SUBJECT OUTLINE

Subject Name: **Subject Code:**

Biochemistry for Complementary Therapists BIOO211

SECTION 1 - GENERAL INFORMATION

Award/s:		**Total Course Credit Points:**		**Level:**
	Bachelor of Health Science (Acupuncture)	128	Core	2nd Year
	Bachelor of Complementary Medicine	48	Elective	3rd Year
Duration:	1 Semester			
Subject Coordinator:	Dr Vishnu Bhat (Melbourne campus)			
Subject is:	Core or Elective as noted	**Subject Credit Points:**	2	

Student Workload:		
No. timetabled hours per week: 3	**No. personal study hours per week: 2**	**Total hours per week: 5**

Delivery Mode:

Face to Face (On campus)	1 x 2 hour lecture	1 x 1 hour tutorial
e-Learning (Online)	Narrated PowerPoint presentations Tutorials: Asynchronous tutor moderated discussion forum and activities Student handouts, web-based resources	
Intensive Delivery (Summer School)	Contact hours are delivered over 5 weeks with 2 x 4 hour days delivered per week Content: Combination lecture and tutorial activities Assessment: Quiz 1 - Week 2; Quiz 2 - Week 3; Assignment - Week 4; Concept Map - Week 5; Written Assignment - Week 6 Full Time Part Time	

Pre-requisites: Nil

Co-requisites: Nil

SECTION 2 – ACADEMIC DETAILS

Subject Rationale

This subject introduces students to the concepts of general and organic chemistry, helping them prepare for further studies in human biology, nutrition and human clinical sciences. The subject also provides basic concepts in DNA structure, function and replication and covers foundational knowledge of the major biochemical pathways. The overall objective of the subject is to assist in understanding the chemical workings of the human body at the cellular, tissue and systemic levels.

Learning Outcomes

1. Explain elements, atoms, ions, chemical bonding, states of matter, gas behaviour, chemical reactions and equilibrium, the importance of energy transfer, catalysts, and identify applications in biological systems.
2. Identify functional groups and analyse chemical nature of all organic molecules, including carbohydrates, lipids, proteins and nucleic acids.

3. Explain common chemical reactions and properties associated with organic functional groups and state their applications in biological systems.
4. Describe the function and main biochemical pathways for each major biochemical group.
5. Apply the knowledge of the major biochemical pathways and how they relate to health and disease states.
6. Illustrate regulation and integration within the main biochemical pathways and explain how this contributes to normal homeostasis in the body.

Assessment Tasks

Type	Learning Outcomes Assessed	Session Content Delivered	Due	Weighting
Quiz 1 multiple choice and definitions (40 minutes)	1	1-4	Week 5	20%
Quiz 2 multiple choice and definitions (40 minutes)	2-3	5-9	Week 10	20%
Assignment carbohydrate metabolism (1000 words or multimedia)	4-6	6, 10-11	Week 12	20%
Concept Map	4-6	9, 13	Week 13	20%
Written Assignment lipid metabolism (1000 words)	4-6	7, 12	Week 14	20%
All written assessments and online quizzes are due at 11:55 p.m. and submitted through the LMS				

Prescribed Readings:

1. Stoker, H. S. (2016). *General, organic, and biological chemistry* (7th ed.). Boston, MA: Cengage Learning.
2. Summers, J., & Smith, B. (2014). *Communication skills handbook* (4th ed.). Milton, QLD: Wiley. [ebook available]

Recommended Readings:

1. Batmanian, L., Ridge, J., & Worrall, S. (2011). *Biochemistry for health professionals*. Chatswood, NSW: Mosby Elsevier. [ebook available]
2. Bettelheim, F. A., Brown, W. H., Campbell, M. K., Farrell, S. O., & Torres, O. J. (2016). *Introduction to general, organic and biochemistry* (11th ed.). Boston, MA: Cengage Learning.
3. Dominiczak, M. H. (2007). *Flesh and bones of metabolism*. Edinburgh, Scotland: Elsevier Mosby.
4. O'Toole, M. T. (Eds.). (2013). *Mosby's dictionary of medicine, nursing and health professions* (9th ed.). St. Louis, MO: Elsevier. [ebook available]
5. Timberlake, K. C. (2015). *General, organic, and biological chemistry: Structures of life* (5th ed.). Harlow, England: Pearson.
6. Tortora, G. J., Derrickson, B., Burkett, B., Peoples, G., Dye, D., Cooke, J., … Mellifont, R. (2019). *Principles of anatomy and physiology* (2nd Asia-Pacific ed.). Milton, QLD: Wiley.

