University of Glasgow

Institute of Biodiversity, Animal Health & Comparative Medicine

# Institute of Biodiversity, Animal Health & Comparative Medicine (IBAHCM)

# Master's Programmes Overview

# 2017-2018

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**Master's Programmes in the Institute of Biodiversity, Animal Health and Comparative Medicine IBAHCM**

**Introduction to the Programmes:** There is a growing interest in the inter-related fields of biodiversity, animal ecology, conservation biology, epidemiology, applied behaviour and animal welfare. Despite overlap between these subject areas, there is very little opportunity in current undergraduate programmes to acquire the range of sophisticated practical skills required in the modern practice of these disciplines. There are also few postgraduate opportunities to combine skills across these subject areas. The Master's programmes offered through IBAHCM are designed to provide the opportunity for motivated students to gain the relevant skill sets over the course of a number of short courses, which will allow the student flexibility to acquire the most appropriate combination of skills and experiences relevant to their future career paths.

These programmes are part of the Animal and Plant Sciences Postgraduate Taught (PGT) cluster, which includes: MSc in Quantitative Methods in Biodiversity, Conservation and Epidemiology (QMBCE), MSc in Animal Welfare Science, Ethics & Law (AWSEL), MRes in Ecology and Environmental Biology (EEB), MSc in Conservation Management of African Ecosystems (CMAE), MSc in Food Security (FS), Master's of Veterinary Public Health (MVPH), and an e-learning MSc on Wildlife and Livestock Management (WLM). IBAHCM is home to top-quality researchers who focus on combining ecology and evolution with more applied problems in animal health and welfare, contributes to each of these programmes. This direct linking of veterinarians and life sciences is rare but offers unique opportunities to provide training that spans both fundamental and applied research. The courses taught through IBAHCM encompass key skills in monitoring and assessing biodiversity critical for understanding the impacts of environmental change; quantitative analyses of ecological and epidemiological data essential for animal health and conservation; and key skills to assess welfare of both captive and wild animals in theory and with respect to ethics and legislative policy critical for promoting humane treatment of animals. The uniqueness of the Masters programmes is the opportunity to gain core skills and knowledge across a wide range of subjects, which will enhance future career opportunities, including entrance into competitive PhD programmes. For example, it is rare for students in animal welfare to gain extensive quantitative skills, even though this can be critical for designing experiments that meet the criteria of the "three R's" (reduce, refine, replace) in animal-based research. Similarly, there are identification-based programmes offered elsewhere, but no others combine practical field skills with advanced informatics for assessing biodiversity based on molecular markers, and advanced statistics and modelling. Other courses in epidemiology are rarely ecologically focused; the specialty in IBAHCM is in understanding disease ecology, in the context of both animal conservation and implications for combined perspectives on animal and public health ("One Health").

Four of the on-site specialities are offered wholly within IBAHCM: QMBCE, AWSEL, EEB and CMAE. The main benefits of these programmes are their emphasis on flexibility, discipline specific training and timeliness of topics learned. Courses will be taught by research-active staff and will involve the latest approaches in quantitative methods (mostly using the programming environment R), sequence analysis (including uses of new high throughput sequencing technologies), practical approaches to assessing biodiversity, and welfare assessment, legislation and ethics associated with the use of animals in research, farms, and zoos. The emphasis for each is on 'hands-on' skills training and all courses include a combination of lectures to set the theoretical background and computer, laboratory, or field-based practicals to apply skills learned. After a suite of core courses in the first term designed to improve generic or subject-related skills, students can choose from a range of options in the 2nd term. Students enrolled in the EEB MRES programme undertake a single research topic divided into two project components (Nov-August). Students enrolled in the QMBCE and AWSEL MSc programmes complete an independent research project in term 3 (May-August). Students in the CMAE MSc spend a full year on an independent research project conducted in an African setting (starting in June of Year 1).

Opportunities for independent research projects include use of: the University field station on Loch Lomond (Scottish Centre for Ecology and the Natural Environment, SCENE) for freshwater or terrestrial-based projects; Millport field station on the Isle of Cumbria for marine projects; and Cochno farm in Glasgow for research based on farm animals. In addition, opportunities will be

sought for students to obtain placements with practitioners such as zoos (for welfare-based research) or environmental consulting firms.

**Course Structure:** Each term consists of 60 credits. Each programme has their own specific requirements for core and optional courses so please check the relevant CID for your programme. For all programmes, **you will require a laptop computer for most of the modules**. There is a strong emphasis on in-course assignments to develop practical skills, and some courses require you to keep a detailed reflective portfolio (logbook) of skills and knowledge learned, and written reports that will require incorporating key research skills learned across modules. Some courses will also involve fieldwork and offsite visits. Students wishing to exit with a PGdip or who do not meet the minimum standard for continuing through the MSc will finish after term 2.

**Assessment Methods:** There are no formal examinations for any of the courses. Students will demonstrate that they have grasped the principles of the subject area and can apply them through integration of the methods, concepts and broader context of the discipline in the form of independent assignments, essays and reports. Some courses will be partly assessed on take-home problem-based assignments to demonstrate learned principles (practical skills assessment) or an assessment of participation and competencies learned, based on a reflective portfolio of assignments and learning outcomes. Some courses will also have in-class tests to test competencies learned. For QMBCE and AWSEL students completing a full MSc (i.e., including an independent project), 60% of the project mark will be based on the write-up, with the remainder based on assessment of performance and diligence in carrying out the project (15%) and on a written project proposal (25%). CMAE students will submit a project proposal (10%), present their final project orally or as a poster (10%) and write up their results suitable for publication (80%). For students on the MRES, in addition to the first stage project assessment includes a written report (80%) and oral presentation (20%); and final assessment includes, a report (70%) a poster presentation (15%), as well as a separate mark for the supervisor's assessment (15%). Students will be permitted to progress to preparation of the research project only if he or she has obtained an average aggregation score of 12 (equivalent to C3) in 120 credits with at least 75% of the credits at Grade D3 or better and all credits at Grade F or above. Students can exit with a Postgraduate Diploma if they achieve an average aggregation score of 9 (equivalent to D3) or above in 120 credits, with not less than 80 of these credits at Grade D or above. Students may exit with a Postgraduate Certificate with an average aggregation score of 9 (equivalent to D3) or above in 60 credits, with not less than 40 of these credits at Grade D or above. More details on regulations will be provided in the CIDs.

