School of Biology

General degree students wishing to enter 3000-level modules and non-graduating students wishing to enter 3000-level or 4000-level modules must consult with the relevant Honours Adviser within the School to confirm they are properly qualified to enter the module.

Biology (BL) modules

BL3000 Field Course

SCOTCAT Credits:	10	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	1-week residential course in summer vacation normally just prior to Orientation week.			
This module involves field-based exercises in a range of aquatic and/or terrestrial habitats. Students will examine and measure biodiversity, ecophysiological adaptation, and community structure, with both plant and animal material. Class exercises are used to develop good sampling techniques and to generate and analyse large data sets. Students also work in small project groups to develop individual skills in experimental design, practical manipulations, time-management and personal initiative, and in verbal/written presentation of project results.				
Programme module type:	Compulsory for Ecology and Conservation, Marine Biology, and Zoology. If BL3308 or BL3309 is taken then compulsory for all Biology degree programmes. Optional for Behavioural Biology, Biology and Geology, Biology, Biology and Economics, Biology and Mathematics or Statistics, Biology with French/Arabic, Biology and/with Psychology, Biology and Geography, Evolutionary Biology, Sustainable Development.			
Pre-requisite(s):	2016/7 - Normally BL2105 or BL2106 2017/8 - BL2300 and (BL2307 or BL2310)			
Co-requisite(s):	BL3308 or BL3309		**Anti-requisite(s):**	BL3321, BL3322
Learning and teaching methods and delivery:	**Weekly contact**: 6-day field course, 8-hours per day			
	Scheduled learning: 48 hours		**Guided independent study:** 52 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 50%, Coursework = 50%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of coursework			
Module Co-ordinator:	Prof D Paterson			
Lecturer(s)/Tutor(s):	Prof D Paterson, Dr A Blight, Dr R Aspden, Dr Shuker, Dr J Graves, Dr S Healy			

BL3301 Protein Structure and Function

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 9.00 am Mon, Tue and Wed Practicals: to be arranged.			

This module builds on the material covered in BL1201 and BL2104 to provide an understanding of more advanced aspects of protein structure and enzymology. The module begins by considering the protein-folding problem. The energetics of protein folding and the dependence of structure on sequence are examined. Protein folding diseases like spongiform encephalopathies are used as examples to highlight the significance of protein folding. The molecular basis of prion diseases is discussed in detail. The second part of the module focuses on the mechanisms of enzymes. This in turn leads into the phenomena of allosteric regulation, signalling cascades and transporter systems and is followed by a consideration of enzymes as pharmacological targets. The third part of the module introduces the major techniques for protein structure determination that are at the heart of modern biochemistry, molecular biology and drug discovery. Strategies for obtaining three-dimensional images of macromolecules by electron microscopy, X-ray crystallography and nuclear magnetic resonance are discussed. The laboratory course associated with this module introduces the fundamentals of safe laboratory practice. It provides grounding in the basic laboratory techniques, including associated calculations, as well as those associated with the study of proteins and enzymes.

Programme module type:	Compulsory for Biochemistry, Biomolecular Science, Molecular Biology. Optional for Cell Biology, Behavioural Biology, Biology, Neuroscience, and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	2016/7 - BL2101 or BL2104 2017/8 - BL2302 and (BL2306 or BL2309)	
Required for:	BL4212, BL4215, BL4223	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 3 x 6-hour practicals, split over several days, during the semester.	
	Scheduled learning: 51 hours	**Guided independent study:** 149 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 83%, Practical Examinations = 0%, Coursework = 17%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Dr U Schwarz-Linek	
Lecturer(s)/Tutor(s):	Dr U Schwarz-Linek, Dr J Nairn, Prof T Smith, Dr T Gloster and Dr R Guimaraes da Silva	

BL3302 Gene Regulation

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 10.00 noon Mon, Tue and Wed Practicals: to be arranged.			

This module builds on material covered in BL1201 Molecular Biology and BL2104 Biochemistry and Molecular Biology. It first considers the structure of genes and the composition of genomes and then examines genetic activity in eukaryotes in relation to nuclear organisation, chromatin structure and epigenetic mechanisms. Regulation of expression at the levels of gene transcription, RNA processing, RNA stability and translation are next covered in detail, drawing particular attention to the nature of protein-nucleic acid interactions. Specific control mechanisms in different prokaryotic and eukaryotic systems, induced by environmental, cell cycle, and metabolic signals are highlighted.

Programme module type:	Compulsory for Biochemistry, Cell Biology, Molecular Biology. Optional for Behavioural Biology, Biology, Evolutionary Biology, Neuroscience, Zoology and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	2016/7 - Normally BL2104 2017/8 - BL2302 and (BL2306 or BL2309)	
Required for:	BL4223, BL5421	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 3 x 16-hour practicals, split over several days, during the semester.	
	Scheduled learning: 81 hours	**Guided independent study:** 119 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 0%, Coursework = 34%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Dr S MacNeill	
Lecturer(s)/Tutor(s):	Dr P Coote, Dr H Ferreira, Dr S MacNeill, Dr J Sleeman, Prof M Ryan, Prof M White	

BL3303 Membranes and Cell Communication

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 9.00 am Mon, Tue and Wed Practicals: to be arranged.			

This module looks at the various ways in which cells communicate with each other. Cell signalling not only involves the creation and reception of signals but also the mechanisms by which signals are transported across biological membranes. We will therefore consider the central role that biological membranes play in the regulation of the movement of molecules between different extracellular, intracellular and transcellular compartments. Also protein sorting and membrane trafficking will be studied. Using various examples of cell communication, the module will discuss both the molecular and the organismal implications of cell signalling. Topics covered include:(i) Lipids; (ii) Protein targeting and sorting; (iii) Membrane trafficking and transport; (iv) Wnt, Notch and Hedgehog signalling; (v) Plant cell signalling; (vi) Hippo signalling (vii) Ubiquitylation and SUMOylation.

Programme module type:	Compulsory for Cell Biology. Optional for Biochemistry, Molecular Biology Biology and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	2016/7 - Normally BL2101 2017/8 - BL2301 and (BL2305 or BL2306 or BL2309)	
Required for:	BL4224, BL5420	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 3 x 7-hour practicals, split over several days during the semester.	
	Scheduled learning: 54 hours	**Guided independent study:** 146 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 0%, Coursework = 34%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Dr M Bischoff	
Lecturer(s)/Tutor(s):	Dr R Ramsay, Dr G Prescott, Dr M Bischoff, Prof T Smith, Prof F Gunn-Moore, Prof L Torrance, Dr J Tilsner	

BL3307 Evolution

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 11 am Mon, Tue and Wed Practicals: to be arranged.			

Topics in this module will include: molecular variation and evolution, including phylogeny reconstruction; the evolution and maintenance of sex; the genetics of continuous traits, and the relative importance of continuous and discontinuous variation in evolution; evolutionary developmental biology; evolution of population genetic structure; the genetics of speciation, covering the evolution of pre- and post-zygotic isolation, and parapatric, sympatric and island speciation. Practicals will involve computer simulations to investigate a range of evolutionary phenomena, plus use of molecular markers to examine population structure and speciation.

Programme module type:	Compulsory for, Marine Biology, Evolutionary Biology. Optional for Ecology and Conservation, Behavioural Biology, Biology, Zoology and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	2016/7 - Normally BL2105 or BL2106 2017/8 - BL2303	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 1 x 2-hour and 1 x 3-hour practical during the semester.	
	Scheduled learning: 38 hours	**Guided independent study:** 162 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 0%, Coursework = 34%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Prof T Meagher	
Lecturer(s)/Tutor(s):	Prof T Meagher, Dr D Ferrier, Dr N Bailey, Prof M Ritchie, Dr M Webster	

BL3308 Aquatic Ecology

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 10.00 am Mon, Tue and Wed Practicals: residential field trip.			
This module introduces the ecology of aquatic systems beginning with a description of the problems of life in a fluid medium. The module then considers the contrasting conditions that are inherent in freshwater, estuarine and marine systems. The influence of global climate variation and the close coupling between land and sea will be emphasised. Case studies will then be used to introduce the ecology of a variety of aquatic systems including tropical, temperate and polar systems. This module involves a residential field trip to Kindrogan field station in the Scottish Highlands.				
Programme module type:	Compulsory for Marine Biology. Optional for Behavioural Biology, Ecology and Conservation, Biology, Biology and Geology, Evolutionary Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	2016/7 - Normally BL2105 or BL2106 2017/8 - BL2307			
Co-requisite(s):	BL3000		**Required for:**	BL4301
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 1 x 3-day residential field course			
	Scheduled learning: 53 hours		**Guided independent study:** 147 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 14%, Coursework = 20%			
	As used by St Andrews: 3-hour Written Examinations = 66%, Coursework = 34%			
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%			
Module Co-ordinator:	Dr I Matthews			
Lecturer(s)/Tutor(s):	Dr I Matthews, Prof C Todd, Dr P Miller, Dr A Blight			

BL3309 Ecosystems and Conservation

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 10.00 am Mon, Tue and Wed Practicals: to be arranged.			
This module will examine how ecosystems function and how they provide services for humans: information which is essential for ecologists, conservationists and land managers. The module will consider examples of natural systems being altered by man to demonstrate how ecosystems function and the consequences of anthropogenic change. Disturbance and regulation in ecosystems, atmospheric and hydrological regulation, (including the green house effect and acidification), soil ecology, conservation and management of natural resources, agricultural and grazed ecosystems (including GMOs), urban ecosystems and aspects of sustainable development will also be discussed.				
Programme module type:	Compulsory for Ecology and Conservation, Marine Biology, and Behavioural Biology. Optional for Biology, Biology and Geology, Evolutionary Biology, Sustainable Development Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	2016/7 - Normally BL2105 or SD2001 2017/8 - BL2307 and (BL2303 or BL2304 or BL2308)			
Co-requisite(s):	BL3000		**Required for:**	BL4254, BL4266, BL4268
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 2 x 3- hour practicals during the semester.			
	Scheduled learning: 39 hours		**Guided independent study:** 161 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 0%, Coursework = 34%			
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%			
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%			
Module Co-ordinator:	Prof W Cresswell			
Lecturer(s)/Tutor(s):	Prof W Cresswell, Dr S Northridge, Dr I Matthews, Prof T Meagher, Dr A Blight, Dr V Dietrich-Bischoff			

BL3310 Bioenergetics

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 12.00 noon Mon, Tue and Wed Practicals: to be arranged.			

