Name: ……. College: ……

Lancaster Environment Centre
Faculty of Science and Technology
Lancaster University

BSc Environmental Science
BSc Earth and Environmental Science
BSc Earth Science with Geography
BSc Environmental Chemistry
MChem Environmental Chemistry

Part 2 Handbook

May, 2009

You will need to refer to and use this handbook throughout Part 2

The information in this booklet is accurate at the time of writing. However it is liable to alterations.

CONTENTS

1. INTRODUCTION

Welcome to Part 2 in the Lancaster Environment Centre (LEC). The LEC runs four Environmental Science (ES) -based degree programmes: Environmental Science, Earth and Environmental Science, Environmental Chemistry, and Earth Science with Geography. The first two are entirely made up of ES-course material (with an ENV mnemonic) but the last two include courses in other disciplines (i.e. chemistry and geography); thus we are able to offer a wide diversity of degree programmes. For brevity, anything that refers to this group of programmes collectively is referred to as Environmental Science.

This handbook provides information on all aspects of the Part 2 of these programmes, including academic content, administrative matters, the rules by which we work, and student welfare. It will be assumed that you have read and understood the content of this handbook.

1.1 Term dates

Academic year 2009/2010

Michaelmas term	2 October 2009 to 11 December 2009
Lent term	8 January 2010 to 19 March 2010
Summer term	16 April 2010 to 25 June 2010

Academic year 2010/2011

Michaelmas term	8 October 2010 to 17 December 2010
Lent term	14 January 2011 to 4 April 2011
Summer term	29 April 2011 to 1 July 2011

Please note that term starts on a Friday. In 2nd year, in particular, there may be exams on these dates, so you should take this into account when planning your holidays. In 3rd year, you may need to be present for a viva towards the end of Summer term (see section 4.3 for details).

1.2 Exam periods

Year 2

Lent Term:	Wk1	Exams for Michaelmas term Year 2 modules
Summer Term:	Wk1	Exams for Lent term Year 2 modules
August		Year 2 resit examinations

Year 3

Summer Term:	Wk3-7	Final examinations

1.3 Other important dates

Below is a summary of key deadlines that you will be expected to meet during Part 2. You will be informed of the specific dates for these deadlines in due course via the ES student notice board.

Year 2

Michaelmas Term:

Wk5	Dissertation information distributed to students
Wk10	Dissertation supervisor selection made by students

Lent Term:

Wk2	Dissertation supervisors allocated
Wk7/8	Year 3 course registration information distributed
Wk10	Submission of dissertation rationale

Summer Term:

Wk1-10	Dissertation work
Wk1/2	First Aid training
Wk3	Confirmation of choice of Year 3 courses
Wk9/10	Provisional results list posted for Year 2
Wk 10	Submission of 1500 dissertation report

Year 3

Michaelmas Term:

Wk1	Submission of one chapter of the dissertation to supervisor
Wk10	Deadline: Submission of final dissertation

Lent Term:

Wk2-6	Dissertation viva

Summer Term:

Wk8	Deadline for submission of all Part 2 coursework to the Teaching Office
Wk9/10	Vivas and posting of provisional degree results

1.4 Email communication

Your Lancaster email address, which includes your name then @lancaster.ac.uk, will be used extensively by us to communicate with you. In addition, **you must use this email address for all email communication with the Department and its members** (replies to messages will not generally be sent to other accounts). **It is essential that you check this account on a daily basis.**

There are also a number of rules that must be followed when communicating on University matters (disciplinary action may ensue if they are breached):

(1) A number of grouped email addresses, known as "mailing lists", are used by the University. They all end with @lists.lancs.ac.uk. **You must not use these lists for non-University reasons, i.e. contacting friends.**

(2) **Be polite and, in particular, do not be offensive**. We prefer you to use proper grammar and punctuation; these are formal communications.

(3) **Do not circulate messages that show the email addresses of multiple recipients, without their permission (you would be breaking the Data Protection Act, 1998).**
(4) **Do not attach files – unless you have been given permission to do so.**

1.5 Points of contact

The **ES Part 2 Teaching Office is located in A507** (Tel: 01524 593968) on the ground floor of the Environmental Science Building. The person in charge of this office is **Mrs Sue Taylor**. Sue is your initial point of contact for all matters related to coursework, timetabling, forms, deadlines, practicals etc. If you cannot get to the Teaching Office, you can email Sue on: sue.taylor@lancaster.ac.uk Sue is very experienced and helpful, and there are few problems that she has not experienced in her role. Sue can also provide advice on who to contact concerning non-academic matters. Details of formal student-support services are given in section 6.1 below.

If you want to arrange a formal meeting with a member of the teaching staff, including the Part 2 Director of Studies, then contact them via email in the first instance. All staff members operate an open door policy; however, please bear in mind that we have other duties and will not always be available to speak with you immediately.

There is an ES Part 2 Noticeboard in A505 that is used to convey important information, including changes to previously published information, and information relating to lectures, practical classes, fieldtrips, examination dates and assessment grades. **You are expected to check the notice-board every weekday.**

Below is a list of people that can provide additional information about our courses:

		Room	Tel.
LEC Associate Director for Undergraduate Studies			
	Prof Colin Pooley	A29	10237
Director of Undergraduate Studies	Dr Jackie Pates	A512	93896
Part 1 Director of Studies	Dr J Hamilton-Taylor	B509	93893
Part 2 Director of Studies for Environmental Science			
	Dr Wlodek Tych	A514a	93973
Part 2 Director of Studies for Earth and Environmental Science			
	Dr Jennie Gilbert	B523c	53022
Part 2 Director of Studies for Earth Science with Geography			
	Dr Jennie Gilbert	B523c	53022
Part 2 Director of Studies for Environmental Chemistry and MChem			
	Dr Hao Zhang	A510	93899
Study Abroad Tutor	Dr Emily Heath	B508	94209
LEC Advisor for Natural Science	Dr Wlodek Tych	A514a	93973
LEC Advisor for Environmental Mathematics			
	Dr Arun Chotai	A509	93897
LEC Careers Advisor	Dr Nigel Watson	B25	10258
LEC Academic Officer (plagiarism)	Dr David Cox	A38/B4b	93379
LEC Disabilities and Equal Opportunites Advisor			
	Dr Suzanna Ilic	B32	10264

Undergraduate Teaching Office	Mrs Sue Taylor	A507	93968
Student Records Officer	Dr Arun Chotai	A509	93897
ES Examinations Officer	Prof Keith Beven	B538	93892
Chair of the Safety Committee	Prof Kevin Jones	B534	93972
Area Safety Officer	Mrs Sue Hodson	B521d	93947

2. TEACHING AND LEARNING

2.1 Modules and units

Teaching in ES is delivered through taught courses known as **modules**. In 2nd year modules are grouped into **units** for assessment purposes, with 2 modules together forming one **half-unit**. The exact groupings will depend on your degree. In 3rd year, each module is worth one half-unit, and therefore they stand alone for assessment purposes.

The majority of ENV modules run over 5 weeks, with the main exception being residential field courses, which run over 1 week. In Part 2, 2nd year teaching runs through the entire academic year. Most modules are run in Michaelmas and Lent terms, with the Summer term being used for ENV202, ENV204 and the dissertation.

2.2 Programme rules

The programme rules depend on your degree, sometimes referred to as your "major". The programme rules deal with the modules you take and the pass marks required to progress to 3rd year. Only the former is dealt with here, progression rules being dealt with in section 4.4. The International variants of each degree programme are dealt with on a case by case basis by the Study Abroad Tutor. There will be opportunities prior to, and during, Registration Day to discuss your final selection of modules with members of the academic staff.

Part 2 of each degree consists of three components: the Year 2 module courses; the dissertation project, which is carried out during the Summer Term of the second year and written up over the Summer and Michaelmas term of the third year; and Year 3 module courses. Note that each year staff commitments to research, national and international meetings, etc. may enforce some changes to the planned and published course. We try to minimise any resulting inconvenience to you, but in the end it is a consequence of being part of a department with a vigorous research programme.

Year 2

This is a core of 8 or 9 modules, which are combined to make up 3 units of assessment, which we consider to be essential for all Environmental Scientists. The exact combination of modules forming units depends on your major. The constituent modules of the Year 2 courses are listed below (Table 1). Full details of the Part 2 courses are given later in the handbook (Appendix 1).

Part 2 begins with a residential field course which runs for 6 days in late September/early October. Although a Lancaster University grant covers the teaching costs associated with this field course, students are required to cover the costs of their accommodation and subsistence. Grants are available for students suffering significant financial hardship.

Tutorials are given in small groups to maintain close contact between staff and students throughout the course. Tutorials held in Michaelmas term will include preparation for Part 2 examinations. Lent term tutorials are held with your dissertation supervisor to plan for the dissertation.

Table 1: Year 2 modules for ES programmes.

Module	Term	Weight	ES	EES	ESG	EChem
ENV200 Environmental field course	Pre-M	0.5	x	x	x	x
ENV201 Project skills	M&L	0.5	x	x	x	x
ENV210 Catchment hydrology	M1	0.25	x	x	x	
CHEM201 Electrochemistry & kinetics	M1	0.5				x
ENV211 Aquatic biogeochemistry	M2	0.25	x	x		x
GEOG209 Environment & society	M	0.5			a	
GEOG203 Earth surface processes	M	0.5			a	
ENV220 Dynamic landscapes II	L1	0.25	x	x	x	
ENV230 Atmosphere, weather & climate II	L1	0.25	x	x		x
CHEM203 Transition metals	L1	0.5				x
ENV221 Soil science	L2	0.25	x	x	x	x
ENV231 Introduction to atmospheric chemistry	L2	0.25	x			x
ENV203 Earth science field skills	L2	0.25		x	x	
GEOG210 Natural resources & sust. development	L	0.5			b	
GEOG204 Interacting landscapes	L	0.5			b	
ENV202 Data analysis & programming skills	S	0.5	x			
ENV204 Geological mapping field course	S	0.5		x		

a: choose 1 of these modules; b: choose 1 of these modules

Dissertation

The dissertation is a substantial piece of work worth 1 unit of assessment. It is completed by all Environmental Science students, including those on Year Abroad programmes. Using our Socrates links with other European universities a few students may have the opportunity to undertake dissertation work outside the U.K. Knowledge of a European language is helpful but not essential. If you are interested in the possibilities see Dr. Emily Heath. Full details of dissertation timing, procedures and assessment can be found in Appendix 5.

Year 3

The reminder of the course consists of 8 modules, each worth 0.5 units of assessment, covering specialist topics relevant to your degree. Some degree schemes have a combination of core and optional modules, whereas others are entirely optional (Table 2). Earth Science with Geography students take 4 ENV modules and 4 GEOG modules. Students taking Environmental Science, Earth & Environmental Science and Environmental Chemistry may include up to 2 GEOG, BIOL or LEC modules.

These modules are chosen at the beginning of Summer term in Year 2, usually on the basis of the student's experience with these topics in the Year 2 course, and with developing ideas about a career.

Table 2: Year 3 modules for ES programmes.

Module	Term	ES	EES	ESG	EChem
ENV300 Dissertation	Y2-Y3	c	c	c	c
ENV310 Hydrological processes field course	S Vac	x			
ENV316 Freshwater and groundwater chemistry	M1	x	x		x
ENV324 Interpreting the sedimentary record of env. change	M1		c	x	
ENV332 Air quality, aerosol and climate	M1	x	x		c
ENV345 Risk assessment and management	M1	x	x	x	x
ENV311 Surface water hydrology: from process to models	M2	x	x	x	
ENV323 Geological hazards	M2	x	c	x	x
ENV342 Environmental effects of soil and water pollution	M2	x	x		x
CHEM202 Phase equilibria & thermodynamics	M2				c
ENV313 Water resource management	L1	x	x	x	x
ENV315 Applications of aquatic chemical models	L1	x			c
ENV321 Dynamic Earth	L1	x	c	x	x
ENV341 Environmental radioactivity	L1	x	x	x	x
ENV314 Chemical oceanography	L2	x	x		c
ENV322 Introduction to geophysical techniques	L2	x	c	x	x
ENV325 Comparative planetary science	L2	x	x	x	x
CHEM204 Organic photochemistry	L2				x
LEC201 Enterprise for the environment	L	x	x	x	x
ENV320 Volcanic processes field course *	EVac		x	x	
ENV326 Metamorphism: process and product *	EVac		x	x	

* These modules have a taught component running in Michaelmas or Lent terms.
x: Optional module; c: Compulsory module

GEOG modules available to ES / EES / ECHEM students

GEOG340	Physical Geography Fieldcourse: Geomorphology of Northern Spain	EVac
GEOG353	Recent Change in Aquatic Environments	M
GEOG377	Quaternary Environmental Change	M
GEOG385	Glacial Systems	M
GEOG367	Coastal Processes	L
GEOG371	Environmental Remote Sensing and Image Processing	L
GEOG382	Environmental Magnetism	L

GEOG modules available to ES / ECHEM students

GEOG366	Water, Society and Sustainability	M

GEOG387	Environment, Politics and Society in Amazonia	M
GEOG386	Geographies of Agriculture	L
GEOG375	Water and Environmental Management: Mediterranean Fieldcourse	EVac

BIOL modules available to ES / ECHEM students

BIOL317	Ecology Field Course	SVac
BIOL341	Trends in Environmental Biology (counts as 2 modules)	M
ECOL301	Conservation in Practice	M1
ECOL302	Conservation Biology	M2

2.3 On-line Courses Handbook

This can be found at http://www.lusi.lancs.ac.uk/OnlineCoursesHandbook/. It provides information on all taught degree programmes and modules in the University, in any one academic year. Module summaries of Part 2 ENV, CHEM and LEC modules are also shown in Appendices 1 and 2 of this handbook.

2.4 Teaching methods

ES teaching in Part 2 is delivered through lectures and practicals. Lectures are generally timetabled in the mornings and practicals in the afternoons. **Attendance at ENV lectures and practicals is compulsory.**

Lectures: While all lectures involve oral and visual communication of subject matter, you will find that individual staff deliver their lectures differently. In some cases, staff will encourage questions and dialogue, the main purpose of which is to encourage thought rather testing knowledge. You are encouraged to participate in such activity. Perhaps the most important thing is to ensure that you have a good set of notes. Many staff provide some sort of handout of their notes, but you should not totally rely on this as a record of the lecture. Staff will generally provide advice as to how to add to the printed lecture material. A common approach is to annotate the handouts during the course of the lecture. Alternatively you may record the main headings and as much detail as possible, especially of the key points. It is important to think during a lecture, e.g. to identify what are the key points.

Practicals: As the name suggests these are laboratory and field-based exercises, designed to give you hands-on experience that reinforces and extends the lecture material. The practicals also provide you with various generic skills, e.g. related to working in a chemical laboratory and the field, and undertaking numerical analysis. In addition to a member of the academic staff there will also be demonstrators available to offer help and advice during the practical. These are normally ES post-graduate students, some of whom will have completed a Lancaster ES degree. You should consult these people at any time during the practical session if you are unclear about any aspect of the practical.

Safety is a key issue in all practical work (see section 5.7 for more details). Linked to safety:

1. **You must provide yourself with a laboratory coat for use during laboratory practicals.** Failure to wear a lab coat may result in your exclusion from the laboratory

2. **You must provide yourself with sturdy footwear and suitable outdoor clothing (e.g. waterproof cagoule) for use on fieldwork.** Failure to wear suitable clothing may result in you not being allowed to participate in fieldwork.
3. All students registered for ENV204 and those students wishing to conduct independent field work as part of their dissertation **must participate in a one-day First Aid course** at the start of Summer term in Year 2. Failure to attend this training may result in your exclusion from ENV204 and/or require your dissertation to be re-scheduled.

2.5 Contact time and independent learning

An academic year is equivalent to 1200 learning hours, based on three 10-week terms @ 40 hours/week. The number of learning hours associated with each module is given in the module outlines, but is 75 for 0.25 unit modules and 150 for 0.5 unit modules. These hours are designated as either **contact time** (i.e. with academic staff) or **independent learning**. Tables 3 and 4 show how the learning hours are normally allocated in our Part 2 modules and the activities expected in your independent learning.

Table 3: Breakdown of 75 learning hours for a typical 0.25 unit 2nd year module.

	Activity	**Time spent (h)**
Contact time	12 x 1-h lectures	12
	2 x 3-h practicals	6
	Revision session	1
	Sub total	19
Independent learning	Review of lecture notes	12 (1 h/lecture)
	Extend notes through outside reading	12 (1 h/lecture)
	Coursework	16
	Revision for exam	16
	Sub total	56
	Grand total	75

Table 4: Breakdown of 150 learning hours for a typical 0.5 unit 3rd year module.

	Activity	**Time spent (h)**
Contact time	15 x 1-h lectures	15
	3 x 3-h practicals	9
	Revision session	1
	Sub total	25
Independent learning	Review of lecture notes	15 (1 h/lecture)
	Extend notes through outside reading	30 (2 h/lecture)
	Coursework	27
	Revision for exam	53
	Sub total	125
	Grand total	150

Guidance and advice on independent learning:

1. Following each lecture review your notes, making sure that you can read them and that you understand the concepts. The latter is likely to involve reference to the recommended textbooks. Some students like to organise themselves into learning

groups, where people with a different mix of knowledge co-operate in reviewing and revising their notes. The Department encourages this as long as it does not extend to coursework assignments (e.g. practical write-ups). It is essential that these are completed independently, unless otherwise instructed (see section 5.6 Malpractice in Exams and Coursework).
2. Extend the breadth and depth of your lecture notes through outside reading of recommended texts etc. Outside reading becomes more important as you progress through Part 2, and we expect to see evidence of it in your coursework (see Appendix 3 Marking Criteria).
3. Complete all coursework on time (see section 5.2 Coursework submission and penalties). Missing coursework assignments rapidly add up and seriously work against you in assessment of your degree.
4. Spend adequate time on revision.

Lancaster University has a set of minimum commitments on academic contact time (http://www.lancs.ac.uk/celt/celtweb/policies). These commitments indicate the amount of contact time that you should typically expect on an annual basis if you take traditionally taught modules, i.e. delivered entirely by lectures / seminars / practicals / workshops etc. However, it should be noted that your actual experience will vary due to your module choices, for example dissertation units and modules with a large proportion of blended learning (i.e. using online resources) typically have less face-to-face contact and a greater amount of independent study.