**Expectations:** There is a large jump between undergraduate and Master's degrees in terms of expectations. At the postgraduate level, you are primarily responsible for your own learning. The staff are there to guide you and help you to advance your skills but achievement at this level requires self-motivation and commitment. You always will be provided with guidelines for assignments but there is a strong emphasis on self-learning at the Master's level so there may be more decisions that you are expected to make yourself (as you would if you were preparing your own scientific paper). Please always carefully read the documentation that is provided for each course and assignment; if elements are unclear it is always good to ask the staff for clarification but your own judgement should not be undervalued. You will also benefit from being proactive about choosing a subject area that you would like to explore during the research project component of your programme. We encourage Master's students to become fully integrated into the Institute so you should feel free to talk to researchers at any level. We benefit enormously from your feedback to continue to improve the programmes; always feel free to provide an honest constructive assessment of what works and what could be improved. We will hold regular student-staff liason meetings to make sure that there is open communication and that any issues are resolved at the time, rather than after it is too late to make changes. Your participation in surveys is particularly valuable, to provide quantitative data that can be used to justify programme changes that will improve your student experience. We also provide you with feedback in various forms; written feedback on assignments only comprises a small fraction of this. A benefit of master's programmes is that you will obtain feedback more similar to what you would receive in real life situations: comments from peers; oral feedback during discussions; individual help during practical sessions from instructors and demonstrators; summaries of common "errors" made that are worth

looking out for; the opportunity to extrapolate comments from one assignment to future written or analytical work (e.g. extending learning from term 1 courses to independent research projects).

# Detailed Course Descriptions

## Term 1: Core Courses

### BIOL 5126: Key Research Skills (required for all; 40 credits; term 1)

***Course Coordinator:*** Prof. Barbara Mable (Barbara.mable@glasgow.ac.uk)

***Core Instructors:*** Prof. Daniel Haydon (Daniel.haydon@glasgow.ac.uk), Dr. Roman Biek (roman.biek@glasgow.ac.uk), Dr. Sofie Spatharis (sofie.spatharis@glasgow.ac.uk)

***Course Aims***: The aims of this course are to ensure that all students enrolled in the MSc/PGdip and MRES programmes receive advanced and evidence-based training in the key skills essential for any modern ecology/evolution-based research career and for the courses that they will take later in the programme. All sessions will involve practical hands-on training, as well as lectures introducing the concepts. Sessions are divided broadly into: 1) Scientific Communication and 2) R & Statistics (including Introduction to the Programming Environment R, Introduction to General Linear Models, Advanced Statistics, and Experimental Design & Power Analysis).

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Carry out an appropriate and thorough search of the primary literature.
- Critique scientific evidence
- Produce well-structured and critical evidence based essays, grant proposals and scientific reports that set the context of the objectives based on a critical review of the primary literature, and clearly describe methodology (including quantitative analyses), present results in an easily understandable format, and discuss results in the context of the broader body of literature in the relevant scientific field
- Download and install R, along with packages and libraries relevant to the analysis of biological data, import data, use objects, and plot data, acquiring technical help as required from literature and online sources
- Critically discuss appropriate uses of some of the key features of R including random number generation, data manipulation, input output, and basic descriptive statistics.
- Use R to implement a wide range of generalised linear mixed models, and discuss critically the justification for choice of models for particular scientific questions
- Organize data in a form appropriate for further analysis
- Use the evidence base to formulate null and alternate hypotheses associated with particular statistical tests
- Critically interpret the output from these analyses, test identified hypotheses and discuss the results in the context of the primary literature
- Recognize and critically assess the underlying models associated with these statistical analyses
- Identify and interpret statistical interactions and random effects in the context of real data
- Conduct a full range of diagnostic tests to ensure the data complies with assumptions of the methodology
- Take an critical evidence-based approach to designing effective experiments (and other data collection exercises)
- Critically evaluate other scientists' experimental designs
- Critically discuss the key concepts in experimental design with reference to the literature
- Integrate knowledge and skills learned in the analysis of experimental data and scientific writing to write a report using real data to generate a specific hypothesis to be tested in the context of a critique of the existing background in the primary literature, describe the specific methods used to analyse the data, describe and interpret the results based on the evidence base and write a critical discussion that sets the results in the context of the primary literature

***Assessment:*** In-class and home assignments (coursework) will comprise 60% of the mark and will be divided equally between the Scientific Communications and R components. The remaining

40% of the mark will be based on a scientific report (3000 words) in the form of a publishable journal article that will integrate skills across all topics. Specifically, students will be provided with a dataset and a brief description of the motivation for why the data were collected. They will need to analyse the data using the skills learned in the introduction to R, Experimental design, and Advanced Statistics components and write up the report as a full scientific paper appropriate for submission to a peer-reviewed journal.

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**BIOL 5129: Spatial Ecology and Biodiversity (required for QMBCE, CMAE; 20 credits)**

***Course Coordinator:*** Prof. Jason Matthiopoulos (Jason.matthiopoulos@glasgow.ac.uk)

***Additional Instructors***: Dr. Grant Hopcraft (grant.hopcraft@glasgow.ac.uk), Dr. Richard Reeve (Richard.reeve@glasgow.ac.uk), Dr. Stewart White (stewart.white@glasgow.ac.uk)

***Course Aims:*** This course will provide students with evidence-based core training in the fundamental concepts and quantitative tools used to estimate species distributions, habitat preferences and biodiversity patterns from field data. The main aim is to encourage students to think critically about the results of such analyses by highlighting the limitations of the current approaches and the contemporary primary literature that works to overcome them. All taught material will be demonstrated and consolidated with associated practicals in the programming language R.

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Critically discuss with respect to the evidence base the relative merits of estimating maps of species abundance and the strengths and pitfalls of different methods used to achieve this
- Critically discuss with respect to the evidence base the challenges of developing and interpreting models of habitat preference
- Critically discuss with respect to the evidence base methods for quantifying habitat preference and the use for prediction of special abundance
- Critically discuss with respect to the evidence base techniques for importing and representing complex special data using geographic information systems
- Critically discuss with respect to the evidence base the origin and interpretation of different indices of biodiversity
- Critically discuss with respect to the evidence base the unifying measures of biodiversity and the ecological interpretation
- Extrapolate their learning from individual practicals to an integration across subjects in the preparation of an independent final project

***Assessment:*** Students will be assessed based on completion and accuracy of practical assignments that will be initiated in class and completed independently. The workflow of the practicals will not be prescriptive and will allow initiative, in line with the expectations of a postgraduate course. The first of the 9 assessments will be formative (i.e. marked but not used for assessment). Each of the remaining 8 assessed practicals will contribute 7.5% of the final course mark. The remaining 40% will require students to integrate practical and lecture work with independent reading in the generation of an analytical report based on application of the methods learned, to a new dataset.

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**BIOL5115: Animal Welfare Science (required for AWSEL; 20 credits)**

**Course Coordinator:** Dr Ruedi Nager (ruedi.nager@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with an evidence-based critical and detailed understanding of the concept of welfare and the range of issues animals are facing in various contexts.

***Intended Learning Outcomes***

*By the end of this course students will be able to critically evaluate with respect to literature:*

- The complexity of the concept of welfare and critically analyse the application of different welfare concepts
- Approaches for analysing and evaluating appropriate methods that can be used to assess specific welfare issues
- The latest issues and outcomes of research into animal welfare issues

*In addition, they will:*

- Obtain knowledge of welfare issues in different forms of human use of animals and be able to have an informed discussion and make critical judgements about a range of welfare issues
- Apply critical analysis, evaluation and synthesis of principles of welfare to work with wild animals

***Assessment:*** Students will write an essay (2000-2500 words) reviewing an issue of welfare concern (50%) and write a report (50%) on how a specific exhibit meets the animal's welfare requirement; the latter is based on a formal welfare assessment taking place at one of the site visits in term 2.

