MRes Tropical Forest Ecology

COURSE GUIDE 2018-19

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1 COURSE OVERVIEW

Welcome to Imperial College London and the MRes in Tropical Forest Ecology.

This course reflects the research interests and activities of a growing number of Imperial staff who work in the tropics, both at Silwood Park and from other departments at the South Kensington campus.

The aim of the course is to teach you how to do excellent science in tropical forest environments, and the emphasis is on learning the skills to become an independent researcher and scientist. We will provide you with high-level research training in the latest developments in tropical forest ecology, covering the physical and biological aspects of the forest ecosystem, and give you the opportunity to explore those developments and apply your skills in your own research project.

The taught component of the course provides an introduction to a range of disciplines that are relevant to tropical forest ecology through lectures, practicals and field courses. The research project provides you with the opportunity to develop a long piece of independent research either in collaboration with staff within the college or with other institutions in the UK or internationally.

1.1 COURSE ADMINISTRATION

1.1.1 KEY PEOPLE AND CONTACTS

Course Director	Dr. Rob Ewers (ext. 42223, r.ewers@imperial.ac.uk)
Project organiser/liaison	Mrs. Olivia Daniel (olivia.daniel08@imperial.ac.uk)
Postgraduate Administrator	Mrs. Amanda Ellis (ext. 42251, amanda.ellis@imperial.ac.uk)
Postgraduate Tutor	Dr. Julia Schroeder (julia.schroeder@imperial.ac.uk)
Course Representative	Up to you (see note below)

Each Masters course has one or more Course Representatives to represent the student body at Student-Staff meetings and act as a first point of contact if and when issues arise that need to be discussed with the Course Directors. You will be asked in the first week of term to decide among yourselves who will represent you.

1.1.2 COURSE DATES AND TIMETABLES

The course runs for one year, beginning in the first Monday of October and ending in the last week of September the following year. The taught components of the courses (lectures, practicals and workshops) typically start at 10.00 and finish by 17.00 but this will vary from week to week – details for each week are provided on an electronic timetable. Wednesday afternoon is normally, but not always, reserved for sports, leisure activities or private study.

In addition to the formal taught and research components of the programme, there is a research seminar series that runs at Silwood Park. It runs on Thursdays 13.00 and seminars are typically

presented by visiting academics. You are expected to attend these seminar series – they will expose you to a much greater breadth of relevant topics and potential project ideas than we can do within the course itself.

1.1.3 COURSE MATERIALS

Teaching and other course materials are provided using the online Blackboard virtual learning environment: http://bb.imperial.ac.uk. Paper copies of lecture notes and hand-outs are not normally provided but you will receive printing credit for use during the course on your security card.

It is expected that reading and coursework will require additional study in your own time. During research projects, you are expected to work full time on the project, including Wednesday afternoons. Some projects may require out-of-hours work.

The full programme specification is available on Blackboard and from the course website below, but the following sections provide a summary of the programme and assessment structure.

- Course website: http://www.imperial.ac.uk/life-sciences/postgraduate/masters-courses/mres-in-tropical-forest-ecology/

1.2 COURSE AIMS

The aim of this course is to provide you:

- A thorough understanding of a range of theoretical and practical aspects of interdisciplinary research in tropical forest ecology
- A thorough understanding of a range of modern field techniques used in tropical forest ecology
- An ability to design an appropriate research plan to answer a particular science question
- An ability to generate and interpret ecological data of various kinds
- A sophisticated approach to designing scientific data collection to test ecological theory
- A broad range of transferable skills

The course aims will be achieved by providing:

- A course of lectures, seminars and practicals within distinct modules linked to cutting edge academic research and research groups in Silwood Park and collaborator institutions elsewhere.
- A three week field course providing practical experience in the taxonomic identification of plants, vertebrates and invertebrates, and hands-on experience in designing, collecting and managing meteorological, hydrological, biogeochemical and biodiversity field data.
- A 30 week research project on an advanced and original topic in tropical forest ecology, supervised by academics in Silwood Park or in collaboration with researchers at external institutions.

1.3 LEARNING OUTCOMES

You will emerge from this course with knowledge and understanding of:

- The ecosystem processes operating in tropical forests.
- Key taxa involved in tropical forest ecosystem processes.
- Techniques in tropical forest ecology; the main tools for addressing ecological questions in tropical forest ecology, from data collection to statistical analysis and mathematical modelling.
- Key issues in tropical forest ecology, covering the fundamental underlying science and key knowledge gaps about ecological processes.
- Research techniques, including information retrieval, experimental design and statistics, modelling, field sampling, field safety, analysis and presentation of results.
- Transferable skills including problem definition, project design, teamwork, written, poster and oral reports, scientific publications.

