LONDON SOUTH BANK UNIVERSITY

module guide

Biological Principles

Module Reference : SFB-4-103

Blackboard site

Faculty of Engineering, Science and Built Environment

2011/12

become what you want to be

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1. MODULE DETAILS

ModuleTitle:	Biological Principles
Module Level:	4
Module Reference Number:	SFB-4-103
Credit Value:	30 credits
Student Study Hours:	300
Contact Hours:	78
Private Study Hours:	222
Pre-requisite Learning (If applicable):	None
Excluded Combinations:	Foodology (except microbiology)
Course(s):	Biosciences & Food, Forensic Science
Year and Semester	2011/12 - Semesters 1 + 2
Module Coordinator:	Mandy Maidment
MC Contact Details (Tel, Email, Room)	020 7815 7937 maidmeml@lsbu.ac.uk , B139
Teaching Team & Contact Details (If applicable):	Ms Louise Powell-Cook, B136 powellcl@lsbu.ac.uk Dr Anne – Maria Brennan Brennan@lsbu.ac.uk B 138
Subject Area:	Bioscience & Food
Summary of Assessment Method:	2 Essays and 4 workshops

"This guide is designed to help you structure your learning by providing an indicative structure and content for the module. It is a guide and not a definitive statement of what you will be taught. We will try to follow this published schedule as far as possible, but there may be some variation as the module develops and as we try to match the pace and content of our teaching to student need".

2. SHORT DESCRIPTION

This is an introductory module providing a foundation for further studies in all areas of biology. The cellular organisation of living organisms is introduced and the organisation and functions of eukaryotic and prokaryote cells are explored. Genetics, the study of heredity, is introduced and heredity is examined at the levels of organisms, cells and molecules. Current methods for studying cells and manipulating genes will be highlighted. The origin of life and its mechanisms underlying evolution will be introduced.

3. AIMS OF THE MODULE

The aims of this module are:

- To transmit a body of information about the organization of different types of cell and explore the relationship between structure and function in eukaryotic cells.
- To present the principles of information storage and expression in living organisms along with the genetic basis of variation.
- To explore the diversity of microorganisms and their pivotal role in biological systems.
- To act as a review of the modern synthesis of evolutionary theory and its explanatory power of biological complexity.

4. LEARNING OUTCOMES

Knowledge and Understanding:

- Explain the importance of the cell as the basic unit of living organisms and describe the key differences between different types of cell.
- Outline the functions of the main compartments of eukaryotic cells and appreciate the relationships between them.
- Describe the principles of genetic inheritance.
- Understand the diversity of microorganisms and be aware of their role in the environment, in disease and in providing products and services for humankind.
- Describe how natural selection can lead to a change in the proportions of different genotypes within a population and the role this plays in speciation.

Intellectual Skills:

- Describe the cellular basis of life and the complexity within cells that underpins multicellularity.
- Explain how changes at the level of the genes can explain the complexity and diversity of organisms and the organisation of their populations and communities.
- Identify the key elements in the principle of natural selection and evaluate the evidence in support of its modern synthesis.
- Integrate knowledge about sub-cellular and cellular organisation to explain how this can provide information about the phylogenetic history of multi-cellular organisms.

Practical Skills:

- Display basic numerical, reasoning and logical skills.
- Use graphs and other forms of data presentation to answer specific questions.
- Apply logic to correctly interpret the results from simple scientific experiments
- Write brief and cogent answers to highly specific questions, drawing on presented evidence.
- Suggest reasonable and appropriate ways of testing a hypothesis prompted by the results from a simple experiment.

Transferable Skills:

- Develop oral communication skills in giving class presentations.
- Develop their skills in rational argument and data analysis for the testing of ideas and experimental outcomes.

5. ASSESSMENT OF THE MODULE

For Bioscience students (BSc and HND)

The module will be assessed in three sections:-

a. Cells and Genes – an essay under examination conditions – no notes

b. Microbiology – an essay under examination conditions – no notes

c. Biological Organisation – set of 4 workshops

This part of Biological Principles is assessed by **in-class** workshops (except the practical). There are four elements of assessment and we take the best three to derive your mark for this element of the unit.