## Term 2: Core Courses (all 10 credits)

### BIOL5114: Animal Ethics (required for AWSEL, option for QMBCE, CMAE; 10 credits)

***Course Coordinator:*** Dr. Dorothy McKeegan (dorothy.mckeegan@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with an awareness of the principles of relevant animal ethics frameworks and how these may be applied to consider the moral implications of different forms of human use of animals.

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Recognise, evaluate and critically discuss the whole range of relevant animal ethics frameworks Discuss critically with reference to the primary literature the tools to be used to recognise and reflect on ethical questions relating to the different human uses of animals and apply ethical reasoning to the main controversial issues in animal ethics
- Critically discuss, evaluate and synthesise welfare and ethical issues relating to different forms of human use of animals, contrasting our treatment of animals in different contexts where appropriate
- Critically analyse ethical dilemmas, employing ethical reasoning and applying ethical principles in the context of relevant case examples

***Assessment:*** Students will produce an oral presentation based on a welfare issue in which they explore different ethical perspectives and their own view (50%). They will also write an essay (2000 words) that critically reflects on their own ethical position and its evolution (50%).

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### BIOL5127: Legislation & Societal Issues (core for AWSEL; option for QMBCE, CMAE)

**Course Coordinator:** Dr. Ruedi Nager (ruedi.nager@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with a rigorous evidence-based understanding of key features of relevant legislation and societal issues regulating the use of animals in various contexts. Students will explore relevant legislation on a specific animal use issue of a country of their choice (ideally their home country).

***Intended Learning Outcomes***

*By the end of this course students will be able to critically discuss with respect to the primary literature:*

- Legislation concerning keeping animals in captivity in the UK and demonstrate a basic understanding of the UK legislative frameworks protecting animals in different contexts
- Key legislation relating to animal welfare in laboratory and zoo environments
- How societal influences affect discussion and public attitudes towards different forms of human use of animals, especially with respect to controversial issues
- How legislation is underpinned by ethical principles and results of current research in welfare science.
- Have a critical awareness how new policies are made and how the policy making process as well as the public may be influenced.

***Assessment:*** Students will write a position paper essay (2000 words) on a chosen case study about an issue of animal use; the position paper should critically reflect on legislative, scientific and ethical aspects relevant to the chosen case, and come up with a clear conclusion on the student's position on the chosen case. This will comprise 50% of the mark. The remaining 50% will be based on a press release describing their views and rationale in their position paper to the general public.

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**BIOL5292: Human Dimensions of Conservation (required for CMAE; option* for AWSEL, QMBCE, MRES)**

***Course Coordinator:*** Prof. Sarah Cleaveland (sarah.cleaveland@glasgow.ac.uk)

***Course Aims:*** The course explores human dimensions of conservation, including topics relating to biodiversity conservation and human development, sustainable use, wildlife trade, hunting, human-wildlife conflict and wildlife interventions. These subjects will be considered from diverse ethical, ecological, socio-economic and political perspectives.

*** Instructor approval required**

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Critically discuss with reference to the evidence base and primary literature:
    - Different approaches to natural resource management and their implications for biodiversity conservation and human development.
    - Interacting ecological, ethical, social and economic issues affecting conservation and the management of wildlife.
    - Challenges surrounding the sustainable utilisation of wildlife, including tourism, sport hunting and wildlife trade.
    - Dilemmas arising from human-wildlife conflict and different approaches to conflict mitigation.
    - Attitudes and approaches towards different types of wildlife interventions for conservation.
- Demonstrate a detailed understanding of a contemporary conservation dilemma.
- Make a rationale argument for/against a particular conservation action/approach.

***Assessment:*** Students will prepare a short piece of written work that addresses a contemporary conservation dilemma in the form of a press statement. This will form the basis of a media-style interview or presentation. Students will be assessed on their ability to summarise, synthesize and communicate key messages in a way that is accessible to a lay audience (50%). The remaining 50% will be based on a written exercise that will require integration of the evidence-based knowledge and skills learned in this module.

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**BIOL5293: Principles of Conservation Ecology (required for CMAE; option* for AWSEL, QMBCE, MRES)**

***Course Coordinator:*** Dr. Grant Hopcraft (grant.hopcraft@glasgow.ac.uk)

***Course Aims:*** The course explores human dimensions of conservation, including topics relating to biodiversity conservation and human development, sustainable use, wildlife trade, hunting, human-wildlife conflict and wildlife interventions. These subjects will be considered from diverse ethical, ecological, socio-economic and political perspectives.

*** Instructor approval required**

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Identify and critically evaluate key concepts underpinning the interaction between species and their environments in protected African ecosystems
- Critically discuss the key ecological processes underlying the abundance and spatial distribution of species of conservation interest, and the conceptual and quantitative models that are used to characterise them
- Apply appropriate processes to measure and manage ecosystem stressors
- Critically discuss the ecological basis on which to build options for the management of natural resources and their implications for biodiversity conservation.

- Critically discuss and evaluate, with reference to the evidence base and primary literature, a particular conservation action/approach based on recognised ecological principles in order to make a rational argument for or against the action/approach
- Design management and research projects around sound and recognised ecological principles
- Appraise the usefulness of quantitative assessment of a given ecological process, and design processes for the acquisition of relevant quantitative data in conservation ecology.

***Assessment:*** Engagement and application of theory during discussions: students will be assessed based on active participation in discussions and their ability to present, synthesise and engage with others about theories (30%). They will also be assessed on a set exercise that tests the practical skills learned (15%). Students will submit two drafts of a poster presentation that outlines their experimental plan for their independent research project (55%). This will incorporate the theories and practical lessons learned during the course and will help to develop their critical thinking skills for their projects. They will have the opportunity to improve their presentation based on formative feedback provided on the first draft.

**BIOL5294: Protected Area Management (required for CMAE; option* for AWSEL, QMBCE, MRES)**

***Course Coordinator:*** Prof. Markus Borner (markus.borner@glasgow.ac.uk)

***Course Aims:*** This course will introduce students to key issues in the management of protected areas in Africa, including resource protection, ecological monitoring, fire management, tourism management and development, infrastructure management and community conservation. The course will draw on examples from savannah, forest, wetland and marine ecosystems in Africa and special emphasis will be placed on introducing students to practical aspects of protected area planning. Further topics will consider setting of conservation priorities, monitoring and evaluation of conservation actions, and conservation financing.