1.4 TRANSFERABLE SKILLS

A central objective of the MRes Tropical Forest Ecology is to prepare you for PhD studies and/or a career in tropical forest ecology by teaching a suite of transferable skills. You will learn a unique set of transferable skills that are relevant to conducting research across the broad discipline of ecology, be that in a tropical forest or another biome.

Your skill set will include practical skills such as how to:

- Identify key taxa of plants, vertebrates and invertebrates
- Plan and safely execute field-based data collection
- Field first aid
- Use computational tools and packages
- Apply statistical and modelling skills to understand and interpret quantitative analyses
- Analyse scientific results and determine their strength and validity
- Write concisely and effectively for a scientific and a lay audience
- Use the scientific literature effectively

You will also emerge from the course with a suite of professional skills including how to:

- Manage a project: decision making, problem definition, project design and evaluation, risk management, teamwork and coordination
- Integrate and evaluate information from a variety of sources
- Transfer techniques and solutions from one discipline to another

- Use Information and Communications Technology
- Manage resources and time

1.5 COURSE ACTIVITIES AND ASSESSMENT

1.5.1 COURSE STRUCTURE

You must attend the first 11 weeks of taught modules in the Autumn Term, and the first four weeks of taught modules and field course at the start of the Winter Term. Attendance at department seminars is compulsory when based at Silwood. You may be able to attend additional taught modules that have relevance to your project and that are taught in other courses, but your ability to attend these, and research seminars, will depend on the location of your research project – many students will be working off-site and that will prevent them from attending.

You will complete a single research project running between February and September. This represents the majority of the course and the majority of your assessment.

1.5.2 COURSE ASSESSMENT

- *Coursework*: 40 % of the final mark, including practical assignment (5 %), grant proposal (10 %), risk assessment (5 %), and three practical write ups during the field course (each worth 6.67 %).
- *Research project*: 60 % of the final mark, including thesis (36 %), supervisor's report (6 %), lay summary (3 %), presentation (3 %) and final viva (12 %).

There are no written examinations.

1.5.3 ASSESSMENT TIMETABLE:

Time	Date	Assessment
17:00	19 Oct 2018	Practical assignment
17:00	23 Nov 2018	Risk Assessment
17:00	30 Nov 2018	Grant proposal
20:00	11 Feb 2019	Field course write-up 1
20:00	18 Feb 2019	Field course write-up 2
20:00	25 Feb 2019	Field course write-up 3
17:00	5 Aug 2019	Science communication
13:00	29 Aug 2019	Research project deadline
09:00 – 17:00	10-12 Sep 2019	Research project presentations
09:00 – 17:00	16-18 Sep 2019	Research project vivas

1.5.4 COURSE PRIZE

This course awards the **Biruté Mary Galdikas Prize in Tropical Ecology** to the top student on the course. It is decided on strictly numeric criteria: it is awarded to the student with the top mark across the whole course (coursework and project combined).

The prize is named after Prof. Biruté Galdikas, a pioneering primatology researcher who emerged from the same research group as Dian Fossey and Jane Goodall. Prof. Galdikas has a long history of working in SE Asia on forest ecology and orang-utans as a scientist, has engaged in direct, hands-on conservation actions, and her pioneering work is held in high esteem in academic circles.

1.6 EXTERNAL VIVAS AND EXAMINERS

All students will undertake an additional 30 minute viva with one of the External Examiners, to be held between the research project viva and the final meeting of the Board of Examiners. Although this is mandatory for all students, it *does not* form part of your assessment. These vivas form a part of both the exam moderation process and oversight of the course by the External Examiners.

Time	Date	Activity
09:00 – 17:00	19-20 Sep 2019	External vivas

We have either one or two external examiners depending on the number of students. For this year, the external examiner(s) will be:

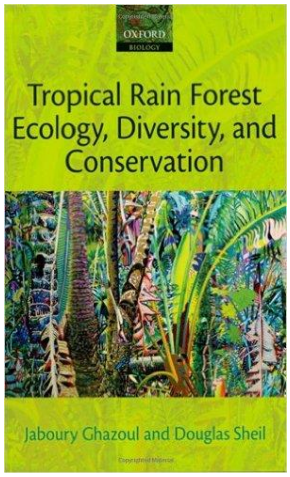
Prof. Susan Page	University of Leicester
TBC	