2.6 Learning outcomes

Learning outcomes describe what you will be able to do as a result of studying any part of your degree course (assuming you have undertaken the necessary independent learning). They cover both subject-specific and generic outcomes. The latter are also known as transferable skills and an example is "make a PowerPoint presentation". The learning outcomes of Part 2 ENV modules are also shown in the module summaries given in this handbook (Appendices 1 and 2). The programme learning outcomes are given below:

Year 2

Generic outcomes:

Year 2 of the degree structure in the Department of Environmental Science further enhances the development of generic skills acquired by the students in their 1st year of their degree course. On successful completion of Year 2, the student will be able to manage their time effectively and work to deadlines; learn independently; recognize their role in a team maximizing the group's product, communicate using more advanced IT techniques such as PowerPoint, Word and Excel; use online databases, such as Web of Science; write more extended and detailed reports; carry out more technically demanding laboratory, field and modelling experiments.

Subject specific outcomes:

On successful completion of Year 2, the student will be able to discuss a wide range of theoretical and factual concepts, building on Part 1, providing a foundation for selection and successful completion of Year 3 modules; interpret simple data sets relating to its broader context.

Year 3

Generic outcomes:
Year 3 of Environmental Science programmes further enhances the development of generic skills acquired by the students in their 1st and 2nd years of their degree course. On successful completion of Year 3, the student will be able to work efficiently within a pre-determined time frame; learn independently and work effectively within a group; communicate clearly and succinctly using a variety of methods; use a range IT skills to an advanced level; appraise scientific literature and work confidently in laboratory and field settings.

Subject specific outcomes:
On successful completion of Year 3, the student will be able to critically evaluate concepts within environmental science chosen from a particular range of themes; evaluate the scientific literature within specialist fields, formulate hypotheses from specific environmental concepts and datasets, underpinned by a thorough understanding of the subject; plan and execute an independent research project, involving laboratory, field and/or computer based experiments.

Learning outcomes become especially important when you start to choose your options and dissertation topic in Part 2, prepare your CV, and start looking for a job (see section 2.8).

2.7 Course books

Relevant textbooks are listed within individual-module information. Sometimes you will be directed towards specific sections of these texts, but you will also be expected to use the books more generally to supplement and complement the lecture notes and practical handouts. Section 2.5 includes details of the sort of background reading that is required of you as part of "independent learning".

In Part 2, we will continue to use the primary texts we recommended for purchase in Part 1. The other texts referred to should be available in the university library (inform lecturers if they are not). You may wish to purchase them if you are particularly interested in the topic, or intend postgraduate study in that area, but you should not need to buy your own copy.

2.8 E-Learning (LUVLE and *My*Place)

E-Learning is defined as education through the medium of computer technology. It is increasingly being used in education and takes various forms, some of which you will experience over the next three years. The main way that you will experience e-Learning is through LUVLE (Lancaster University Virtual Learning Environment), which provides a range of resources. A description of what LUVLE can offer and how to use it is given at http://www.lancaster.ac.uk/celt/celtweb/luvle_students. The LUVLE homepage can be found at http://luvle.lancs.ac.uk/ . You will need your University login and password to access the LUVLE services. Lecturers utilise LUVLE to deliver learning materials (e.g. lecture and practical handouts), engage you in active learning (e.g. online exercises and tests) and update you with information.

*My*Modules provides your personal home page for LUVLE with key information about the modules you are studying, additional information about teaching and exam timetables and access to *My*Place. You can access *My*Modules through the LUVLE homepage. A simple use of *My*Modules is as a means of checking which modules you are officially registered for.

*My*Place is your private and social web space to record and share reflections on learning, achievement and career aspirations, e.g. you can record information, such as skills learnt, as a basis for writing a CV. It can be accessed via the LUVLE homepage or your *My*Modules homepage.

CELT is the Centre for the Enhancement of Learning & Teaching provides a range of advice and support on effective learning, LUVLE, *My*Place, online assessment, essay writing & plagiarism etc – see http://www.lancs.ac.uk/celt/celtweb/students. Our students find the support offered on maths skills particularly useful – see http://www.lancs.ac.uk/depts/celt/sldc/mathswebsite/index.html .

2.9 Teaching timetable

Your own teaching timetable is available via *My*Modules. Its correctness relies on your module enrolment and the contact times of each module both being correct. This is frequently not the case in our experience, so you should always check your *My*Modules timetable (activities, times and places) against the information posted on the ES Teaching Office noticeboard. **The definitive timetable is that displayed on the noticeboard.** You should also regularly check in ES noticeboard for late changes in timetabling, e.g. of fieldtrip departures, that sometime occur due to unavoidable circumstances.

3. ENROLMENT ARRANGEMENTS

3.1 Enrolment

Registration for Part 2 (2nd year) in ES-based programmes is done **automatically** by the Student Registry (ignore any Student Registry letters about Part 2 registration). If you are undertaking a joint degree with another department, follow the procedures given to you by the Student Registry in the second half of Lent term.

Registration for 3rd year modules will be carried out in early Summer term of 2nd year. You will be given more detailed information nearer the time.

3.2 Changing modules

Changing modules is only permitted for valid academic or other good reasons, and requires written approval. You may only change modules within the first 2 weeks. Retrospective change of module enrolment is not allowed. If you are thinking of changing a module you should discuss your plans with your Director of Studies in the first instance.

In order to change a module, you must:

(a) Obtain a 'change of module enrolment form' from the ES Part 2 Teaching Office or from **http://www.lancs.ac.uk/depts/studreg/undergrads/forms.htm**.
(b) Make an appointment with your Director of Studies.
(c) If another Department is involved, contact will also have to be made with them. With the form, first visit the department that you wish to undertake modules within to see if they are agreeable to you taking the module. If so, obtain the signature of their Part 2 Director of Studies.
(d) Next visit the department for the module that you wish to drop, and obtain the signature of their Part 2 Director of Studies.
(e) Make sure that you have obtained the signature of your major department, even if they are not directly involved in the module change.
(f) Submit the fully completed form to the ES Teaching Office.

3.3 Changing degree programme

Although most students decide which programme they wish to follow in Part 1, there is some degree of flexibility within the first term of Part 2. If you have the necessary pre-requisites, and you have not missed any compulsory module for the degree you wish to move into, you may change degree until the end of Michaelmas term in 2nd year. (This change is mostly only possible between Environmental Science and Earth & Environmental Science).

If you wish to change degree, you should speak with your Director of Studies in the first instance, who will be able to advise on how to proceed.

3.4 Confirming module enrolment

At the start of 2nd and 3rd years, you should check the modules you are registered for using *My*Modules. Sometimes mistakes occur, and it is your responsibility to ensure that the listed modules are correct.

In December or January, the Student Registry will formally require you to check and confirm the modules for which you are registered (these are available to you at any time through *My*Modules). This is the definitive list of modules for which you will be examined in the Summer Term. If you think there are errors, you must go to the ES Teaching Office and request changes before the deadline imposed by the Student Registry. If you are not officially registered for a module or block of modules, you will not be able to sit examinations in these subjects.

3.5 Intercalation and withdrawal

Intercalation

Sometimes because of medical, financial or personal difficulties students feel they have no alternative but to apply to suspend their studies for a year. Whilst this option can be of benefit to some students, it is not without its drawbacks: one of the major ones being the fact that students are not permitted by the Department of Social Security (DSS) and Housing Benefits Offices to claim benefits if they would normally be excluded under the full-time education rules. The DSS and Housing Benefit Offices regard intercalating students as continuing students on the grounds that they intend to resume their studies.

Don't allow yourself to drift into a situation that ends with intercalation being the only option, because without some assured financial support - a guaranteed job or financial help from your family - you could be left with no source of income.

Do ensure that you seek help early if you are experiencing any problems that may adversely affect your academic work. Speak to Sue Taylor, your Director of Studies, any of the various welfare agencies or call into the Student Support Office.

If personal circumstances mean that you are left with no alternative but to seek a period of intercalation, please contact the Student Support Office first to discuss your application.

Withdrawal

If you feel uncertain about carrying on at Lancaster, it is important that you talk it through with your Director of Studies or one of the support services, such as your college personal tutor or someone in the Student Support Office.

Should you decide to leave, it is essential that you do not just walk out. You should contact the Student Support Office who will discuss your plans with you and formally approve your withdrawal. The Student Support Office will inform the Student Registry in order that we can arrange with your Local Education Authority to have payment of your loan and tuition fees stopped. If you have any books on loan from the Library or are in possession of any university equipment or property, please make sure you return these - it will save you and us a lot of unnecessary letters and telephones calls.

In order to safeguard your entitlement to funding for any future course you should seek advice as soon as possible. Full details on this, and information regarding a transfer to another course/college, may be obtained from the Student Registry or the Student Support Office.

4. ASSESSMENT

4.1 Module assessment

In 2nd year, each ENV module is either assessed by a combination of exam and coursework (each worth 50%) or coursework only. In 3rd year, again each ENV module is either assessed by a combination of exam (67%) and coursework (33%) or coursework only.

Programmable calculators, electronic dictionaries and PDAs are not permitted in examinations; any non-programmable calculator is permitted. **Test and examination answers must be written in ink, and not pencil;** you may receive a zero mark for text written in pencil, depending on legibility.

For each Year 2 Environmental Science exam you will be required to answer two sections. Section A: a compulsory section of 5 short answers questions; Section B one question to be answered from a choice of two, both sections to be completed within a period of 1 hour.

For each Year 3 Environmental Science exam you will be required to answer two questions from a choice of three. The exams last 90 minutes.

Questions are set by staff giving the individual courses and vetted by the External Examiners for the Environmental Science degree programmes. Past examination papers are available from the Undergraduate Teaching Office and on the Registry website http://www.lancs.ac.uk/depts/studreg/undergrads/exams.htm. The examination schedule is published in advance.

4.2 Assessment units

As explained in section 2.2, 2nd year modules are grouped into units for assessment purposes. Each degree programme has a defined combination of modules forming each half-unit (listed below). All 0.5 unit weighted modules stand alone for assessment purposes.

Environmental Science

ENV 290 Assessment Unit ENV 210, ENV 211
ENV 291 Assessment Unit ENV 220, ENV 221
ENV 292 Assessment Unit ENV 230, ENV 231

Earth and Environmental Science

EES 290 Assessment Unit ENV 210, ENV 211
EES 291 Assessment Unit ENV 220, ENV 221
EES 292 Assessment Unit ENV 230, ENV 203

Earth Science with Geography

ESG 290 Assessment Unit ENV 210, ENV 203
ESG 291 Assessment Unit ENV 220, ENV 221

Environmental Chemistry

ECH 290 Assessment Unit ENV 230, ENV 231
ECH 291 Assessment Unit ENV 211, ENV 221

Both the unit marks and the module marks are reported at the end of the year in your transcript. Progression rules are based on unit marks only.

4.3 Checking marks, moderation and Exam Board process

All marks are provisional until confirmed by the Part 2 Examination Board. You will be asked to check our record of your coursework marks in the Summer term of both your 2nd and 3rd years. Entry of the Summer Examination marks will be double-checked by ES staff.

The Department will moderate each course module by sampling, where the second markers review a representative sample of work first-marked by other colleagues for the purpose of: checking the consistent application of marking criteria and moderating marks awarded. In addition, any module with a class-mean mark that falls outside the range 55-65% is considered for possible moderation on the basis of marking trends. The mean is compared with those for the same module in previous years, and with means for other modules taken by the same group of students. Specific reasons for the differences are assessed. Moderation of the marks up or down may then be undertaken to bring the mean into line with comparable modules.

Your final unit marks then go before a meeting of the Part 2 Board of Examiners held at the end of June. This Board looks at your results and decides whether or not you have qualified to proceed to 3rd year (in 2nd year) or the classification of your degree (in 3rd year).

The Part 2 Board of Examiners consists of all the Departmental academic staff plus two External Examiners (two senior academic staff members of other British Universities, appointed by Lancaster University Senate). All examination, coursework and dissertation marks are considered, as are any important personal circumstances such as serious illness etc. The external examiners check the marking of dissertations and exam papers, and may interview you to assess you individually, or as a typical member of some part of the academic spectrum of the whole class. (Such vivas can improve your academic standing but not worsen it.) The full committee then decides on your academic standing (the class of your degree), and the results are normally published at once, even though their formal ratification by Senate may not come for another week or so at which point the Student Registry will make Part 2 marks available to you.

Year Abroad degrees

The assessment of the Year Abroad degrees differs in that the 6 Year 2 units are based on your performance at the overseas university.

4.4 Progression rules for Part 2

In order to progress to 3rd year, it is necessary to have passed at least 4 of the 6 half-units of assessment, following resits. A pass mark is defined at 40%.

You will be required to resit failed modules in units that you have failed. Resit exams take place in mid-late August. **You will be expected to be in Lancaster to take your resit examinations on the days and times specified by the University in the resit examination timetable. You must take this into account when making your summer vacation plans**. If you do not get the marks you need in the late summer resits or if you do not attend, you have no automatic right to any further reassessment opportunity and, sadly, may not be able to continue with your degree unless the Part 2 Resit Board of Examiners grants you an exceptional second resit opportunity as an external candidate the following June. This means you will have to suspend your registration for a year. It is very important therefore that you prepare properly for any resit examinations.

The maximum mark for the failed unit is 40%. The module mark going forward will be the resit exam mark.

4.5 Degree classification

The examiners shall have before them an array of 16 marks derived from:

(a) the combined percentage mark for each whole unit (where the combined percentage mark is recorded twice) and for each half unit (where the combined percentage mark is recorded once); and

(b) percentage marks for the constituent elements of that mark (usually coursework and examination and including, where appropriate, supplementary evidence). Each unit or half unit shall be given a result expressed as an arithmetic mean: the overall mark of each Part 2 array shall be expressed to two places of decimals.

A given class shall normally be awarded as follows, provided that the conditions set out below have been fulfilled and all failed marks have been condoned or proposed for condonation:

- a I honours degree either when six of the sixteen marks are first class and the average mark, calculated from all sixteen marks does not fall below 68%; or when eight of sixteen marks are first class and the average mark, calculated from the best fourteen marks, does not fall below 68%;
- a II(i) honours degree shall be awarded if at least eight of the sixteen marks attain the class and the average mark, calculated from all sixteen marks, does not fall below 58.0%;
- a II(ii) honours degree shall be awarded if at least eight of the sixteen marks attain at least that class and the average mark, calculate from all sixteen marks, does not fall below 48.0%;
- a III honours degree shall be awarded if a least eight of the sixteen marks attain at least that class and the average mark, calculated from all sixteen marks, does not fall below 40.0%;
- the average mark is at or above the class boundary, 70%, 60%, 50%. This is to be used as a single criterion irrespective of the number of units in the class (does not apply to III class honours).

If a candidate does not qualify for an honours degree, a pass degree at the discretion of the Part 2 Board of Examiners may be awarded if both the following conditions prevail:

(a) the average of the sixteen marks attains at least 38%; and
(b) there are no more that four uncondoned marks below 40% out of sixteen.

A degree shall not normally be awarded, where there are nine or more marks below 40% or where the average calculate from all sixteen marks is less than 38%.

Full details the degree classification regulations are given within section E of the Manual of Academic Regulations and Procedures (MARP) which can be found at:
http://www.lancs.ac.uk/celt/celtweb/marp.

4.6 Repeated years and modules

A widely held, but incorrect, belief is that you can repeat a year of study if you haven't done very well, repeat a module or part of a module (e.g. retake failed tests), or replace a module in which you have done badly with another one. This is not the case. The University's examination and assessment regulations contain the following statement:

"No student should be given an unfair advantage over fellow students through being allowed to repeat individual course units or to repeat a whole year of study. Exceptional permission to do so may be granted by the Pro-Vice Chancellor, by the Part 1 Review Committee or by the Standing Academic Committee in cases where a student's academic performance has been adversely affected by personal, health or financial problems and where such cases are properly documented.

No student should normally be allowed to replace units of assessment in which he or she has failed or performed poorly by taking a different unit of assessment in the hope of achieving better marks. Exceptional permission to do so may be granted by the Chair of the Undergraduate Studies Committee, by the Part 1 Review Committee or by the Standing Academic Committee in cases where a student's academic performance has been adversely affected by personal, health or financial problems and where such cases are properly documented."

5. ADMINISTRATION AND REGULATIONS

5.1 Code of Practice

The purpose of our **Code of Practice** is to promote the smooth running of undergraduate programmes within ES. It defines the rules by which we work and what both staff and students may reasonably expect of one another. There is a copy in Appendix 6 of this handbook. A copy is also available at http://intra.es.lancs.ac.uk/COP/ . Ignorance cannot be used as an excuse for not following the rules so make sure you are familiar with them. Some key points are also included in this section.

5.2 Coursework submission and penalties

Submission of all coursework (practical write-up and test) for each module is compulsory. **Deadlines** for the completion of practical write-ups will be clearly indicated by the member of staff in charge of each module, and communicated via the noticeboard in the Part 2 Teaching Office. If you have extenuating circumstances, it is essential to talk to your Director of Studies **before the deadline** is reached about obtaining an extension. Poor time management, simultaneous deadlines and computer problems are not grounds for an extension.

Coursework should be submitted via the boxes in the ES Part 2 Teaching Office **with a completed cover sheet attached to the front of the work.** The cover sheets are available next to the submission boxes. All late coursework (with or without an extension) should be submitted directly to the Teaching Office staff, and not placed in the boxes.

Any coursework not submitted by the deadline and without an agreed extension will receive a 10% penalty if it is between one and seven days late, i.e. a mark of 60% would become 50%. Work more than seven days late and without an agreed extension or where the marked assignment has been handed back to other students, will be awarded a mark of zero.

5.3 Return of marked coursework

Marked coursework will normally be returned to you via the ES Part 2 Teaching Office within 4 weeks of submission. Coursework submitted at the end of term will be returned at the start of the next term.

5.4 Attendance, progress monitoring and the Standing Academic Committee

Attendance at ENV lectures and practicals is compulsory. Attendance will be routinely monitored in practicals. Attendance at lectures will also be monitored in the case of

students who are a cause for concern, either because of poor practical attendance or because of poor coursework performance.

The Teaching Office staff monitor coursework marks. If your marks or attendance are poor, your Part 2 Director of Studies will write to you and ask you to attend a meeting to discuss the situation. **Continued poor performance will result in a further written warning, and ultimately your case may be referred to the Standing Academic Committee (SAC) of the University, with a recommendation that you be excluded from the University.** In such a case, you would be requested to attend a meeting with the Standing Academic Committee and they can decide to exclude you **permanently** from the University.

