<table>
<tr><td>Course Title</td><td colspan="5">Biology I</td></tr>
<tr><td>Course Code</td><td colspan="5">MED-103</td></tr>
<tr><td>Course Type</td><td colspan="5">Required</td></tr>
<tr><td>Level</td><td colspan="5">Undergraduate</td></tr>
<tr><td>Year / Semester</td><td colspan="5">Year 1/ Semester 1 (Fall)</td></tr>
<tr><td>Teacher’s Name</td><td colspan="5">Course Lead:
Dr Christiana Charalambous
Contributors:
Prof Constantina Constantinou
Dr Ender Volkan</td></tr>
<tr><td>ECTS</td><td>6</td><td>Lectures / week</td><td>3</td><td>Laboratories / week</td><td>2</td></tr>
<tr><td>Course Purpose and Objectives</td><td colspan="5">This course is the first part of a two parts course in General Biology. The main objectives of the course are:
To make students aware of the diversity/complexity of organisms, the major categories of biological molecules and their basic functions.
To describe the structure-function of cell organelles and demonstrate the differences between prokaryotic and eukaryotic cells.
To demonstrate the energy requirements of organisms through the study of energy pathways such as photosynthesis and respiration.
To make students aware of the biological processes of cell division, reproduction and genetic inheritance.
To provide students the opportunity to study the scientific method through experiments and to practice problem solving techniques.
To provide students the opportunity to practise on basic laboratory equipment, to collect and report data and interpret results accurately.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">The following list provides the learning objectives that will be covered in the lectures, lab practicals and tutorials of each week:

Week 1
LOBs covered during lectures
1. Identify the levels of organization of living organisms (biological hierarchy).
2. Describe the properties of living organisms.
3. Identify the classification of living organisms (taxonomy).</td></tr>
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4. Explain Darwin's theory on the origin of species (evolution) including its two main concepts (natural selection and decent with modification).

LOB covered during tutorial:

5. Describe the basic laboratory safety regulations and equipment.
6. Define the steps of the scientific method.
7. Define hypothesis and know what requirements hypotheses should fulfil.
8. Define independent, dependent, standardized variables and control treatments.

Week 2

LOBs covered during lectures:

9. Define molecules, compounds and elements and identify key chemical elements and their properties.
10. Define isotopes and radioisotopes and provide examples of their clinical applications.
11. Describe and compare ionic bonds, covalent bonds, hydrogen bonds and Van der Waals interactions.
12. Describe the properties of water and its role in living organisms.
13. Define hydrophilic/hydrophobic molecules, acid/bases, pH and buffers.

LOBs covered during lab practical:

14. Convert between units of the metric system.
15. Convert blood sugar concentration from mM to mg/dl and vice versa.
16. Calculate the body mass index (BMI) based on the height and weight.

Week 3

LOBs covered during lectures:

17. Describe the structure and function of different types of biologically important carbohydrates in living organisms.
18. Describe the structure and function of different types of biologically important lipids in living organisms.
19. Name the 20 amino acids and identify the group that they belong to (polar, non-polar, electrically charged).
20. Describe the structure and function of different types of proteins in living organisms, including the 4 different levels of protein structure.
21. Discuss the role of the change in primary protein structure in the pathogenesis of sickle cell anaemia.
22. Describe and compare the structure and function of DNA and RNA.
23. Describe the different types of light and electron microscopes and compare their application in studying cell morphology.

LOBs covered during lab practical:

14. Convert between units of the metric system.
15. Convert blood sugar concentration from mM to mg/dl and vice versa.
16. Calculate the body mass index (BMI) based on the height and weight.
24. Identify the parts of the compound microscope.
25. Describe the steps required to locate and focus on any specimen using the low-power or high-power objective.
26. Define optic field and calculate by approximation the real size of any specimen under view.
27. Describe the function of the electron microscope and its role in histopathological sample examination.