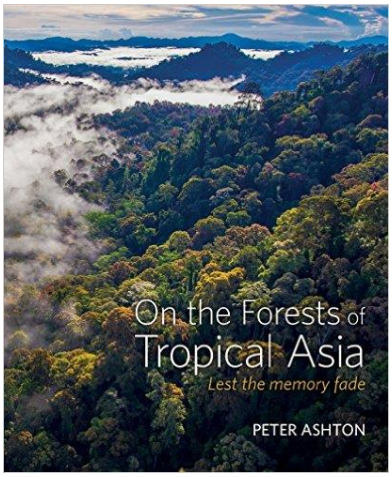
1.7 RECOMMENDED READING

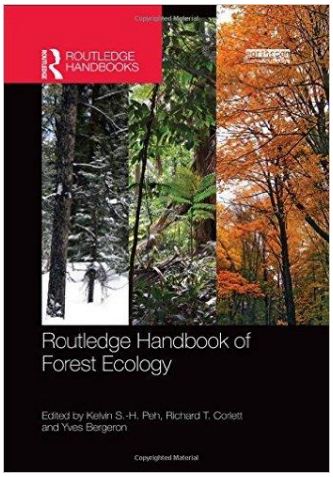
These three books give an excellent overview of the origins of, patterns among, and ecological processes happening inside, tropical forest. Ghazoul and Sheil is broader in geographic scope, tackling tropical biomes around the world, whereas Ashton's monograph reflects his 50 years of experience working specifically in the tropics of South East Asia. Peh et al. are not focussed on tropical forests, but have excellent breadth in their coverage of ecosystem processes relevant to forests and that aren't covered in the other two books.

- Ghazoul and Sheil (2010) Tropical Rain Forest Ecology, Diversity, and Conservation. Oxford University Press.
- Ashton (2014) On the Forests of Tropical Asia: Lest the memory fade. Kew.
- Peh, Corlett and Bergeron (2015) Routledge Handbook of Forest Ecology. Routledge.

The individual taught modules that you will attend may also have required or recommended reading lists that are in addition to the texts listed above. You will find any reading lists described in the Taught Module Descriptions in this Course Handbook.







2 TAUGHT COURSE DETAILS, TIMETABLES AND MODULE DESCRIPTIONS

2.1 OUTLINE TIMETABLE

The full course timetable is available through Imperial's Timetable Calendar, which you can access here: http://www.imperial.ac.uk/timetabling/view/icalendar. Below is a summary timetable giving the basic structure of the course in week-long blocks.

Week commencing	Module	Module convenor
01-Oct-18	Course induction	Robert Ewers
08-Oct-18	Field Ecology Skills	Catalina Estrada
15-Oct-18	Biological computing in R	Samraat Pawar
22-Oct-18	Statistics in R	Julia Schroeder
29-Oct-18	Geographic Information Systems (GIS)	Robert Ewers
05-Nov-18	Genomics and bioinformatics	TBC
12-Nov-18	Biogeochemistry	Terhi Riutta
19-Nov-18	Planning research projects	Robert Ewers
26-Nov-18	Energy, water and plants	Colin Prentice
03-Dec-18	Biodiversity	Robert Ewers
10-Dec-18	Reading week	NA
07-Jan-19	Field course planning	Robert Ewers
14-Jan-19	Generalised linear models	Julia Schroeder
21-Jan-19	Advanced statistics	TBC
28-Jan-19	Project preparation	NA
04-Feb-19	Tropical field course	Robert Ewers

2.2 TAUGHT MODULE DESCRIPTIONS

2.2.1 INTRODUCTION TO MRES TROPICAL FOREST ECOLOGY

Description:

The induction and welcome programme for all of the MSc and MRes courses at Silwood Park runs in the first week of term, alongside the first module of the taught course. Much of this week is shared with other MSc and MRes courses at Silwood, and you will receive transferrable skills training from the Graduate School. For course specific material, you will start the course by examining why tropical forests are important and their key processes.

Recommended reading:

- Evans et al. (2012) Predictive ecology: systems approaches. Philosophical Transactions of the Royal Society B: Biological Sciences 367:163-169.

2.2.2 FIELD ECOLOGY SKILLS

Description:

The aim of this module is to allow you to become familiar with a wide range of basic techniques used to assess an ecosystem's productivity and describe its animal and plant populations and communities. The course will take place at Silwood Park. Our campus, with about 100 ha of land, has several types of natural habitats including grassland, scrubland and woodlands. It is also an active place of field research, hosting multiple long-term experiments and sites for global studies. Please wear the suitable clothes and footwear for outdoor activities and according with the weather forecast. Long trousers, waterproof boots, waterproof jacket, hat, sun cream and water are recommended.