5.5 Absence due to illness etc.

If you are forced to miss lectures or practicals you should let the Teaching Office know the reason in writing, so that a note can be placed in your file. If the reason is illness you should do this by completing a 'Student Self-Certification Medical Note' (copies available from ES Part 2 Teaching Office). The maximum period covered by Self Certification is 6 days after which a medical note signed by a medical practitioner is required. The form should be returned to ES Part 2 Teaching Office on the day following the last day of the illness. You should ensure that you have access, from your colleagues, to any lecture material which you may have missed during your absence.

If, due to illness or other reason, you find yourself unable to submit your coursework by the deadline, you may request an extension. **All extensions must be requested prior to the deadline.** You can collect an extension request form from the Teaching Office. It must be signed by your Director of Studies and the Module Convenor.

5.6 Malpractice in exams and coursework (plagiarism)

The University Rules define in detail the definitions and penalties for dealing with malpractice and you can find these on the university website. It is very important that you abide by these rules and don't attempt to gain advantage by any unfair means. **Malpractice is taken very seriously and there are formal disciplinary procedures to deal with cases. Repeat offences can lead to permanent exclusion from the university.**

The form of malpractice that is least understood by Part 2 students, is **plagiarism**. The key point is that coursework must be your own work, unless otherwise instructed, and any assistance or use of reference/published material must be correctly acknowledged. Useful advice can be found at:
http://www.lancs.ac.uk/celt/celtweb/essay_assist_students

The internet has become a source for plagiarism malpractice, however, mechanisms for detecting such practice are now readily available. The penalties for plagiarism offences are summarised at:
http://www.lancs.ac.uk/depts/studreg/facts/plagiarism.htm

5.7 Safety

Most University activities are governed by legally-binding safety regulations. It is incumbent on all members of the University to abide by its safety rules. Failure to do so will lead to warnings and possibly to disciplinary procedure. More information can be found at http://www.lancs.ac.uk/depts/safety/default.htm.

Laboratory and fieldwork activities give rise to the most serious hazards that you are likely to experience during ES modules. Safety assessments have been made of the potential hazards associated with all practical work. You will be instructed on any particular safety issues associated with individual exercises. You are not allowed to work in any laboratory or workshop, or with any hazardous equipment, without permission and supervision. You must follow the supervisor's instructions to the letter in any safety matter, and if you are uncertain about the safety of anything you are meant to use or do, you must ask the supervisor.

Specific issues may arise in dissertation work, so all students are required to read and assent to the ES Safety Handbook before starting such work. You will have received a copy of the ES Safety Handbook during Part 1. You can also find an electronic version here: http://www.es.lancs.ac.uk/safety/safety.htm We have a good safety record and we intend to keep it that way. Note that the consumption of food and drink is strictly forbidden in all laboratories and lecture rooms.

For safety reasons, students are only permitted to use their own vehicles for University related work (i.e. field work) under exceptional circumstances. Field work includes: an afternoon trip as part of a module and residential field courses. In the case of exceptional circumstances, the student must provide documentary evidence of adequate insurance (i.e. full business cover) and make a written case to the Area Safety Officer, currently Mrs Sue Hodson.

All students intending to participate in the ENV204 field course and any student planning independent field work as part of their dissertation must attend the First Aid training provided by the department at the start of Summer term, year 2. Any student failing to attend this training will be excluded from the field course (with a zero mark awarded) and/or be required to undertake an alternative dissertation.

5.8 Ethical issues (for coursework / dissertations)

Depending upon the nature of the work you are doing, there may be specific research ethics issues that you need to consider (for example if your project involves human subjects in any way). You may need to complete a research ethics form and you should consult your dissertation supervisor for details of the required process.

5.9 Complaints procedure

The University Student Complaints Procedure can be found at

http://www.lancs.ac.uk/depts/studreg/docs/Complaints/Students-ComplaintsProcedure.doc

This procedure applies to complaints made by current Lancaster University students, or leavers within 3 months of the date of their graduation or withdrawal (the Complaints

Coordinator may accept complaints beyond this period if exceptional circumstances apply), in respect of:

- the delivery and/or management of an academic module or programme, or supervised research;
- any services provided by academic, administrative or support services (other than LUSU, who will operate to their own Complaints Procedure)

This procedure does not apply to complaints relating to:

- decisions of Boards of Examiners (these are governed by the Academic Review and Appeal Procedures);
- suspected professional malpractice (if it is established that misconduct of staff or students has occurred that is governed by other disciplinary procedures or external legal systems, then these procedures will be invoked and the complaint will not be dealt with under the student complaints procedure);
- any suspected potential breach of criminal law.

6. STUDENT MATTERS

6.1 Equal opportunities and Student Support Services

Lancaster has adopted a student-centred approach in which access to high quality support across a range of areas is provided by different agencies in a way which best meets each student's individual circumstances and needs. This is summarised in the Student Support Policy which can be found at:
http://www.lancs.ac.uk/celt/celtweb/policies/studentsupport

You are admitted to the University on your academic record. The University welcomes all students and has an array of support services to ensure no student feels disadvantaged.

This department follows University Policy and strives to make itself inclusive. If you have any sort of personal issue or problem, health-related or otherwise, that is detrimentally affecting your performance in ES you are encouraged to discuss it informally and confidentially with your Director of Studies. If s/he cannot help directly s/he will put you in touch with someone who can. Seeking informal help early can often lessen the seriousness of the impact of most issues.

Additionally, at the beginning of the year all students will be asked to complete a confidential medical form for the department. The information that you add to this form is used only by the ES Part 2 Teaching Office to make sure that you have the necessary cover and support within laboratory and field practicals, or additional time in tests. Please inform the ES Part 2 Teaching Office of any change in your circumstances throughout the year.

From a university perspective, it is possible that you have already had support from the Disabilities Service as part of your admission process. Christine Quinn in the Disabilities

Service will continue to provide guidance and support by working with the department to ensure your learning support needs are met, especially with regards to exams and assessments. You can contact the Disabilities Service at any time if you feel you might need advice (for example you might want to be assessed for dyslexia).

There is also financial help that is available. If using the library is an issue because of dyslexia, a disability or medical condition, get in touch with Fiona Rhodes, f.rhodes@lancaster.ac.uk, for advice and help.

General note on confidentiality: if it is useful for you, do talk in confidence to any of the staff named here, but please remember that you may not be able to access all the support available to you unless we can inform other staff involved in support arrangements.

You may also find it helpful to look at some of the following web pages for local and national background.

Lancaster Disabilities Service:
http://www.lancs.ac.uk/depts/disabilities/index.htm

Lancaster Equal Opportunities web pages:
http://www.lancs.ac.uk/depts/equalopp/

You can also easily reach the two sites above via the alphabetical list on the University home page.

Links to national equalities bodies and organisations:
http://www.lancs.ac.uk/depts/equalopp/eolinks.htm

6.2 Student representation

Students are represented in the activities of the university in various ways, including through membership of various committees. The main such committee is the **Staff-Student Consultative Committee (SSCC).** The SSCC discusses matters related to the ES degree programmes and day-to-day student contact with the department, e.g. students can comment on and suggest modifications to teaching and facilities. Only general issues should be raised at this meeting, e.g. if several of you are experiencing the same problem that goes beyond the day-to-day running of individual modules. Day-to-day problems are best dealt with directly through the lecturer involved, e.g. problems with handouts or availability of course texts, late return of coursework. Only if you are not happy with the lecturer's response should this type of problem be brought to the SSCC. Items for the agenda should be given to your student representative.

During the first few weeks of Part 2, a representative for each of the ES-based degrees needs to be nominated. **Anyone wishing to take on this role should notify the ES Part 2 Teaching Office asap, and certainly within the first two weeks of Michaelmas term.** Being a rep is a good way of getting to know the department and is also good in terms of your CV. One of the SSCC reps will also be asked to represent ES students at the LEC Learning and Teaching Committee, which approves new modules and programmes, as well as developing teaching policy.

6.3 Student Society

The Lancaster University Environmental Science Student Organization (LUESSO) aims to promote interest in all aspects of Environmental Sciences by organizing lectures, film shows, parties and fieldtrips to places of environmental interest. The society is run by ES students, and all majors are encouraged to join.

6.4 Careers

The department's careers tutor is Dr Nigel Watson. He can provide you with advice on the types of careers available to you. Also, CEEC (the Centre for Enterprise, Employment and Careers) will have department specific sessions in both 2nd and 3rd year. We strongly advise you to visit CEEC regularly so that you can use their expertise to ensure that by start of your final year you have the necessary work experience, other extra curricular activities and knowledge of the job market to be put together a successful application for your first graduate job.

APPENDIX 1: OUTLINE CONTENTS OF YEAR 2 MODULES

Module number: **ENV 200**	*Module title*: **ENVIRONMENTAL FIELDCOURSE**		
Number of weeks: 1	*Term taught*: Pre-M1	*Contact hours*: 48	*Learning Hours*: 150
Pre-requisites: Part 1 ES	*Co-requisites*: ENV201 (Project Skills)		*Credits :* 15
Module organiser: Dr Wlodek Tych	*Other lecturers*: Prof Andrew Binley, Dr. Yani Najman, Dr Jackie Pates, Dr John Quinton		

Aims and scope: This is a residential field course held in the Lake District in the week prior to start of the Michaelmas Term of the second year. Groups of approximately 20-25 students work together on hydrological, geological, geochemical, surveying and erosion projects. Training is provided through 6 days which offer complementary field skills and insight into local environmental processes. The aims are (1) to assess the present and future impacts on water quality of a disused tungsten mine and (2) to provide training in environmental field techniques.

Syllabus

Practical	*Title*	*Lecturer*
	Site investigation	WT
	Geological processes	YN
	Hydrological investigations	AMB
	Geochemical survey	JMP
	Erosion processes	JQ

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes
- Record data/observations in the field.
- Carry out field projects as part of a team.
- Plan and present a large integrated field report.
- Organise an oral presentation as part of a team.

Subject Specific Outcomes
- Use basic geological field techniques.
- Carry out stream gauging using a number of techniques.
- Implement a water quality measurement programme.
- Use a GPS for basic surveying
- Undertake simple erosion measurements

Assessment: *CWA: 100 %* *Exam: none* *Module test: none*

Details of CWA:
The assessment requires the submission of a 3000 word report with associated tables, figures and references. The deadline for the report is Week 10 of the Michaelmas Term. Students are expected to draw from their field experiences and data analysis/project writing skills derived from related courses e.g. ENV 201.

Recommended texts and other learning resources:
No texts are recommended for purchase because a detailed field guide is provided. This contains information on the various experiments undertaken and associated texts. The following references are relevant:

Adams, J. 1995. Mines of the Lake District Fells. Dalesman, Skipton
Gordon, N.D. McMahon, T.A. and Finlayson, B.L. 1992. Stream Hydrology: an Introduction for Ecologists. Wiley, Chichester.
Maltman, A. 1992. Geological Maps: an Introduction. Wiley, Chichester.
Tyler, I. (2003) Carrock and the Mines of Skiddaw and Blencathra. Blue Rock Publications, Keswick

Module number: **ENV201**	*Module title*: **PROJECT SKILLS**		
Number of weeks: 20	*Term taught*: M & L	*Contact hours*: 50	*Learning hours:* 150
Pre-requisites: Part I ES, ENV200	*Co-requisites*: none	*Credits :* 15	
Module organiser: Dr Jackie Pates	*Other lecturers*: Bob Blake (SLDC), Ken Harrison (Library), CEEC		

Aims and scope: To provide computational skills for project work and techniques for data analysis and presentation of environmental data. Each week there will be a lecture with an associated practical focussing on data handling and statistical methods. In Michaelmas term, there will be weekly writing workshops and in Lent term, the workshops will focus on dissertation and careers skills. Note that the module focuses on data from the ENV200 field course which is thus a pre-requisite for this module. The module assumes no prior computing knowledge.

Syllabus

Lecture/ Practical	*Title*	*Lecturer*
M1	Introduction: experimental design	JMP
M2	Samples and populations	
M3	Errors and uncertainty	
M4	Descriptive statistics and distributions	
M5	From samples to populations	
L6	Hypothesis testing	
L7	Comparing the means of two samples	
L8	Relationships between variables	
L9	Comparing the means of more than two samples	
L10	Course summary and revision	
Workshops	*Title*	*Lecturer*
M1	Report writing: standard lab reports	JMP/BB
M2	Writing an introduction: structure and purpose	JMP/BB
M3	Writing the results: using figures, tables and appendices effectively	JMP/BB
M4	Writing the conclusions: tying the report together	JMP/BB
M5	Writing an abstract: structure and function	JMP/BB
L6	Introduction to the Library and literature searching	JMP/KH
L7	Using information sources: referencing, note taking and avoiding plagiarism	JMP/BB
L8	Careers workshop 1	CEEC
L9	Careers workshop 2	CEEC
L10	Careers workshop 3	CEEC

Learning outcomes:
On completion of this module a student will be able to:
Generic outcomes:

- Carry out literature searches for scientific material
- Perform basic statistical analysis of environmental data
- Prepare a structured scientific report using the following: word processor, spreadsheets, simple graphics tools, the internet
- Use basic poster presentation tools
- Demonstrate awareness of their own skills, motivations and personal and career development needs
- Identify and investigate the range of career opportunities available
- Demonstrate the ability to effectively apply for jobs and other opportunities

Assessment*:* CWA*: 50% Exam: none Module tests: 50%*

Details of assessment: Class test on statistical techniques x 2 (20% each); group mini-project using statistical techniques (10% for group aspects (poster presentation); 30% for individual aspects (report)); CV and job application (20%). There is no examination for this module.

Recommended texts and other learning resources:
LUVLE is used extensively in this module, and a wide variety of additional resources can be found on the ENV201 LUVLE website.

Wheater, C.P. and P.A. Cook, 2000, *Using Statistics to Understand the Environment*, Routledge.
Townend, J., 2001, *Practical Statistics for Environmental and Biological Scientists*, Wiley.
Kirkup, L., 2002, *Data Analysis with Excel*, Cambridge.
Pentecost, A., 1999, *Analysing Environmental Data*, Longman.
Salkind, N.J., 2004, *Statistics for People Who (Think They) Hate Statistics*, 2nd ed., SAGE Publications.
Utt, J.M., 2005, *Seeing Through Statistics*, 3rd ed., Thomson.
Jones, A., R. Duck, R. Reed and J. Weyers, 2000, *Practical Skills in Environmental Science*, Prentice Hall.
Peck, J. and M. Coyle, 2005, *The Student's Guide to Writing*, 2nd ed., Palgrave.
Barrass, R., *Scientists Must Write*, Routledge.

Module number: **ENV 202**	*Module title*: **DATA ANALYSIS AND PROGRAMMING SKILLS**		
Number of weeks: 10	*Term taught*: Summer Term	*Contact hours*: 60	*Learning Hours*: 150
Pre-requisites: Part I ES (ENV100), ENV122/124 (or equivalent)		*Co-requisites*: none	*Credits :* 15
Module organiser: Dr Włodek Tych		*Other lecturers*: Dr Arun Chotai	

Aims and scope:
The course should provide the students with advanced scientific numeracy skills. The course focuses on data processing and visualisation for use with dissertation work. It includes introductory elements of Matlab and Simulink, currently a de facto visualisation and numerical processing standard. Some comparison to other programming languages, in particular Fortran and C, is provided. The main programming elements are introduced and used in examples: data input, processing, output in numerical and graphical forms, programming tools and structures (loops, conditional statements and other flow control). The course introduces selected principles of dynamic systems analysis such as transfer functions applied to environmental systems in the form of examples and case studies.

Syllabus: The course consists of 30 2-hour interactive computer based workshops

Workshop	*Title*	*Lecturer*
	Introduction; Aims of programming; Course aims; Basic definitions; The scientific method;	WT/AC
	Programming languages: development, common features, application areas	
	Starting and using Matlab; scripts; toolboxes; search paths;	
	variables and expressions; programmer's tools: editor/debugger;	
	Program control: loops and nested loops;	
	The concept of a dynamic system, transfer function, ADZ model of dispersion in a river	
	Introduction to graphical simulation systems: Simulink, block diagrams analysis;	
	More program control: Conditional statements	
	Functions and subroutines	
	Simulink: second order system examples: Gilliland climate model; feedback connections.	
	First module test (week 24)	
	Matlab and general defaults handling; error handling	
	Files and data input and output;	
	Computer graphics and visualisation with handle graphics	
	Advanced visualisation (multivariable data) – continued from ENV201	
	Program design, libraries; program development and debugging	
	Summary and revision workshop	
	End of module test (week 27)	
	Case studies and dissertation data processing clinics	

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes
- Communicate with programming professionals on a basic level.
- Adapt the obtained MATLAB programming skills to learning of most other programming languages (such as Fortran, C).
- Solve basic data processing problems using MATLAB or other programming languages.
- Recognise the most fundamental features of computer programming languages.
- Use a sophisticated, programmable data presentation and visualisation tool; load, process and save data in numerical and graphical form.
- Describe the way in which simple mathematical concepts can be used to build models of environmental systems.

Subject Specific Outcomes
- Design, write, run and debug simple MATLAB programs; with a potential to use MATLAB as a comprehensive programming language
- Relate the concepts of serial, parallel and feedback connections to processes in the environment.
- Formulate Simulink block diagram representations of simple environmental systems.

Achievement of these outcomes will be assessed by cwa and module tests

Assessment: CWA*: 50%* Exam*: none* Module test*: 50%*

Details of CWA:
Coursework will include significantly modified, commented examples provided as part of the course material, answers to comprehension questions (Control Tasks in the tutorials including essay elements) and elements of original coding. CW is submitted by the end of week 27.
Open book module tests will be taken during week 24 and week 27 (weeks 4 and 7 of the course). Tests consist of writing short programs solving a set of simple numerical and graphical problems, using both the worked examples from the previous workshops and the student's course work. Short descriptive questions will be used as well.