The conversion of one form of energy into another by a biochemical process is at the centre of all life. This module studies the biological systems for conserving energy from food oxidation and light absorption (photosynthesis) and the conversion of the resulting redox energy into chemical energy in the pyrophosphate bonds of ATP. The module also considers electron transfer processes in biology and the energetics of trasport processes. Chemiosmotic theory and the principles are considered in detail as are the structure and function of electron and proton transfer systems of energy tranducing systems. Practical classes will introduce the student to the methods used in this field of study. The module will comprise twenty lectures, eight hours tutorials/seminars in total, and twelve hours in practical classes.

Programme module type:	Compulsory for Biochemistry, Biomolecular Science. Optional for Molecular Biology Cell Biology Biology, Neuroscience and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	2016/7 - BL2104 2017/8 - BL2302 or BL2306	
Required for:	BL4222	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 2 x 6-hour practicals, split over 2 days, and 2 x 3-hour student presentation seminars, during the semester.	
	Scheduled learning: 51 hours	**Guided independent study:** 149 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 0%, Coursework = 34%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Dr J Nairn	
Lecturer(s)/Tutor(s):	Dr J Nairn, Dr R Ramsay, Prof P Heathcote, Dr R Guimaraes da Silva, Dr G Prescott, Prof F Gunn-Moore, Dr J Lucocq	

BL3311 Infection and Disease

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 10.00 am Mon, Tue and Wed Practicals: to be arranged.			
This module has lectures in three component areas: parasite infections, viral disease, and pathogenicity of common bacterial infections, and will include consideration of host defences and effective treatment. In all three component areas the emphasis will be on understanding at the molecular level.				
Programme module type:	Compulsory for Molecular Biology. Optional for Biochemistry, Cell Biology, Biology, Neuroscience, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	2016/7 - Normally BL2101 and BL2104 2017/8 - BL2301 and BL2309			
Required for:	BL4211, BL4213			
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks) and 2 x 9-hour practicals and 1 x 12-hour practical, split over several days, during the semester			
	Scheduled learning: 63 hours		**Guided independent study:** 137 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%			
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%			
Module Co-ordinator:	Dr P Coote			
Lecturer(s)/Tutor(s):	Dr P Coote, Prof T Smith, Dr D Jackson, Prof M Ryan, Dr C Adamson, Dr P Kerry, Dr R Randall			

BL3315 Developmental Biology

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 11.00 am Mon, Tue and Wed Practicals: to be arranged.			
This module deals with the fascinating and rapidly changing field of Developmental Biology. It examines how an organism develops from an egg to an adult (including instances of metamorphosis), as well as how lost or damaged body parts can be regenerated. Also the interactions between development and ecology and evolution will be considered. There will be a focus on some of the typical model species used in developmental biology, including fruit flies, nematodes, mice and frogs, but this will be expanded to include other valuable comparative models, such as sea squirts, annelids, cnidarians and flatworms. The course will encompass multiple biological levels, from molecules, through cells and embryos, to the environment and the organism's evolutionary history. As such this module is of wide relevance to a range of other biological disciplines.				
Programme module type:	Optional for Neuroscience, Cell Biology, Evolutionary Biology, Marine Biology, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	2016/7 - Normally BL2101 or BL2102 2017/8 - 2 of (BL2301, BL2302, BL2304, BL2308)			
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x11 weeks) and 2 x 15-hour practicals, split over several days, during the semester.			
	Scheduled learning: 63 hours		**Guided independent study:** 137 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 34%, Coursework = 0%			
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%			
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%			
Module Co-ordinator:	Dr D Ferrier			
Lecturer(s)/Tutor(s):	Dr D Ferrier, Dr G Miles, Dr I Somorjai, Prof C Todd			

BL3316 Animal Plant Interactions

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 12.00 noon Mon, Tue and Wed Practicals: to be arranged.			

This module concerns the coevolution of plants and animals, including the ecological, behavioural and physiological aspects of their interactions. Pollination biology and the constraints on participating plants and animals are dealt with in depth, including applied aspects of crop pollination, and this is followed by a review of seed dispersal. Then patterns of herbivory by insects, vertebrates and other animals are considered, illustrating the interactions of plant physical and chemical defences and herbivores' reciprocal adaptations from feeding specialisations and host plant selection through to detoxification systems and life history adaptations. Interactions with third parties are also explained, especially plant-fungus-insect systems. There is an introduction to other tritrophic interactions (whereby plants can recruit herbivores' enemies as part of their defences, or recruit ants as biotic plant guards), to insects as plant pests, and to integrated and sustainable approaches to control measures and plant protection.

Programme module type:	Optional for Behavioural Biology, Ecology and Conservation, Evolutionary Biology, Sustainable Development, Zoology and all Biology or Environmental Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	2016/7 - Normally BL2102 or BL2106 2017/8 - BL2304 or BL2307 or BL2310	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks), 1 x 3- hour practical and 1 x 3-hour student presentation seminar during the semester.	
	Scheduled learning: 39 hours	**Guided independent study:** 161 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 22%, Coursework = 12%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Prof P Willmer	
Lecturer(s)/Tutor(s):	Prof P Willmer, Prof G Ruxton, Dr A Karley, Dr S Healy, Dr G Ballantyne	

BL3318 Biology of Marine Organisms

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 12 noon Mon, Tue and Wed Practicals: to be arranged.			

This module will include lectures on the range of microbial and metazoan organisms and ecological systems in the marine environment. The coverage will range from bacteria, to algae, invertebrates and vertebrates (fish, birds, reptiles and mammals). The biology of marine organisms is considered in the context of both adaptations at the level of the individual and its expression in terms of large-scale latitudinal and depth-related variations in productivity and food web structure. Examples from the poles to the tropics and from shallow water to the deep ocean will be included. Practicals will be field- and laboratory-based and will provide an experimental introduction to both ecological and physiological problems in marine biology.

Programme module type:	Compulsory for Behavioural Biology, Ecology and Conservation, Marine Biology. Optional for Evolutionary Biology, Sustainable Development, Zoology and all Biology or Environmental Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	2016/7 - Normally BL2102 or BL2105 2017/8 - 3 of BL2304 or BL2307 or BL2308 or BL2310	
Required for:	BL4257, BL4259, BL4260, BL4301	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks), 2 x 3-hour practicals and 1 x 1-hour Museum quiz during the semester.	
	Scheduled learning: 40 hours	**Guided independent study:** 160 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 0%, Coursework = 34%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Dr V Smith	
Lecturer(s)/Tutor(s):	Dr V Smith, Prof C Todd, Prof A Brierley, Prof P Hammond, Dr L Rendell, Dr C Smith, Dr A Blight, Prof P Tyack, Dr L Boehme, Dr B McConnell, Dr D Thompson	

BL3319 Animal Behaviour: A Quantitative Approach

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	Lectures: 9.00 am am Mon, Tue and Wed Practicals: to be arranged.			

This module is designed to provide a broad and multifaceted perspective on animal behaviour, emphasising contemporary theoretical, mathematical and statistical approaches to the discipline. Nobel-Prize-winning ethologist, Niko Tinbergen, pointed out that to understand behaviour fully researchers had to answer four types of questions, about its causation, function, development and evolution. All four areas are covered in the course, which includes lectures on the genetic, neural, physiological and experiential (i.e. learning) influences on behaviour; behavioural development; foraging; sexual behaviour, sexual selection and mate choice; communication, cooperation and culture. The course contains extensive material of a formal theoretical nature, and emphasises quantitative skills throughout. Students will be introduced to new mathematical and statistical approaches within the field.

Programme module type:	Compulsory for Ecology and Conservation and Behavioural Biology. Optional for Evolutionary Biology, Marine Biology, Zoology, and all Biology or Environmental Biology Joint or Major/Minor Degree programmes.		
Pre-requisite(s):	2016/7 - Normally BL2102 2017/8 - BL2303 or BL2307	**Required for:**	BL4258, BL4263
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures (x 11 weeks), 3 x 1- hour mini-project group meetings during the semester.		
	Scheduled learning: 36 hours	**Guided independent study:** 164 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 7%, Coursework = 27%		
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%		
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%		
Module Co-ordinator:	Dr M Webster		
Lecturer(s)/Tutor(s):	Dr M Webster Dr W Hoppitt, Dr M Webster, Dr L Rendell, Dr C Templeton, Dr S Healy, Prof M Ritchie, Prof V Janik, Dr W Heitler		

BL3320 Statistical and Quantitative Skills for Biologists

SCOTCAT Credits:	10	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Few biologists are statisticians or mathematicians, but all biologists use statistics and mathematics. This series of workshops is designed to build confidence in organising and analyzing data to address biological questions efficiently. The module will help you learn how to identify statistical and quantitative approaches, and how to manage and analyse data in a code driven statistical programming package. An introductory workshop will cover basic concepts and practical training that will be used in a choice of specific workshops that cover applications across the range of Biology.				
Programme module type:	Compulsory for all Biology degrees. Optional for Sustainable Development.			
Pre-requisite(s):	2016/7 - 2 from BL2101 - BL2106 2017/8 - BL2300		**Required for:**	BL4273
Learning and teaching methods and delivery:	**Weekly contact**: Varied weekly contact, but to include 1 full-day of lectures in Pre-sessional week (8-hours), plus 2 x 3-hour introductory workshops and 5 x 3-hour practical workshops during the semester			
	Scheduled learning: 29 hours		**Guided independent study:** 71 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 80%, Practical Examinations = 0%, Coursework = 20%			
	As used by St Andrews: 2-hour Written Examination = 80%, Coursework = 20%			
Re-Assessment pattern:	2-hour Written Examination = 66%, Existing Coursework = 34%			
Module Co-ordinator:	Prof W Cresswell			
Lecturer(s)/Tutor(s):	Prof W Cresswell, Dr G Ruxton, Dr A Smith, Dr R Ramsay, Dr J Nairn			