*** Instructor approval required**

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Critically discuss and evaluate, with reference to the evidence base and primary literature, the key issues and activities involved in the management of terrestrial and marine ecosystems in Africa, including practical aspects of protected area planning.
- Critically discuss and evaluate, with reference to the evidence base and primary literature, approaches used in setting conservation priorities and the appropriate scales for conservation planning.
- Critically compare and contrast the type of economic instruments available to support conservation and sustain the management of protected areas.
- Critically discuss contemporary controversies in relation to protected area management and different conservation paradigms.
- Develop an outline management plan for a protected area.
- Conduct a conservation priority-setting exercise

***Assessment:*** Students will make a presentation outlining their approach to a conservation management problem facing a protected area in Africa. Students will be assessed on their ability to present and synthesize evidence and how they engage with others in discussing different approaches (50%). The remaining 50% will be based on a written set exercise that will require integration of the evidence-based knowledge and skills learned in this course.

**BIOL5133: Programming in R (required for QMBCE; option* for AWSEL, CMAE, MRES)**

***Course Coordinator:*** Dr. Richard Reeve (richard.reeve@glasgow.ac.uk)

***Course Aims:*** The aim of this course is to provide hands-on training in programming in the R environment, and teach students to use the data structures appropriately to solve problems.

* **Since this is an advanced programming course rather than an extension of introduction to R, non QMBCE students will be required to achieve at least a B average in the R and statistics components of KRS.**

***Intended Learning Outcomes***

*With reference to the evidence base, by the end of this course students will be able to:*

- Use appropriate data structures to retrieve and store information in R
- Select and justify the appropriate loops and program structures in R when solving a problem
- Use comments appropriately to explain program structure and design
- Write a document functions in R to carry out specified procedures
- Design simple computer programs to solve specified problems
- Write programs in R
- Generate reports in R where code is run and the output is discussed

***Assessment:*** Students will write submit annotated code and reports generated in R from small assignments during the module, reflecting participation and competencies learned in practical computer laboratories (50%). The remaining 50% will be based on an independent assignment studied during last day of class and completed after the module that will require integration of the evidence-based knowledge and skills learned, involving direct application of programming skills obtained.

**Term 2: Optional Courses (listed alphabetically)**

**BIOL5132: Biodiversity Informatics**

***Course Coordinator:*** Prof. Rod Page (rod.page@glasgow.ac.uk)

***Course Aims:*** To provide evidence-based advanced practical training in using web services to aggregate and visualise biodiversity data, using an interactive and open-access based approach.

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- demonstrate advanced competence in querying biodiversity databases and be able to critically discuss with respect to the primary literature their most appropriate uses
- critically discuss with respect to the literature the strengths and limitations of existing biodiversity databases
- consider a biological question related to biodiversity informatics and take an evidence-based approach to determine which current databases and services are relevant to answering that question

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self-reflection of the theories learned (25%). The remaining 75% will be based on a set exercise that tests the practical skills and theories learned.

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**BIOL5117: Biology of Suffering**

***Course Coordinator:***

Dr Dorothy McKeegan (dorothy.mckeegan@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with an advanced understanding of sentience and suffering in animals and how this relates to ethical and legal considerations.

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Discuss critically the challenges faced by welfare research that aims to assess animal subjective states, and the strengths and weaknesses of different approaches
- Discuss critically the physiological basis of the stress response, the latest methodological developments on how to measure stress, and how these can inform welfare research
- Demonstrate detailed knowledge and critical understanding of the physiological basis of pain, discuss its evolution in the animal kingdom, and be informed by the developments at the forefront of pain research
- Apply knowledge and synthetic understanding of pain and stress to critically reflect on ethical issues and legislation
- Discuss critically the principles and concepts of disturbance and a critical awareness of its impacts on captive and wild animals

***Assessment:*** Students will prepare an essay (2000 words; 100% of the course grade) where they will critically discuss current scientifc evidence for different types of animal suffering.

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**BIOL5118: Care of Captive Animals**

***Course Coordinator:*** *Dr. Ruedi Nager (*ruedi.nager@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with a critical awareness of issues relating to care of captive animals and relate these to legislation, ethics and welfare science.

***Intended Learning Outcomes***
*By the end of this course students will be able to critically describe with respect to the primary literature*:

- The theories and principles underlying the design of animal husbandry approaches
- Critical evaluation of requirements to be met when deciding on the use of an animal
- The techniques available to assess the health status of captive animals
- The concept of behavioural and physiological needs, critical analysis of how this can be met in captive situations, as well as the welfare consequences
- Principles of welfare in the design of novel animal enclosures/cages/animal rooms

Assessment: The assessment for this course will be a written planning document (100% of the course grade) on designing an animal research facility based on the latest animal welfare science studies and relevant legislation (2500 words).

**BIOL5120: Enrichment of Animals in Captive Environments**

***Course Coordinator:*** Dr. Ruedi Nager (ruedi.nager@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with knowledge of the underlying principles that guide enrichment and the design of enclosures and encourage students to creatively think about their own solutions to welfare issues.

***Intended Learning Outcomes***
*By the end of this course students will be able to discuss critically with respect to the primary literature:*

- The relevant key enrichment pathways and choice of enrichment options appropriate to a given problem
- The appropriate methods to design and assess a novel enrichment technique
- How enrichment and enclosure design impact on the animal's welfare
- Key issues in environmental enrichment for animal welfare, with respect to legislation and animal care staff
- Latest developments in research on environmental enrichment

***Assessment:*** The students will write one essay of 2,000 words (100% of the course grade) where they critically discuss the enrichment options for a particular animal/group of animals of your choice that are kept in captivity. The essay should critically reflect on different possibilities and practicalities of existing or suggested enrichment options in real life situation and justify a chosen solution in terms of ethical, legal and welfare considerations.

**BIOL 5250: GIS for Ecologists**

***Course Coordinator:*** Dr Colin Macleod (contact: dominic.mccafferty@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with training in the collection and analysis of ecological data using a geographic information system (GIS). The objective is to develop key skills in creating a GIS using existing data and collecting suitable field data for an ecological project.

***Intended Learning Outcomes***
By the end of this course students will be able to: create a Geographic Information System (GIS) for an ecological research project and populate a GIS with existing data layers, data layers which they have created and with data collected in the field. In addition, students will be able to: (1) collect GIS compatible data in the field using a global positioning system (GPS) receiver, (2) setup and use a GPS receiver to record ecological field data (3) design a GIS project, and populate it with the required data to answer a specific research question.

***Assessment*:** Students will produce a GIS report displaying distribution maps, appropriate graphs and summary flow diagram based on collection of field data (60%). The remaining assessment will be a 1500 word review critically assessing the current use of GIS projects in specialised ecological research.

**BIOL5123: Infectious Disease Ecology & the Dynamics of Emerging Disease***

***Course Coordinator:*** Dr. Louise Matthews (louise.matthews@glasgow.ac.uk)

***Course Aims:*** The aim of this course is to equip students with the mathematical and programming skills and theoretical background to be able to create simple epidemiological models, to interpret their outputs and to be able to critically evaluate published papers on infectious disease dynamics.