Week 4

LOBs covered during lectures:

28. Compare the basic structure of prokaryotic and eukaryotic cells.
29. Compare the structure of plant vs animal cells and identify the function of the different cell structures and organelles.
30. Describe the structure and function of the different components and filaments of the cytoskeleton, including the role of the centrosome, the flagella and the cilia.
31. Describe the structure and function of the different extracellular components of animal and plant cells.
32. Identify the different types of intercellular junctions in animal cells vs plant cells and their function.

LOBs covered during lab practical:

24. Identify the parts of the compound microscope.
25. Describe the steps required to locate and focus on any specimen using the low-power or high-power objective.
26. Define optic field and calculate by approximation the real size of any specimen under view.
27. Describe the function of the electron microscope and its role in histopathological sample examination.

Week 5

LOBs covered during lectures:

33. Describe the properties (structure and function) of biological membranes.
34. Identify the structure and function of different types of membrane lipids, proteins and carbohydrates.

35. Compare active transport processes with passive transport processes and describe the processes of diffusion and osmosis.
36. Describe and compare the processes of exocytosis and endocytosis.

LOB covered during lab practical:

37. Define hypotonic, hypertonic and isotonic in terms of relative concentrations of osmotically active substances.
38. Explain how incubating plant and animal cells in hypotonic, hypertonic and isotonic solutions affects their structure and function.

Week 6

LOB covered during lab practical:

36. Define hypotonic, hypertonic and isotonic in terms of relative concentrations of osmotically active substances.
37. Explain how incubating plant and animal cells in hypotonic, hypertonic and isotonic solutions affects their structure and function.

Week 7

Summative midterm exam

LOBs covered during lectures:

39. Explain the mechanisms by which cells communicate with each other in local vs distal signalling.
40. Describe the stages of the cell signalling process.
41. Identify the different types of intracellular and plasma membrane receptors and describe their function.
42. Describe the role of second messengers in the cell signalling cascades.

Week 8

LOBs covered during lectures:

43. Explain the thermodynamic laws and describe the concepts of endergonic and exergonic reactions.
44. Describe the structure, function, production and hydrolysis of ATP.
45. Define an enzyme and explain the regulation of enzymatic activity by allosteric regulation and negative feedback inhibition.
46. Describe the different types of enzyme inhibitors and their mode of action.
47. Identify the structure and function of the mitochondria.

48. Identify the location of the different stages of cell respiration in animal cells.
49. Explain how organisms derive and utilize energy through cellular respiration.
50. Describe the process of chemiosmosis in mitochondria, including the electron transport chain and ATP production.

LOBs covered during lab practical:

51. Describe methods for measurements of biomolecule concentrations using blood and urine strips.

LOBs covered during tutorial:

52. Define solvent, solute, solution molarity, mole and molecular weight.
53. Calculate isotonic, hypotonic and hypertonic solution concentrations.
54. Calculate drug dosage and concentration.

Week 9

LOBs covered during lectures:

55. Describe the processes of alcohol fermentation and lactic acid fermentation.
56. Compare aerobic to anaerobic respiration in organisms.
57. Explain cell division and its role in unicellular vs multicellular organisms.
58. Describe the different stages of the cell cycle, including the different stages of mitosis.
59. Discuss the clinical consequences for a patient suffering from a metabolic disorder.

LOBs covered during lab practical:

51. Describe methods for measurements of biomolecule concentrations using blood and urine strips.

LOBs covered during tutorial:

52. Define solvent, solute, solution molarity, mole and molecular weight.
53. Calculate isotonic, hypotonic and hypertonic solution concentrations.
54. Calculate drug dosage and concentration.