Recommended texts and other learning resources:
Young, P.C. (editor) (1993) Concise Encyclopaedia of Environmental Systems, Pergamon Press. (Lancaster University Library: 8 copies, classmark DG1 (Y)) – several articles are highly relevant to the data analysis component
A comprehensive Matlab bibliography is available at: http://www.mathworks.co.uk
Otherwise, there is no primary reading list, as the extensive on-line documentation files and manuals provided with Matlab, combined with the server and Web based course materials are considered to be sufficient for this course.
Additional and fully optional reading list:
. Hanselman & Bruce Littlefield, Mastering MATLAB 7: A Comprehensive Tutorial and Reference , Prentice Hall, 2004, (Lancaster University Library Classmark: AZKF.M1,)
Rudra Pratap, Getting Started with MATLAB 5: A Quick Introduction for Scientists and Engineers, Oxford University Press, 1999; ISBN: 0195129474 (Lancaster University Library Classmark: AZKF.M1, 4 copies)
Kermit Sigmon, MATLAB Primer, 5e CRC Press, Inc., 1998, ISBN 0-8493-1305-8
Gerard V. Middleton, Data Analysis in the Earth Sciences Using MATLAB , Prentice Hall, 2000,ISBN 0-13-393505-1
Brian D. Hahn, Essential MATLAB for Scientists and Engineers , Arnold, 1997, ISBN 0-340-69144-1

Module number: **ENV 203**	*Module title*: **EARTH SCIENCE FIELD SKILLS**		
Number of weeks: 5	*Term taught*: L2	*Contact hours*: 48	*Learning hours*: 75
Pre-requisites: ENV 220	*Co-requisites*: None	*Credits :* 7.5	
Module organiser: Dr Jennie Gilbert	*Other lecturers*:		

Aims and scope: This module is designed for students to learn about geologic and geomorphologic processes, and to acquire the skills to enable them to work competently in the field. The course deals with the following geologic processes: sedimentation; glaciation; volcanism and deformation. It covers the field skills: use of topographic and geologic maps; use of field notebooks; geologic mapping; field sketches; use of compass clinometers; stratigraphic logging and descriptions of rocks, sediments and fossils. It is relevant for students who anticipate careers involving field work. The teaching is carried out in the field for four days over a five week period. There are four half days of practical classes to consolidate each day's activities.

Syllabus

Day	*Title*	*Lecturer*
1	3 hours classwork in week 6: safety in the field, introduction to module, use of maps and notebooks etc	JSG
2	9 hours fieldwork in week 7: Clapham/Austwick area - glaciation, sedimentation, use of field notebook, unconformities, stratigraphic logging	
3	3 hours classwork in week 7: follow up work to Day 2	
4	9 hours fieldwork in week 8: Heysham area - sedimentation, stratigraphic logging, sketch map and assessed exercise	
5	3 hours classwork in week 8: follow up work to Day 4	
6	9 hours fieldwork in week 9: Kisdon area - slope stability and management of slopes, sedimentation, geomorphology, quarrying and assessed exercise	
7	3 hours classwork in week 9: follow up work to Day 6	
8	9 hours fieldwork in week 10: introduction to geological mapping of igneous and metamorphic rocks, and glacial and fluvial deposits	

Learning Outcomes:
On completion of this module students will be able to:

Generic Outcomes
- Work competently in the field for a full day at a time
- Record data/observations in the field
- Carry out short, time-limited, independent field and team-based projects
- Plan and write a detailed field report

Subject Specific
- Apply geologic field techniques and use these to unravel the geologic history of an area
- Interpret geologic maps and be able to communicate with geologists at a professional level

Assessment: *CWA: 100%* *Exam: None* *Module test: None*

Details of CWA:
This is in two parts.

1. A stratigraphic log will be made in the field in week 8. This will be drawn up in neat the following day and the environment of deposition interpreted. It will be submitted at the end of the practical in week 8. This exercise carries 50% of the module mark.
2. A field sketch will be carried out in week 9. This will be annotated with the aim of unravelling geologic processes involved in the formation of the rocks, sediments and landforms. This will be drawn up in neat the following day and will be submitted at the end of the practical in week 9. This exercise carries 50% of the module mark.

Recommended texts and other learning resources:
Tucker ME 2003, Sedimentary Rocks in The Field, The Geological Field Guide Series. Wiley ISBN 0-470-85123-6.
STUDENTS ARE REQUIRED TO SPEND AT LEAST 12 HOURS READING TUCKER (2003) IN ADVANCE OF ENV203

Barnes JW, Lisle 2006 Basic Geological Mapping, The Geological Field Guide Series. Wiley ISBN 0-471-96031-4.
Maltman A 1995 Geological Maps. Wiley, ISBN 0-471-93240-X.
Woodcock N, Strachan R 2002 Geological History of Britain and Ireland. Blackwell ISBN 0-632-03656-7.

Module number: **ENV 204**	*Module title*: **GEOLOGICAL MAPPING**		
Number of weeks: 1	*Term taught:* S1	*Contact hours:* 75	*Learning hours:* 150
Pre-requisites: ENV203	*Co-requisites:* None	*Credits :* 15	
Module organiser: Dr JS Gilbert	*Other lecturers:*		

Aims and scope: The aim of this module is to build on the skills acquired on the ENV200 Environmental Fieldcourse (taken in September) and the ENV203 Earth Science Field Skills course (taken during the following February/March). This is a core course for Earth and Environmental Science students. It provides training in geological mapping, Earth processes and field work logistics, and prepares those students who wish to do a geological field project as part of their dissertation.

Syllabus

Fieldwork	*Description*	*Lecturer*
	This is a six day residential geological mapping course, held in SW Mull, Scotland, which provides training in geological mapping. Students will collect field data in order to make a single solid geological map. Students will describe, sketch, photograph and map key localities. They will be taught geological mapping skills, i.e. indication of outcrops on field slips of 1:10,000 scale, map reading, recording of information in notebooks, inking in of maps and safety in the field. Work will be in teams of up to five or six students. The course will commence with an orientation day during which we will visit outcrops significant to the mapping area. There will be four days of mapping. Each team will be expected to cover a broadly similar area. Most of the time the teams will be supervised by myself and/or a teaching assistant and/or a demonstrator and at other times they will work solely as a student team. One day will involve observations of some of the oldest rocks in the UK (the Lewisian gneisses on the island of Iona) and the rocks that formed during the opening of the Atlantic Ocean at Fingal's Cave on the island of Staffa. **ATTENDANCE AT THE FIRST AID COURSE AT THE START OF SUMMER TERM IS COMPULSORY FOR ALL STUDENTS ATTENDING THIS MODULE.**	
Practical/ workshop	The first evening will cover "The Logistics of Geological Field Projects". On other evenings, students will ink in maps and field notebooks, plot structural data on maps, establish the likely processes which formed the rocks, sediments and geomorphology of the mapped area, and determine the geological history of the mapped area.	*Lecturer* JSG

Learning outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Plan the logistics of a geological field project
- Work both independently and as part of a team on exercises out-of-doors
- Work in challenging weather with notebook/map and the 'tools of the trade' (and with a sense of humour)

Subject Specific Outcomes

- Understand the techniques of geological map making
- Understand the values of geological maps
- Make a 1:10,000 geological map
- Make comprehensive geological field notes
- Plot structural data on maps
- Recall key aspects of the geological history of the British Isles, from the Precambrian to the present day

Assessment: *CWA: 100 %* *Exam: none*

Details of CWA:
This is in two parts.

1. Students are required to submit their fair copy geological map. This carries 60% of the module mark.
2. Students are required to submit their field notebook. This carries 40% of the module grade.

Recommended texts and other learning resources (note that other reading material will be provided on the field course)

Barnes JW, Lisle RJ, 2005, Basic geological mapping. John Wiley & Sons, ISBN 0-470-84986-X.
STUDENTS ARE REQUIRED TO SPEND AT LEAST 12 HOURS READING BARNES AND LISLE (2005) IN ADVANCE OF THE FIELDCOURSE
Maltman A, 1995, Geological maps: an Introduction. John Wiley & Sons, ISBN 0-471-93241-8.
Woodcock N, Strachan R, 2002, Geological history of Britain and Ireland. Blackwell Science Ltd, ISBN 0-632-03656-7.
Hunter A, Easterbrook G, 2004, The geological history of the British Isles. The Open University, ISBN 0-7492-0138-X.
McClay K, 2006, The mapping of geological structures. John Wiley & Sons, ISBN 13-9-780471-932437.
Thorpe R, Brown G, 2001, The field description of igneous rocks. John Wiley & Sons, ISBN 0-471-93275-2.
Fry N, 1989, The field description of metamorphic rocks. John Wiley & Sons, ISBN 0-471-93221-3.

Module number: **ENV 210**	*Module title*: **CATCHMENT HYDROLOGY**		
Number of weeks: 5	*Term taught*: M1	*Contact hours*: 20	*Learning Hours*: 75
Pre-requisites: ENV 104, ENV124	*Co-requisites*: none	*Credits :* 7.5	
Module organiser: Dr N A Chappell	*Other lecturers*: Dr Nick Kettridge		

Aims and scope:
To introduce concepts, plus measurement and analytical techniques used by hydrologists to solve water-related problems in catchments.

Syllabus

Lecture	*Title*	*Lecturer*
1	Introduction to module & catchment	NAC
2	Rainfall: processes & measurement	NAC
3	Rainfall: analysis	NAC
4	Evapo-transpiration: processes	NK
5	Evapo-transpiration: new methods	NK
6	Subsurface: groundwater flow	NK
7	Subsurface: recharge by infiltration	NK
8	Runoff: measurement & basic analysis	NAC
9	Rainfall-runoff: processes & pathways	NAC
10	Rainfall-runoff: black-box models	NAC
11	Rainfall-runoff: process models	NAC
12	Summary and practice	NAC

Practical/ workshop	*Title*	*Lecturer*
1	Groundwater modelling exercise	NK
2	Upper Eden Field Trip	NAC

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes
- Demonstrate the ability to manipulate physical equations.
- Demonstrate the skills to use and cite primary references.

Subject Specific Outcomes
- Demonstrate how to describe catchment processes, quantitatively
-

Assessment: *CWA: 50%* *Exam: 50%* *Module test: None*

Details of CWA:
1. Practical report on groundwater modelling exercise

Recommended texts and other learning resources:
Hornberger et al. , 1998, *Elements of Physical Hydrology*, Johns Hopkins University Press
Shaw, E M, 1994, Hydrology in Practice, Prentice and Hall (3rd Edition)
Most required reading available as PDF files on LUVLE
Lecture and practical material also available as PDF files on LUVLE

Module number: **ENV 211**	*Module title*: **AQUATIC BIOGEOCHEMISTRY**		
Number of weeks: 5	*Term taught*: M2	*Contact hours*: 21	*Learning Hours*: 75
Pre-requisites: Some chemical background or ENV123		*Co-requisites*: none	*Credits :* 7.5
Module organiser: Dr Hao Zhang		*Other lecturers*: none	

Aims and scope: The aims are to introduce students to (1) the nature of aquatic systems from a chemical standpoint, (2) the main processes and factors governing the chemical composition of natural waters, (3) a range of case studies to illustrate 1 and 2, and (4) various analytical methods and analytical quality control considerations.

Syllabus

Lecture	*Title*	*Lecturer*
1-2	The nature of aquatic systems and the nature and characterization of substances	HZ
3	present in natural waters.	
4	Chemical equilibrium.	HZ
5-7	Acids, bases, pH, pH buffering, alkalinity, the CO_2 system.	HZ
8-9	Chemical weathering and clay minerals.	HZ
10-11	Redox processes.	HZ
12	Sorption phenomena and colloids.	HZ
13	Acid rain case study.	HZ
	Revision.	

Practical/ workshop	*Title*	*Lecturer*
1	Practical concerned with spectrophotometry analysis and quality assurance	HZ
2	Practical concerned with CO_2 system and pH buffering, including measurement of pH, alkalinity, and Ca.	HZ

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Prepare an Excel spreadsheet for data analysis and presentation.
- Apply algebraic and IT skills to aquatic chemistry.

Subject Specific Outcomes

- Describe the basic chemical characteristics of natural waters.
- Discuss the factors and processes controlling the chemical composition of natural waters.
- Carry out pH measurements, colorimetric analysis of phosphate, atomic absorption measurements of metals, acid-base titrations.

Assessment: CWA*: 50%* Exam*: 50%* Module test*: none*

Details of CWA: A scientific report based on the data produced in practicals 1 and 2 (90% of CWA). Satisfactory completion of all practicals (10% of CWA).

Recommended texts and other learning resources:
Andrews, J.E. et al. 2004. An Introduction to Environmental Chemistry. 2nd edition, Blackwell.
Drever, J.I. 1997. The geochemistry of natural waters. 3rd edition, Prentice Hall, DRHC
Harrison, RM et al. Introductory Chemistry for Environmental Sciences. Cambridge UP. DUHS.
VanLoon, G.W. and Duffy, S.J. 2005. Environmental chemistry, a global perspective. Oxford University

Supporting lecture notes and a practical/workshop handout

Module number: **ENV 220**	*Module title*: **DYNAMIC LANDSCAPES 2: ENDOGENETIC PROCESSES & PRODUCTS.**		
Number of weeks: 5	*Term taught*: Lent 1-5	*Contact hours*: 26	*Learning hours*: 75
Pre-requisites: Env 102, 103, 113.	*Co-requisites*:		
Module organiser: Dr Yani Najman	*Other lecturers*:		

Aims and scope: The landscapes we see today are the consequence of interaction between tectonic uplift (endogenetic) processes and denudational (exogenetic) processes. These processes are continually in flux resulting in a dynamic landscape which evolves and adjusts through time. This module examines tectonic processes and products (rocks), the interaction between uplift and denudation, and looks at how we can recognise and quantify the amounts and rate of change. This module complements Dynamic Landscapes I which focuses on exogenetic processes.
This is a strongly practical-based course, designed to provide students with key geological skills. Lectures are designed to provide introductory background to the practical and field skills required for the assessed assignments.

Syllabus

Lecture	*Title*	*Lecturer*
1 2 3 4 5 6 7 8 (1.5 hrs) 9 (1.5 hrs) 10	Introduction Endogenetic processes and product. Epeirogenesis and orogenesis. Assessed assignment introduction Recognising and interpreting endogenetic processes: metamorphic rocks Recognising and interpreting exogenetic processes: sedimentary rocks Video: tectonic processes. Field trip introduction: determining tectonics and sedimentary facies in the field. Using a stereonet to determine stress direction from fold data Using a stereonet to determine palaeocurrent information from sedimentary structures. Determining rates of endogenetic and exogenetic processes: isotopic techniques. **Compulsory day field trip to Tebay (Assessed Assignment 3):** **9.30-5pm. Alternates: Saturday Jan 30th OR Sunday Feb 7th.** - **determination of tectonics and deformation from fold, fault and way-up structures.** - **Determination of facies from palaeocurrent data and depositional environment assessment.**	YN
Workshops/practicals		*Lecturer*
2 practicals & 3x1 hr workshops. 1 8 hr fieldtrip	practical sessions to develop skills needed to complete the assessed assignments (see below) – emphasis on developing microscopy skills. Development of field skills – measurements and interpretations related to tectonics and sedimentary rocks. This module is designed to develop generic skills required by Earth Scientists. Assessment is therefore 100% cwa (no exam) in order to maximise the amount of time available for the development of these skills. Substantial amounts of private lab study are required in order to complete the cwa.	YN

Learning outcomes:
On completion of this module students will be able to:

Generic Outcomes

- Synthesis data from a number of different sources and compile it into a coherent picture.
- Carry out independent thinking, and interpretations of data for which there may be more than one potential answer.

Subject Specific Outcomes

On completion of this module, students will be able to:

- Be able to identify rocks in the lab, identify minerals in thin section, interpret structural, sedimentological and isotopic data.
- From the above information, determine how rocks can be used to determine past sedimentary, igneous and metamorphic environments.
- From this information, determine the processes by which deformation and uplift occur, the interaction with erosion in the development of earth's surface features, and how the rates at which these processes occur can be quantified.
- Carry out field measurements (structural and sedimentary) and interpret the data.

Module number: **ENV 220**	*Module title*: **DYNAMIC LANDSCAPES 2: ENDOGENETIC PROCESSES & PRODUCTS. (Continued)**

Assessment: CWA assignments*: 100%*

Assessed Exercise 1: 35% of marks
Assessed Exercise 2: 35% of marks
Assessed Exercise 3: 30% of marks
AE1: recognition of rocks in thin section and hand specimen – interpretation of their evolution and facies. Synthesis into the rock cycle.
AE2: synthesis of lecture material, rock, mineral, fossil, isotopic, structural and sedimentological data into an overall interpretation in order to understand the tectonic processes that shape the earth.
AE3: interpretation of field tectonic tectonic and sedimentary rock data.

Recommended texts:

Extensive use should be made of the text books in the "lab library", copies of most of which can be found in the main University library as well.

Module number: **ENV 221**	*Module title*: **SOIL SCIENCE**		
Number of weeks: 5	*Term taught*: L2	*Contact hours*: 21	*Learning Hours*: 75
Pre-requisites: Part I E.S.		*Co-requisites*: none	*Credits :* 7.5
Module organiser: Dr. Hao Zhang		*Other lecturers*: Dr S Lane	

Aims and scope: This module aims to demonstrate the nature and properties of soils in an environmental context. An introduction to soil formation, description, chemical and physical properties, and biology, leads to the application of soil science to a variety of practical problems.

Syllabus

Lectures	*Title*	*Lecturer*
1	Introduction to the soil	SL
2	Soil formation.	SL
3	Physical Properties 1 – soil texture/structure.	SL
4	Physical Properties 2 – density, pore space, aggregation.	SL
5	Physical Properties 3 – Engineering aspects.	SL
6	Soil and water -physical	SL
7	Adsorption and ion exchange	HZ
8	Soil acidity and alkalinity	HZ
9	Organic material	HZ
10	Biota and nutrients	HZ
11	Nutrients, N, P, K etc	HZ
12	Soils and pollution	HZ
13	Revision	HZ

Practical workshop	*Title*	*Lecturer*
1.	Physical soil properties	SL
2.	Chemical soil properties	HZ

Learning Outcomes:

On completion of this course students will be able to:.