Aims:

- Learn general field sampling techniques for plants, insects and other invertebrates
- Learn to plan field surveys to describe and compare natural communities
- Learn basic taxonomic sorting and identification of common organisms in Silwood Park grounds (insects, plants, aquatic invertebrates)
- Learn to estimate an ecosystem productivity
- Get familiar with Silwood Park ecosystems, and field experiments

Recommended reading:

This is a good reference book for designing and planning ecological work aiming to survey populations and communities in a variety of habitats:

- Henderson PA & Southwood TRE (2016) Ecological Methods. Fourth Edition. Jhon Wiley & Sons, Inc. 632p.

This book chapter contains the history of Silwood Park grounds, ecosystems and research:

- Crawley MJ (2005) Silwood Park and its history. In: Crawley MJ, ed. The Flora of Berkshire. Harpenden, Hertfordshire, UK: Brambleby Books, 215–253.

Check this link at Imperial College website to know more about Silwood Park long-term field studies: http://www.imperial.ac.uk/visit/campuses/silwood-park/research/silwood-lte/

2.2.3 BIOLOGICAL COMPUTING IN R

Description:

In this module, you will learn how to use this freely available statistical software with strong programming capabilities. R has become tremendously popular in Biology due to several factors: (i) many packages are available to perform all sorts of statistical and mathematical analysis, (ii) it can produce beautiful graphics, and (iii) it has a very good support for matrix-algebra (you might not know it, but you use it!). So with R, you have an expanded and versatile suite of biological computing tools at your fingertips, especially for automating statistical analysis and the generation of figures. Therefore, R should become an indispensable component of your biological research workflow.

Aims:

- Learn how to use R for data exploration
- Learn how to use R for data visualization and producing elegant, intuitive, and publication quality graphics.
- Learn R data types \& structures and control flows.
- Learn how to write and debug efficient R scripts and functions.
- Learn how to use R packages.

Recommended reading:

The Use R! series (the yellow books) by Springer are really good. In particular, consider:

- Zuur et al. (2009) A Beginner's Guide to R. Springer.
- Albert and Rizzo. (2012) R by Example. Springer
- Borcard et al. 2011. Numerical Ecology With R. Springer
- Hadley. (2009) ggplot2. Springer
- Stevens. (2009) A Primer of Ecology with R. Springer
- Ritz and Streibig. (2008) Nonlinear Regression with R. Springer
- Paradis. (2012) Analysis of Phylogenetics and Evolution with R. Springer

For more focus on dynamical models:

- Soetaert and Herman. (2009) A practical guide to ecological modelling: using R as a simulation platform. Springer

There are excellent websites you should also check out:

- cran (containing all sorts of guides and manuals (www.statmethods.net)
- R graph gallery (http://archive.today/gallery.r-enthusiasts.com)
- R programming wikibook (http://en.wikibooks.org/wiki/R_Programming)

2.2.4 STATISTICS IN R

Description:

In this module we will build upon the introduction to R you received in "Biological computing in R" and review a core set of statistical methods that are of wide use in research projects. These statistical tests will form the basis for any data analysis you will do in the future. This module is shared with most courses and runs in two blocks A and B like the previous module.

Aims:

We will cover:

1. The difference between response and explanatory variables and between ordinal, categorical and continuous variables
2. The underlying structure of statistical testing using both parametric and non-parametric approaches
3. Tests for assessing differences between samples and correlation between samples
4. Analysis of categorical data
5. Fitting and assessing linear models of continuous response variables

Recommended reading:

There are a wide range of introductory books for R. For this week, the following are good introductory and reference texts that are available in Silwood library and as an e-book through Imperial:

- Crawley (2012) Statistics: An Introduction Using R. John Wiley.
- Beckerman and Petchey (2012) Getting Started with R: An introduction for biologists. Oxford University Press.

A more general reference text for R:

- Crawley (2012) The R Book. John Wiley.

2.2.5 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Description:

This week will teach key skills in using and handling GIS data, along with basic remote sensing to generate GIS data and the use of GIS data in a range of applications. We will use the open source GIS program QGIS (http://www.qgis.org/). We will look at creating and georeferencing both vector and raster data and how to use GIS tools to create a workflow to carry out simple analyses.