Subject Content		
Week	**Lectures**	**Tutorials / Practicals**

1.	Introduction (Subject Outline / Subject Aims / Assessment / Teaching Resources)
	Chemistry: The Study of Matter
	• How matter is organised
	  ○ Elements, compounds
	  ○ Periodic Table
	  ○ Atoms, structure of atoms
	  ○ Atomic number and mass number
	  ○ Valence electron, octet rule
	• Chemical bonds
	  ○ Ionic, covalent
	• Naming compounds
	  ○ Ionic and covalent compounds
		Activities are developed to allow the students to explore relevant concepts, expand on ideas and have peer and lecturer interaction. Activities also allow for formative assessment and feedback
		• Review of the Periodic Table and elements, octet rule and chemical bonds

2.	**Chemical Reactions** • Chemical equation and balancing • Redox reaction– oxidation and reduction reaction • Reversible reaction and equilibrium	• Review of chemical formulae and naming compounds

3.	**Introduction to Reaction Rates and States of Matter**
	• Reactions and rates
	  ○ Factors affecting reaction rate, activation energy, catalysts (enzymes), exothermic and endothermic reaction
	• States of matter
	  ○ Strength of attractive forces
	  ○ Attractive forces between particles and hydrogen bonding
	• Gases
	  ○ Gas laws (Boyle's and Dalton's law)
	  ○ Breathing
	  ○ solutions
		• Review of chemical reactions and Le Châtelier's principle

4.	**Acids and Bases**
	• Acidic and basic solutions
	  ○ Concept of pH
	  ○ Strong and weak acids and bases
	  ○ Conjugate acid–base pairs
	• Biological buffers (e.g., bicarbonate, phosphate in the blood)
		• Review of acids, bases and buffers

5.	**Introduction to Organic Chemistry**
	• Organic compounds
	  ○ Organic molecules and their properties
	  ○ Bonding with carbon
	  ○ Functional groups
	• Formulas
	  ○ Molecular, structural
	• Naming of organic compounds
	  ○ Overview – IUPAC system basics
	• Functional groups (overview)
		• Review of functional groups using molecular models

6.	**Carbohydrates**
	• Introduction to the structure and function of carbohydrates
	  ○ Simple and complex carbohydrates
	  ○ Monosaccharides
	  ○ Disaccharides
	  ○ Polysaccharides
	  ○ Dietary considerations & carbohydrates
		• Review of carbohydrates
		• Concept map on carbohydrates

7.	**Lipids** • Introduction to lipids • Classification of lipids • Structure and function • Types of fatty acids • Triacylglycerols • Phospholipids	• Review of Lipid classification, structure and function
	NON-TEACHING WEEK (note that make-up classes may be scheduled in this week) **Semester 1** - This aligns with the week after Easter so it may fall between Weeks 6 to 8 **Semester 2 & Online students** - The non-teaching week falls between Weeks 7 and 8	
8.	**Introduction to Nucleic Acids, DNA and Replication** • Types of nucleic acids • Nucleosides and nucleotides • Primary structure of nucleic acids • DNA double helix • DNA replication	• Review of DNA structure and function • Virtual laboratory exercise on DNA extraction
9.	**Amino Acid, Proteins and Enzymes** • Characteristics of proteins • Amino acids: Building blocks for proteins • Primary, secondary, tertiary & quaternary structure of proteins • General characteristics of enzymes • Enzyme structure • Enzyme function and inhibition	• Review of amino acids, protein and enzymes • Animations on the structure and level of organisation of protein, mechanism of enzyme action
10.	**Carbohydrate Metabolism** • Digestion of carbohydrates • Glycolysis • Glycogen metabolism • Pyruvate pathways	• Review of carbohydrate metabolism

11.	**Carbohydrate Metabolism (Continued)** • Krebs cycle • Electron transport chain • Energy from glucose	• Review of carbohydrate metabolism, Krebs cycle and energy production
12.	**Lipid Metabolism** • Digestion of lipids • Lipolysis and beta oxidation, energy yield • Ketogenesis • Lipogenesis	• Review of lipid metabolism, concept map of lipid metabolism
13.	**Protein Catabolism** • Digestion of protein • Oxidative deamination • Urea cycle • Metabolic outcome of amino acids **Integration of Metabolic Pathways**	• Review of protein catabolism and concepts map on protein catabolism, integration of metabolic pathways
14.	**Non-Teaching Week/Practical Examination Week 1** Note that make-up classes may be scheduled in this week	
15.	**Non-Teaching Week/Practical Examination Week 2** Note that make-up classes may be scheduled in this week	
16.	**Final Examination Week 1** There is no final exam for this subject	
17.	**Final Examination Week 2** There is no final exam for this subject	