*** Prerequisite Programming in R**

***Intended Learning Outcomes***
*By the end of this course students will be able to critically discuss with respect to literature and theoretical background:*

- The value of currently used standard epidemiological models
- The distinction between: frequency and density-dependent transmission; micro and macroparasite models
- The concept of herd immunity
- The principles behind standard vaccination strategies
- The distinction between and appropriate use of stochastic and deterministic formulations
- The definition and conceptual framework for the basic reproduction number
- The concept of critical community size
- The context for use of metapopulation models
- Impacts of host heterogeneity on infection dynamics
- The use of standard model types in the epidemiological literature

*In addition, they will be able to:*

- Program standard epidemiological models in R and interpret outputs
- Calculate the basic reproduction number for simple epidemiological models
- Identify and interpret equilibria in standard epidemiological models
- Generate a mathematical description of an infection dynamics model for a problem of their own choice

***Assessment:*** Students will write submit annotated code and reports generated in R from small assignments during the module, reflecting participation and competencies learned in practical computer laboratories (50%). The remaining 50% will be independent assignment completed after

the module that will require integration of the evidence-based knowledge and skills learned, involving direct application of programming skills obtained.

**BIOL5124: Introduction to Bayesian Statistics***

***Course Coordinator:*** Prof. Jason Matthiopoulos (Jason.matthiopoulous@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide the student with an evidence-based founding in the basic theory and practice of Bayesian statistics.

*** Prerequisite Programming in R**

***Intended Learning Outcomes***

*By the end of this course students will be able to critically discuss with reference to theory and practice:*

- The key differences between a Bayesian and frequentist approach
- How prior information is used in a Bayesian approach
- The concept of Markov Chain Monte Carlo techniques
- The distinction between Metropolis-Hastings and Gibbs sampling

*In addition, they will be able to:*

- Write simple programs in WinBugs or JAGs
- Specify and discuss critically the appropriate use of both informative and 'uninformative' priors
- Identify when a model has converged
- Conduct model selection using DIC

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self-reflection of the theories learned (50%). The remaining 50% will be a take-home problem-based assignment that will require integration of the knowledge and skills learned in this module, in the analysis and discussion of an independent dataset.

**BIOL5125: Invertebrate Identification**

***Course Coordinator:*** Dr. Stewart White (stewart.white@glasgow.ac.uk)

***Course Aims:*** The aim of this course is to provide students with in depth hands-on training to enable them to identify key vertebrate groups, using field guides, identification keys, and vocalizations, as required for assessment of biodiversity.

***Intended Learning Outcomes***

*By the end of this course students will be able to take an evidence-based approach to:*

- Identify species from key invertebrate groups, to the lowest taxonomic level possible for that group
- Use taxonomic keys and the principles behind them so that they can understand and implement the use of novel keys for groups that have not been studied directly in this course
- Understand and calculate biodiversity based on a range of indices and choose those most relevant to the taxa under study
- Consolidate the methodologies learned, in terms of an in-class laboratory test to evaluate their ability to use keys
- Devise and deploy an independent research assignment aimed at comparing trap efficiency, both qualitatively and quantitatively, and comparing levels of biodiversity in different habitat types in terms of species richness and abundance, which will require

integration of knowledge learned in the core course Measuring Biodiversity and Abundance in the autumn term

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self reflection of the theories learned (20%), as well as demonstrating proficiency in identification through in-class tests (40%). Students will integrate knowledge learned in the preparation of an independent and evidence based assignment that will involve quantifying biodiversity in a sample obtained from either an aquatic or the terrestrial sampling course, and evaluating which measures of diversity are most appropriate for the taxonomic groups identified, for the particular habitat type sampled, as well as assessing which trapping techniques learned during the sampling modules are most efficient both qualitatively and quantitatively (40%).

**BIOL5130: Molecular Analyses for Biodiversity and Conservation**

***Course Coordinator:*** Prof. Barbara Mable (Barbara.mable@glasgow.ac.uk)

***Course Aims:*** To provide practical training in and the theoretical basis for basic molecular analyses used for identification and characterising of biodiversity, as applied to problems in the assessment of biodiversity, including approaches to DNA barcoding for identification and population genetics analyses of population structure and genetic history at a level sufficient to perform independent analysis of real datasets. The course will also highlight recent advances in sequencing technology and approaches to genotyping, along with the new challenges that this will bring for analytical approaches.

***Intended Learning Outcomes***

*By the end of this course students will demonstrate competence, be able to critically discuss the underpinning theoretical background, and provide an evidence-based justification to choose the most appropriate methods to apply to particular research questions related to:*

- Basic manipulation of sequence and genotyping data using appropriate specialised software and interpretion of the patterns
- Use of specialised computer programmes for analysing molecular data to address research problems in biodiversity and conservation

*In addition, students will be able to critically discuss in depth with respect to literature:*

- The history of development of molecular techniques used in biodiversity research and the future changes that will come with continuing advances in sequencing and genotyping technology
- The scope and limitations of the range of analytical methods used to assess biodiversity through identification
- The theoretical basis behind the range of analytical methods available to infer population structure and genetic history using population genetics approaches

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self-reflection of the theories learned (40%). The remaining 60% will be based on an independent and evidence-based assignment (1500-2000 words) that will require integration of the knowledge and skills learned across the range of method and theories, including analytical approaches and interpretation of results in the context of the primary literature.

**BIOL5119: Molecular Epidemiology and Phylodynamics**

***Course Coordinator**:* Dr. Roman Biek (roman.biek@glasgow.ac.uk)

***Course Aims:*** To provide students with the conceptual background and hands-on training required for analysing and interpreting genetic data to answer applied questions in evolutionary biology and epidemiology, through the use of relevant specialised computer software and critical evaluation of the scientific literature.

***Intended Learning Outcomes***
*By the end of this course students will be able to:*

- Critically discuss with respect to the primary literature the use of various types of genetic data used in evolutionary analysis and epidemiology and their suitability for addressing specific research questions
- Conduct basic analyses on such data using contemporary software (including the program BEAST and others) and to diagnose and troubleshoot problems encountered during analysis
- Critically interpret and synthesise results of these analyses and make specific research and management recommendations on their basis with reference to the evidence base

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self reflection of the theories learned (40%). The remaining 60% will be based on a particular applied research problem in pathogen evolution and epidemiology for which the students are asked to analyse a provided data set using the tools learned in the course and write up a scientific report based on their findings (2000-3000 words).

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**BIOL5131: Multi-species Models***

***Course Coordinator:*** Prof. Dan Haydon (Daniel.haydon@glasgow.ac.uk)

***Course Aims:*** This course will introduce students to the theory and practice of formulating multi-species population models. It will aim to introduce students to the different ways these models can be formulated in theory, and implemented in practice (this will be undertaken in the R programming environment). Students will be asked to review a range of previous uses of these forms of models, and be asked to develop critical views of them. Emphasis will be placed on identifying the key assumptions of these different models, and when different formulations are most appropriate.