Generic Outcomes

- Apply algebraic and IT skills to the study of soil science
- Write a standard report describing a laboratory analysis

Subject Specific Outcomes

- Describe the nature and role of soils in the environment
- Give a basic account of soil chemical and physical properties, and soil biology

Discuss applied aspects of soils, specifically waste disposal/management, nutrient cycling and pollution considerations

Assessment: *CWA*: 50% *Exam:* 50% *Module test: none*

Details of CWA:

1. Written evaluation of laboratory practicals 1 and 2.

Recommended texts and other learning resources:

N C Brady, *The Nature and Properties of Soils*

Module number: **ENV 230**	*Module title*: **ATMOSPHERE, WEATHER AND CLIMATE 2**		
Number of weeks: 5	*Term taught*: L1	*Contact hours*: 24	*Learning Hours*: 75
Pre-requisites: ENV105	*Co-requisites*: none	*Credits :* 7.5	
Module organiser: Dr O Wild	*Other lecturers*:		

Aims and scope: To develop a basic understanding of atmospheric physics. The course falls into three parts: introduction to atmospheric structure and behaviour, boundary layer meteorology and deposition, and general circulation in the troposphere and stratosphere.

Syllabus

Lecture	*Title*	*Lecturer*
1-3	Introduction. The equation of state, the hydrostatic equation, potential temperature	OW
4-6	and geostrophic flow. The structure of the planetary boundary layer. Turbulence, flow over complex	
7-9	terrain. Climatology of stability classes. Dry deposition of pollutants. The general circulation. Global air movement, pressure belts and surface winds.	
10-11	Monsoons El Niño – Southern oscillation. Upper tropospheric patterns. The thermal wind, Rossby waves, extra-tropical	
12	cyclones and fronts. Stratosphere-troposphere exchange. The stratosphere. The Brewer-Dobson circulation. Potential vorticity. The polar vortex, the surf zone, and the tropical pipe.	

Practical/ workshop	*Title*	*Lecturer*
1	Visit to Hazelrigg. Analysis of automatic weather station data.	OW
2	Geostrophic trajectory analysis of the radioactive cloud from Chernobyl.	
3	Numerical problems class.	

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Work confidently in a field-station setting, with due regard for safety, careful measurement, and care of equipment.
- Construct simple maps from spatially distributed data

Subject Specific Outcomes

- Describe the structure and behaviour of the atmosphere with reference to meteorological observations
- Describe the pathways of atmospheric transport from analysis of meteorological charts
- Draw schematic diagrams of the general tropospheric circulation and list the major forces driving the circulation.

Calculate atmospheric quantities, such as potential temperature, and use the results of the calculations to describe the state of the atmosphere.

Assessment*: CWA: 50% Exam: 50%*

Details of CWA:
Two assessed laboratory reports, each carrying 20% of the total mark. Reports will be in the form of practical handouts, with calculations and discussion to be completed by the student. The final 10% of the marks will be given for adequate completion of the remaining practical and completion of a drawing assignment.

Recommended texts and other learning resources:
Core texts:
Wallace, J.M., and P.V. Hobbs, Atmospheric Science, An Introductory Survey, Academic Press, 2nd ed., 2006.
Aguado, E., and J.E. Burt, Understanding Weather and Climate, 4th ed. Prentice-Hall NJ, USA, 2007

Subsidiary texts include:
Barry, R. G., and Chorley, R. J., *Atmosphere, weather, and climate*, 8th ed., Routledge, 2003.
Smith, C., Environmental Physics, Routledge, 2001.
McIlveen, J.F.R., *Fundamentals of weather and climate*, 2nd ed., Chapman and Hall, 1992.
O'Hare, G., J. Sweeney, and R. Wilby, Weather Climate and Climate Change, Prentice Hall, 2004.
Lecture notes will be provided.

Module number: **ENV 231**	*Module title*: **INTRODUCTION TO ATMOSPHERIC CHEMISTRY**		
Number of weeks: 5	*Term taught*: L2	*Contact hours*: 24	*Learning Hours*: 75
Pre-requisites: None	*Co-requisites*: none	*Credits :* 7.5	
Module organiser: Prof. Nick Hewitt	*Other lecturers*: none		

Aims and scope: The course introduces the origins and chemical composition of the Earth's atmosphere, the fluxes of C, S and N to and from the atmosphere and the main chemical processes that occur in the atmosphere, with emphasis on the oxidizing capacity of the atmosphere. The course is limited in scope to the lower atmosphere (the troposphere and stratosphere), and, largely, to "natural" chemical processes, not pollution processes.

Syllabus

Lecture	*Title*	*Lecturer*
1.	Introduction, units and their conversion	CNH
2.	Composition and structure of the atmosphere	CNH
3.	The carbon cycle: carbon dioxide in the atmosphere	CNH
4.	Carbon dioxide as a pollutant, methane in the atmosphere	CNH
5.	The cycles of nitrogen and sulphur in the atmosphere	CNH
6.	Particles in the atmosphere	CNH
7.	Atmospheric removal processes	CNH
8.	Gas phase reaction kinetics	CNH
9.	Photochemistry	CNH
10.	Ozone in the troposphere	CNH
11.	Photochemical cycles	CNH
12.	Ozone in the stratosphere	CNH

Practical/ workshop	*Title*	*Lecturer*
P. 1.	Lead in roadside soil	CNH
P. 2.	Simple reaction kinetics	CNH

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Work, under the general guidance of a supervisor, in an analytical chemistry laboratory.
- Write a standard report describing a laboratory analysis.
- Carry out a literature search and condense information in to a report.

Subject Specific Outcomes

- List the components of the unpolluted troposphere, including the trace gases of chemical significance.
- Draw annotated schematic diagrams of the atmospheric cycles of carbon, nitrogen, and sulphur.
- Describe in words and using chemical equations, the ozone chemistry of the troposphere and stratosphere.
- Calculate reactant or product concentrations using chemical kinetic data.

Assessment: CWA: 50% *Exam: 50%* *Module test: none*

Details of CWA:
Detailed laboratory report on one experiment, including wider discussion of topic.

Recommended texts and other learning resources:
VanLoon and Duffy, Environmental Chemistry.
Hobbs, Introduction to Atmospheric Chemistry.
Hobbs, Basic Physical Chemistry for the Atmospheric Sciences.
Jacobs, Introduction to Atmospheric Chemistry.
Graedel and Crutzen, Atmospheric Change, Freeman
Turco, Earth under Siege, Oxford
Harrison et al., Introductory Chemistry for the Environmental Sciences, Cambridge
Wayne, Chemistry of Atmospheres, Oxford
Hewitt, Course handout (50 pp).

Module number: **CHEM 201**	*Module title*: **ELECTROCHEMISTRY AND KINETICS**		
Number of weeks: 5	*Term taught*: -M1	*Contact hours*: 37	*Learning Hours*: 150
Pre-requisites: CHEM 104	*Co-requisites*: None	*Credit s:* 15	
Module organiser: Dr Keith Davidson	*Other lecturers*: None		

Aims and scope: To provide a systematic account of the electrochemical properties of ions in solution, and give a complete overview of the theory and practice of chemical kinetics. Practical classes will give hands-on experience in measuring physical properties and reinforce the theoretical concepts taught in lectures.

Syllabus

Lecture	*Title*	*Lecture*
1-3	Electrodes, electrode potentials, the use of electrode potentials to predict the course of a chemical reaction. Electrochemical cells; thermodynamics, including the determination of ΔG, ΔH and ΔS	KD
4	Ion-selective electrodes, the measurement of pH, Fuel Cells	
5-6	Modern theories of the behaviour of ions in solution, especially Debye-Huckel theory.	
7	Activities and activity coefficients. The Debye-Huckel limiting law and evidence for ion-solvent interactions.	
8	Kinetics. General definitions. Stoichiometry vs. mechanism. Dependence of rate on concentration, rate constant and order of reaction.	
9	Experimental determination of rates of reaction. Determination of orders from rate measurements	
10	Integrated rate equations for simple reaction types. Use of integrated rate equations to determine order. Fractional lives. molecularity vs. order	
11	Kinetics of more complex reactions: approach to equilibrium, parallel and consecutive reactions. Rate determining step. Steady state approximation and its uses.	
12	Effect of temperature on rate and rate constant. Arrhenius equation, significance of activation energy Kinetics of reactions in the gas phase - simple collision theory	
13	Reactions in solution - transition state theory. Enthalpy and entropy of activation	
14	Effects of solvent polarity and viscosity on rates of reaction.	
15	Introduction to homogeneous and heterogeneous catalysis.	
Practical/ Workshop		
Wrks 1	Accuracy and precision, curve fitting, error analysis.	
Pract 1	Determination of the cell potential of the cell $Ag\|AgCl\|Cl^-\|Fe^{3+}$, $FE^{2}+\|Pt$.	
Pract 2	Determine the enthalpy, entropy and free energy change, for zinc-silver oxide system.	
Pract 3	Order of reaction of the catalysed decomposition of hydrogen peroxide in aqueous solution.	
Pract 4	Order the reaction, with respect to MnO_4^- for the permanganate-oxalate reaction.	

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes
- Understand the relationship between electrochemistry and thermodynamics.
- Understand the principles governing reaction kinetics and the effect of concentration, temperature and catalysts on the rate of a reaction.

Subject Specific Outcomes
- Calculate the pH of a solution purely from concentration measurements;
- Determine ΔG, ΔH and ΔS from electrochemical measurements.
- Determine rate constants and activation energies from kinetic measurements.
- Use steady state approximations to derive rate laws of complex reactions.

Assessment: CWA*: 30%* Exam*: 70%:*

Details of CWA: two sets of seminar work and one end of module test.

Recommended texts and other learning resources:

P W Atkins and J de Paula, Physical Chemistry 8th Ed., OUP, 2006

B G Cox, Modern Liquid Phase Kinetics, Oxford Science Publications, 1994.

APPENDIX 2: OUTLINE CONTENTS OF YEAR 3 MODULES

Module number: **ENV 300**	*Module title:* **DISSERTATION WITH EMPLOYABILITY SKILLS**		
Number of weeks: 40	*Term taught:* Y2 – Y3	*Contact hours:* 24	*Learning hours:* 300
Pre-requisites: None	*Co-requisites:* None	*Credits :* 30	
Module organiser: Dr W Tych	*Other lecturers:* Department Part 2 tutor, dissertation supervisor		

Aims and scope: This module integrates development of graduate key skills, e.g. intellectual, practical, communication, numeracy, teamwork, self-management and professional development skills, with production of a thesis based on original work, on a topic of the students' choice. Key parts of the module, such as time management, self-management, intellectual and practical skills are vital for the successful completion of the dissertation.

Syllabus

Timetable	*Description*
Michaelmas Term	Careers, time management and graduate key skills tutorials with department Part 2 tutor.
Lent Term start of week 1	Allocation of dissertation supervisor.
Lent Term	Dissertation tutorials with dissertation supervisor. Establish dissertation aims and methods; submit rationale and work plan.
Summer Term 1-10	Carry out practical aspects of dissertation, e.g. laboratory, field, computer work. Data manipulation analysis and presentation for dissertation.
Summer Term week 10 (normal deadline)	1500 word dissertation progress report submitted which carries 10% of the total module mark.
September	Marked report (with feedback) returned to the student.
Michaelmas Term start of week 2	Submit one dissertation chapter for feedback.
Michaelmas Term end of week 3	Supervisors provide feedback on one dissertation chapter.
Michaelmas Term start of week 10 (normal deadline)	Dissertation submitted, which carries 90% of the total module mark.

Learning outcomes

On completion of this module a student will be able to:

Generic Outcomes

- Plan, carry out and write-up a scientific study
- Manage a long-term project effectively.

Subject Specific Outcomes

- These will depend on the style (e.g. laboratory-, field-, computer-based) and topic of the dissertation project.

Assessment: *CWA: 100%* *Exam: None*

Details of CWA:

The assessment requires the submission of: (1) 1500 word dissertation progress report (**10%** of module mark); and (2) <5000 word dissertation (**90%** mark).

Recommended texts and other learning resources

Guidance on learning resources for the dissertation will be provided by the dissertation supervisor on an individual basis. Dissertation information is provided in the course handbooks. Course notes for ENV201 Project Skills should be consulted where appropriate.

Module number: **ENV 310**	*Module title*: **HYDROLOGICAL PROCESSES FIELDCOURSE (SLAPTON)**		
Number of weeks: 1	*Term taught*: Summer Vacation	*Contact hours*: 60	*Learning hours*: 150
Pre-requisites ENV 210*	*Co-requisites*: (* or equivalent modules undertaken in North America/Australasia)		
Module organiser: Dr N.A. Chappell	*Other lecturers*: IGER staff	*Credits :* 15	

Aims and scope: The field course is an introduction to the study of flow and transport processes based on projects leading to an understanding of the spatial distribution of hydrological processes and a physical basis for the delineation of nitrate protection or buffer zones in the Slapton Wood Catchment. Places limited and pre-registration required.

Syllabus

Day	*Title*	*Lecturer*
1	The Slapton Wood catchment: introduction to research	NAC
2	Small group project: Measurement of Soil and Rock Hydraulic Properties	
3	Small group project: Transport Parameter Estimation	
4	Visit to IGER, North Wyke (http://www.iger.bbsrc.ac.uk/igerweb/): Modelling	IGER
5	nitrate fluxes	NAC
6	Small group project: Hydrological modelling	
	Small group project: Soil Moisture Patterns and Topographic Indices	

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Identify errors involved in taking measurements and developing models
- Compare primary field data with data contained in published studies

Subject Specific Outcomes

- Assess the hydrological processes occurring within a small catchment Develop skills in measuring the relevant flow and transport parameters
- Calibrate and evaluate models of flow and transport processes
- Devise a plan for reducing nitrate inputs into Slapton Ley.

Assessment: CWA: *100%* Exam: *None*

Details of CWA:

A workbook containing questions specific to the four projects (60%), field notes (10%) and an integrated, management question (30%)

Recommended texts and other learning resources:

Course handout 60 pp
Copies of relevant books and papers will be available during the field course and before (summer term)

Module number: **ENV 311**	*Module title*: **SURFACE WATER HYDROLOGY: FROM PROCESSES TO MODELS**		
Number of weeks: 5	*Term taught*: M2	*Contact hours*: 30	*Learning hours*: 150
Pre-requisites: ENV210	*Co-requisites*:	*Credits :* 15	
Module organiser: Prof. Keith Beven	*Other lecturers*: Dr Arun Chotai, Dr Wlodek Tych		

Aims and scope: This course aims to introduce the principles of modelling surface flow and transport processes. This is achieved through practical application of models to particular hydrological data sets. A problem based learning approach is adopted using lectures to support practical sessions. Particular reference is made throughout to models as tools for the Water Framework Directive.

Syllabus

Lecture	*Title*	*Lecturer*
1	The perceptual model: How catchment systems work?	KJB
2	Models for the future: WFD, land use change, climate change	KJB
3	Input data and errors in representing catchments systems	KJB
4	Models based on data: DBM principles	AC/WT
5	Models based on data: representing catchment nonlinearities	AC/WT
6	Models based on data: representing transport processes	AC/WT
7	Conceptual models: Distributed representation of catchment processes	KJB
8	Conceptual models: Topmodel	KJB
9	Calibration and Uncertainty for Conceptual Models	KJB
10	Flood routing and transport of pollutants	KJB
11	Real-time forecasting	KJB
12	Flood frequency estimation using continuous simulation	KJB
13	Looking at long term records: detecting change	WT
14	Hydrological impacts of land use change	KJB
15	Hydrological impacts of climate change	KJB

Practicals	*Title*	
Week 7	TFM analysis	AC
Week 8	Topmodel	KJB
Week 9	Flood Forecasting	KJB
Week 10	Analysis of long term records	WT

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes
- Understand various steps in the modeling process
- Interpret computer graphics from model software and use of graphical outputs in reports
- Understand numerical evaluation of model results
- Understand sources of error in modelling
- Prepare reports for a Head of Section as if working for an organisation such as the Environment Agency

Subject Specific Outcomes
On completion of this module a student will be able to:
- List the classes of models available for practical use and be able to differentiate types of models
- List the basic steps necessary for forming a model of surface flow and transport and state the assumptions required
- List different sources of error in the modeling process
- State the limitations of such models for practical use
- Demonstrate practical use of a range of models and understand the issues in parameter calibration

This will be achieved through lectures and hands-on practical training with a variety of models.

Assessment: *CWA: 33%* *Exam: 67%*

Details of CWA:
Two reports based on the practical work are required, written as if reports prepared for a Head of Section at the Environment Agency.

Recommended texts and other learning resources:

Beven, K J, 2001, Rainfall-runoff modelling - the primer, Wiley, Chichester

Rutherford, J C, 1994, River Mixing, Wiley

Young, P C (editor) (1993) Concise Encyclopaedia of Environmental Systems, Pergamon Press. (Lancaster University Library: 8 copies classmark DG1(Y) – several (articles are highly relevant.

Module number: **ENV 313**	*Module title*: **WATER RESOURCES MANAGEMENT**		
Number of weeks: 5	*Term taught*: L1	*Contact hours*: 27	*Learning hours*: 150
Pre-requisites: -None	*Co-requisites*:	*Credits :* 15	
Module organiser: Dr Ben Surridge	*Other lecturers*: - Guest speakers		

Aims and scope: The aim of this module is to introduce the legislative, policy and procedural issues in the management of water resources within England and Wales.

Syllabus

Lecture	*Title*	*Lecturer*
1-15	1. UK context of water resource management 2. Sustainable water management 3. Water Framework Directive and River Basin Management. 4. Managing flow 5. Managing habitats 6. Water quality standards 7. Chemical water quality assessment 8. Biological water quality assessment 9. Critical load management 10. Water treatment processes I 11. Water treatment processes II 12. Water treatment processes III 13. Diffuse pollution and groundwater protection 14. Climate change and future water management 15. Synopsis	AJ
Practical/ workshop	*Title*	*Lecturer*
W1	Introduction to EA cwa case study	
W2	Case study computer workshop	AJ
W3	Lancaster STW site visit	
W4		

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes
- Use excel spreadsheets to analyse and present data using a standard format.
- Re-arrange algebraic expressions in order to calculate unknown variables.
- Write a technical report in a specified style.
- Work effectively within a group, prioritizing and delegating responsibilities in order to deliver to a deadline.

Subject Specific Outcomes
- Apply standard EA statistical procedures to assess chemical water quality.
- Apply standard EA procedures to assess biological water quality.
- Identify the strategy for assessing and managing water quality in the UK.
- Derive simple dilution models to describe pollutant concentrations in river networks.
- Identify and describe the fundamentals of water treatment processes.

Assessment*:* CWA*: 33%* Exam*: 67%*

Details of CWA:
A group report on an Environment Agency effluent consent setting case study.