Aims:

At the end of this module you should have:

1. Familiarity with a range of GIS data types
2. Confidence in obtaining and handling GIS data
3. Familiarity with open source tools for GIS
4. Practical experience in applying GIS to ecological questions

Recommended reading:

- Longley (2011) Geographical information systems and science. Wiley.
- Rosa et al. (2013) Predictive modelling of contagious deforestation in the Brazilian Amazon. PLoS ONE 8:e77231.
- Van Sickle, G (2010) Basic GIS coordinates. CRC Press.

2.2.6 GENOMICS AND BIOINFORMATICS

Description:

Genetic data contain information about who organisms are, their relationships to other organisms, their population histories, and their histories of adaptation. Thus, genetic data and genetic techniques are central to addressing many questions in evolution, ecology and conservation. New technologies allow for genetic characterisation at the genomic level, and these data allow for an understanding of population processes at resolutions not possible in the past. The goal of this module is to introduce students to the types of questions that can be addressed with genomic data, and the methodologies that are available for answering these questions. Learning will be accomplished through a mix of lectures, computer practicals and group discussions.

Aims:

This module provides an understanding of:

1. Genomic data collection methods, and how to choose the data collection technique most appropriate to your question
2. The wealth of data available to biologists in public genomic databases
3. How genetic structure develops within and between populations, how to characterise it, and how to interpret the results of common analyses such as STRUCTURE and PCA
4. How demographic history affects genomic variation, and how to infer past population expansions and contractions from genomic data
5. How migration affects genomic variation, and how patterns of gene flow can be inferred from genomic data
6. How natural selection affects genomic variation, and how selection can be identified from genomic data
7. How phylogenetic relationships among species can be inferred, and what this information can tell us about evolution and conservation efforts

2.2.7 BIOGEOCHEMISTRY

Description:

This module will give an introduction to biogeochemical cycles at the global and ecosystem scales, with a particular focus on the carbon cycle.

Aims:

This module will provide you with an understanding of:

1. The main biotic and abiotic drivers of the biogeochemical cycles
2. The impact of the anthropogenic perturbation on the biogeochemical cycles

Recommended reading:

- Malhi, et al. 2014. The productivity, metabolism and carbon cycle of two lowland tropical forest plots in south-western Amazonia, Peru. Plant Ecology & Diversity 7:85-105.
- Le Quéré et al. 2015. Global Carbon Budget 2015. Earth Syst. Sci. Data 7:349-396.

2.2.8 PLANNING RESEARCH PROJECTS

Description:

Adequate planning preparation is a key step towards successfully conducting field work projects in an international setting. This module will walk you through the steps involved in planning a project, beginning with how you develop and present a project idea, how you budget for the field costs, how you identify when you need animal ethics approval, and how you go about conducting risk assessments.

Aims:

At the end of this module, you should:

1. Be aware of what is required in a project proposal and gain experience in preparing a proposal
2. Develop appropriate methods for collecting and managing field data
3. Be able to accurately budget for field work activities
4. Be aware of health and safety requirements in field work
5. Be aware of animal ethics legislation and requirements in relation to field work

2.2.9 ENERGY, WATER AND PLANTS

Description:

This module aims to convey knowledge of the key principles of environmental physics, climatology and hydrology as they influence and interact with terrestrial ecosystems. Material covered includes the standard model for photosynthesis and the nature of the coupling between energy, water and CO2 exchanges at the scales from leaf to catchment. The module will begin by introducing students to the fundamentals of the Earth's climate system and how it generates the observed climate zones; proceed to consider processes by which soils, climate and plants interact; and end by showing how these processes bring about the observed spatial distribution of primary production and vegetation. A class exercise will serve the function of "bringing to life" quantitative approaches to estimating fluxes of energy, water and CO2 between ecosystems and the atmosphere through hands-on small-group work.

Aims:

At the end of this module, you should:

1. Understand the standard model for photosynthesis
2. Understand the nature of the coupling between energy, water and CO2 exchange
3. Understand how to estimate fluxes of energy, water and CO2

Recommended reading:

- HG Jones (2013) Plants and Microclimate, 3rd edition, Cambridge University Press.
- Barry, R.G. & Chorley R.J. Atmosphere, weather & climate, Routledge, 9th ed., 2009
- Wohl, E., et al. (2012). The hydrology of the humid tropics. Nature Climate Change, 2(9), 655–662.

2.2.10 BIODIVERSITY

There are hundreds of different ways to measure biodiversity, and some of them are more right than others. This module will provide the background knowledge and practical skills needed to quantify and compare the biodiversity of different samples and sites.