BL3321 Advanced Critical Analysis Reading Party

SCOTCAT Credits:	10	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	1 week in summer vacation just prior to Orientation week			
An introductory residential module to Honours study for students studying Cell Biology, Neuroscience and Biology degrees held at the Burn between the resit diet and the start of semester 1. This module introduces students to the skill of critically analysing scientific literature and the methodology behind preparing research proposals. Students will work in groups to develop a grant proposal and present their ideas to a mock research grant panel. In response to detailed feedback students can improve their skills and finally submit an extended referees report on a real grant proposal.				
Programme module type:	Optional for Cell Biology, Evolutionary Biology, Neuroscience and all Biology Joint and Major/Minor degree programmes			
Pre-requisite(s):	2016/7 - 2 from BL2101 - BL2106 2017/8 - 4 of (BL2300 - BL2310)		**Anti-requisite(s):**	BL3000, BL3322
Co-requisite(s):	Any 3000-level BL module			
Learning and teaching methods and delivery:	**Weekly contact**: 5-day residential course, 8-hours per day			
	Scheduled learning: 40 hours		**Guided independent study:** 60 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 5%, Coursework = 95%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of coursework			
Module Co-ordinator:	Dr J Sleeman			
Lecturer(s)/Tutor(s):	Prof D Evans, Dr J Sleeman, Prof F Gunn-Moore, Dr G Miles, Dr S Pulver			

BL3322 Basic Biochemistry Laboratory

SCOTCAT Credits:	10	SCQF Level 9	**Semester:**	1
Academic year:	2016/7			
Planned timetable:	1 week in summer vacation just prior to Orientation week			
This module aims to provide students with the basic skills for independent laboratory work and an opportunity to develop academic skills such as: the design of experiments; logistic planning; the gathering and assessment of data; and the presentation of results. In addition, transferable skills such as group work, working to deadlines, numeracy, critical reading of peer-reviewed literature, and presenting material (oral and written) will be developed. Importantly, the course will also be an opportunity to meet and work with others in the honours cohort. The practical element will emphasise techniques in protein biochemistry.				
Programme module type - UG Compulsory:	Compulsory for Biochemistry, Molecular Biology single honours degrees and MBiochem intregated masters degree			
Programme module type - UG Optional:	Optional for Cell Biology, Biology and joint honours degrees			
Pre-requisite(s):	2016/7 - BL2101 and BL2104 2017/8 - BL2301 or BL2302 or BL2306			
Anti-requisite(s):	BL3000, BL3321			
Learning and teaching methods and delivery:	**Weekly contact**: 5-day laboratory course, 8-hours per day			
	Scheduled learning: 40 hours		**Guided independent study:** 60 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: 1-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	1-hour Written Examination = 66%, Existing Coursework = 34%			
Module Co-ordinator:	Dr R R Ramsay			
Lecturer(s)/Tutor(s):	Dr R R Ramsay, Dr C Adamson, Dr C Botting. Prof M White, Prof M Ryan, Prof R Randall			

BL3323 Terrestrial Zoology

SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	9.00 am Mon, Tue, Wed. Practicals: to be arranged.			

This module covers the biology of land animals, including their early evolution, their strategies to cope with unusual terrestrial habitats (extremes of hot, arid and cold, urban life, island life, etc, including climate change effects), and their special problems with reproduction and locomotion. It then looks at insights gained from modern techniques, including molecular, bioinformatics and bar-coding approaches, bio-logging and tracking, and developmental adaptations. It concludes with special topics on particular animals or groups that have improved our understanding of terrestrial peculiarities, whether behavioural, sensory, physiological, mechanical, metabolic or ecological; and of threats to terrestrial diversity for certain groups.

Programme module type:	Compulsory for Zoology Optional for BSc Hons Behavioural Biology, Biology, Evolutionary Biology, Ecology & Conservation and Neuroscience degrees, MBiol degree and all Biology joint honours degrees.	
Pre-requisite(s):	2016/7 - BL2102 or BL2106 2017/8 - BL2304 and BL2308	
Learning and teaching methods and delivery:	**Weekly contact**: 3 x 1-hour lectures per week; 6-hour practicals (x 2 weeks), and 4 hours of seminars over the semester.	
	Scheduled learning: 49 hours	**Guided independent study:** 151 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 14%, Coursework = 20%	
	As used by St Andrews: 3-hour Written Examination = 66%, Coursework = 34%	
Re-Assessment pattern:	3-hour Written Examination = 66%, Existing Coursework = 34%	
Module Co-ordinator:	Prof P G Willmer	
Lecturer(s)/Tutor(s):	Team taught	

BL3400 Tropical Research and Field Study				
SCOTCAT Credits:	20	SCQF Level 9	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	4 weeks in field locations in summer vacation.			
The module allows is for students studying with Operation Wallacea in terrestrial and marine environments for a minimum of four weeks during the summer vacation. Students will gain experience in researching a variety of habitats and investigate the species in locations such as Indonesia, Honduras, South Africa and Mozambique. Students will be introduced to tropical ecology, sustainable development and conservation, fieldwork and novel research methods under the supervision of experts in those research areas. Students will be expected to maintain a journal of their field studies, in addition to being assessed on the application of field techniques and knowledge. The module will culminate in the production of a detailed research proposal.				
Programme module type:	Optional for Behavioural Biology, Biology, Ecology and Conservation, Evolutionary Biology, Marine Biology, Zoology, and all Biology or Environmental Biology Joint or Major/Minor Degree programmes. Optional for Sustainable Development.			
Learning and teaching methods and delivery:	**Weekly contact:** Lectures, practicals and occasional seminars.			
	Scheduled learning: 160 hours		**Guided independent study:** 40 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 20%, Practical Examinations = 10%, Coursework = 70%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Dr C Peddie			

BL4200 Literature-based Research Project

SCOTCAT Credits:	30	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

This project will involve an extensive literature review to investigate a defined hypothesis or problem within the field of biology, appropriate to the degree programme being studied by each student. The project will involve diligence, initiative and independence in pursuing the literature, and the production of a high-quality dissertation that demonstrates a deep understanding of the chosen area of research. Students will be allocated to a member of staff who will guide and advise them in research activities throughout the academic year. The project will be written up in the form of a research dissertation.

Programme module type:	Either BL4200 or PS4050 compulsory for Biology and Psychology. BL4200 or BL4201 or PN4299 compulsory for Neuroscience. Optional for Biology Joint or Major/Minor Degree programmes.		
Pre-requisite(s):	Permission of Biology Honours Adviser required	**Anti-requisite(s):**	BL4201, PN4299
Learning and teaching methods and delivery:	**Weekly contact**: 1 dedicated meeting with supervisor per week, students should expect to spend the equivalent of 8 weeks full-time on this research project.		
	Scheduled learning: 22 hours	**Guided independent study:** 278 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 20%, Coursework = 80%		
	As used by St Andrews: Coursework = 100% (10% - Thesis outline and resource list 1,000 words 70% - Written thesis 15,000 words 20% - Viva (20 minutes))		
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework		
Module Co-ordinator:	Prof O Gaggiotti		
Lecturer(s)/Tutor(s):	Individual Supervisors across the School of Biology		

BL4201 Experimental Research Project

SCOTCAT Credits:	60	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This project will involve extensive laboratory or field research to investigate a defined problem within biology, appropriate to the degree programme being studied by each student. The project will involve diligence, initiative and independence in pursuing the literature, good experimental design, good experimental and/or analytical technique either in the field or the laboratory, and excellent record keeping. The project will culminate in the production of a high-quality report that demonstrates a deep understanding of the chosen area of research. Students will be allocated to a member of staff within the School of Biology who will guide and advise them in research activities throughout the academic year.				
Programme module type:	Optional for all Biology Joint or Major/Minor Degree programmes. May be taken for Biomolecular Science (conditions apply			
Pre-requisite(s):	Permission of Biology Honours Adviser required		**Anti-requisite(s):**	BL4200, PN4299
Learning and teaching methods and delivery:	**Weekly contact**: 1 dedicated meeting with supervisor per week. Students should expect to spend the equivalent of 1 semester full-time conducting supervised research and completing the associated assessments. This time is either condensed into 1 semester or spread out over the whole year.			
	Scheduled learning: 33 hours		**Guided independent study:** 567 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 20%, Coursework = 80%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Prof O Gaggiotti			
Lecturer(s)/Tutor(s):	Individual Supervisors across the School of Biology			

BL4210 Practical Skills for Molecular Biology and Biochemistry

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

Practical skills are the core of research in biochemistry and molecular biology. This module is designed to prepare students for laboratory research projects in internationally competitive research. The module is designed to foster skills such as experimental design, core practical skills, data analysis and excellent record keeping. Each practical requires some prior theoretical familiarity. Emphasis is placed upon experimental design - notably anticipation of experimental outcomes and the choice of appropriate experimental controls. This planning phase is followed by execution of the experiment and analyses of the data.

