Demonstration School of Suan Sunandha Rajabhat University, English Program

Class Information and Learning Approach

Instructor: Ajchara Aksomboon Vongsawan

The Goal:
The three-year Biology curriculum serves as a pre-requisite for Science-Math majors in preparation for entering biomedical sciences as well as other science fields.

Mathayom 4 (Secondary Grade 10): Year 1 Biology 1, 2
Mathayom 5 (Secondary Grade 11): Year 2 Biology 3, 4
Mathayom 6 (Secondary Grade 12): Year 3 Biology 5, 6

The study approach adheres to the Thai curriculum using combination of US and Singaporean textbooks with emphasis in preparing students to apply analytical thinking in the subject matter. English is the language of instruction in the English Program. Students planning to enter the biomedical field or medical field within the Thai university system are advised to read a Thai version of textbook in preparation for their entrance exam due to technical term discrepancy that may be used in Thai exams. Pre-med and biomedical science students will be expected to pay close attention to current knowledge of bioscience technology for future use at undergraduate university level.

Grade 10 (M4): Year 1 Biology 1 Semester 1: (SCI 31241) 1.5 Credits, 60 hours	
Course Content	**Details**
Unit 1: Maintaining stability of living things **Homeostasis**	• Science and Biology • Structure and Function Characteristics of Living Things • Research Methodology and Ethics
Unit 2: Cell and Cellular Function	• Subunit of life: cell • Cell Specialization and Structure • Microscope: types and application in research studies, component and proper usage • Cellular Reproduction and Inheritance: Mitosis, Meiosis
Midterm Exam	**Material Covered from Units 1 and 2**
Unit 3: Chemistry of Life **Basic Molecules of Living Things**	• Organic and Inorganic molecules in the human body

	• Biomolecules that are Macromolecules: Carbohydrate, Protein, Lipid, Nucleic acid • Small biomolecules such as water and ions • Chemical Reactions and Processes within living cells • Enzymatic reactions
Unit 4: Cellular Respiration	• Biomolecules within Cells of Living Organisms • Breakdown using Aerobic and Anerobic process • Biomolecule in which Cells use Energy: glucose • Basic Biomolecules in Living Things • Cellular Respiration
Final Exam	**Material Covered from Units 3 and 4**
Grade 10 (M4): Year 1 Biology 2 **Semester 2: (SCI 31242) 1.5 Credits, 60 hours**	
Course Content	**Details**
Unit 1: Heredity	• Gregor Mendel: also known as the Father of Modern Genetics. • Mendel's experiments with pea plants • Mendel's Laws of Inheritance • The Chromosomal Basis of Inheritance • Genetic Material and Gene Expression • Mechanisms leading to Mutations
Unit 2: Genes and Chromosome	• History of Genetic Material: experiments leading to unraveling Genetic Material, DNA structure and function. • DNA Replication • Central Dogma: Gene flow from DNA-RNA-Protein
Midterm Exam	**Material Covered from Units 1 and 2**

Unit 3: Genetics and DNA Technology	• Errors during Gene Expression giving rise to Mutations • Genomics and Biotechnology • Genetic Engineering/ Recombinant DNA Technology
Unit 4: Evolution	• Darwin's Theory of Natural Selection • Genotype Frequency • Hardy-Weinberg Theory • Origin of Species
Final Exam	**Material Covered from Units 3 and 4**

Grade 11 (M5): Year 2 Biology 3 **Semester 1: (SCI 32241) 1.5 Credits, 60 hours**	
Course Content	**Details**
Unit 1: Structure and Function of Flowering Plants	• Structure and Function of Plant tissue • Structure and Function of Root, Stem and Leaf • Transpiration in Plant • Transport System of water and Mineral Salt in Plants • Transport of Organic Substance in Plants
Unit 2: Plant Growth and Development	• Plant Hormones • External Stimulus Inducing Plant Development
Midterm Exam	**Material Covered from Units 1 and 2**
Unit 3: Adaptations Flowering Plant use for Survival	• Life Cycle of Flowering Plant • Reproduction in Flowering Plant • Plant Sexual Organs • Seed Germination

