Unit Title	Metabolic Biochemistry	
Level	5	
Reference No	EAA_5_417	
Credit value:	1 credit = 15 CATS points	
Student Study Hours:	Contact Hours	42
	Student Managed Hours	108
Pre-requisite learning	(Bio)molecules	
Co-requisites	None	
Excluded Combinations	None	
Unit Coordinator:	Dr. M. Byford	
Faculty/Department	ESBE/Applied Science	

Short Description:

This unit studies in detail the processes involved in the key metabolic pathways involved in the metabolism of carbohydrates, fats and proteins with particular emphasis on biosynthesis of biomolecules. Regulation of metabolic process at both the molecular and cellular level and its importance to the whole organism will also be highlighted. Aspects of microbial metabolism will be contrasted with those of eukaryotes.

Aims:

The aims of this unit are:

- To provide students with a broad understanding of the topics which constitute the recognized 'core' of molecular biological knowledge and principles of intermediary metabolism, its energetics and regulation.
- To provide the intellectual framework whereby the student develops the ability to execute his/her own experiments, to analyze experimental data, to draw qualitative and quantitative conclusions from available data and to discern whether such conclusions are justified.
- To provide students with an appropriate range of transferable skills.

Learning Outcomes:

Knowledge and Understanding:

- Describe in detail the processes involved in the key pathways of intermediary metabolism.
- Explain the interrelationships of these pathways with special reference to their regulation in satisfying the requirements of the cell and organisms as a whole.
- Understand the importance of major biosynthetic pathways to the organism.

- Understand the importance of metabolic regulation and the major mechanisms by which this is effected.
- Understand the similarities and differences between pro- and eu-karyotic metabolic modes.

Intellectual Skills:

Have the ability to integrate knowledge and understanding of numerous diverse processes into a comprehensive understanding of the interrelationships between them and their bearing on a complete system.

Practical Skills:

Basic laboratory skills from level 4 reinforced. New skills more specifically relating to the means by which basic metabolic and molecular processes can be easily studied will be developed. Ability to produce a coherent and succinct practical report enhanced. A range of methodologies will be presented in both lectures and the practical classes in order to encourage an understanding of the experimental basis of metabolic biochemistry and enzymology.

Transferable Skills:

Progression a continuing programme of acquisition of transferable skills namely: numeracy, presentation skills, teamwork, individual study skills, time management and word processing skills.

Employability:

Employability is enhanced by the key transferable skills imparted by the practical component. Biochemistry and microbiology students will find that this unit is crucial to their employability. Metabolism also impacts heavily on the nutrition discipline.

Teaching and Learning Pattern:

The unit comprises 2 hours of formal lectures per week along with a 1-hour long tutorial. The unit will also have an associated series of four three-hour practical classes.

Indicative Content:

***Carbohydrate metabolis*m.** Glycolysis, gluconeogenesis, Glucose metabolism to include reference to substrate cycles, overall energy yields, substrate level phosphorylation, alternative fates of pyruvate.

Proteins and Amino Acid Metabolism. The origins and breakdown of amino acids.

Lipid metabolism. β-Oxidation of fatty acids and fatty acid biosynthesis.

Integration of catabolism and anabolism. Central role of the Krebs' cycle in intermediary metabolism (including gluconeogenesis and amino acid metabolism), the glyoxalate shunt, and relationships to electron transport and oxidative phosphorylation. Pentose phosphate pathway (as a source of NADPH, ribose).

Energy Metabolism and Photosynthesis. Mitochondrial electron transport and oxidative phosphorylation, electron and hydrogen carriers, relationship between free energy and redox potential, chemiosmotic coupling.

Secondary metabolism The crucial role of secondary metabolism in the synthesis of antibiotics, other drugs of use to humans and pigments and flavourings in plants will be explored.

Assessment:

The pass mark for the unit is 40%.

Examination at the end of Semester 1, 60%. Unseen examination, three from six questions in 2 hours.
All four practicals to be written up in the format stipulated in the module guide, 40%

Indicative Sources:

Core reading:
Nelson, D. L. & Cox, M. M. (2009) *Lehninger Principles of Biochemistry*, 5th Edition. W. H. Freeman.

Optional reading:
Madigan, M. T., Martinko, and Parker, J**.** *Brock: Biology of Microorganisms*, 10th edition, Prentice Hall (2002)
Salway J. *Metabolism at a Glance* (Blackwell, Oxford) 2004
Waites, M. J., Morgan, N. L., Rockey, J. S. and Higton, G. *Industrial Microbiology: an introduction.* Blackwell Science (2001). Chapters 1 - 3.
Reed, R. *Et al* (2007) *Practical Skills in Biomolecular Sciences,* 3rd Edition. Benjamin Cummings.