Most sessions contain some form of exercise or tutorial. The assessed workshops are shown in bold below. You are *strongly advised* to read about each topic in advance of the sessions – we give the details of each session below to guide your preparatory reading.

You have a limited time to complete these exercises so it is necessary to read about these subjects before the workshop. All assessed exercises have to be submitted at the end of that teaching session at 5.00pm.

It is not possible to do the assessed exercises outside of the designated teaching session.

For Food Science, Food and Nutrition, Human Nutrition students
The module is assessed by b. only.

For Forensic Science students.
The module is assessed by a.

6. FEEDBACK

Feedback will normally be given to students 15 working days after the submission of an assignment.

7. INTRODUCTION TO STUDYING THE MODULE

INDICATIVE CONTENT

The cell as the basic unit of living organisms. Common features of cells. Origin and structure of eukaryotic cells. Endosymbionts. Functional significance of compartmentalisation. Key biochemical functions associated with particular compartments and the trafficking of molecules within the cell. Intra- and inter-cellular signalling. Methods for studying cells.

Chromosomes as carriers of genetic information. Cell division and its regulation. Mitosis and meiosis. Principles of heredity. Sex chromosomes and sex-linkage. Linkage and gene maps. Introduction to the molecular basis of information storage and expression and to methods for analyzing and manipulating genes. Genetically modified organisms.

Microbiology and its history. An examination of microbial classification, taxonomy and diversity. Microbial structure, nutrition and growth and an introduction to the application of microbiology to humankind.

Systematics. Systematics and the major domains of the hierarchical classification system. Basic taxonomy.

Evolution. Introduction to the development of evolution theory. Darwinism and early views on species change and immutability. Neodarwinism and the modern synthesis. Variation and adaptation. Ecological niche. Natural selection, competition and sexual selection. Rates of evolutionary change and the fossil record. Habitat change, speciation and extinction. Simple population genetics.

7.1 Overview of Types of Classes

The module comprises 2 hours of formal lectures per week along with a 1-hour long tutorial on alternate weeks.

7.2 Importance of Student Self-Managed Learning Time

Self-managed learning time is a key aspect of this module and it is important that students make full use of this time to prepare for tutorials and consolidate lecture material.

7.3 Employability

This module provides the foundations for further study in all aspects of modern biology. This will underpin more specialised and vocational study at higher levels.

8. THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT

LECTURE SEQUENCE

Week No & Time	**Lecture Title**	**Lecturer**
Weeks 1-8	*Cells & Genes*	
Week 1	What is life?	Louise Powell-Cook
	The domains of life	Anne-Maria Brennan
Week 2	Introduction to cells and organelles	Louise Powell-Cook
	Mitochondria I	Louise Powell-Cook
Week 3	Origin of life	Anne-Maria Brennan
	Endosymbiont theory	Anne-Maria Brennan
Week 4	Mitochondria II	Louise Powell-Cook
	Chloroplasts, peroxisomes	Louise Powell-Cook
Week 5	Endomembrane system	Anne-Maria Brennan
	Nucleus, cytosol	Anne-Maria Brennan

Week 6	Chromosomes and DNA	Louise Powell-Cook
	Transcription, translation, genetic code, genetic variation	Louise Powell-Cook
Week 7	Mitosis	Anne-Maria Brennan
	Meiosis	Anne-Maria Brennan
Week 8	Organelles of intracellular traffic	Anne-Maria Brennan
	Sex and gametes	Louise Powell-Cook
Week 14	Assessment 1	

Tutorials

Tutorial 1	Characteristics of living organisms
Tutorial 2	My favourite cell
Tutorial 3	Cell division and chromosomes
Tutorial 4	Genes and the environment/human pedigrees

Food students join

Week No & Time	**Lecture Title**	**Lecturer**
Weeks 9-12 S1 Weeks 1-4 S2	*Microbiology*	
Week 9		
1400-1500	History of microbiology	Mandy Maidment
1500-1600	Introduction to Microbes	TBC
Week 10		
1400-1500	Prokaryotic structure	Mandy Maidment
1500-1600	Virus	TBC
Week 11		
1400-1500	Cell envelopes Gram + and -ve	Mandy Maidment
1500-1600	Microbial growth	TBC
Week 12		
1400-1500	Growth Physiology 1	Mandy Maidment
1500-1600	Growth Physiology 2	Mandy Maidment