Unit 4: Photosynthesis	• Importance of Photosynthesis • Mechanism of Photosynthesis • Photorespiration • C_3 and C_4 Plants • CAM Plants • Factors affecting Photosynthesis
Final Exam	**Material Covered from Units 3 and 4**
Grade 11 (M5) Year 2: Biology 4 Semester 2: (SCI 32242) 1.5 Credits, 60 hours	
Course Content	**Details**
Unit 1: Respiratory System and Circulatory System	• Gas Exchange in Living Things • Open and Closed Circulatory System • The Structure and Function of Mammalian Heart. • Human Circulatory System
Unit 2: Maintaining Homeostasis in the body	• Excretion of waste product in Unicellular Organisms, invertebrates, and vertebrates including humans • Kidney Function • Kidney Diseases
Midterm Exam	**Material Covered from Units 1 and 2**
Unit 3: Digestive System	• Digestive System in Micro-organisms • Digestion System in Mammals • Digestion System in Humans
Unit 4: Immune System	• Defence Mechanisms of the Body • Types of Immune System • Components of the Immune System • Immune Deficiency

Final Exam	Material Covered from Units 3 and 4
Grade 12 (M6) Year 3 Biology 5 **Semester 1: (SCI 33241) 1.5 Credits, 60 hours**	
Course Content	**Details**
Unit 1: Animal Reproduction **Animal Development and Growth**	• Sexual and Asexual Reproduction • Male and Female Reproductive System • Spermatogenesis, Oogenesis, and Fertilization • *In vitro* fertilization • Embryogenesis
Unit 2: Nervous System	• Central Nervous System (CNS) in Vertebrates: Brain and Spinal Column (Function of Synapse within brain cells and Spinal Column) • Peripheral Nervous System (PNS): Cranial and Spinal Nerves, Ganglia, and Sensory Receptors • Function of Nervous System: Somatic and Automatic • Sympathetic Nervous System
Midterm Exam	**Material Covered from Units 1 and 2**
Unit 3: Endocrine System and Ductless Glands **Endocrine System and Hormones**	• Endocrine System and Ductless Glands • Ductless gland and hormonal production in animals • Mechanism of Hormone produced from Ductless Glands/Endocrine Signaling • Hormonal Balance and Regulation
Unit 4: Conservation	• Energy Transfer in Ecosystem • Biomass • Biogeochemical Cycles: Nitrogen, Sulfur, Phosphorus • Renewable and Nonrenewable Energy • Sustainability

	• Environmental Problems
Unit 5: Population Growth	• Population Growth: Exponential and Logistic • Population Control
Final Exam	**Material Covered from Units 3 and 4**

Grade 12 (M6) Year 3 Biology 6 **Semester 2: (SCI 33242) 1.5 Credits, 60 hours**	
Course Content	**Details**
Unit 1: Biodiversity	• Kingdoms of Life • The Origin of Life and the Cell Theory • Taxonomy and Biological Classification • Binomial Nomenclature
Midterm Exam	**Material Covered from Unit 1**
Unit 2: Muscular and Skeletal System	• Protein Filaments for muscle function • Interaction of Protein Filaments for Muscle Function • Muscular System in vertebrate: Skeletal, Smooth, and Cardiac Muscle
Unit 3: Animal Behavior	• Mechanism of Animal Behavior • Inherited Behavior • Learned Behavior
Final Exam	**Material Covered from Units 2 and 3**

Grading and Evaluation	
Percent Allocation	**Percent**
Attendance and Participation	10
Assignments and Quiz	20
Experiments and Lab Report	30

Midterm	20
Finals	20
Grade	**Percent**
A	80-100
B+	75-79
B	70-74
C+	65-69
C	60-64
D+	55-59
D	50-54
F	Below 50

Expectations from students:
(1) to always attend class
(2) to critically read the assigned material before class
(3) to enthusiastically participate in class discussions and problem-solving sessions
(4) to diligently prepare for all exams

Study and Reading Materials
(1) Campbell PowerPoint Lectures and uploads given in conjunction with textbooks
(2) Textbooks

2.1. Biology: A Global Approach, Global Edition, 10/E
Neil A. Campbell, University of California, Riverside
Jane B. Reece, Palo Alto, California
Lisa Urry
Michael L Cain, Bowdoin College, Brunswick, Maine
Steven A Wasserman, University of California, San Diego
Peter V Minorsky, Mercy College, Dobbs Ferry, New York
Robert B Jackson, Duke University, Durham, North Carolina
or equivalent version.

2.2. Biology for AP® Courses SENIOR CONTRIBUTING AUTHORS JULIANNE ZEDALIS, BISHOP'S SCHOOL JOHN EGGEBRECHT, BROOKLYN TECHNICAL HIGH SCHOOL, OpenStax©2018 Rice University.

2.3. New Century Elective Biology: Secondary 4,5, and 6.
Hodder Education Singapore, 2019 Edition.
Beverly Tay, Loo Kwok Wai, Ong Bee Hoo, and Janlin Chan

(3) Video Clips and Scientific Readings from Journals