Programme module type:	Compulsory for Biochemistry, Biomolecular Science, Molecular Biology Optional for Cell Biology and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	Permission of Biology Honours Adviser required	
Learning and teaching methods and delivery:	**Weekly contact**: Occasional seminars and 3 blocks of practicals conducted over several days.	
	Scheduled learning: 35 hours	**Guided independent study:** 115 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 30%, Practical Examinations = 0%, Coursework = 70%	
	As used by St Andrews: 1-hour Written Examination = 30%, Coursework = 70%	
Re-Assessment pattern:	hour Written Examination = 30%, Existing Coursework = 70%	
Module Co-ordinator:	Dr M Nevels	
Lecturer(s)/Tutor(s):	Dr M Nevels, Prof M White	

BL4211 Antimicrobials - Modes of Action and Resistance

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will commence by establishing the fundamental basis of antimicrobial efficacy in terms of selective toxicity, with a brief history of antimicrobials and factors that make the ideal antimicrobial. This will be followed by study of the known inhibitory action of antibacterial and antifungal drugs at the molecular level, and study of the molecular basis of microbial resistance to these drugs. Lastly, potential new sources of antimicrobials will be considered, particularly antimicrobial peptides and 'natural' antimicrobials.				
Programme module type:	Optional for Biochemistry, Cell Biology, Molecular Biology, Biology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	BL3311			
Learning and teaching methods and delivery:	**Weekly contact**: 2 x 1-hour seminars (x 11 weeks).			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 20%, Coursework = 30%			
	As used by St Andrews: 1-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	1-hour Written Examination = 50%, Existing Coursework = 50%			
Module Co-ordinator:	Dr M Nevels			
Lecturer(s)/Tutor(s):	Dr M Nevels, Prof M White			

BL4212 How Enzymes Work

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
All cells depend on enzymes to catalyse the reactions that produce the energy required for life and that make and repair DNA, proteins and lipids. Understanding enzymes and their regulation underpins research on, for example, drug development. This module will study how the structures and molecular functions of selected examples enable the biological roles. Topics will include flavoproteins, DNA repair enzymes, nitric oxides synthases and other enzymes depending on the research interests of the academic staff. It will develop deductive skills, literature research, and communication of specific knowledge from reviews and primary research articles, and will encourage integration of previous basic knowledge of bioenergetics, protein structure and function, gene expression and metabolic regulation into the exploration of the cellular roles of enzymes.				
Programme module type:	Optional for Biochemistry, Cell Biology, Molecular Biology, Biology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	BL3301			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminars (x 10 weeks).			
	Scheduled learning: 20 hours		**Guided independent study:** 130 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 66%, Practical Examinations = 0%, Coursework = 34%			
	As used by St Andrews: 2-hour Written Examination = 66%, Coursework = 34%			
Re-Assessment pattern:	2-hour Written Examination = 66%, Existing Coursework = 34%			
Module Co-ordinator:	Dr R R Ramsay			
Lecturer(s)/Tutor(s):	Dr R R Ramsay, Prof M White			

BL4213 Molecular Virology

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

Viruses as a group include many important human and veterinary pathogens such as influenza virus, hepatitis C virus, foot and mouth disease virus as well as emerging viruses like Ebola virus, and remain a continuing threat to human and animal welfare. This module will consist of a mixture of lectures, tutorials and personal-based learning on aspects of RNA virus host interactions. The topics covered will include comparison of the molecular mechanisms employed by enveloped and non-enveloped viruses to enter and exit from cells, discussion of how small RNA viruses maximise their coding capacity, comparison of the replication of positive and negative strand RNA viruses, discussion of how selected viruses reprogram the host cell to ensure their own replication, description of how RNA viruses intercede with innate immune responses, and understanding of how selected viruses interact with their vectors. In addition, discussion of virus-related topics that have made headline news in recent years will be addressed, and an understanding of the more commonly used molecular techniques to study viruses will be expected.

Programme module type:	Optional for Biochemistry, Biomolecular Science, Cell Biology, Molecular Biology, Biology and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	BL3311	
Learning and teaching methods and delivery:	**Weekly contact**: 2 x 1-hour seminars (x 6 weeks), student debate	
	Scheduled learning: 15 hours	**Guided independent study:** 135 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%	
	As used by St Andrews: 3-hour Written Examination = 60%, Coursework = 40%	
Re-Assessment pattern:	3-hour Written Examination = 60%, Existing Coursework = 40%	
Module Co-ordinator:	Prof R Randall	
Lecturer(s)/Tutor(s):	Prof R Randall, Dr D Jackson, Dr C Adamson, Dr J Tilsner	

BL4215 Bacterial Virulence Factors

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
In order to establish an infection in a host, pathogenic bacteria rely on mechanisms to adhere to host tissue, gain entry into cells, escape the host's immune response and spread and survive within or on the host. These processes are mediated by bacterial virulence factors, i.e. proteins and other bacterial products that utilise and subvert diverse host cellular processes for the benefit of the pathogen. In this module students will explore how structural biology has led to significant breakthroughs in understanding the molecular bases of some important bacterial infections.				
Programme module type:	Optional for Biochemistry, Biomolecular Science, Cell Biology, Molecular Biology Biology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	BL3301			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour lecture (x 4 weeks), 3 x 3-hour student talks			
	Scheduled learning: 17 hours		**Guided independent study:** 133 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 30%, Coursework = 30%			
	As used by St Andrews: 1.5-hour Written Examination = 40%, Coursework = 60%			
Re-Assessment pattern:	1.5-hour Written Examination = 40%, Existing Coursework = 60%			
Module Co-ordinator:	Dr U Schwarz-Linek			
Lecturer(s)/Tutor(s):	Dr U Schwarz-Linek			

BL4216 Structure-based Drug Discovery

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
The process of developing a new drug from conception to the clinic takes on average 15 years and costs over $800M. There are now many examples of drugs developed based on a knowledge of the three dimensional structure of the target, and all major pharmaceutical companies have structural biology as part of their core drug discovery programmes. Many drugs currently used to combat AIDS were developed from a detailed knowledge of key HIV proteins, as were the two drugs used for influenza. Most major pharmaceutical companies are targeting kinases in the search for new cancer therapies, with international efforts focusing on producing structural details of huge numbers of human kinases.This module will examine case studies of drugs that have been developed with the aid of structure-based methods.				
Programme module type:	Optional for Biochemistry, Biomolecular Science, Cell Biology, Molecular Biology Biology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 4 weeks) and 1 x 2-hour student presentations in teams representing imaginary drug companies (x 3 weeks).			
	Scheduled learning: 14 hours		**Guided independent study:** 136 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 40%, Coursework = 20%			
	As used by St Andrews: 1.5-hour Written Examination = 40%, Coursework = 60%			
Re-Assessment pattern:	1.5-hour Written Examination = 40%, Existing Coursework = 60%			
Module Co-ordinator:	Dr J Nairn			
Lecturer(s)/Tutor(s):	Dr T Gloster, Prof G Taylor, Dr J Nairn			

BL4222 Metabolic and Clinical Biochemistry

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

This module extends the students' knowledge of human metabolism and applies it to pathologies. The syllabus includes: a study of the integration of whole body metabolic processes, discussion of the role of biochemistry in investigating and monitoring human disease, the methods of diagnosing and treating some common diseases. Topics will cover integration of whole body metabolism, starvation processes, diabetes, metabolic variability, inborn errors of metabolism, endocrinology, homeostasis, plasma protein metabolism, muscle and hepatic metabolism, drug disposition and metabolism, and defects in glucose and lipid metabolism.

Programme module type:	Optional for Biochemistry, Biomolecular Science, and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	Permission of Biology Honours Adviser required	
Learning and teaching methods and delivery:	**Weekly contact**: 2 x 1-hour seminars (x 10 weeks), 1 x 3-hour students presentations for 1 week	
	Scheduled learning: 23 hours	**Guided independent study:** 127 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 30%, Coursework = 30%	
	As used by St Andrews: 3-hour Written Examination = 40%, Coursework = 60%	
Re-Assessment pattern:	3-hour Written Examination = 40%, Existing Coursework = 60%	
Module Co-ordinator:	Dr G Prescott	
Lecturer(s)/Tutor(s):	Dr G Prescott, Dr R Ramsay and invited NHS staff	

BL4223 Eukaryotic Chromosome Replication and Genome Stability

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

Highly-efficiently chromosomal DNA replication is essential for all forms of cellular life and requires the complex interplay of a large range of protein factors in a temporally- and spatially-coordinated manner. In humans, defects in the replication process may lead to genetic disease or cancer. This module will summarise current knowledge of the enzymes and mechanisms of chromosomal DNA replication in eukaryotic cells with particular emphasis on exploring the diverse range of experimental systems and techniques used in the laboratory to probe the structure, function and regulation of the replication apparatus.

Programme module type:	Optional for Biochemistry, Biomolecular Science, Cell Biology, Molecular Biology, and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	Normally BL3301 and BL3302	
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks)	
	Scheduled learning: 22 hours	**Guided independent study:** 128 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 20%, Coursework = 20%	
	As used by St Andrews: 3-hour Written Examination = 60%, Coursework = 40%	
Re-Assessment pattern:	3-hour Written Examination = 60%, Existing Coursework = 40%	
Module Co-ordinator:	Dr S A MacNeill	
Lecturer(s)/Tutor(s):	Dr S A MacNeill	

BL4224 Molecular Mechanisms of Membrane Trafficking

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Membrane trafficking mediates the transport of substances between different cellular organelles and the secretion of substances from cells. As such, regulation of membrane trafficking is applicable to all cell types, but especially to specialised secretory cells such as neurons, which secrete neurotransmitters and pancreatic beta-cells which secrete insulin. This module will consider how molecules control the movement of substances through the secretory pathway, but will focus on how cells regulate the release of contents. Within the module you will look at the proteins involved, the different experiments used to study the process and how model organisms are enhancing our understanding.				
Programme module type:	Optional for Biochemistry, Cell Biology, Molecular Biology, Neuroscience and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	BL3303			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks)			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 25%, Practical Examinations = 20%, Coursework = 55%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	2-hour Written Examination = 50%, Existing Coursework = 50%			
Module Co-ordinator:	Dr G Prescott			
Lecturer(s)/Tutor(s):	Dr G Prescott, Dr J Tilsner			

BL4232 Neuroethology

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Neuroethology is the study of the neural control of natural animal behaviour from a comparative biological perspective. In this module we focus mainly on behaviours arising from the interactions between predators and their prey. Predators and prey are locked in an evolutionary arms race which continuously refines and improves the abilities of predators to locate and capture prey, and of prey to detect and evade predators. This strong selective pressure has produced some spectacular adaptations in both the nervous systems and the overall anatomy of the animals concerned. This, combined with the usually unambiguous motivation of the animals involved in predator-prey interactions (eat or starve, escape or be eaten) has made such adaptations favoured targets for study by neuroscientists, behavioural scientists, and biomechanicists.				
Programme module type:	Optional for Behavioural Biology, Cell Biology, Neuroscience, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	BL2101 (or equivalent)			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks)			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	2-hour Written Examination = 50%, Existing Coursework = 50%			
Module Co-ordinator:	Dr W J Heitler			
Lecturer(s)/Tutor(s):	Dr W Heitler, Prof K Sillar			

BL4248 Human Physiology of Diving

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8			
Planned timetable:	To be arranged.			