Recommended texts and other learning resources:
Gray NF (2005) Water technology. An introduction for environmental scientists and engineers. Elsevier.
Helmer R (1997) Water pollution control : a guide to the use of water quality management principles. Spon.
Tebbutt THY (1998) Principles of Water Quality Control. 5th edition. Butterworth-Heinemann.
Mays, L (2006). Water Resources Sustainability. McGraw Hill.
http://www.environment-agency.gov.uk/

Module number: **ENV 314**	*Module title*: **CHEMICAL OCEANOGRAPHY**		
Number of weeks: 5	*Term taught*: L2	*Contact hours*: 25	*Learning hours*: 150
Pre-requisites: Normally ENV 211	*Co-requisites*:	*Credits :* 15	
Module organiser: Dr. J. Hamilton-Taylor	*Other lecturers*:		

Aims and scope: To explore the main chemical characteristics of the oceans and estuaries, and the associated controlling processes. To undertake a field study of the distributions of nutrients in estuaries.

Syllabus

Lecture	*Title*	*Lecturer*
1.	Elemental composition of seawater. Conservative and non-conservative behaviour. Salinity, its measurement and applications.	JH-T
2.	Steady vs non-steady state of ocean composition.	
3.	Mean oceanic residence times; the thermocline and the 2-box model of ocean chemistry; thermohaline circulation.	
4-6.	Estuaries	
7.	Evaporites	
8.	Primary productivity and particle fluxes.	
9-11.	The biolomited elements: P, N and Si. Biological cycling of other elements.	
12.	$CaCO_3$ biogeochemistry and changing pH of oceans.	
13.	Dissolved oxygen and anoxia.	
14.	Scavenged elements.	
15.	Geochemistry of ocean sediments.	

Practical/ workshop	*Title*
	A study of P and Si in the Lune estuary:
1.	Fieldwork.
2.	Laboratory analysis of field samples
3.	Tutorial on results.

Learning Outcomes

On completion of this module students will be able to:

Generic Outcomes

- Write a scientific report based on novel experimental data.
- Undertake field studies (fieldwork and chemical analyses) in estuaries.

Subject Specific Outcomes

- Describe the chemical composition of the oceans and discuss its origins.
- Describe and account for the chemical characteristics of estuaries.
- Describe and discuss nutrient distributions and primary productivity in the oceans.

Assessment*:* CWA*: 33%* Exam*: 67%*

Details of CWA:

Scientific report based on the results from the study of micronutrient distributions in the Lune estuary.

Recommended texts and other learning resources:

Libes, S.M. An introduction to marine geochemistry. Wiley, 1992.

Chester, R. Marine Geochemistry. 2nd edition. Unwin Hyman, 2000.

A set of supporting lecture notes and a set of practical notes. Included in these are a range of useful references and www addresses.

LULVE web page

Module number: **ENV 315**	*Module title*: **APPLICATIONS OF AQUATIC CHEMICAL MODELS**		
Number of weeks: 5	*Term taught*: M2	*Contact hours*: 30	*Learning hours*: 150
Pre-requisites: ENV211	*Co-requisites*:	*Credits :* 15	
Module organiser: Prof. Bill Davison	*Other lecturers*:		

Aims and scope: This module aims to provide environmental chemists with a detailed understanding of the importance of particular chemical forms in the environment. The systematic treatment of speciation calculations, from numerical approximations and graphical solutions, to the application of modern computer models, will enable the students to apply their chemical knowledge to real environmental problems related to water quality and the availability of metals to biota.

Syllabus

Lecture	*Title*	*Lecturer*
1.	What is meant by chemical speciation? Operational classifications, kinetic/thermodynamic definitions, redox species, ion species, ion pairs, activities,	WD
2 and 3.	surface species. Equilibrium constants. Simple calculations of equilibrium distributions, numerical	
4 and 5.	approximations.	
6.	pH as a master variable. Graphical solutions to equilibrium calculations.	
7.	Understanding gaseous equilibria.	
8.	Dealing with activity using ion association and ion interaction models.	
9.	The solubility of hydroxy and carbonate species.	
10.	Use of the visual MINTEQ computer models for speciation calculations.	
11.	Correcting for temperature and selecting stability constants.	
12.	Application of speciation models to surfaces.	
13.	Dealing with binding to humic substances.	
14.	Procedures for making speciation measurements.	
15.	Redox equilibria.	
	Use of other speciation codes.	
	Revision.	

Practical/ workshop	*Title*	*Lecturer*
1.	Workshop on simple numerical and graphical solutions.	WD
2.	Workshop on using the computer model to simulate the distribution of chemical	
3.	species in a hardwater.	
4.	Workshop on using the computer model to simulate carbonate equilibria in natural	
5.	waters.	
	Workshop on using the computer model to simulate the distribution of metal species in natural waters	
	Workshop on using the WHAM 6 model and comparing it to the VMINTEQ model	

Learning outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Improved numeracy and computer skills

Subject Specific Outcomes

- use computer speciation models to calculate metal-ligand equilibria in natural waters.
- appreciate the power and limitations of speciation models.
- appreciate the role of speciation in natural waters

Assessment: Cwa: 33% Exam: 67%

Details of cwa: Written evaluation of distribution of chemical species in a natural water calculated using model output.
Recommended texts and other learning resources: W. Stumm and J.J. Morgan, *Aquatic Chemistry* (1981). J. F. Pankow, *Aquatic Chemistry Concepts* (1991). G.K. Pagenkopf, *Introduction to Natural Water Chemistry* (1978). V.L. Snoesjink and D. Jenkins, *Water Chemistry* (1980). P. Fletcher, *Chemical Thermodynamics for Earth Scientists* (1993).

Module number: **ENV 316**	*Module title*: **FRESHWATER AND GROUNDWATER CHEMISTRY**		
Number of weeks: 5	*Term taught*: M1	*Contact hours*: 27	*Learning hours*: 150
Pre-requisites: ENV211	*Co-requisites*:	*Credits :* 15	
Module organiser: Prof W Davison	*Other lecturers*:		

Aims and scope: This course is built on the foundations of aquatic chemistry laid by ENV 211. It aims to provide environmental chemists with a sound understanding of chemical processes in freshwaters and groundwaters. It will show how chemical substances are introduced into these aqueous environments and provide clear conceptual frameworks for discussing their interactions and fates. Attention will focus on underlying controlling processes which will be illustrated by considering particular elements.

Syllabus

Lecture	*Title*	*Lecturer*
1	Introduction of thermal structure and basic processes in lakes.	WD
2	Biogeochemical interactions of iron, Part 1.	
3	Biogeochemical interactions of iron, Part 2.	
4	Biogeochemical interactions of manganese.	
5	Nitrogen and silicon cycles in lakes.	
6	Interactions of sulphur in lakes.	
7	The composition of major rivers.	
8	Major ions in lake waters.	
9	Trace metal characteristics.	
10	Trace metals in lake waters.	
11	Sediments: historical record, indicators of erosion.	
12	Sediments: diagenesis and remobilization.	
13	Fundamentals of groundwater chemistry.	
14	Evolution of groundwaters.	
15	Revision Lecture.	

Practical/ workshop	*Title*	*Lecturer*
	Field trip and allied laboratory work. Revision lecture	WD

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes
- Write reports based on data interpretation.
- Undertake in situ field measurements in lakes, collect sediment cores and analyse porewaters.

Subject Specific Outcomes
- Describe the processes in soils that determine freshwater composition.
- Describe the physical structure of lakes.
- Discuss the chemical dynamics of lakes.
- Describe the chemical processes determining the composition of groundwaters.

Assessment: *CWA: 33%* *Exam: 67%*

Details of CWA:
Written evaluation of measurements of O_2 and T in a lake water column and of iron and phosphate in porewaters.

Recommended texts and other learning resources:
J.O. Reuss and D.W. Johnson, Acid Deposition and the Acidification of Soils and Water;
J.I. Drever, The Geochemistry of Natural Waters;
C.A.J. Appelo and D. Postma, Geochemistry : Groundwater and Pollution.

Module number: **ENV 320**	Module title: **VOLCANIC PROCESS FIELD COURSE**		
Number of weeks: 1	Term taught: Lent +Easter Vacation 2010	Contact hours: 60	Learning hours: 150
Pre-requisites: ENV 203, ENV 112	Co-requisites:	*Credits :* 15	
Module organiser: Prof. H Pinkerton	Other lecturers: Dr Mike James		

Aims and scope: This course will build upon skills acquired during previous geological field courses. During an intensive week-long field course to an active volcanic region, students will improve their understanding of many of the complex processes that take place both on the surface and beneath volcanoes. This will be achieved by undertaking detailed fieldwork at key localities of a basaltic volcano (Mount Etna in 2009, but the location may change in subsequent years). Students will also gain experience in hazard analysis and mitigation. The cost in 2009 will be £500, but this is subject to change depending on flight costs each year.

Syllabus

	Description	Lecturer
Fieldwork	This course allows students to improve their theoretical knowledge of volcanic processes and their field skills by studying the evolution of a basaltic volcano. It will be a problem-based learning course in which students will be presented with two levels of problems. The higher level problem (e.g. understanding the plumbing system of a complex volcano or the role of 'volcano spreading' or slope instability in the evolution of volcanoes) will occupy the entire course and will form the basis for the assessment. Lower level problems will be solved at a number of key localities where students will be expected to unravel the processes involved. During the course, students will improve their observational and deductive skills, and they will learn how to work both individually and in small groups. Group discussions and group analysis of data form an essential component of this course. In addition to improving their observational and deductive skills, students will learn a number of field techniques such as the use of GPS and other navigational and mapping methods.	H.P./ M.J
Practical/ workshop	During the Lent Term, there will be 3 seminars to provide background on the main problems to be studied on Etna. Students will be expected to read up to 20 relevant papers between then and the field course. Most of the relevant hands-on skills will be taught in the field. In addition there will be evening sessions on a range of volcanological topics, as well as theoretical and data interpretation sessions based on Thermal infrared imagery and other important volcanological tools. Three additional tutorials run during the Lent term will explore these topics in greater depth.	Lecturer H.P./ M.J

Learning Outcomes:
On completion of this module students will be able to

Generic Outcomes
- Use a range of observational, technical, deductive and analytical skills to solve problems in volcanology,
- Work effectively in groups and as individuals in demanding conditions.

Subject Specific Outcomes
- Systematically identify volcanic rocks in the field.
- Use observations and knowledge of field relationships to reconstruct the conditions during the formation of volcanic rocks.
- Gain a deep understanding of the effusive, explosive and intrusive processes that take place during volcanic eruptions.
- Recognise the role of regional tectonics, gravitational deformation of the volcano and major slope instabilities on the evolution of basaltic volcanoes.
- Explain the problems of dealing with volcanic hazards on heavily populated active volcanoes.

Assessment: CWA: 67% Exam: 33%

Details of CWA: This is in three equally-weighted parts: (i) a project based on papers read before the field course. This will be on a topic such as the plumbing system of the volcano, or the role of 'volcano spreading', slope instability or volcanic hazard assessment (33%); detailed field notes that involve unravelling field relationships at a number of key localities and describing the processes involved in their formation (33%); and (iii) 1 question (out of 2) in the final examination based on reading during the previous 6 months and information gathered in the field (33%). The cwa is designed to test each of the above outcomes. This is reflected in the marking schemes.
Recommended texts and other learning resources: Elizabeth Parfitt and Lionel Wilson 2008. Fundamentals of Physical Volcanology. Blackwell; Allessandro Bonaccorso et al. 2004. Mt Etna: Volcano Laboratory. Geophysical Monograph 143. American Geophysical Union; John Guest, Paul Cole, Angus Duncan & David Chester 2003. Volcanoes of Southern Italy. Geological Society of London. An updated list of other papers will be given to all students two months before the start of the course.

Module number: **ENV 321**	*Module title*: **: THE DYNAMIC EARTH**		
Number of weeks: 5	*Term taught*: M2?	*Contact hours*: 21	*Learning hours*: 150
Pre-requisites: ENV 114	*Co-requisites*: None	*Credits :* t 15	
Module organiser: Dr Emily Heath	*Other lecturers*: None		

Aims and scope: This course is aimed at students who are familiar with current models of the Earth's internal structure and plate tectonic processes, but want to learn more about the geophysical techniques that are used to investigate the Earth. Students will learn how these techniques are applied, and how the results may be interpreted.

Syllabus

Lecture	*Title*	*Lecturer*
	Lectures:	EH
	1. Using seismology to investigate the Earth's interior	
	2. Geomagnetism and the Earth's core	
	3. Gravity anomalies and mass distribution within the Earth	
	4. Seismic tomography	
	5. Heat flow in the Earth	
	6. Mantle convection	
	7. Isostasy and vertical movements of the lithosphere	
	8. Paleomagnetism and lateral movements of the lithosphere	
	9. Stresses, faults and earthquakes	
	10. Earthquake focal mechanisms	
	11. Triple junctions	
	12. Measuring plate velocities	
	13. Continental collision and rifting	

Practical/ workshop	*Title*	*Lecturer*
	Practical/Workshop	EH
	1 x 3 hrs Earthquake focal mechanisms	
	1 x 3 hrs Plate boundaries and triple junctions	
	1 x 3 hrs Geophysics problem-solving workshops	

Learning Outcomes:
On completion of this module students will be able to:

Generic Outcomes

- Manipulate and solve relevant equations, including trigonometric functions
- Interpret and construct a variety of graphs, maps and diagrams

Subject Specific Outcomes

- Describe the principles behind a variety of geophysical techniques, and explain how these techniques may be applied to the solid Earth.
- Compare, contrast and combine different lines of evidence about how the Earth works.
- Apply graphical techniques (e.g. stereonets and velocity vectors) to determine faulting mechanisms. plate boundary types and plate motions.

Assessment: *CWA: 33%* *Exam: 67%*

Details of CWA:
Practical report.

Recommended texts and other learning resources:
Set text: Lowrie, W. (2007) Fundamentals of Geophysics. 2nd Ed. Cambridge Univ. Press.
Other useful texts:
Davies, G.F. (1999) Dynamic Earth. Cambridge Uni. Press.
Kearey, P. & Vine, F.J. (1996) Global Tectonics, 2nd Edition, Blackwell Science.
Fowler, C.M.R. (2005) The Solid Earth, Cambridge U. P. (2nd edition)
Cox, A. & Hart, R.B. (1986) Plate Tectonics - How it Works, Blackwell Science.
Mussett, A.E. & Aftabkhan, M (2000) Looking into the Earth, Cambridge U.P.
WWW resources to be advised at start of course.

Module number: **ENV 322**	*Module title*: **INTRODUCTION TO GEOPHYSICAL TECHNIQUES**		
Number of weeks: 5	*Term taught*: L2	*Contact hours*: 27	*Learning hours*: 150
Pre-requisites: Elementary maths equivalent to ENV 123		*Co-requisites*:	*Credits :* 15
Module organiser: Dr Mike James		*Other lecturers*:	

Aims and scope: This module introduces the underpinning aspects of geophysical and remote sensing techniques used to investigate the Earth's surface and near surface. The techniques covered are illustrated by case studies demonstrating their advantages and limitations, for example, for the investigation of contaminated sites and sites suitable for exploitation (e.g. for minerals or for hydrothermal energy) and for monitoring hazardous regions such as volcanoes. The course provides a synoptic view of active and passive techniques – seismic, gravity, magnetic, radar and electrical methods for sub-surface characterisation and GPS, radar and laser techniques for surface measurements. The techniques are linked through developing an understanding of measurements in terms of both spatial and temporal coverage and resolution.

Syllabus

Lecture	*Title*	*Lecturer*
1.	Introduction to traditional geophysical and remote sensing techniques, their advantages and limitations	M.J.
2.	Different technique styles and sampled fields: passive/active, dc/ac	
3.	Implications of the geophysical characteristics of materials and how they vary	
4.		
5.	Measurement platforms: sub-surface, ground-, air-, space-based instruments.	
6.		
7.	Electrical methods	
8.	Electromagnetic methods	
9.	Magnetic and gravity methods	
10.	Seismic and GPR methods	
11.	Data processing techniques	
12. & 13.	Surface (topographic) measurement (e.g. surveying, GPS, inSAR, LIDAR)	
14.	Remote sensing from the ground, air and space Case studies (e.g. contaminated land, water resources)	
15.	Event detection: Seismics (tectonic and volcanic earthquakes, anthropogenic causes e.g. reservoir filling, nuclear monitoring) Event detection: Other techniques (e.g. electrical techniques, infrasound, deformation monitoring)	
Practical/ workshop	Measurement sensitivities, resolutions and coverage Electrical techniques (field-based) Application of remote sensing	*Lecturer* M.J.

Learning outcomes:
On completion of this module students will be able to:

Generic outcomes
- Converse with geophysics and remote sensing specialists
- Relate different environmental measurements in terms of coverage and spatial and temporal resolution
- Construct an organised report containing geophysical data

Subject specific outcomes
- Discuss the advantages and disadvantages of different geophysical and remote sensing techniques
- Assess appropriate measurement strategies specific environmental problems
- Identify sources of geophysical measurement error

Assessment: CWA: 33% Exam: 67%

Details of CWA:
1. Written report of field-based practical work.
2. Written analysis and interpretation of a remote sensing or geophysical dataset

Recommended texts and other learning resources:
Milsom, J. (2003) Field geophysics. 3rd ed. Wiley.
Parasnis, D.S. (1986) Principles of applied geophysics. 4th ed. Chapman & Hall
Campbell, J.B. (2002) Introduction to remote sensing. 3rd ed. Tayor & Francis
Sigurdsson, H. (ed., 2000) Encyclopedia of volcanoes. Academic Press

Module number: **ENV 323**	*Module title*: **GEOLOGICAL HAZARDS**		
Number of weeks: 5	*Term taught*: M1	*Contact hours*: 30	*Learning hours*: 150
Pre-requisites: None	*Co-requisites*: None	*Credits :* 15	
Module organiser: Prof. Harry Pinkerton	*Other lecturers*:		

Aims and scope: This module is designed for students who wish to understand more about fundamental geological hazards and the processes responsible. The course puts geological hazards in the context of other natural hazards and includes response and preparedness issues. Specific hazards addressed are the failure of geological materials (slope stability, rock mechanics, landslides), volcanic hazards (eruption styles, plumes and pyroclastic flows) and earthquakes. It will include case histories of both local and major international disasters.