End of term

Forensic students finish

Week 1		
1400-1500	Maths for microbiology	TBC
1500-1600	Growth media	TBC
Week 2		
1400-1500	Control of microbes - chemical	Mandy Maidment
1500-1600	Control of microbes - Physical	TBC
Week 3		
1400-1500	Industrial microbiology	Mandy Maidment
1500-1600	Medical Microbiology	TBC
Week 4		
1400-1500	Review and assessment 2	Mandy Maidment
1500-1600		

Tutorials

Tutorial 1	Units in microbiology	Week 10
Tutorial 2	Growth kinetics 1	Week 11
Tutorial 3	Growth kinetics 2	Week 12
Tutorial 4	Environmental microbiology	Week 16
Tutorial 5	D Z F values – calculations	Week 19
Tutorial 6	Preparation for assessment	Week 20

Week No & Time	**Lecture Title**	**Lecturer**
Weeks 5-13	*Biological organisation*	
Week 5	Being Multicellular	Anne-Maria Brennan

The advantages and disadvantages of being multicellular. The problem of scale and functional differentiation. Multicellular organisation. The limited range of metabolisms in multicellular organisms. Heterotrophy and autotrophy. Symbiosis: lichens, corals, mycorrhizae, ruminants etc.
Tutorial on writing up the biological principles practicals.

Week 6 Development and differentiation Larry Richmond

The division of labour and maintaining the integrity of the genotype in multicelluar organisms. Simple vertebrate development up to the neurula. The HOX genes in the animal kingdom as an example of gene conservation. Symmetry and bilateralism in higher animals.
Tutorial on cloning

Week *7* The variety of life Anne-Maria Brennan

Modern classification systems. The rules of taxonomy and nomenclature. Cladistics. The biological species concept. Examples of the main types of speciation. Niche and niche differentiation. Ecotypes. Measures of niche overlap and competition.
Tutorial on measuring selective pressure.

Week 8 The principle of evolution by natural selection. Larry Richmond
What Darwin said. Neo-Darwinism and the genetic basis of inheritance. The Hardy-Weinberg equilibrium as a null hypothesis for natural selection. Several (novel) examples of measured evolutionary change.
Exercise - Hardy-Weinberg Equilibrium

Week 9 No session, assessment 3 - deadline for practical write-up submissions 30th March 2012

Week 10 Costs and benefits Larry Richmond

The differentiation of the sexes in multicellular organisms.
The differentiation of the gametes and the role of the male gamete in evolutionary change. Cost-benefit analysis of sex. Reproductive strategies. Asexual reproduction and cloning. Sexual selection.
Exercise - Cost-Benefit Analysis – The cyclist's dilemma

Week 11 Life tables Anne-Maria Brennan

Life table and their uses
Exercise – Life table analysis

Week 12 Diversity Anne-Maria Brennan

Global patterns of diversity in space and time.
The geological record of diversity and the big five mass extinctions. Factors driving speciation. The current mass extinction.
Tutorial on how species become extinct

Week 13 What we know about evolution today Larry Richmond
Life history strategies in plants and animals. Phenotypic and genotypic adaptation in humans. The genetic history of modern humans.

9. LEARNING RESOURCES

Core reading:

- Beeby, A.N. & Brennan A-M. (2007) *First Ecology*, 3rd Edition. Oxford University Press, Oxford.
- Bolsover, S.R., Hyams, J.S., Jones, S., Shephard, E.A. & White, H.A. (1997) *From Genes to Cells*. Wiley-Liss.
- Campbell, N.A, Reece J,B & Mitchell L,G (2008) *Biology*, 8th Edition. Benjamin Cummings, San Francisco.[www.campbellbiology.com]
- Coyne, J.M. (2008) *Why Evolution is True*. Oxford University Press.
- Prescott, L.M., Harley, J.P. & Kline, D.A. (2007) *Microbiology*, 7th Edition. McGraw Hill.

Optional reading:

- Becker, W.M., Kleinsmith, L.J. & Hardin. (2002) *The World of the Cell*, 5th Edition. Benjamin/Cummings, San Francisco. [www.thecellplace.com]
- Freeman, S. & Herron, J.C. (2004) *Evolutionary Analysis*, 3rd Edition. Pearson.
- Jones S. (2000) *The Language of the Genes*, revised edition. Flamingo.
- Waites, M.J., Morgan, N.L., Rockey, J. & Higton, G. (2001) *Industrial Microbiology*. Blackwell.