Aims:

On completing this module, you should have:

- Understanding how a range of biodiversity indices are calculated
- Experience in quantifying and comparing the diversity of samples

Recommended reading:

- Magurran, A. E., and B. J. McGill, editors. 2011. Biological Diversity: Frontiers in Measurement and Assessment. Oxford University Press, Oxford, UK.

2.2.11 FIELD COURSE PLANNING

Adequate planning preparation is a key step towards successfully conducting field work projects in an international setting. This module will take you through three mini-project planning case studies. You will work as a group to examine and summarise the state of knowledge on an ecological topic, use that summary to guide the development of a question and a falsifiable hypothesis, and plan the field and statistical methods needed to test the hypothesis. These plans will then be implemented during the field course.

Aims:

On completing this module, you should be able to:

- Summarise state of scientific knowledge on ecological topics
- Identify gaps in scientific knowledge
- Formulate falsifiable hypotheses to test ecological questions
- Design appropriate field sampling and experimental procedures
- Work as a group member to share tasks and information

2.2.12 GENERALISED LINEAR MODELS

This module builds on the basic linear models introduced in the module ‘Statistics in R’ to introduce some key concepts that allow linear models to be applied to a wider range of research problems. This will include using generalised linear models to handle count and binomial data - where residuals are not expected to follow a normal distribution - and the use of structured models to allow for non-independence in data and to control for known sources of variation in data.

Aims:

At the end of this module, you should:

- Understand and apply generalised linear models for the analysis of count and binomial data
- Understand and apply structured models to allow for non-independence in data

2.2.13 ADVANCED STATISTICS

This module will present a series of single day workshops by members of staff on the use of the particular statistical techniques used in their research. The week aims to build familiarity with more complex statistics and with using R and to introduce a wider range of statistical methods that may be of use in projects and in later research. Each day will introduce the research need for the methods, describe how the method is applied and then use research data to learn the use of the method in practice.

Aims:

At the end of this module, you should:

- Understand and apply a diverse suite of advanced statistical techniques to ecological data
- Understand and apply non-linear least squares fitting methods
- Understand and apply ordination methods to ecological community data
- Understand and apply multivariate statistical methods to ecological data

2.2.14 TROPICAL FIELD COURSE

Description:

This field course will embed you within the research environment of the Stability of Altered Forest Ecosystems (SAFE) Project (www.safeproject.net). It will provide you with hands-on experience in:

- Generating hypotheses
- Experimental design
- Field data collection and management
- Field taxonomy
- Field first aid, health and safety

The course will be structured around a series of two to four day group projects. For each project, the class will: discuss a research question with a researcher currently working at SAFE; develop that question into a testable hypothesis; design the collection of field data to test that hypothesis; collect the data over a period of several days; and collate the field data and metadata into a format appropriate for inclusion in the SAFE Project online database. You will then be expected to conduct basic analyses of the data and present your findings in short write-ups.

Location:

The field course will be based at the SAFE Project field site and at the Maliau Basin Field Centre. Both are located in Sabah, Malaysia. The nearest city is Tawau, which is about a two and a half and four and a half hour drive from the airport to SAFE and MBFC respectively.

Maliau Basin is where the SAFE Project has its primary forest control sites, but the actual SAFE Project fragmentation experiment is situated midway between Tawau and Maliau. We will take several days to visit the experiment, and some projects will be conducted in the logged and fragmented forests there rather than in the primary forests of Maliau.

Recommended reading:

The exact reading you will need will depend on which researchers we interact with in the field, and they will be expected to provide pdfs or hard copies to you out there, but the following two papers give an overview of the SAFE Project and an insight into the breadth of data being collected at the site.

- Ewers et al. (2011) A large-scale forest fragmentation experiment: the Stability of Altered Forest Ecosystems Project. Philosophical Transactions of the Royal Society B 366:3292-3302.
- Ewers et al. (2015) Logging cuts the functional importance of invertebrates in tropical rainforest. Nature Communications 6:6836.

Assessment:

You will be expected to write short accounts of the three field projects conducted during the course. These should be a maximum of three sides of A4 each (double-spaced), and can be either typed or hand-written. The purpose is to give you practical experience and a large set of feedback on basic construction of hypotheses and reporting of scientific and statistical results.

Logistics and costs:

The costs for travelling to and from the UK, and the field course itself, are embedded within the course fee. We will arrange the flights for all students on the course.

Timetable:

Flights to and from Tawau course won't be booked until one or more months after the course starts, which is the date at which we have a finalised course list and when we will begin to have a reasonable idea of which students will be staying on in Sabah to conduct their project work. Because of this, **the exact date on which we leave will not be known until the course is underway**, but we will assemble in Tawau at the beginning of the fifth week of term in the New Year.