*** Programming in R recommended**

***Intended Learning Outcomes***
*By the end of this course students will be able to discuss critically with respect to the evidence base and primary literature:*

- Applications, limitations and assumptions of the main areas of multi-species population models
- Features of a range of commonly used multi-species population models, and evaluate the various assumptions that each make
- Examples of when these different models have been applied to particular situations, and what different sorts of predictions such models are most appropriate for
- Current issues and controversies in this area of multi-species ecological modelling

*In addition, they will be able to:*

- Implement a range of different multi-species models in R, and be able to conduct comprehensive numerical analysis of these models.
- Estimate critical parameters contained within these different formulations, and determine how the stability of these models depends on their formulation and parameterization.

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self-reflection of the theories learned (50%). The remaining 50% will be a set exercise that will require integration of the evidence-based knowledge and skills learned in this module.

**BIOL5135: Single-species Models***

***Course Coordinator:*** Dr. Jan Lindström (jan.lindstrom@glasgow.ac.uk)

***Course Aims:*** This course will introduce students to the theory and practice of single-species population models. It will aim to introduce students to the different ways these models can be formulated in theory, and implemented in practice (this will be undertaken in the R programming environment). Students will be asked to review a range of previous uses of these forms of models, and be asked to develop critical views of them. Emphasis will be placed on identifying the key assumptions of these different models, and when different formulations are most appropriate.

*** Programming in R recommended**

***Intended Learning Outcomes***
*By the end of this course students will be able to critically discuss with reference to the evidence base and primary literature:*

- The applications, limitations and assumptions of the range of currently used single-species population models
- The key features of a range of commonly used single-species population models, and evaluate the various assumptions that each make
- Examples of when these different models have been applied to particular situations, and what different sorts of predictions such models are most appropriate for current issues and controversies in this area of ecological modelling

*In addition, they will be able to:*

- Implement a range of different single-species models in R, and be able to conduct comprehensive numerical analysis of these models
- Estimate critical parameters contained within these different formulations, and critically evaluate the sensitivity of model outputs to these parameters

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self-reflection of the theories learned (30%). The remaining 70% will be a take home problem-based independent assignment that will require integration of the knowledge and skills learned in this course.

**BIOL5137: Vertebrate Identification**

***Course Coordinator:*** Dr. Stewart White (stewart.white@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with core evidence-based training in techniques for identifying key vertebrate groups, including bird songs and mammalian scats.

***Intended Learning Outcomes***
*By the end of this course students will be able to take an evidence-based approach to:*

- Identify species from key invertebrate groups, to the lowest taxonomic level possible for that group

- Use taxonomic keys and the principles behind them so that they can understand and implement the use of novel keys for groups that have not been studied directly in this course
- Understand and calculate biodiversity based on a range of indices and choose those most relevant to the taxa under study
- Consolidate the methodologies learned, in terms of an in-class laboratory test to evaluate their ability to use keys
- Devise and deploy a digital collection (i.e. photographs and/or bird songs) for which complete species descriptions are generated, such as would be found in a monograph describing a new species

***Assessment:*** Students will submit practical exercises to gauge their depth of understanding and engagement with the skills learned in each of the practical sessions. The work will be assessed not only on completion of the assigned tasks but on interpretation and self-reflection of the theories learned (20%), as well as demonstrating proficiency in identification through in-class tests (40%). Students will integrate knowledge learned in the preparation of an independent and evidence-based assignment in the form of a monograph of species description or creation of a novel key (40%).

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**Welfare Assessment**

***Course Coordinator:*** Dr. Ruedi Nager (ruedi.nager@glasgow.ac.uk)

***Course Aims:*** The aim of the course is to provide students with an evidence-based understanding of methods and techniques used to assess physiological state of wild animals and provide them with the competence to identify the health state of wild animals

***Intended Learning Outcomes***

*By the end of this course students will be able to:*

- Comprehensively discuss the relevance of concepts from behaviour and physiology to welfare assessment with reference to key literature
- Critically analyse, evaluate and synthesise methodologies and techniques that can be used to monitor the welfare state of captive and wild animals
- Demonstrate knowledge and critical awareness of what factors contribute to the wellbeing of individuals and populations

***Assessment:*** Students will be assessed on a written essay reflecting on strength and weaknesses of existing welfare assessment tools. They will choose one technique and thoroughly assess it. The essay should include the following: (i) a critical appraisal of what this technique/method is doing, (ii) reviewing the literature for application of this method to welfare and non-welfare-related questions, (iii) rigorously critique the application of methods in the reviewed papers with respect to their suitability to its aims, (iv) discuss the limitations of the technique and (v) conclude how well the method works and what will be its relevance for welfare assessment. The word count of the essay is 2500 words and contributes 100% to the mark.

## PRACTICAL INFORMATION

### Useful Contacts

*Course Coordinator (QMBCE):* Dr. Roman Biek (roman.biek@glasgow.ac.uk)
*Deputy Coordinator (QMBCE):* Prof. Jason Matthiopoulos (Jason.matthiopoulos@glasgow.ac.uk)
*Course Coordinator (AWSEL):* Dr. Ruedi Nager (Ruedi.nager@glasgow.ac.uk)
*Co-Coordinator (AWSEL):* Dr. Dorothy McKeegan (Dorothy.mckeegan@glasgow.ac.uk)
*Course Coordinator (MRES):* Dr. Dominic McCafferty (dominic.mccafferty@glasgow.ac.uk)
*Deputy Coordinator (MRES):* Prof. Heather Ferguson (heather.ferguson@glasgow.ac.uk)
*Course Coordinator (CMAE):* Prof Sarah Cleaveland (sarah.cleaveland@glasgow.ac.uk)
*Deputy Coordinator (CMAE):* Dr. Grant Hopcraft (grant.hopcraft@glasgow.ac.uk)
*Institute Administrator:* Chris Bevan (Christopher.Bevan@glasgow.ac.uk) GK Rm 201
*Institute Senior Secretary:* Lorna Kennedy (lorna.kennedy@glasgow.ac.uk) GK Rm 205A
*PGT Administrators:* Gillian Moynagh (Gillian.Moynagh@glasgow.ac.uk), Emily Jackson (Emily.jackson@glasgow.ac.uk), MVLS Graduate School, Wolfson Link Building
*Graduate Student Coordinator:* Prof Louise Matthews (louise.matthews@glasgow.ac.uk)
*Institute Director:* Prof. Dan Haydon Daniel.haydon@glasgow.ac.uk
*Animal & Plant Sciences Cluster Lead:* Prof. Barbara Mable (Barbara.mable@glasgow.ac.uk)

**On-line resources**: We will circulate information electronically as much as possible. Early in semester 1, you will receive information on use of the University Virtual Learning Environment, MOODLE2. Staff will post information on MOODLE2 on a regular basis, including course materials. We would also encourage you to interact with one another using chat groups available through MOODLE2, facebook, or other on-line social networking options (e.g. sharing files through GOOGLE documents, Mendeley or Dropbox).