Syllabus

Lecture	*Title*	*Lecturer*
	An introduction to Natural Hazards, including the relative magnitudes of different events, human impacts, frequencies and spatial distribution. An introduction to ground instability mechanisms and landslip classifications in rocks and soils. Strength measurements of soils in the laboratory and field (direct shear tests, triaxial tests, shear vane *etc.*). Rock mechanics: basic principles; measurements in field and laboratory; "Strength" as a function of specimen size and orientation. An introduction to slope stability analysis Analysis of planar slides, rotational slips; slope stabilisation measures. Applied geology applied to hazard and risk analysis and mitigation Earthquake locations, magnitudes, scales, depths and sources, rupture mechanisms Local effects, engineering issues, earthquake prediction Types of volcano, magma rheology and eruption styles Volcanic plumes and pyroclastic flows; column collapse Associated hazards; mudflows, gas, volcano stability Preparedness and response	H.P.
Practical/ workshop	Strengths of geological materials and the Mohr Circle. Introduction to monitoring of volcanoes. Remote sensing as a tool in hazard mitigation.	*Lecturer* H.P.
Seminars	Dealing with a geological hazard (Students working in groups and different roles to address issues raised by a real geological hazard)	

Learning outcomes:
On completion of this module students will be able to:

- Recognise the effects of geological hazards and understand current mitigation strategies
- Investigate the stability of slopes both in the field and analytically
- Understand the Earth processes responsible for the occurrence, recurrence and magnitude of hazards.
- Play an active role in discussions and decision-making in meetings concerned with natural hazard mitigation

Assessment: CWA*: 33%* Exam*: 67%*

Details of CWA:
This is in two equally-weighted parts. The first involves a series of calculations which are designed to test numerical problem-solving ability in soil and rock mechanics, and the second is based on a power point presentation.

Recommended texts and other learning resources:
Craig, R.F. (1997) 'Soil Mechanics' Pub. E. & F.N. Spon.
Bromhead, E.N. (1992) 'The stability of slopes' Pub Blackie Academic and Professional.
Waltham, A.C. (1993) 'Foundations of Engineering geology'. Pub. Blackie Academic and Professional.
Smith, K. (1996) 'Environmental Hazards', Pub. Routledge.

Module number: **ENV 324**	*Module title*: **INTERPRETING THE SEDIMENTARY RECORD OF ENVIRONMENTAL CHANGE**		
Number of weeks: 5	*Term taught*: M1	*Contact hours*: 27	*Learning hours*: 150
Pre-requisites: ENV 203	*Co-requisites*: None	*Credits :* 15	
Module organiser: Prof I Marshall	*Other lecturers*: None		

Aims and scope: This module covers clastic processes and the evidence they leave of environmental change in the sedimentary record. The module introduces sequence stratigraphy as a framework for interpreting historic sedimentary evidence, and targets the use of this evidence to clarify understanding of contemporary sedimentary processes and climate change. The module will cover: glacial and periglacial processes, fluvial processes, seal level change, weathering, mass movement, sequence stratigraphy case studies. The module will use the Carboniferous sequences of Northern England as the main study examples for sequence stratigraphy.

Syllabus

Lecture	*Title*	*Lecturer*
1-5	Introduction to sequence stratigraphy.	IM
6-10	Earth surface processes.	
Seminar		
1-4	Case studies	
5	Revision	
Practical workshop	*Title*	*Lecturer*
1.	Hand sample lab	IM
2.	Use of maps and memoirs	
3.	Field trip	
4.	Process lab 4	
5.	Research workshop (present reports on field trip and associated research	

Learning outcomes:
On completion of this module a student will be able to:

Generic Outcomes
Link interpretations with observations

- Describe a wide range of examples of current processes, change and impact.
- Produce a research presentation.

Subject Specific Outcomes

- Describe a wide range of examples of sedimentary evidence for historic climate change.
- Outline the principles of sequence stratigraphic modelling.
- Interpret sedimentary sequences in a sequence stratigraphic framework.
- Propose process drivers for changes in the record.

Assessment: *CWA: 33%* *Exam: 67%* *Module test: None*

Details of CWA:
Research presentation and written research report.

Recommended texts and other learning resources:
Set text:
Coe, et al. (2002) The sedimentary record of sea level change. Open University
Other useful text:
Allen, P (pub 1998) Land Surface Processes or a modern equivalent TBA.

Module number: **ENV 325**	*Module title*: **COMPARATIVE PLANETARY SCIENCE**		
Number of weeks: 5	*Term taught*: L2	*Contact hours*: 27	*Learning hours*: 150
Pre-requisites: None	*Co-requisites*: None	*Credits :* 15	
Module organiser: Prof. L. Wilson	*Other lecturers*: None		

Aims and scope: This course is an introduction to the investigation of the origin and development of the Solar System, stressing what we can learn from other planets about the geological processes that have influenced the evolution of the Earth.

Syllabus

Lecture	*Title*	*Lecturer*
1.	Introduction: the diversity of bodies in the Solar System.	LW
2.	The history of the Moon: a key to the histories of all planets.	
3.	Basic planetary processes (A): Impact cratering.	
4.	Basic planetary processes (B): Volcanism.	
5.	Basic planetary processes (C): Tectonism.	
6.	The planet Venus.	
7.	The planet Mercury.	
8.	Basic planetary processes (D): Weathering.	
9.	The planet Mars: twin of Earth in complexity of processes.	
10.	The "planet" Io.	
11.	The origin and evolution of the Solar System.	
12.	What we can learn from asteroids and comets.	
Practical/ workshop	*Title*	*Lecturer*
1.	Impact craters: probes of planetary interiors and aids to dating surface features.	LW
2.	Morphologies, Origins and Emplacement Mechanisms of Planetary Lava Deposits.	
3. & 4.	Mars: Morphology and morphometry of features on the surface of a planet having a complex geological and climatic history.	

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Work as a member of a small group in practical sessions, using both communication and organisational skills.
- Access data from current spacecraft missions via the world-wide web.

Subject Specific Outcomes

- Compare the geophysical processes that have shaped the Earth's surface with the same or similar processes at work on the surfaces of other planets in the Solar System.
- Critically discuss ongoing research topics in which very conflicting opinions are currently held and often little progress can be made until future spacecraft missions are launched.

Assessment*:* CWA*: 33 %* Exam*: 67%*

Details of CWA: three photogeological interpretation projects are carried out in the practicals; the last of these is written up and assessed.

Recommended texts and other learning resources:
Planetary Geology. C. Vita-Finzi (2005) Terra Publishing. Paperback: 168 pp. ISBN-10: 1903544203, ISBN-13: 978-1903544204
An Introduction to the Solar System. Neil McBride and Iain Gilmour (eds.) (2004) Cambridge Univ. Press. Paperback: 418 pp., ISBN-10: 0521546206, ISBN-13: 978-0521546201
The Planetary System. David Morrison and Tobias Owen (2003; 3rd edition) Addison Wesley. Paperback: 570 pp. ISBN-10: 080538734X ISBN-13: 978-0805387346
http://photojournal.jpl.nasa.gov/
http://pds.jpl.nasa.gov/planets/

Module number: **ENV 326**	*Module title*: **METAMORPHIC ROCKS: PROCESS AND PRODUCT**		
Number of weeks: 11	*Term taught*: choice of M or L (on line component), fieldtrip in Easter vacation	*Contact hours*: 35 (fieldtrip). On-line support: as required.	*Learning hours*: 150
Pre-requisites: ENV203 and ENV220 Students will also be expected to have some basic numerical skills (ENV123 or equivalent) and basic chemistry skills (ENV122 or equivalent).			*Co-requisites*: *Credits:* 15
Module organiser: Dr Yani Najman (Lancaster) Prof. A. Skelton (Stockholm University).			*Other lecturers*:

Aims and scope: This module introduces the processes of metamorphism and deformation, focussing on the interpretation to be gained from the study of the rocks in hand specimen, thin section, and outcrop scale in the field. The classification of metamorphic rocks is explained and the student will learn how to determine the protolith of a metamorphic rock (i.e. the type of rock it was before it was metamorphosed) and interpret the pressure-temperature conditions and therefore plate tectonic setting in which metamorphism occurred. The course will provide a more in-depth understanding of how mudstones, mafic igneous rocks and carbonates are metamorphosed. The role of metamorphic fluids will be discussed. The residential field excursion will consolidate this knowledge by enabling the students to identify metamorphic rocks in the field, deduce their protoliths and interpret the grade of metamorphism. The course will convey the skills needed to use a geological map to understand the regional geology of a metamorphic terrain.

The focus of this course is the 6 day residential fieldtrip to the Scottish Island of Islay (4 days in the field, two travel days) taught alongside students from Stockholm University by Prof. Alasdair Skelton, a leading metamorphic petrologist from Stockholm University. The theoretical component, which supports the fieldtrip, is taught as 6 topics by distance learning, with on-line support, co-ordinated through Stockholm. Lancaster students are also provided with a Lancaster course convenor, Dr. Yani Najman, to act in a liaison capacity.

NOTE: ENV326 IS A NEW MODULE, AND THIS IS A DRAFT ENTRY, SUBJECT TO CHANGE.

Syllabus

Online Topics	*Title*	*On line Lecturer*
1	Introduction to the rock-forming minerals in thin section.	AS
2	Introduction to the concepts of metamorphism and deformation.	
3	Classifying and working with metamorphic reactions.	
4	Metamorphism of mudstones.	
5	Metamorphism of mafic rocks.	
6	Metamorphism of carbonate rocks and metamorphic fluids.	
Fieldtrip 6 day excursion (2 travel days)	Located on the Scottish Island of Islay, taught jointly with students from Stockholm University. The field trip will teach students how to: 1) identify and describe metamorphic rocks in the field 2) determine the metamorphic rock's protolith 3) understand deformation at the outcrop scale 4) use a geological map to understand the metamorphic geology at a regional scale	*Lecturer* AS

Learning outcomes:
On completion of this module students will be able to:

Generic Outcomes	**Subject Specific Outcomes**
• Converse with petrologists about metamorphism. • Identify the rock-forming minerals in thin section. • Construct an organised field report containing petrological data.	• Classify types of metamorphism and deformation. • Determine the protolith of a metamorphic rock • Interpret the pressure-temperature conditions of metamorphism and suggest a plate tectonic setting. • Describe and classify metamorphic rocks in the field.

Assessment: CWA *100%* *Exam: None*

Details of CWA
On line test at the conclusion of each of the 6 online topics (50%).
Field trip report and field note book (to be completed and finished in the field) (50%).

Text required for completion of the online topics:
Blatt, H. and Tracy, R. (2005) Petrology, Igneous, Sedimentary and Metamorphic, 3rd Rev. Ed. Palgrave Macmillan, ISBN: 9780716737438

Module number: **ENV 332**	*Module title*: **AIR QUALITY, AEROSOL, AND CLIMATE**		
Number of weeks: 5	*Term taught*: M1	*Contact hours*: 27	*Notional hours*: 150
Pre-requisites: None	*Co-requisites*: None	*Credits :* 15	
Module organiser: Prof C N Hewitt	*Other lecturers*: None		

Aims and scope: This module is intended for students who wish to gain experience in the field of air pollution, particularly under a changing climate.
The aim is to introduce the principal sources, reactions, sinks, control methods and effects of the major air pollutants. This includes gases and aerosol particles. Some of these gases and aerosol particles in the atmosphere also affect global climate, and so the module starts with an examination of the global radiative balance (i.e., climate). This module aims to provide an introduction to the physical processes which control the atmospheric aerosol, and the chemical processes affecting gaseous pollutants, leading to a better understanding of the science behind climate prediction.

Syllabus

Lecture	*Title*	*Lecturer*
1-3	Atmospheric structure and simple models of climate balance	CNH
4	The carbon cycle	
5-7	The atmospheric aerosol	
8-9	The direct and indirect aerosol effect on climate	
10	Stratospheric ozone destruction	
11	Acid rain	
12-15	Photochemical smog (and climate)	

Practical/ workshop	*Title*	*Lecturer*
1	Radiative balance - Hazelrigg	CNH
2	Aerosol sampling equipment	
3	Chemical analysis of hi-vol aerosol sample	
4	short presentations	

Learning objectives: On completion of this module a student will be able to:

Generic Outcomes
- Work as a team in the field to solve a problem to a strict deadline
- Prepare and deliver a short talk on a scientific subject.
- Fluently rearrange and solve algebraic equations.
- Carry out integration of simple first-order differential equations.

Subject-specific outcomes
- Calculate a global 2-compartment radiative budget.
- Discuss the sources and sinks of the major air pollutants.
- List the physical processes affecting aerosol, and calculate the effects of these processes on individual particles.

Assessment*:* CWA*: 33 %* Exam*: 67 %*

Details of CWA:
Short presentation to class with a written extended abstract.

Recommended texts and other learning resources:
M. Z. Jacobson, Atmospheric Pollution, Cambridge Univ. Press, 2002, ISBN 0521010446 – chapters 1,3,4,5,10,11,12

G. W. van Loon and S. J. Duffy, Environmental Chemistry, 2nd ed., Oxford, 2005, ISBN 019927499 - all of part A is relevant

Students are expected to supplement the course with reading from the wide range of aerosol science and atmospheric chemistry textbooks in the library.

Module number: **ENV 341**	*Module title*: **ENVIRONMENTAL RADIOACTIVITY**		
Number of weeks: 5	*Term taught*: M1	*Contact hours*: 38	*Learning hours*: 150
Pre-requisites: None	*Co-requisites*: None	*Credits :* 15	
Module organiser: Dr J M Pates	*Other lecturers*: None		

Aims and scope: The aim is to provide an understanding of the origin and behaviour of natural and artificial radionuclides in the environment. Their detrimental consequences as pollutants for human health and the environment are discussed. Finally, their use in the understanding of environmental processes and to determine "rates and dates" is examined.

Syllabus

Lecture	*Title*	*Lecturer*
1	Introduction to radioactivity.	JP
2	Radioactive decay and ingrowth.	
3	Interactions of radiation with matter.	
4	Human radiation dose & detriment.	
5	The effects of ionising radiation.	
6	Radiation protection in the UK.	
7	Natural sources of environmental radioactivity.	
8	Artificial sources of environment radioactivity.	
9	The nuclear fuel cycle.	
10-11	Radiometric dating	
12-13	Behaviour of radionuclides in the marine environment	
14	Artificial enhancement of natural radionuclides	
15	Behaviour of radioactive contaminants in the terrestrial environment	
Practical/ workshop	*Title*	*Lecturer*
Prac 1	Radioactive decay and ingrowth	JP
Prac 2	Radiation dose estimation	
Prac 3	Radon in homes	
Wkp 1-	Using computer revision systems	
Wksps 2-4	Calculation methods.	
Excurs'n	BNFL Springfields	Guides

Learning Outcomes:

On completion of this module a student will be able to:

Generic Outcomes

- Manipulate and solve basic radioactive decay law equations.
- Interpret data produced by a range of common radioanalytical techniques.

Subject Specific Outcomes

- Identify the sources of natural and artificial radionuclides in the environment
- Explain the main processes by which radionuclides are distributed through the environment.
- Explain the use of radioactive tracers to solve environmental problems (e.g. establishing a chronology, determining the speed of a current).
- Apply the principles of dose assessment to determine the impact of environmental exposure to radioactivity.

Assessment: *CWA: 33%* *Exam: 67%*:

Details of CWA:

Practical report and weekly computer-based assessment.

Recommended texts and other learning resources:

Cooper, J.R. et al. (2003) Radioactive releases in the environment: impact and assessment. John Wiley (DUHSQ)
Eisenbud, M. & Gesell, T. (1997): Environmental Radioactivity. 4th ed. Academic Press. (DUHSQ).
Hughes, J.S. 1999: Ionising radiation exposure of the UK population. (DUHSQ69 Oversize).
Sumner, D. et.al. (1994): Radiation risks. 3rd ed. Tarrogon. (DUHSQ).
Tkyva, R. & Sabal, J. (1995) Low-level environmental radioactivity: source & evaluation. Technomic Publishing Company (DUHSQ)

Module number: **ENV 342**	*Module title*: **THE ENVIRONMENTAL EFFECTS OF SOIL AND WATER POLLUTION**		
Number of weeks: 5	*Term taught*: M2	*Contact hours*: 24	*Learning hours*: 150
Pre-requisites: None	*Co-requisites*:	*Credits :* 15	
Module organiser: Prof K C Jones	*Other lecturers*: Prof W Davison, Dr J Hamilton-Taylor		

Aims and scope: This course covers the sources, pathways and effects of pollution in soils and within the aquatic environment. The material highlights the management of contemporary issues of lake acidification, euthrophication, soil contamination, and indicators of environmental health. Lectures on the different pollution examples are given by the relevant specialist enabling current techniques to be presented.

Syllabus

Lecture	*Title*	*Lecturer*
1-5	Eutrophication and its impact on the freshwater environment.	JH-T
6	Sources of acidity in soils and freshwaters	WD
7	Procedures for remediating acidity in lakes.	WD
8	Mechanisms that self-regulate the acid-base balance of lakes	WD
9 - 15	(Soil contamination and remediation. (Effects of pollution on human health	KCJ

Practical/ workshop	*Title*	*Lecturer*
	Eutrophication workshop.	JH-T
	Restoration acid lakes. (Video and lecture presentation of case studies)	WD
	Soil contamination and land fill.	KCJ

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Produce a short policy document.
- Produce a contaminated land assessment scheme.

Subject Specific Outcomes

- Identify appropriate management options for contaminated land and control of eutrophication.
- Discuss contaminated land regulatory issues.
- Evaluate the impact of human activities on aquatic and terrestrial ecosystems, their complexities and the difficulties of the associated environmental management issues.
- Discuss the scientific principles underlying eutrophication, to summarise its effects and to discuss the key issues involved in its management.
- Discuss the issues and science of contaminated land and its remediation, and the sources and potential effects of contaminants on human health

Assessment*:* CWA*: 33%* Exam*: 67%*

Details of CWA:

1. Production of a short policy document relating to some aspect of eutrophication.
2. Production of a contaminated land assessment scheme.

Recommended texts and other learning resources:
Reading lists of specialised journal publications will be provided by the different lecturers on the course.