This module will provide an understanding of diving physics and how pressure changes affect the physiology of the human diver. It will use both tutorials and self-study sessions to cover theoretical topics such as oxygen toxicity, nitrogen narcosis and the symptoms and treatment of decompression illness. Thermal considerations of diving, long-term effects and the physiology of technical mixed gas and rebreather diving will also be investigated.

Students will also explore applied topics such as the management of diving casualties and the treatment of diving- associated illnesses. The final emphasis will be on how our understanding of diving physiology directs current practice in the UK on safe diving practices. There are additional costs attached to this module which the student will be expected to meet.

Programme module type:	Optional for Marine Biology, Zoology and all Biology Joint or Major/Minor Degree programmes	
Pre-requisite(s):	Permission of Biology Honours Adviser required	
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks).	
	Scheduled learning: 22 hours	**Guided independent study:** 128 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 20%, Coursework = 40%	
	As used by St Andrews: 2-hour Written Examination = 40%, Coursework = 60%	
Re-Assessment pattern:	2-hour Written Examination = 40%, Existing Coursework = 60%	
Module Co-ordinator:	Dr C Peddie	
Lecturer(s)/Tutor(s):	Dr C Peddie, Dr G Prescott	

BL4249 Scientific Diving

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Availability restrictions:	subject to availability			
Planned timetable:	Full Time 2-3 weeks in March/April			

This module will provide both theoretical and practical experience of the techniques used by scientific divers. The module is restricted to students who have an existing diving qualification (PADI Advanced Open Water Diver or BSAC Sports Diver or equivalent). Seminars during the field trip will cover diving safety, dive project planning, management, risk assessment and the theory behind underwater surveying techniques. Abroad, students will receive training in underwater marine identification, construction and deployment of underwater surveys and sampling techniques, gaining practical experience of recording, analysing and interpreting survey data. Then they conduct a mini-research project using suitable survey techniques and present their findings through a report and a presentation. There are additional costs attached to this module which the student will be expected to meet.

Programme module type:	Optional for Ecology and Conservation, Marine Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	BL4251, PADI Advanced Open Water Diver or BSAC Sports Diver (or equivalent)	
Learning and teaching methods and delivery:	**Weekly contact**: 8 hours per day for 2 weeks.	
	Scheduled learning: 96 hours	**Guided independent study:** 54 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 45%, Coursework = 55%	
	As used by St Andrews: Coursework = 100%	
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework	
Module Co-ordinator:	Dr C Peddie	
Lecturer(s)/Tutor(s):	Dr C Peddie, Dr S Whiten	

BL4251 Tropical Marine Biology

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

The goal of this module is to examine the ecological and biological principles underpinning the major tropical marine ecosystems. The module provides an understanding of the ecological processes that control tropical marine ecosystems, and considers the organisms that are characteristic of each. All the major tropical marine habitats will be considered, but with a focus on coral reef, seagrass and mangrove ecosystems. The module also tackles topical research areas on the subject through student-led seminars, which will vary depending on the latest scientific research and the specific interests of participants.

On completion of the module, students will have an understanding of coral reef, mangrove and seagrass ecology. They will understand the biology and physiology of corals and be able to identify the major phyla associated with tropical marine ecosystems. The module will also provide an understanding of the threats to tropical marine habitats, current research trends on tropical marine systems, and the scientific approaches and techniques used tackle scientific questions relating to tropical marine biology.

Programme module type:	Optional for Ecology and Conservation, Evolutionary Biology, Marine Biology, Zoology and all Biology or Environmental Biology Joint or Major/Minor Degree programmes. Optional for Sustainable Development.	
Required for:	BL4249 - unless other pre-requisite(s) for that module held.	
Learning and teaching methods and delivery:	**Weekly contact**: Lectures and seminars.	
	Scheduled learning: 21 hours	**Guided independent study:** 129 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 50%, Coursework = 50%	
	As used by St Andrews: Coursework = 100%	
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework	
Module Co-ordinator:	Dr C Peddie	

BL4254 Fisheries Research

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

This module will provide an introduction to the utilisation of fish stocks in a sustainable way. It will focus on how the status of these stocks can be assessed, the problems associated with determining catch limits, and how advice from fisheries scientists is communicated to managers. There will be a mixture of dedicated lectures (including talks from outside experts), student-led seminars, tutorials and practical computer sessions.

Programme module type:	Optional for Ecology and Conservation, Marine Biology, Sustainable Development and all Biology Joint or Major/Minor Degree programmes	
Pre-requisite(s):	BL3309	
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks)	
	Scheduled learning: 22 hours	**Guided independent study:** 128 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 30%, Practical Examinations = 45%, Coursework = 25%	
	As used by St Andrews: 1.5-hour Written Examination = 30%, Coursework = 70%	
Re-Assessment pattern:	1.5-hour Written Examination = 30%, Existing Coursework = 70%	
Module Co-ordinator:	Dr C Paxton	
Lecturer(s)/Tutor(s):	Dr C Paxton	

BL4255 Marine and Environmental Biotechnology

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will examine the diversity of useful natural products from the sea, consider the ways in which genomic and other approaches are being used to bioprospect for new substances (especially from micro-organisms), learn how genomic approaches are overcoming the problem of unculturability of many marine prokaryotes to find such compounds, and explore some of the more unusual applications of materials derived from marine invertebrates. It will also consider how marine biotechnology is contributing to improved disease control in aquaculture, how it can help the 'greening' of more conventional 'dirty' industries and may enable us to meet our future energy needs via renewable biofuels. The societal, ethical and environmental issues associated with the development of environmental biotechnology are also considered.				
Programme module type:	Optional for Biochemistry, Ecology and Conservation, Marine Biology, Molecular Biology, Sustainable Development and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks)			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 30%, Coursework = 30%			
	As used by St Andrews: Written Examination = 40% (open book essay), Practical Examinations = 30%, Coursework = 30%			
Re-Assessment pattern:	Written Examination = 40%, Existing Coursework = 60%			
Module Co-ordinator:	Dr V J Smith			
Lecturer(s)/Tutor(s):	Dr V J Smith			

BL4256 Marine Bioacoustics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will provide seminar- and practical-based instruction on sound propagation in the ocean, use of sound by marine mammals for communication, orientation, and foraging (as monitored by humans using techniques to record sound). It will also examine sound-based conflicts between humans and marine organisms.				
Programme module type:	Optional for Behavioural Biology, Marine Biology, Zoology and all Biology Joint or Major/Minor Degree programmes			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 7 x 2-hour seminars, 8 x 1-hour seminars and 2 x 3-hour practical over a 4 week period			
	Scheduled learning: 28 hours		**Guided independent study:** 122 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 75%, Practical Examinations = 25%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	2-hour Written Examination = 50%, Existing Coursework = 50%			
Module Co-ordinator:	Prof P Tyack			
Lecturer(s)/Tutor(s):	Prof P Tyack, Prof V Janik			

BL4258 Foraging in Marine Mammals

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will provide primarily seminar and practical-based analysis of the life-history requirements of foraging in marine mammals, geographical and physiological constraints on finding food, food and feeding with a focus on types of prey and adaptations by the prey, adaptations for marine mammals feeding in the marine environment, optimal foraging theory, and optimal diving theory. Initial lectures will focus on theoretical issues and description of methods to study foraging. Students will then conduct case-studies of marine-mammal foraging, which will be presented in a seminar format as a group. Some practical work will also be included.				
Programme module type:	Optional for Behavioural Biology, Ecology and Conservation, Marine Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	BL3319			
Learning and teaching methods and delivery:	**Weekly contact**: Introductory lecture plus 3 x 1-hour lectures (x 3 weeks), 2 x 2-hour student-led seminars (x 4 weeks)			
	Scheduled learning: 26 hours		**Guided independent study:** 124 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 20%, Coursework = 40%			
	As used by St Andrews: 2-hour Written Examination = 40%, Coursework = 60%			
Re-Assessment pattern:	2-hour Written Examination = 40%, Existing Coursework = 60%			
Module Co-ordinator:	Dr P Miller			
Lecturer(s)/Tutor(s):	Dr P Miller, Dr S Smout, Dr D Thompson			

BL4259 Marine Mammals and Man

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Marine mammals interact with human activities in a variety of ways and are frequently the focus of more general concerns about the health and exploitation of marine ecosystems. This module explores the impact of these activities on individuals and populations of seals and cetaceans, and vice versa. Most marine mammals species are long-lived and slow reproducing and the impacts of unmanaged human activities can be severe; a number of species or populations are threatened as a result. The module explores how best to provide robust scientific advice to inform conservation and management at local, national and international level.				
Programme module type:	Optional for Ecology and Conservation, Marine Biology, Zoology and all Biology Joint or Major/Minor Degree programmes			
Pre-requisite(s):	BL3318			
Learning and teaching methods and delivery:	**Weekly contact**: 12 x 2-hour seminars over two weeks followed by 4 x 3-hour presentation assessment sessions at the end of the semester.			
	Scheduled learning: 36 hours		**Guided independent study:** 114 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 50%, Coursework = 50%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Prof P S Hammond			
Lecturer(s)/Tutor(s):	Prof P S Hammond, Dr S Northridge, Dr A Hall, Dr Gordon			