Notes

10. ACADEMIC CALENDAR: 2011-2012

The academic year has traditionally been organised into three terms and a small number of programmes at LSBU are organised in this way. Most programmes, however, are organised by semesters. The academic year incorporates two semesters, each lasting 15 weeks.

The Week beginning	Semester week no.		Key activities
12 Sep 2011		Monday 12 Sep 11	Enrolment begins
19 Sep 2011		Monday 19 Sep 11	Autumn Term begins Enrolment continues
Semester One			
26 Sep 2011	1	Monday 26 Sep 11	Semester One begins
03 Oct 2011	2		
10 Oct 2011	3		
17 Oct 2011	4		
24 Oct 2011	5		
31 Oct 2011	6		
07 Nov 2011	7		
14 Nov 2011	8		
21 Nov 2011	9		
28 Nov 2011	10		
05 Dec 2011	11		
12 Dec 2011	12	Friday 16 Dec 11	Autumn Term ends
19 Dec 2011	Christmas vacation		
26 Dec 2011	Christmas vacation		
02 Jan 2012	Christmas vacation		
09 Jan 2012	13	Monday 09 Jan 12	Spring Term begins
16 Jan 2012	14	Monday 16 Jan 12	Semester One exams, week 1 begins
23 Jan 2012	15	Monday 23 Jan 12	Semester One exams, week 2 begins
		Friday 27 Jan 12	Semester One ends
Semester Two			
30 Jan 2012	1	Monday 30 Jan 12	Semester Two begins
06 Feb 2012	2		
13 Feb 2012	3		
20 Feb 2012	4		

The Week beginning	Semester week no.		Key activities
27 Feb 2012	5		
05 Mar 2012	6		
12 Mar 2012	7		
19 Mar 2012	8		
26 Mar 2012	9	Friday 30 Mar 12	Spring Term ends
02 Apr 2012	Easter vacation		
09 Apr 2012	Easter vacation		
16 Apr 2012	Easter vacation		
23 Apr 2012	10	Monday 23 Apr 12	Summer Term begins
30 Apr 2012	11		
07 May 2012	12	Monday 07 May 12	May Day Holiday
		Tuesday 08 May 12	Spring Graduation Ceremony - for students from the Faculty of Health and Social Care
14 May 2012	13		
21 May 2012	14	Monday 21 May 12	Semester Two exams, week 1 begins
28 May 2012	15	Monday 28 May 12	Semester Two exams, week 2 begins
04 Jun 2012		Monday 04 Jun 12	Recess Week Spring Bank Holiday
		Tuesday 05 Jun 12	Queen's Jubliee Holiday
		Friday 08 Jun 12	Semester Two ends
End of semesters			
11 Jun 2012			
18 Jun 2012			
25 Jun 2012			
02 Jul 2012		Friday 06 Jul 12	Summer Term ends Latest date for results to be issued to students
09 Jul 2012			
12 Jul 2012			
16 Jul 2012			
23 Jul 2012		Monday 23 Jul 12	Summer Graduation Ceremonies take place
		Tuesday 24 Jul 12	Summer Graduation Ceremonies take place
		Wednesday 25 Jul 12	Summer Graduation Ceremonies take place
		Thursday	Summer Graduation Ceremonies take place

The Week beginning	Semester week no.		Key activities
		26 Jul 12	
		Friday 27 Jul 12	Summer Graduation Ceremonies take place
30 July 2012			
06 Aug 2012			
13 Aug 2012		Monday 13 Aug 12	
20 Aug 2012		Monday 20 Aug 12	Re-sit exams week 1 begins Submission date for all referred/deferred coursework
27 Aug 2012		Monday 27 Aug 12	Summer Bank Holiday
		Tuesday 28 Aug 12	Re-sit exams week 2 begins
10 Sep 2012		Monday 10 Sep 12	Re-sit exams finish
		Friday 14 Sep 12	The Academic Year ends
17 Sep 2012		Monday 17 Sep 12	Results letters to be sent to students