**Equipment**: ***For all courses a laptop computer will be required***. You may be able to borrow one for classes, but you are strongly advised to purchase your own laptop. The University IT services web page (http://www.gla.ac.uk/services/it/) has links to suppliers.

**Seminars and Discussion Groups:** There are weekly seminars on Friday afternoons at 4 pm in which PhD students and postdocs present informal half-hour talks (there are two talks each week). There is also an Institute Seminar series on Wednesdays. You are encouraged to attend these to find out what type of research is going on in the department. There are also various discussion groups on particular research themes that will be running, as well as a postgraduate journal club that we'll keep you informed about. Part of your portfolio for the key research skills module will be to keep a logbook of discussion groups and seminars attended that includes a critical analysis of the papers discussed or presentations provided. The institute also has a podcast and a Blog ("Naturally Speaking") that highlight particular research areas or topics related to "surviving" in an academic environment (http://naturallyspeakingpodcast.wordpress.com/). To keep up to date on seminars and other events, you should subscribe to the Institute Google calendar (see below). You can also follow the institute on Twitter and join Facebook (http://www.gla.ac.uk/researchinstitutes/bahcm/about/socialmedia/).

**Social Events**: An important part of postgraduate programmes is socialisation with other students, postdocs and staff members. There is a social room on the ground floor of the Graham Kerr Building where people can go for coffee in the mornings (most people go between 10:30 and 11:30) and those who bring their lunch can eat together (most people go between 12:30 and 1:30 pm). There are a number of cafeterias on campus and a lot of restaurants close to the University if you prefer to buy your lunch. Some people also have a tea break in the afternoon (usually between 3 and 4 pm).

On Fridays, there is a tradition of going to pubs after the seminars. A facebook site (https://www.facebook.com/groups/217683908272058/) has been set up to make it easier for people to find out where everyone will be going. On Wednesday evenings sometimes the seminar speakers will stay and students are welcome and encouraged to meet them under a relaxed setting by going to a pub and/or restaurant.

**Schedules:** Although the class schedules will be output from MyCampus, there might be slight scheduling changes throughout the term so you should check frequently or use the mobile timetable app. You should also check your email for notifications sent through MOODLE. There is also Google calendar for the Institute (BAHCM), which will tell you about other events (e.g. seminars) that might be of interest. You will be added to the Institute's email circulation list so you will also receive weekly notices of the events scheduled for the week, on Mondays. https://www.google.com/calendar/embed?src=qfqgdt1ontekida2ruamh3152g%40group.calendar.google.com&ctz=Europe/London%20

**Feedback Sessions**: We will ask for two student reps from each of the programmes, who will participate in regular student-staff liason meetings to enable a transparent flow of information. The purpose of these meetings will be to discuss any issues arising in an informal setting. We always welcome and value your input so you also should feel free to contact us with problems or suggestions outside of these times and to communicate with one another. There will also be feedback surveys to fill out; we use this information to continue to improve the courses so please be honest about the parts you particularly like, as well as those that you think could be improved.

**Facilities:** IBAHCM is divided between the Graham Kerr Building (GK) on the main (Gilmorehill campus) and the Garscube Estate in Anniesland, where the Veterinary School and Centre for Virology Research are located. The GK has a computer cluster just off of the Museum and it will be possible to use the GK Library when it is not booked for classes or discussion groups. If you have classes or are doing research on the Garscube campus, it is about 3 miles from the main campus. Bus route 59/118 (First in Glasgow) goes from Great Western Road (stops opposite the Botanic Gardens) to the Switchback road, which is the side of the estate where the vet school is located. There are also buses along Maryhill road that go to the other side of the Garscube estate, where the sports complex is located. It takes about 45-60 minutes to walk to Garscube from the main Gilmorehill campus. Taxis cost about £7-9. There is also a nice cycle route along the river Kelvin and the canal:
http://www.cycle-route.com/routes/Glasgow_Centre_to_Clydebank_Loop-Cycle-Route-1623.html.

*Other Facilities*

- The Scottish Centre for Ecology and the Natural Environment (SCENE) is the foremost field station in Scotland for teaching, training and research in ecology and environmental sciences
- The University Marine Biological Station, Millport; The National Facility for Marine Biology Fieldwork Teaching. An institute of the University of London, managed in association with the University of Glasgow
- Cochno Estate (University Farm) - Large Animal Clinical Sciences and Public Health
- Manu Learning Centre Amazonian research station in southeaster Peru. An arrangement has been made with the local partners (Crees) to allow master's project students to base their projects there.

**Athena SWAN**

The Institute of Biodiversity, Animal Health and Comparative Medicine is the recipient of an Athena SWAN Departmental Silver Award. This award establishes our commitment to gender equality for recruitment, career development and progression of our staff and students, and sets out our future plans to continue developing this culture. Please see weblink for further details: http://www.gla.ac.uk/researchinstitutes/bahcm/institute/athenaswan/

**Regulations:**
Regulations governing postgraduate programmes within the College of MVLS can be accessed on the University calendar: http://www.gla.ac.uk/services/senateoffice/policies/calendar/calendar2017-18/mvls/#/. Details will also be provided in your programme-specific handbook, which will be available on the MOODLE site for your programme. You should carefully read through these.

**Library:**
The main university library is open at 0715-0200 hrs, seven days a week. For further information please visit http://www.gla.ac.uk/services/library/usingthelibrary/

**Library - Group Study Rooms:** If you want to get together to work through problem sets or writing assignments together, there are a number of group study rooms in the main Library that can be booked. Advance booking isn't necessary, but is advisable as rooms are busy and groups with bookings take priority. In addition to the rooms, groups can also meet at the tables and booths, in the Social Learning Space and Cafe on level 3, for group work and discussion.

- for up to 6 people: Room 4A, 8A, 6A, 9A
- for up to 8 people: Room 4D or 4E
- for up to 10 people: Room 4B or 4C

The rooms have electricity points, are wireless enabled and have whiteboards. Rooms 4A, 4B, 4C, 4E, 6A, 8A and 9A are furnished with tables and chairs, and room 4D is furnished with soft tub chairs, each with a small writing tablet attached.
*Bookings:* Rooms can be booked up to two weeks in advance by visiting the Welcome Desk on Level 2. Please have your student card handy as you will need this to make the booking. You will be given a receipt with details of your booking date and time, and room number. Hold on to this as it is your proof of booking, if the room is already occupied when you turn up. A booking period can last from 1 to 3 hours with a maximum of 3 hours per day per group.