BL4260 Biological Oceanography

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will provide primarily seminar-based instruction on the fundamentals of Biological Oceanography (BO). A few introductory lectures will focus on basic principles in BO and oceanography, including physical and geochemical principles as they apply to biological oceanography. Students will present seminars on particular focus areas within each lecture topic, based upon reading primary literature. BO is a broad field, so the module will provide an overview of the field with depth in a few chosen areas. At least one practical will be offered on the use of remote-sensing data for ocean observation, and we hope to develop a practical of zooplankton sampling. This module should coordinate especially well with marine acoustics and scientific diving.				
Programme module type:	Optional for Ecology and Conservation, Marine Biology, Zoology and all Biology Joint or Major/Minor Degree programmes			
Pre-requisite(s):	BL3318			
Learning and teaching methods and delivery:	**Weekly contact**: 10 x 2-hour seminars (x 6 weeks)			
	Scheduled learning: 20 hours		**Guided independent study:** 130 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 30%, Practical Examinations = 30%, Coursework = 40%			
	As used by St Andrews: 2-hour Written Examination = 40%, Coursework = 60%			
Re-Assessment pattern:	2-hour Written Examination = 40%, Existing Coursework = 60%			
Module Co-ordinator:	Dr P Miller			
Lecturer(s)/Tutor(s):	Dr P Miller			

BL4262 Physical Oceanography

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module aims to give a broad overview of the concepts and fundamental achievements of physical oceanography. Physical oceanography is the study of physical conditions and physical processes within the ocean, especially the motions and physical properties of ocean waters. A series of lectures will be provided to assure that students have the broad background required to tackle primary literature in this field. Students will present seminars on particular focus areas within each lecture topic, based upon reading primary literature.				
Programme module type:	Optional for Ecology and Conservation, Marine Biology, Sustainable Development and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 2 x 2-hour seminar or lecture (x 5 weeks)			
	Scheduled learning: 20 hours		**Guided independent study:** 130 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 40%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 60%, Coursework = 40%			
Re-Assessment pattern:	2-hour Written Examination = 60%, Existing Coursework = 40%			
Module Co-ordinator:	Dr L Boehme			
Lecturer(s)/Tutor(s):	Dr L Boehme			

BL4263 The Question of Culture in Cetaceans

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

The existence and extent of social learning and cultural transmission in non-humans is a very active area of current research, as well as of controversy, with an active ongoing debate. The aim of this module is to provide an introduction to this area through considering the conceptual issues and direct and indirect evidence for cultural transmission in cetaceans, the whales and dolphins. We will consider what is meant by the term 'culture', how it can be studied in non-humans, and the evidence for and against such processes being present in cetacean societies.

Programme module type:	Optional for Behavioural Biology, Marine Biology, Zoology and all Biology Joint or Major/Minor Degree programmes	
Pre-requisite(s):	BL3319	
Learning and teaching methods and delivery:	**Weekly contact**: 10 x 2-hour seminars over 6 weeks	
	Scheduled learning: 20 hours	**Guided independent study:** 130 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 10%, Coursework = 50%	
	As used by St Andrews: 1.5-hour Written Examination = 40%, Coursework = 60%	
Re-Assessment pattern:	1.5-hour Written Examination = 40%, Existing Coursework = 60%	
Module Co-ordinator:	Dr L Rendell	
Lecturer(s)/Tutor(s):	Dr L Rendell	

BL4266 Conservation Research Methods

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

The conservation of animal and plant populations relies initially on information of population sizes and trends. This information can only be collected by fieldwork. This module teaches the basic field techniques that underpin the monitoring of populations. Each week the theory behind a different technique is introduced, then the technique is practiced in the field, and finally data collected by the technique are analysed and discussed in a workshop at the end of the week, so that a full understanding of a technique and its proper application is gained. The module ends with students carrying out a project applying and integrating the techniques they have learnt.

Programme module type:	Optional for Ecology and Conservation, Marine Biology, Sustainable Development, Zoology, and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	BL3309	
Learning and teaching methods and delivery:	**Weekly contact**: Variable combination of lectures, field practicals, data collection in the field and analysis workshops per week for 11 weeks	
	Scheduled learning: 40 hours	**Guided independent study:** 110 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 25%, Coursework = 75%	
	As used by St Andrews: Coursework = 100%	
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework	
Module Co-ordinator:	Prof W Cresswell	
Lecturer(s)/Tutor(s):	Prof W Cresswell	

BL4268 Scientific Communication in Biodiversity and Conservation

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will focus on the scientific problems associated with the conservation and sustainable use of animals and plants, and on the way in which scientific advice on these issues is provided. Initial lectures will cover sustainable development and the precautionary principle; the causes of extinction; the economics of conservation; management of exploitation; and estimating species richness. After this student-led seminars will cover a range of more specialist issues of current concern. Practical work on population viability analysis, classifying populations using the IUCN criteria, and species richness estimation may be included.				
Programme module type:	Optional for Ecology and Conservation, Marine Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	BL3309			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks) plus 6 additional 2-hour lectures during the sememster			
	Scheduled learning: 34 hours		**Guided independent study:** 116 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 40%, Coursework = 60%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Dr M Dornelas			
Lecturer(s)/Tutor(s):	Dr M Dornelas			

BL4270 Plant-environment Interactions

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will provide an analysis of the ways in which plants interact with their physical, chemical and biological environments. This is a wide-ranging course which will bring together current knowledge of the physiological and molecular responses of plants within the wider context of how whole organisms and communities respond to the environment. Topics include: parasitism, plant pathogens and diseases, symbioses, plant stress responses, and human influences such as pollution, bioremediation and genetic modification.				
Programme module type:	Optional for Cell Biology, Ecology and Conservation, Sustainable Development and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks), plus 1 x additional seminar			
	Scheduled learning: 24 hours		**Guided independent study:** 126 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 34%, Coursework = 66%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Dr J Jones			
Lecturer(s)/Tutor(s):	Dr J Jones			

BL4273 Bioinformatics for Biologists

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8			
Planned timetable:	To be arranged.			

This module is about using computers to search and study protein and DNA sequences, and related data such as mRNA expression levels. Vast quantities of such data are publicly available, and, if viewed in the right way, can provide strong evidence concerning function, structure, and evolution of DNA, RNA, proteins and genes. Because of this, computational analysis has become a crucial component of modern biology, including biochemistry, molecular biology, ecology, evolutionary biology and biomedical research. With hundreds of genome sequences and vast quantities of expression data available, the approach has greater potential than ever before. This module will give an overview of the data, software and methods of analysis, and in-depth practical training in applying bioinformatics techniques to questions of biology and biomedical research. Case studies where researchers use genomes to ask questions about divergence, adaptation and speciation will be discussed. The emphasis of the module is not mathematical, but rather concerns data, the general features of methods, use of software, applications relevant to biology, and results. The module will involve use of computers and simple computer programming, for which training will be provided as part of the module.

Programme module type:	Optional for Biochemistry, Cell Biology, Evolutionary Biology, Marine Biology, Molecular Biology, Zoology and all Biology Joint or Major/Minor Degree programmes	
Pre-requisite(s):	Normally BL3320	
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour computer-based practical (x 8 weeks) plus 6 x 1-hour lectures plus 1 x 1-hour seminar	
	Scheduled learning: 23 hours	**Guided independent study:** 127 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%	
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%	
Re-Assessment pattern:	2-hour Written Examination = 50%, Existing Coursework = 50%	
Module Co-ordinator:	TBC	

BL4274 Evolutionary Developmental Biology

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Evolution of new morphologies involves changes to the development of organisms. The field of evolutionary developmental biology is thus becoming established as a major and essential component of any comprehensive understanding of evolutionary biology. This module aims to cover some of the main, current themes in evolutionary developmental biology. Since animal life evolved in the sea, much of what we can learn about the major events in animal evolution can be obtained from studying marine invertebrates. Consequently the examples covered in this module will tend to be drawn from these organisms.				
Programme module type:	Optional for Cell Biology, Evolutionary Biology, Marine Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks).			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 50%, Coursework = 50%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Dr D Ferrier			
Lecturer(s)/Tutor(s):	Dr D Ferrier, Dr I Somorjai			

BL4275 Evolution in Action

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will focus on recent developments relating to evolutionary biology, placing particular emphasis on research related to medical or societal application or public policy. Examples of topics to be covered include: emergent diseases, biodiversity policy, conservation management, biological impacts of climate change, and public understanding of science.				
Programme module type:	Optional for Cell Biology, Evolutionary Biology,Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks) plus an additional 2 x 2-hour seminars.			
	Scheduled learning: 26 hours		**Guided independent study:** 124 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 20%, Coursework = 80%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Prof T R Meagher			
Lecturer(s)/Tutor(s):	Prof T R Meagher			

BL4278 Biology of Dinosaurs and Other Extinct Vertebrates

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
It seems natural to use our understanding of extant biology to make inferences about the past. This allows us to test ideas about evolution and biodiversity in a wider context. Additionally, "rewilding" is an active but controversial strand of conservation biology that suggests that where "keystone" species have gone extinct, we should introduce an analogous species. Vertebrates fossilise well, and so offer a good foundation of source material. They are generally large and complex organisms, and we particularly focus on the large representatives of each taxonomic group; this allows us to explore the physical constraints on the functioning of organisms.				
Programme module type:	Optional for Evolutionary Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks).			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 35%, Coursework = 15%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	2-hour Written Examination = 50%, Existing Coursework = 50%			
Module Co-ordinator:	Prof G Ruxton			
Lecturer(s)/Tutor(s):	Prof G Ruxton			

