph.D.**
Instructor	Program Head, BS Biology	Dean, Institute of Arts and Sciences	AVP for Academic Affairs