**Studying at Glasgow**: Your online programme-specific handbooks will also have links to useful University services to support you in your studies. This includes not only academic-related support, but also assistance for international students and psychological and counselling services. Postgraduate training can be stressful so if you are feeling overwhelmed, please talk to your programme coordinator or contact the University support team.
http://www.gla.ac.uk/myglasgow/students/new/

**Guidelines for PhD Applications**

*Are you considering a PhD after your Masters degree?*

Many students wish to use the Masters degree as a preparation for going on to a higher research degree like a PhD. The Masters can prepare you academically for a PhD in a range of areas and our programmes have a good success rate for students proceeding directly to a PhD. A PhD in Glasgow and most UK universities is based on individual supervision by an established researcher/senior academic and a significant period of individual original research by the student.
Useful information about opportunities for PhDs and other higher degrees in Glasgow is available from the College Graduate School and at http://www.gla.ac.uk/research/opportunities/
However, in most cases, what is required is individual contact by prospective students of potential supervisors or Heads of research groups/Postgraduate Conveners. You would be advised to begin this process of seeking PhD opportunities early in your Masters year (usually by December/January) if you wish to start the PhD the next October.

For those interested in applying for PhD positions we will hold an optional information and Q&A session in early November.

A limited number of University scholarships (and part scholarships) are available each year. They are identified on the web pages below together with information about other competitive awards and other opportunities. These are advertised in October/November each year with closing dates in January/February. Please see the web sites below for further information or discuss PhD opportunities with your academic adviser or other senior staff members.
http://www.gla.ac.uk/services/postgraduateresearch/scholarships/

Glasgow and other universities advertise externally at: Find a PhD http://www.findaphd.com/

## PLAGIARISM STATEMENT

Plagiarism is considered to be cheating and an offence against the University. Make sure that you read the following carefully so that you know what we consider to be plagiarism. **This may be different from what you have experienced previously.**

### *What constitutes plagiarism?*

- The use of someone else's sentences or paragraphs without the use of quotation marks, or copying of material from your own previous work (which constitutes auto-plagiarism / self-plagiarism)
- Generating paraphrases of another author's sentences or paragraphs (even if you cite the source you are still plagiarising by using their wording or overall sentence structure without quotation marks)
- The presentation of the work or ideas of others as your own (eg, other students' work, or published works in the scientific literature, or text from the internet)
- Theft of scholarship, in which you transpose citations from someone else's work into your own work, without actually reading and evaluating the cited work (you must have read each source that you cite)

### *Why is plagiarism bad?*

- The need to plagiarize demonstrates that you did not understand the material well enough to write it out in your own words
- Plagiarism indicates that you did not think very much about what you were writing
- Plagiarism is cheating, and an academic offence - see the information at: http://www.gla.ac.uk/services/senateoffice/academic/plagiarism/

### *Plagiarism in coursework*

Any wholly or partially plagiarised coursework, including dissertations, will receive substantially reduced marks, usually zero, and there may be no opportunity permitted to resubmit the work. This is not an empty threat - in the past few years, large numbers of Glasgow University students (including several from postgraduate programmes in Medicine) have been referred to the Senate Assessors for Student Conduct because they have plagiarised coursework.

**Note that at postgraduate level <u>all</u> cases of plagiarism must be referred to the Senate Assessors and the penalties can be severe, even for a first offence; additionally a note in relation to the offence will become part of the university record for that student.**
**The penalty imposed for plagiarism identified in a student's work may lead to such a low grade for that Course that, even if the student passes all other Courses that make up their Programme, they will not be able to meet the criteria for progression to the Dissertation, and thus be unable to complete their MSc.**

### *Good scientific writing (and avoiding plagiarism)*

We want to see coursework that is written **by you** and **in your own words,** demonstrating **your opinions and ideas** where appropriate, in addition to demonstrating **your understanding** of other authors' work. If you are not sure about any aspect of plagiarism please discuss it with the course coordinators.

### URKUND

The University of Glasgow uses URKUND software to detect plagiarism in coursework. URKUND can also help you to learn more about plagiarism and look for potential plagiarism in your own work before submitting your work for assessment.

# Appendix 1: Grading Scheme for MRes/MSc

| Primary Grade | Gloss | Secondary Band | Aggregation Score | Descriptor | Class |
|---|---|---|---|---|---|
| A | Excellent | A1<br>A2<br>A3<br>A4<br>A5 | 22<br>21<br>20<br>19<br>18 | Outstanding in every way and demonstrating a high level of consistency, with all work in suitable scientific format. Project work demonstrates independence of thought and all aspects done to a thoroughly professional standard with data quality and analysis in all essentials of a level expected of refereed publications. No essential information or analysis missed. Other areas of work show evidence of extensive critical reading and the ability to synthesis the important aspects into a comprehensive and coherent text. Work contains only unimportant (trivial) factual or grammatical errors. Both quantity and quality of work excellent within the time constraints. Conclusions are placed in suitable context as well as summarising detail. Truly exceptional work indicating that the student would be an excellent candidate for progression to a research degree. | DISTINCTION |
| B | Very Good | B1<br>B2<br>B3 | 17<br>16<br>15 | Completely sound work in quantity and quality but with some relatively minor deficiencies in presentation, practical work (if applicable), data analysis or review of existing knowledge. Good presentation and structure is normally to be expected of all work, but there may be some minor deficiencies in presentation or content. Quality and preparation very good; based on more than factual presentation and demonstrating analytical ability. Project work (including necessary time for background reading, design of work, data collection and analysis and writing up) very good but with inconsistencies. Little irrelevant material. Of a level suitable for progression to a research degree. | MERIT |
| C | Good | C1<br>C2<br>C3 | 14<br>13<br>12 | At this band, work ranges from satisfactory to good, at a level that we would expect from the majority of Masters students. Work may show some inconsistencies in presentation, organisation, analysis, understanding of concepts, and review of literature. There should be evidence of adequate effort. C3 is the lowest secondary band acceptable for progression to the final 60 credits of the course or, after 180 credits, worthy of the award of the Higher Degree MSc. | PASS |
| D | Satisfactory | D1 | 11 | Completely adequate for the award of a Diploma, but not secure | DIPLOMA PASS |

| | | | | | |
|---|---|---|---|---|---|
| | for Diploma only | D2<br>D3 | 10<br>9 | enough for a Higher Degree. Even if showing some elements of logical review, there are significant omissions, or inclusion of irrelevant material. D3 is the lowest secondary band acceptable for award of a Diploma, subject to the detailed marking scheme of the individual course. | |
| E | Weak | E1<br>E2<br>E3 | 8<br>7<br>6 | An inadequate performance for either Diploma or Masters level. Failed to provide a satisfactory review of the state of knowledge of the subject matter. Failed to design suitable work to add to the understanding of the topic. Failed to present and analyse relevant data, and failed to discuss the results in a coherent way in relation to relevant published literature. A student given this grade will normally be refused permission to continue in the course. | FAIL |
| F | Poor | F1<br>F2<br>F3 | 5<br>4<br>3 | Mostly inadequate performance. Some effort is evident but the work does not represent coherence. Any student given this grade will be refused permission to continue in the course. | FAIL |
| G | Very poor | G1<br>G2 | 2<br>1 | Totally inadequate. No more than a token effort to present work. Any student given this grade will be refused permission to continue on the course. | FAIL |
| H | | H | 0 | Normally indicates failure to deliver any required work. | |

Notes: Students electing to take a Diploma are subject to the full range of grading; i.e. may be awarded Pass, Merit or Distinction