BL4280 Evolution and Human Behaviour

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Evolutionary biologists, anthropologists and psychologists have taken evolutionary principles and used them to explain a range of human characteristics, such as homicide, religion and sex differences in behaviour. Other researchers are sceptical of these interpretations, and critical of the methods. Moreover, researchers disagree as to the best ways to use evolution to explore humanity, and a number of schools of thought have emerged. This module will introduce and critically evaluate the main evolutionary approaches currently being used, including socio-biology, evolutionary psychology, behavioural ecology and gene-culture co-evolution.				
Programme module type:	Optional for Behavioural Biology , Evolutionary Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks).			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 20%, Coursework = 40%			
	As used by St Andrews: 1.5-hour Written Examination = 40%, Coursework = 60%			
Re-Assessment pattern:	hour Written Examination = 40%, Existing Coursework = 60%			
Module Co-ordinator:	Dr M Webster			
Lecturer(s)/Tutor(s):	Dr M Webster. Dr K Cross, Dr L Dean, Dr C Evans, Dr A Navarrete			

BL4281 Animal Communication and Cognition

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Learning to produce sounds is a particularly interesting subject as far as humans are concerned because it is such a notable feature of our own species. Why do we show it, and how did it evolve? As there is little evidence of it in any other primates we need to look further afield for clues. It is found in several other mammalian orders and in three orders of birds, and the evidence for it and nature of it will be examined in these examples. We will discuss why selection may have favoured it in each case. We will also consider vocal learning in a broader sense, including its use in animals that do not themselves produce sounds.				
Programme module type:	Optional for Behavioural Biology, Marine Biology, Sustainable Development, Zoology and all Biology or Environmental Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks).			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 30%, Coursework = 20%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	2-hour Written Examination = 50%, Existing Coursework = 50%			
Module Co-ordinator:	Prof V Janik			
Lecturer(s)/Tutor(s):	Prof V Janik, Dr T Gotz			

BL4282 Biology and Behaviour of Social Insects

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will examine and compare the biology of the four main groups of social insects: termites, ants, wasps and bees. Sociality in other groups (aphids, beetles) will also be considered briefly. Topics will include the evolution of sociality, social organisation and social control systems, reproductive strategies, and diverse communication modes including pheromonal systems, acoustic systems, and 'bee dances'. Aspects of foraging behaviour and learning abilities will also be considered, particularly for ants (leaf cutter ants, army ants, slave-making ants) and for bees both eusocial and semi-social. There will be strong evolutionary, ecological and behavioural themes, and relevance also to conservation issues.				
Programme module type:	Optional for Behavioural Biology, Ecology and Conservation, Evolutionary Biology, Sustainable Development, Zoology and all Biology Biology Joint or Major/Minor Degree programmes.			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 3-hour seminar (x 11 weeks).			
	Scheduled learning: 33 hours		**Guided independent study:** 117 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Prof P Willmer			
Lecturer(s)/Tutor(s):	Prof P Willmer, Dr A Gardner, Dr G Ballantyne			

BL4284 Breeding Systems and Sexual Conflict

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Studies of mating systems in animals are primarily concerned with how animal societies are structured in relation to sexual behaviour. In plants, where many organisms do not have separate males and females, the term refers to the degree to which individuals are self-compatible or the amount of out-crossing that occurs. The effects of breeding system on sexual selection and sexual conflict, together with the costs of inbreeding and the evolution of mating systems, are central concerns of this module.				
Programme module type:	Optional for Behavioural Biology, Evolutionary Biology, Sustainable Development, Zoology and all Biology or Environmental Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks)			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 50%, Coursework = 50%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Dr C Smith			
Lecturer(s)/Tutor(s):	Dr C Smith, Dr J Graves, Prof T R Meagher, Prof M Ritchie			

BL4285 Complex Systems in Animal Behaviour

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
Behaving animals form complex systems, and can create complicated and beautiful phenomena, such as flocks of birds, termite nests, and patterns of army ant swarms. This course will look at research that examines animal behaviour from a complex systems perspective, where analyses range from captive housing of entire bird flocks, computer simulation, and use of robots to interact with the animals. Introductory lectures will be followed by seminar-style discussion of the primary literature, computer practicals, and hands-on practicals where students will identify complex systems in animal behaviour around St Andrews.				
Programme module type:	Optional for Ecology and Conservation, Behavioural Biology, Sustainable Development, Zoology and all Biology Joint or Major/Minor Degree programmes.			
Pre-requisite(s):	Permission of Biology Honours Adviser required			
Learning and teaching methods and delivery:	**Weekly contact**: 14 x 1-hour seminars plus 4 x 2-hour computer-based practical classes over 8 weeks			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 25%, Practical Examinations = 0%, Coursework = 75%			
	As used by St Andrews: 2-hour Written Examination = 25%, Coursework = 75%			
Re-Assessment pattern:	2-hour Written Examination = 25%, Existing Coursework = 75%			
Module Co-ordinator:	Dr V A Smith			
Lecturer(s)/Tutor(s):	Dr V A Smith			

BL4286 Advanced Topics in Evolution

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
In this module, we will consider outstanding questions in modern Evolutionary Biology to develop a detailed understanding of research issues in this field. Both molecular and whole organismal approaches will be addressed. Topics will be based on classic papers in the literature raising theoretical questions about the origin of species, adaptation, genetic drift and natural and sexual selection. Each classic paper will be combined with a recently published study addressing one of these theoretical topics. We will use tutorials and student-led seminars to address the topics in detail. The result will be an exciting opportunity to tackle classic topics in evolution and learn how the very latest research addresses these issues.				
Programme module type:	Optional for Behavioural Biology, Ecology and Conservation, Evolutionary Biology, Marine Biology, Zoology and all Biology Joint or Major/Minor Degree programmes			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar (x 11 weeks).			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 50%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	2-hour Written Examination = 50%, Existing Coursework = 50%			
Module Co-ordinator:	Prof M Ritchie			
Lecturer(s)/Tutor(s):	Dr N Bailey, Prof M Ritchie			

BL4301 Polar Ecology: A field course in Antarctica

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2016/7			
Planned timetable:	To be arranged.			

This module will provide a theoretical and practical introduction to the marine ecology of Antarctica with emphasis on marine top predators (sea birds and marine mammals), ecosystem functionality and conservation issues. Students will participate in a two-week vessel-based expedition to Antarctica during the austral summer (northern winter). This field trip involves traveling to southern Argentina, conducting at-sea surveys of whales, seals and sea birds during transit to/from the Antarctic Peninsula, participating in shore-based activities (e.g. observations at penguin colonies, visit to active research station), and exploring Antarctic coastal waters from small boats and the ice-strengthened vessel. Through a series of lectures, workshops, on-board practicals and field excursions, students will gain appreciation of and insights into the diversity, complexity, scientific and management challenges of the Antarctic ecoregion.

Participating students will need to cover all logistic expenses via payment of a substantial expedition fee.

Programme module type:	Optional for Ecology and Conservation, Marine Biology, Sustainable Development and all Biology Joint or Major/Minor Degree programmes.	
Pre-requisite(s):	BL2105, BL3308, BL3318 or equivalent preferred but not essential; Medical certificate documenting fit for travel to remote Antarctica	
Learning and teaching methods and delivery:	**Weekly contact**: 2.5-week field trip involving extensive travel and 100 hours of contact time on the ship	
	Scheduled learning: 100 hours	**Guided independent study:** 50 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%	
	As used by St Andrews: Coursework = 100%	
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework	
Module Co-ordinator:	Dr S Heinrich	
Lecturer(s)/Tutor(s):	Dr S Heinrich, Dr L Boehme	

BL4601 Research Project Development and Methodology

SCOTCAT Credits:	20	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2016/7 & 2017/8			
Availability restrictions:	Available only to students on the MBiochem, MBiol and MMarBiol degree programmes			
Planned timetable:	Distance learning during External Placement			
This distance learning module will look in detail at the processes involved in creating a scientific research project. The aim of the module is for the students to develop independent thought in experimental design. While on placement, a series of online assessments will test the students' ability to critically analyse research literature, identify core and specialised techniques in the biosciences, design experiments for specific research questions, quantitatively and statistically analyse data and publish research in the appropriate manner. The students should ultimately gain valuable skills necessary for successful independent research careers.				
Programme module type:	Compulsory for the MBiochem, MBiol, MMarBiol.			
Pre-requisite(s):	Approved entry on to the MBiochem, MBiol or MMarBiol degree programmes			
Required for:	BL5410			
Learning and teaching methods and delivery:	**This is a Study Abroad or Work Placement module.** **Weekly contact**: 1 tutorial each week for 5 weeks.			
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Dr J Nairn			
Lecturer(s)/Tutor(s):	Dr J Nairn, Dr G Prescott, Dr A Smith, Prof M Ryan, Dr U Schwarz-Linek			

BL4602 External Research Placement

SCOTCAT Credits:	100	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2016/7 & 2017/8			
Availability restrictions:	Available only to students on the MBiochem, MBiol and MMarBiol degree programmes			
Planned timetable:	External placement			

The module constitutes an independent 7-12 month external research placement hosted by an independent institute/company. The project will be fully supervised at the host institute/company and student performance will be assessed jointly by the immediate supervisor and a member of staff in the School of Biology. During the module students will have the opportunity to practice and learn a range of scientific and generic skills, including an element of independent working, in a working environment outside St Andrews. Ultimately, the module will allow students to gain substantial research experience and work experience thus enhancing their future employability.