There is no pre-set, day-by-day timetable for the field course. Exact activities will depend on a range of factors, including weather conditions, the amount of time needed for particular projects, and the field plans of the researchers we will be working with. As a general outline, however, the plan for the field course is as follows:

Date	Activity
4 Feb 19	Arrive in Tawau
5 Feb 19	Travel to SAFE
6-10 Feb 19	Project 1
11-15 Feb 19	Project 2
16 Feb 19	Transit to Maliau
17 Feb 19	Free day
18-22 Feb 19	Project 3
23 Feb 19	Transit to Tawau
24 Feb 19	Depart Malaysia

3 COURSE SPECIFIC REGULATIONS

3.1 RESEARCH PROPOSALS

The format for this assessment follows what is required by the Maliau Basin Management Committee to conduct research at the SAFE Project. I've chosen this format to save you time: writing it this way means you can use the proposal for submitting to MBMC to obtain research permission without having to make any changes.

You should prepare a proposal that MUST contain the following elements:

- Project Title
- Introduction (max 300 words)
- Objectives (200 words)
- Problem statement (100 words)
- Literature review (500 words)
- Methods (500 words)
- Work schedule/timeline (Gant chart)
- Expected outcomes (300 words)
- References
- Budget (table)
    a. This should have columns for: item, quantity, unit price, total price, source of quotation
    b. It should have a total cost at the bottom
    c. It should indicate project funds available to demonstrate where the money will come from (e.g. course budget; supervisor budget; personal budget)
- Equipment list (table)
    a. This should have columns for: item, quantity, data it will generate

You will need to submit an electronic version on Blackboard, a hard-copy to the teaching office.

3.2 RESEARCH PROJECTS

You will carry out an independent research project leading to a written report (dissertation). The project must have at least one supervisor from the Department of Life Sciences at Imperial College. You can have supervisors from external institutions or other departments at Imperial, but you will still need to have an internal supervisor whose role is to ensure all students obtain consistent levels of supervision throughout their project.

The Silwood Park Campus Student Guidebook contains a considerable amount of information on how you should go about finding a project and supervisor, and how you should structure your approach to successfully completing your project.

3.2.1 A TIMELINE FOR SUBMITTING PROJECT PAPERWORK

It is impossible to work in a foreign country without encountering paperwork; being enrolled on a tropical ecology course does not exempt you from the need to prepare that paperwork. The course is timetabled to give you enough time to get all of the necessary paperwork completed and submitted in advance of leaving the UK for the field course in January. WE ARE UNABLE TO SUBMIT PAPERWORK IN YOUR NAME. It is, therefore, your responsibility to ensure all of the documents you need to have submitted get submitted.

3.2.2 HEALTH AND SAFETY

If your project involves doing fieldwork then you will need to meet Imperial's guidelines for working abroad. College has a streamline process to make this as easy as possible, but you need to give them time to process your application. This is particularly important for the medical side of things – if you will be working somewhere that requires vaccinations, Imperial will provide them for you but you need to leave adequate time to ensure you're able to complete the full course of treatment.

Details of the process can be found here:

- Occupational Health website (vaccines, malaria tablets, etc)
  http://www3.imperial.ac.uk/occhealth/guidanceandadvice/traveladviceandvaccination
  You will need to book an appointment with Occupational Health where they will discuss, and arrange to provide, any vaccinations and prophylactics that you should be taking. Note that they sometimes advise against taking malaria prophylaxis at the field course sites in Maliau Basin and SAFE Project. You should argue with them about this – we have had several cases of malaria at these locations and it is important you take the threat seriously.

- Risk Assessment and Emergency Response Protocol forms can be found here:
  http://www3.imperial.ac.uk/safety/subjects/offsiteworking1/fieldworkriskassessment
  For those of you working at SAFE, we will provide you with examples of both forms that you can more or less copy, depending on what you are working on.

The Risk Assessment itself is formally assessed as part of your coursework, ensuring you get maximum value out of the effort put into developing health and safety protocols for your particular project.

3.2.3 RESEARCH PERMITS

Depending where you end up doing your project, you will almost certainly have to apply for research permits. Most projects by TFE students are conducted in tropical nations, and almost all of those nations will require you to submit applications to do research and, in some cases, to also apply for a research visa. It is incumbent on you to ensure you abide by the laws of the country you are working in.

For context, the steps required to get all the permissions required to conduct research at SAFE takes up quite a large section of the internet – see https://www.safeproject.net/info/steps_to_follow. We will guide you through this process and streamline it to the extent possible, but it remains your responsibility to ensure you have all the appropriate documentation in place before beginning your research.