Week 10

LOBs covered during lectures:

	60. Describe cell cycle control through the checkpoints, including the role of cyclin-cdks, the tumour suppressor genes Rb and p53 and cdk inhibitors (CKIs) in cell cycle regulation. 61. Describe the characteristic of cancer cells related to cell cycle dysregulation including the difference between benign and malignant tumours. 62. Describe the organisation of the eukaryotic genome in the human karyotype. 63. Define and compare haploid and diploid cells. 64. Define and compare autosomes and sex chromosomes. 65. Define the terms chromatin, sister chromatids, chromosome and homologous chromosomes. 66. Describe the process of meiosis and explain its role in gamete production. 67. Compare mitosis to meiosis and distinguish the general purpose of mitosis from the purpose of meiosis. 68. Discuss the mechanisms that contribute to genetic variation. ***LOB covered during lab practical:*** 69. Identify the phases of mitosis in an onion root tip. 70. Identify the phases of meiosis in lilium anthers. **Week 11** ***LOB covered during lab practical:*** 69. Identify the phases of mitosis in an onion root tip. 70. Identify the phases of meiosis in lilium anthers. **Week 12** ***LOBs covered during lectures:*** Revision Session		
Prerequisites	None	Required	None
Course Content	***Topics covered in lectures*** • Introduction to the Science of Life, Levels of Organization. • The chemical basis of life. • Properties of Water, pH, Acid/bases. • Structure and function of macromolecules in the living cell. • Cell structure and function:		

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Prokaryotic vs. Eukaryotic cells; cellular organelles: structure vs. function.
Cytoskeleton and extracellular components.

Membrane structure and function.
Cell communication.
Introduction to Metabolism: Laws of Thermodynamics, ATP regeneration, Enzyme Activity, Feedback Inhibition.
Cellular respiration, electron transport and oxidative phosphorylation.
Cell Reproduction:

Cell Cycle
Cell Cycle regulation.

Meiosis.

Topics covered in laboratory practicals

The metric system.
Microscopy: Microscopy and microscopic preparations.
Membrane structure and Function: Osmosis.
Biomolecules: Calculation of biomolecule concentration using blood and urine
Mitosis and Meiosis.

Topics covered in tutorials

Introduction and Laboratory Safety Issues.
The Scientific Method.
Calculation of solution and drug concentration
Medical interview of a patient suffering with a metabolic disorder.

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<tr><td>Teaching Methodology</td><td>Lectures, Tutorials, Laboratory Practical Sessions.</td></tr>
<tr><td>Bibliography</td><td>
Required Textbooks/Reading:
<table>
<tr><th>Authors</th><th>Title</th><th>Edition</th><th>Publisher</th><th>Year</th><th>ISBN</th></tr>
<tr><td>N.A. Campbell, L. A. Urry, M.L. Cain, S.A. Wasserman, P.V. Minorsky, J.B. Reece</td><td>Biology: A global approach</td><td>12th Edition</td><td>Pearson</td><td>2020</td><td>9781292341637</td></tr>
<tr><td colspan="6">E-book permalink

https://ebookcentral.proquest.com/lib/nicosia/detail.action?docID=6191695</td></tr>
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<tr><td></td><td>Recommended Textbooks/Reading:
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<tr><th>Authors</th><th>Title</th><th>Edition</th><th>Publisher</th><th>Year</th><th>ISBN</th></tr>
<tr><td>Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter</td><td>Molecular Biology of the Cell</td><td>7th Edition</td><td>Norton & Company</td><td>2022</td><td>9780393884852</td></tr>
<tr><td>Jane B. Reece, Martha R. Taylor, Eric J. Simon, Jean L. Dickey</td><td>Campbell Biology: Concepts and Connections</td><td>10th Edition</td><td>Pearson</td><td>2021</td><td>9781292402031</td></tr>
<tr><td>A. Jones, R. Reed and J. Weyers</td><td>Practical skills in Biology</td><td>7th Edition</td><td>Pearson</td><td>2021</td><td>9781292397078</td></tr>
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<tr><td>Assessment</td><td>Laboratory reports (10%), Midterm Exam (30%), and Final Exam (60%). Assessment is by Single Best Answers (SBAs) and Short Answer Questions (SAQs).</td></tr>
<tr><td>Language</td><td>English</td></tr>
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