Programme module type:	Compulsory for the MBiochem, MBiol and MMarBiol degree programmes
Pre-requisite(s):	Approved entry on to the MBiochem, MBiol or MMarBiol degree programmes
Required for:	BL5410
Learning and teaching methods and delivery:	**This is a Study Abroad or Work Placement module.** **Weekly contact**: External Placement
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%
	As used by St Andrews: Coursework = 100%
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework
Module Co-ordinator:	Dr J Nairn
Lecturer(s)/Tutor(s):	Individual Supervisors across the School of Biology

BL5410 Advanced Topics in Biomolecular Sciences

SCOTCAT Credits:	30	SCQF Level 11	**Semester:**	Whole Year
Academic year:	2016/7 & 2017/8			
Planned timetable:	Weeks 1-3: 2 x 2-hour seminars per week, Weeks 3-11: 7 x 1.5-hour School of Biology seminars and discussion plus 2 x 1-hour tutorials over the 9-weeks			
This module will allow you to develop in-depth knowledge of research that is at the forefront of modern biomolecular sciences. You will hear about and discuss current research taking place within the School of Biology through tailored seminars and by attending the School seminar series. You will then have the opportunity to study one of these areas in depth as you write a review article on the subject area. You will then consider how to develop your research area into a funding application and into an industrial business plan. Your learning throughout the module will be supported by 1:1 tutorials that will guide the development of your review article and research proposals.				
Programme module type:	Compulsory for MBiochem programme			
Pre-requisite(s):	BL4601 and BL4602			
Learning and teaching methods and delivery:	**Weekly contact**: 2 x 2-hour seminars (x 7 weeks), 1-hour tutorial (x 7 week), 1.5-hour seminar/discussion session (x 22 weeks)			
	Scheduled learning: 68 hours		**Guided independent study:** 232 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework			
Module Co-ordinator:	Dr J Tilsner (Semester 1) and Dr R Guimaraes da Silva (Semester 2)			
Lecturer(s)/Tutor(s):	Team taught			

BL5420 Advanced Microscopy and Image Analysis – Seeing is Believing

SCOTCAT Credits:	15	SCQF Level 11	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
This module will introduce you to advanced imaging techniques, such as Confocal, Super-resolution, TIRF and Electron Microscopy and how these techniques have been utilised to address fundamental questions in Cell and Developmental Biology. You will get the opportunity to research techniques that are at the forefront of modern Biology and to develop skills in ImageJ analysis of imaging data, a skill that will be central to the advancement of bioscience in the coming years. Activities will be supplemented with research talks from academics at the cutting edge of their field and the opportunity to see advanced imaging techniques in practice.				
Programme module type:	Optional for the MBiochem. Optional for Biochemistry, Cell Biology and Molecular Biology BSc (Hons) Degree programmes.			
Pre-requisite(s):	BL3303 and/or BL3315			
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar.			
	Scheduled learning: 22 hours		**Guided independent study:** 128 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 20%, Practical Examinations = 30%, Coursework = 50%			
	As used by St Andrews: 1.5-hour Written Examination = 20%, Coursework = 80%			
Re-Assessment pattern:	1.5-hour Written Examination = 20%, Existing Coursework = 80%			
Module Co-ordinator:	Dr M Bischoff			
Lecturer(s)/Tutor(s):	Dr M Bischoff, Prof F Gunn-Moore, Dr J Sleeman			

BL5421 Chromatin and Genome Stability

SCOTCAT Credits:	15	SCQF Level 11	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

This module will introduce you to the fundamental concepts of chromatin structure and function and how this affects genome stability. DNA repair and telomere maintenance are perhaps the most significant factors affecting genome stability and these processes are central to the understanding of cancer cell biology. Indeed, most existing anti-cancer agents induce DNA damage and current efforts to target chromatin factors therapeutically are showing promise. You will have the opportunity to independently research and present seminars on the applied biology of chromatin and DNA repair within model organisms such as budding yeast, Caenorhabditis elegans and Drosophila melanogaster. The seminars and student presentations will be supplemented with guest lectures from scientists at the cutting edge of chromatin research and students will also have the opportunity to engage in research debates on topics at the forefront of modern cancer biology. Importantly, you will be expected to design and defend a research proposal that addresses an unsolved question of your choice within the field of genome stability.

Programme module type:	Optional for the MBiochem. Optional for Biochemistry, Cell Biology and Molecular Biology BSc (Hons) Degree programmes.	
Pre-requisite(s):	BL3302	
Learning and teaching methods and delivery:	**Weekly contact**: 1 x 2-hour seminar.	
	Scheduled learning: 22 hours	**Guided independent study:** 128 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 20%, Practical Examinations = 25%, Coursework = 55%	
	As used by St Andrews: 1.5-hour Written Examination = 20%, Coursework = 80%	
Re-Assessment pattern:	1.5-hour Written Examination = 20%, Existing Coursework = 80%	
Module Co-ordinator:	Dr H Ferreira	
Lecturer(s)/Tutor(s):	Dr H Ferreira	

BL5440 Major Review Paper in Evolutionary Biology

SCOTCAT Credits:	15	SCQF Level 11	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:				

Students will prepare a major review paper, reviewing a current topic in evolutionary biology. Extensive one-to-one work with staff will afford students the opportunity to produce a highly polished article. The paper will be submitted for peer (classmate) review, and will receive editorial guidance on changes from staff before a final version is submitted.

Programme module type:	Optional for all Biology degrees	
Pre-requisite(s):	BL2105 and BL3307, possible exceptions on discretion of instructors	
Learning and teaching methods and delivery:	**Weekly contact**: 2-hour seminar (x 5 weeks), 1-hour tutorial (week 3,4,6)	
	Scheduled learning: 13 hours	**Guided independent study:** 137 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%	
	As used by St Andrews: Coursework = 100%	
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework	
Module Co-ordinator:	Dr M Morrissey	
Lecturer(s)/Tutor(s):	Dr M Morrissey, Dr A Gardner, Prof O Gaggiotti	

BL5441 Animal Cognition

SCOTCAT Credits:	15	SCQF Level 11	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			
In this module we will investigate the cognitive abilities of animals, with particular interest in understanding the adaptive value of those abilities. This means that although we will develop an understanding of animal cognition based on standard animal models (typically rats and pigeons), we will extend those principles to addressing cognitive abilities in 'real' animals behaving in the 'real' world. We will use Shettleworth's book, already the key animal cognition text, as our starting point with student-led seminars providing breadth by presenting examples from the recent burgeoning of literature on non-model animals. The result will be a stimulating opportunity to develop a critical understanding of how animals perceive their world, how their cognitive abilities are shaped by that world and how those abilities lead to reproductive success.				
Programme module type:	Optional for Biology, Behavioural Biology, Biology & Psychology, Ecology & Conservation, Environmental Science (& assoc'd), Evolutionary Biology, Marine Biology, and Zoology Honours Programmes.			
Pre-requisite(s):	BL3319			
Learning and teaching methods and delivery:	**Weekly contact**: 3-hour seminar (x 10 weeks), 3-hour lecture (x 1 week)			
	Scheduled learning: 33 hours		**Guided independent study:** 127 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 50%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 50%, Presentation = 50%			
Re-Assessment pattern:	3-hour Written Examination = 100%			
Module Co-ordinator:	Dr S Healy			
Lecturer(s)/Tutor(s):	Dr S Healy			

BL5442 Advanced Biological Statistics

SCOTCAT Credits:	15	SCQF Level 11	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	To be arranged.			

The purpose of the module is to give students an appreciation of recent developments in statistical analysis and to provide them with a strategy for approaching a data analysis. The module will introduce the concept of the "new" statistics and will highlight recent developments in statistics and the common problems associated with the analysis of ecological and evolutionary data. Data exploration will be discussed and alternative approaches to model selection will be considered. Consideration will be given to GLMs, GLMMs, GAMs and GAMMs and the analysis of count data and zero-inflated data will be considered. The concept of Bayesian inference will be introduced, including MCMC estimation methods, and a detailed consideration of its application in ecology presented. The module will include guidance on understanding and interpreting reported statistics through the use of specific case studies.

Programme module type:	Optional for Biology, Ecology & Conservation, Environmental Science (& assoc'd), Evolutionary Biology, Marine Biology, and Zoology BSc Honours Programmes and MBiol and MMarBiol Integrated Masters programmes.	
Pre-requisite(s):	BL3320	
Learning and teaching methods and delivery:	**Weekly contact**: 2 hours of lectures (x 6 weeks), 2 hours of seminars (x 5 weeks)	
	Scheduled learning: 22 hours	**Guided independent study:** 128 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 10%, Coursework = 90%	
	As used by St Andrews: Coursework = 100%	
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework	
Module Co-ordinator:	Dr C Smith	
Lecturer(s)/Tutor(s):	Dr C Smith, Dr R Spence	

BL5499 Advanced Laboratory Research Project

SCOTCAT Credits:	60	SCQF Level 11	**Semester:**	Whole Year
Academic year:	2016/7 & 2017/8			
Planned timetable:	variable, as needed			

This project will involve extensive and advanced laboratory work to investigate a defined problem within biochemistry, appropriate to the MBiochem degree. The project will involve initiative and independence in experimental design and in pursuing the literature, excellent experimental and analytical techniques. The project will begin with an assessed project proposal and culminate in the production of a high-quality dissertation that integrates an awareness of the project subject and a critical, extensive and detailed knowledge of the relevant theories, concepts and principals. Students will be allocated to a member of staff within the School of Biology who will guide and advise them in research activities throughout the academic year. The project will be presented in the form of a proposal, a research dissertation, an oral presentation and a viva.

Programme module type:	Compulsory for MBiochem	
Pre-requisite(s):	BL4601 and BL4602	
Learning and teaching methods and delivery:	**Weekly contact**: 1 dedicated meeting with supervisor per week.	
	Scheduled learning: 33 hours	**Guided independent study:** 567 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 25%, Coursework = 75%	
	As used by St Andrews: Coursework = 100%	
Re-Assessment pattern:	Resubmission of failed item(s) of Coursework	
Module Co-ordinator:	Dr C Adamson	
Lecturer(s)/Tutor(s):	Individual Supervisors across the School of Biology	