3.2.4 TIMETABLE

Below is a rough timetable you should work towards to ensure everything is in place in time to start your project. The deadlines here are approximate, and take into account the fact that you will be in Malaysia for January attending the field course. The timetable assumes you will be conducting your research project at SAFE, so you will need to adapt it accordingly if you are working elsewhere.

Date	Item	Details
01 November	Confirm your project	Look at as many project ideas, and talk with as many potential supervisors, as you can before making this decision, but make sure you have decided on a project by now to give yourself plenty of time to prepare.
01 November	Imperial Travel Health Questionnaire	This should leave enough time to complete any courses of vaccinations you require. Make sure you include Malaysia (for the field course) as well as whatever country you will be conducting your project in. http://www3.imperial.ac.uk/occhealth/guidanceandadvice/traveladviceandvaccination/travelclinic
14 November	Register for Imperial travel insurance	Imperial provides travel insurance for your College-related activities abroad, but you must register your trip in advance. https://jfe.qualtrics.com/form/SV_3UwXyDLcMjr6Aex
25 November	Imperial Fieldwork Risk Assessment	This is your assessed Risk Assessment, which will also be submitted to Imperial as part of the process of obtaining permission to work overseas. http://www3.imperial.ac.uk/safety/subjects/offsiteworking1/fieldworkriskassessment It will include Imperial's Offsite work Emergency Response Protocol, which is now embedded into the formal Risk Assessment. http://www3.imperial.ac.uk/safety/subjects/offsiteworking1/fieldworkriskassessment
25 November	Maliau Basin Management Committee (MBMC) Researcher Application Form	Required to conduct research inside the Maliau Basin Conservation Area – a protected area that is where SAFE's control sites are located. Also required before you are able to apply to SaBC for an Access License to conduct research in Sabah. https://www.safeproject.net/info/steps_to_follow
05 December	Project proposal	This is your assessed project proposal, which will also get submitted to Maliau Basin Management Committee as part of your research visa application. You will also need to upload it to the SAFE Project website, where it will be distributed to past and present researchers at SAFE to ensure what you are planning does not interfere with work that is already happening. Once accepted, your proposal will be added to the SAFE website. https://www.safeproject.net/info/steps_to_follow
09 December	Imperial College Ethics Approval	Required if you're working on vertebrates (including conducting social surveys and questionnaires on people). Those of you working on mammals or fish at SAFE will be embedded within a group application under my name, rather than have to do this individually. http://www.imperial.ac.uk/research-ethics-committee/
14 December	SAFE Project Researcher Key Information Form	Goes to the SAFE Project personnel onsite to ensure they have all relevant emergency contact details.

		https://www.safeproject.net/info/steps_to_follow
20 December	Sabah Biodiversity Centre (SaBC) Access License	Most of you that work at SAFE will be embedded within a group application under my name, rather than have to do this individually. http://ww2.sabah.gov.my/sabc/index.php?option=com_content&view=article&id=50&Itemid=58
20 December	Sabah Biodiversity Centre (SaBC) Export License	Only necessary if you plan to export samples out of Malaysia http://ww2.sabah.gov.my/sabc/index.php?option=com_content&view=article&id=95&Itemid=85
01 February	Apply for Visitor Pass Professional Visa	You will need to pick up your approved Access License from SaBC, collect forms from the Immigration Department, fill in those forms, visit and get your Local Collaborator to fill in their sections of the forms, and take them back to the Immigration Department for processing. https://www.safeproject.net/info/steps_to_follow
14 February	Collect Visitor Pass Professional Visa	The visa takes 14 days to be processed before you are able to get the stamp in your passport that confirms your right to conduct research in Sabah.

For those of you working at SAFE, there are a few extra details to keep in mind:

- You have it easy – we have a great deal of experience in this process and will guide you through it as a group step-by-step.
- You must read and follow the instructions from SAFE's website: https://www.safeproject.net/info/steps_to_follow. Just because Dr. Ewers is the Science Director at SAFE and you're working there under his guidance does not mean you can ignore the requirements that apply to everyone using the site.
- MBMC application forms are all done individually, but you will almost certainly apply to SaBC as one member of a group application that will include Dr. Ewers, his postdocs and PhD students, as well as yourself and other MRes and MSc students working at SAFE.
- You will require a Local Collaborator and a letter from the Sabah Forestry Department to apply for MBMC and SaBC licences. We will arrange these for you.