Module number: **ENV 345**	*Module title*: **RISK ASSESSMENT AND MANAGEMENT**		
Number of weeks: 5	*Term taught*: M1	*Contact hours*: 24	*Learning hours*: 150
Pre-requisites: None	*Co-requisites*:	*Credits :* 15	
Module organiser: J. Quinton	*Other lecturers*:		

Aims and scope:
Environmental decision-making requires us to balance the risks and benefits from natural hazards, the use and generation of toxic chemicals, industrial development, and economic activities. How do we decide whether we should proceed or is it just too risky? This course will consider the environmental risks we face every day, examine the perception of risk, risk conceptualisation and some probability and statistics.

Syllabus

Lecture	*Title*	*Lecturer*
1	Introduction to module	JNQ
2	Environmental Risk assessment and management	
3	A framework for environmental risk assessment and management	
Worksho p	Perceptions of risk	
1	Conceptualising risk	
2	Order of magnitude estimation	
3	Managing risk	
4		

Practical / workshop	Title	*Lecturer*
1	Case study 1 - Den Brook – Assessing the risk of Phosphorus pollution	JNQ
2	Case study 2 - Den Brook – Assessing the risk of Phosphorus pollution	
3	Case study 3 - Den Brook – Assessing the risk of Phosphorus pollution	
4		
5		

Learning objectives:
On completion of this module a student will be able to:

Generic
- Tackle complex problems in a structured and logical fashion
- Write a structured report
- Learn the fundamentals of Monte Carlo Analysis
-

Subject specific
- Describe what is meant by risk and how it relates to environmental decision making.
- Be able to break down complex environmental hazards in their components
- Apply risk analysis tools to a proposed development

Assessment*:* CWA*: 100%* Exam*: 0%* Module test*: None*

Details of CWA
1. Report outlining a risk assessment of the Den Brook site (80%)
2. Assessments associated with workshops (20%)

Recommended texts and other learning resources:

☼ Kammen, D.M and Hassenzahl D.M. (1999). Should We Risk It? Exploring Environmental, Health and Technological Problem Solving. Princeton University Press, Princeton, NJ. P142-150

☼ DETR (2000) Guidelines for environmental risk assessment and management. HMSO, Norwich.

- Standards Australia (2004) Environmental Risk Management: Problems and Process. Standards Australia and Standards New Zealand, Sydney.
- Wisner, B, Blaikie, P Cannon, T. and Davis, I. 2004. At Risk. Natural Hazards, people's vulnerability and disasters. Second Edition, Routledge, London.

Module number: **CHEM 202**	*Module title*: **PHASE EQUILIBRIA AND THERMODYNAMICS**		
Number of weeks: 5	*Term taught*: M2	*Contact hours*: 37	*Learning Hours*: 150
Pre-requisites: CHEM 104	*Co-requisites*: None	*Credits :* 15	
Module organiser: Dr Keith Davidson	*Other lecturers*: None		

Aims and scope: To provide a systematic account of phase equilibria, and an introduction to chemical thermodynamics. Practical classes will give hands-on experience in measuring physical properties and reinforce the theoretical concepts taught in lectures.

Syllabus

Lecture	*Title*	*Lecturer*
1-3	Phase Equilibria: Phase diagrams of single substances, phase boundaries, the Phase Rule. Phase diagrams of mixtures, fractional distillation, eutectic mixtures. Ideal solutions, dilute-ideal solutions. Colligative properties. Partial molar volume.	KD
4	Introduction to chemical thermodynamics: review of first year thermodynamics	
5	Enthalpy changes, ΔH°. Hess's Law. First law of Thermodynamics	
6	Calculations using Hess's Law.	
7	Disorder, Entropy and spontaneous change, ΔS°. Second Law of Thermodynamics. Third Law of Thermodynamics, absolute values of S.	
8	Third Law: calculation of absolute entropies; specific heat; variation in enthalpy	
9	with temperature.	
10-11	Calculations involving entropy and enthalpy; dealing with ions etc.	
12-13	Spontaneity and Free Energy ΔG	
14	Equilibrium; ΔG at equilibrium, equilibrium constant, K.	
15	Variation of ΔG and K with temperature: Ellingham Diagrams	

Practical/ Workshop	*Title*
Pract 1	Construction of a phase diagram for two partially miscible liquids.
Pract 2	Partial vapour pressure curves for a binary liquid mixture.
Pract 3	Determination of the dissociation constant of a weak acid by conductivity
Pract 4	measurements.
Wrks 1	Determination of the dissociation constants of dibasic acids. Ellingham Diagram Workshop.

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Appreciate how substances can exist in different phases,
- understand the relationship of entropy and disorder and spontaneity and free energy.

Subject Specific Outcomes

- To be able to draw and extract information from phase diagrams; calculation of molecular weight from colligative property measurements.
- Calculate, enthalpy, entropy and free energy changes taking place during physical and chemical processes.
- Calculate equilibrium constants.

Assessment: CWA*: 30%* Exam*: 70%:*

Details of CWA: two sets of seminar work and one end of module test.

Recommended texts and other learning resources:

P W Atkins and J de Paula, Physical Chemistry 8th Ed., OUP, 2006

G M Barrow, Physical Chemistry, 6th Ed., McGraw-Hill, 1996.

Module number: **CHEM 204**	*Module title*: **ORGANIC PHOTOCHEMISTRY**		
Number of weeks: 5	*Term taught*: l2	*Contact hours*: 37	*Learning Hours*: 150
Pre-requisites: CHEM 103	*Co-requisites*: None	*Credits* : 15	
Module organiser: Dr Keith Davison	*Other lecturers*: None		

Aims and scope: To provide an introduction to the nature of electronically excited states in organic molecules. To give a systematic account of the photochemical reactions of a range of organic molecules. Practical classes will give hands-on experience in measuring physical properties and reinforce the theoretical concepts taught in lectures.

Syllabus

Lecture	*Title*	*Lecturer*
1-3	Photophysical process in organic molecules. Absorption, internal conversion, intersystem crossing, fluorescence, phosphorescence, delayed phosphorescence, multiplicity, singlet and triplet states. The Jablonski Diagram. Excited state lifetime. Energy transfer. Collisional quenching – Stern-Volmer equation.	KD
4-9	Photochemistry of Alkenes and related compounds. Isomerization reactions. Electrocyclic processes, conrotatory/disrotatory cyclizations. Sigmatropic shifts. Addition reactions, Markovnikov and anti-Markovnikov processes. Cycloaddition reactions. Photochemistry of aromatic compounds. Substitution reactions. Ring isomerisation. Addition reactions and cycloaddition reactions.	
10-11	Photochemistry of organic carbonyl containing compounds. Bond cleavage reactions – Norrish I type. Hydrogen abstraction, cyclization, β-cleavage – Norrish II type.	
12	Photochemistry in the atmosphere. The greenhouse effect, photochemical smog,	
13-14	acid rain. Ozone formation and depletion reactions in the stratosphere. Photosynthesis.	
15	Conductivity and photoconductivity in organic molecules. Synthesis of conjugated polymers. Applications of organic conductors; batteries, LEDs, photovoltaics, chemical sensors. EOMT	KD

Practical/ Workshop	*Title*
Wrks_1	Analysis of fluorescence emission spectra and the construction of Stern-Volmer plots.
Pract_1	pH Decrease Due to Photoproduction of an Acid
Pract_2	Photoreduction of Benzophenone
Pract_3	Photodimerization of Anthracene

Learning Outcomes:
On completion of this module a student will be able to:

Generic Outcomes

- Appreciate the differences between ground state and excited state chemical reactions.
- Understand the nature of photochemistry in the atmosphere and in biological systems.
- Understand the mechanism of conductivity and photoconductivity in organic conjugated polymers.

Subject Specific Outcomes

- To be able to design reaction mechanisms based on the photochemical processes studied.
- To be able to design electrical devices based on organic conductive materials.

Assessment: CWA*: 50%* Exam*: 50%:*

Details of CWA: two sets of seminar work, one end of module test and laboratory reports.

Recommended texts and other learning resources:

J. D. Coyle – "Introduction to Organic Photochemistry".
J. A. Barltrop and J. D. Coyle – "Excited States in Organic Chemistry".
N. J. Turro – "Molecular Photochemistry".
A. Gilbert and J. Baggott – "Essentials of Molecular Photochemistry"

Module Number: **LEC 201**	*Module title*: **ENTERPRISE FOR THE ENVIRONMENT**		
Number of weeks: 1-10	*Term taught*: Lent	*Contact hours*: 25	*Learning hours*: 150
Pre-requisites: --	*Co-requisites*: -	*Credits :* 15	
Module organiser: TBC	*Other lecturers*: Dr. Mark Bacon; Dr. Frank Cave (TBC); Sarah Blackford (external lecturer)		

Aims and scope: To expose students to a rich mixture of experiential learning opportunities in considering the role of the environment and climate change in driving business innovation and commercialisation.
To provide an understanding of the main features and types of businesses, their core operating activities, governance and regulation.
Explore the specific commercial opportunities the environment and climate change adaptation and mitigation brings.
Allow students to experience real business environments and meet with people running businesses.
To de-mystify what working with and in a business is like.

Syllabus

Lecture/ workshop	*Title*	
Lecture 1	**Universities and economy:** the relationship between research and economic prosperity; the current economic policy contexts for the funding of scientific research; the role of academia in economic growth and global competitiveness; knowledge transfer mechanisms past, present and future. Concepts of innovation; open and closed models of innovation. The European policy focus on SMEs. Government strategy on environmental technology innovation and European eco-innovation.	MB MB
Lecture 2	**The environmental technologies and services market place:** the opportunities of climate change; regulation driven businesses; current and future global markets; market failures; eco-innovation.	MB
Lecture 3	**The nuts of bolts of a business:** The different kinds of trading entity; the basic UK legal framework regulating businesses; statutory responsibilities; equity structures. Social enterprises and the environment.	MB
Lecture 4	**Company financial information**: profit and loss; cash flow and the balance sheet. Triple bottom line reporting to assess environmental impact.	FC
Lecture 5	**The business plan**: The purpose of the plan; drafting and structure; the idea; the market; the people; the product or service; competition; the financial projections; necessary investment; return on investment.	FC
Lecture 6	**Funding and selling a business idea:** Types of funding available to set up a new business or fund a new idea; the role of banks, business angels, venture capitalists and the public sector; setting the mission of the business; elevator pictures; formal presentations and the business plan. The CAMPARI criteria. Environmental and clean-technology venture funds.	MB
Lecture 7	**Protecting ideas:** Intellectual property rights; forms of IPR; IPR strategies; barriers to competition. Specific IPR issues relating to the environment.	FC
Lecture 8	**New product and service development:** technological breakthrough or market opportunity? Market research; commercialisation strategies: licensing, joint-ventures, spin-in's; sneak-outs. The role of environmental regulation in creating markets and risks.	FC FC
Lecture 9	**Defining the market place:** definition; segmentation; size; and trends. Market research (primary and secondary); calculating market size. Product; price; promotion and place.	MB /FC
Lecture 10	**People**. Creating and managing the right team for a new business or idea. Changing roles of founders. The entrepreneur. Psychological types, tests and teams.	MB
Workshop 1 3 hours	**The YOMP business planning game.** In teams student will play the business planning game: YOMP.	MB
Workshop 2 3 hours	**Meet my business (I):** Students will get the opportunity to visit resident businesses in LEC III, understand a little about their core activities and their	MB

	own insights into setting up and running a business in the environment sector.	/SB
Workshop 3 3 hours	**Meet my business (II):** Students will visit a range of businesses across the region on a one-day field trip. This will include visits to the Daresbury campus; and a selection of other SMEs in the region.	MB /F M
Workshop 4 3 hours	**The Myers-Briggs Type Indictor (MBTI) Analysis.** Students will carry out the MBTI analysis and consider how to interpret results from such an analysis in the development of the 'dream team'.	
Workshop 5 3 hours	**Business Plan Presentations**. In teams, students will present a business pitch for investment to their peers.	

Learning outcomes:

By the end of the module students will:

- Have developed knowledge of the policy context in which government is steering the role of Universities in wealth creation.
- Understand the different kinds of trading entity, how they are enshrined in law and the advantages and disadvantages of different kinds of trading entity.
- Appreciate the specific market opportunities that climate change is and will bring and the likely growth markets in the next 20 years.
- Be able to read and understand basic company accounts and suggest what these accounts tell you about a companies performance across a 3 year period.
- Be able to write a business plan to attract new investment and understand the necessary components of the plan.
- Understand the types of legal protection for intellectual property available and an appreciation of IPR in a commercial strategy.
- Understand the value of a market-led rather than purely technologically-driven new product or service development.
- Appreciate the need to consider a range of human talents in the development of teams to develop new businesses, products and services.
- Experience real company environments and the people owning, managing and working within them.

Assessment*:* The assessment will be 100% coursework

Details of CWA:

Students will be asked to develop a 3000 business plan proposing a level of necessary investment from a potential investor. Students will be asked to consider the new application of an existing environmental technology or service. The lecture programme will provide details of the overall structure of the plan and a full brief for the cwa provided at the start of the course. 80% of the marks will be awarded for the assessment of this written report, with 20% being awarded against the presentation made in Workshop 5.

Suggested reading*:*

Timmons, J and Spinelli, S (2003) *New Venture Creation.* 6th Edition. McGraw-Hill.
Adams, D. and Sparrow, J (2008). *Enterprise for Life Scientists.* Scion.

APPENDIX 3: MARKING CRITERIA FOR COURSEWORK AND EXAMS

Mark range	Criteria
First Class	
80-100	As below, but in addition, critical or comparative aspects strongly developed. For the case of Year 3 we would also expect evidence of extensive outside reading and understanding of background material.
70-79	Addresses the question without irrelevancies (waffle). Accurate and complete, demonstrating understanding in depth of the lecture material, but including background material derived from the course background reading. Information well ordered, using appropriate headings. Good English. Arguments strongly supported by evidence which should include at least some of the following, as appropriate: properly labelled figures and graphs, algebraic or chemical equations, full chemical formulae.
Upper Second Class	
65-69	Comprehensive, although not complete. Showing understanding and an ability to marshal information and to support arguments with appropriate evidence and examples. Good English and use of figures. Some pieces of information or examples go beyond the lecture material in either depth or breadth.
60-64	As above, but either occasionally lacking accuracy or with few examples.
Lower Second Class	
55-59	Concise but accurate. Most of the important points covered, but not always in depth, or short of evidence or examples. Information presented clearly.
50-54	As above, but with some lapses of accuracy or logic.
Third Class	
45-49	Answer incomplete, with serious lapses in accuracy and logic. Examples few or not relevant. Some evidence of knowledge and understanding of the subject.
40-44	As above, with serious omissions or major errors, although with some material relevant to the question. Evidence that the question has been understood in part at least
Fail	
30-39	Inadequate, with no substance or scientific understanding, but with a vague general knowledge relevant to the question. Some key words or phrases.
20-29	Occasional glimpses of general knowledge relevant to the question. Even at this level, errors serious and fundamental.
10-19	Little or no hint of any knowledge. May be an answer to the "wrong" question.
1-9	No knowledge relevant to the question but the candidate has made some effort.
0	Nothing written.

These criteria are for guidance only and cannot be rigidly applied. For instance, no matter how beautifully and logically presented an answer might be, without evidence of outside reading or originality of thought that answer will not get a first class mark, and may not even get an upper second. Similarly, an original answer with abundant evidence of outside reading, yet with poor and illogical presentation, may well not receive a first class marks, even though the information presented is of first class standard.

Answers to more mathematical questions tend to be marked in proportion to the correctness of the answer and it is, therefore, rather easier to gain high marks in such questions (provided you calculate correctly) than in the more discursive questions. You should note, however, that anonymous scraps of algebra and arithmetic are difficult to mark, and hopeless when anything goes wrong. You should include brief comments throughout your answer on procedure and assumptions; set out expressions and briefly define terms; rearrange expressions if necessary before inserting numbers; set out the final result clearly (including units and omitting insignificant figures). If you feel you have gone wrong somewhere, say so and why you think it.

APPENDIX 4: GENERAL STUDY GUIDANCE

4.1 Referencing your work

In Environmental Science, we prefer the Harvard system, i.e. in the main body of the text use the name and date form rather than the name and superscript number format.

E.g. the texture of rock buns is akin to that of gabbro (Beaton, 1834), although Craddock (1975) has argued that they are nearer to diorite, and examples of Ramsey (2009) have been widely likened to peridotite.

The references are listed at the end of the thesis in alphabetical order of author name in the strict style found in many technical journals. In the above example:

Craddock, F. 1975. The true rock bun as a diorite. *J. Culinary Geol.*, 15, 236-241.

Detailed guidance will be given in ENV201.

4.2 Study advice

The following are points which we know to be important from experience in running the Environmental Science course for more than 30 years. Please also note the points given in the Code of Practice

1) Many students find the pace and technicality of work in Part 2 substantially greater than in Part 1. It is important to meet such increased pressure sensibly without on the one hand throwing in the academic sponge (and getting a low Part 2 classification), or becoming an unbalanced and ineffective workaholic on the other hand! You will need Commitment, Organisation, and a sense of Balance.

- Commitment: attend all lectures, tutorials, practicals and fieldwork and complete all set coursework by the due dates. Make sure you work usefully and are not just going through the motions.

- Organisation: early in the Michaelmas term devise a regular schedule of work which will allow adequate working time (i.e. at least an hour for working over every lecture afterwards, a couple of hours for writing up every practical, and sensible times for working on other types of course work and reading around each topic). Plan a revision timetable for the period before the examination sessions.

- Balance: strike a reasonable balance between a modest amount of term-time recreation and the demands of academic work, one which can be maintained throughout the two terms. If you over-indulge in recreation at some times to the extent that you have to saturate yourself with work at others, you will not achieve your best. If you find yourself becoming submerged or harassed by work, talk it over with your fellow students, the Course Director, or indeed any member of staff (remember WE were all undergraduates once!). If you should be one of the few whose troubles run deeper, then remember that the University's Counselling Service gives free professional and confidential advice on the full range of academic, social and personal problems.

2) Make full use of academic staff and demonstrators. Do not be afraid to ask questions in lectures; your uncertainty is probably shared by others in the class, and all lecturers need to know when they are losing their audience. You are fully entitled to approach academic staff for clarification of lectures, practicals, reading, and coursework assignments and reading recommendations at any time during the working day. If we are busy, then a meeting can usually be arranged within a day. Of course you should prepare for such help by making your own best efforts to understand the material first, but with that proviso we welcome all such questions, and much prefer them to uncomprehending silence.

4.3 Exam preparation

If, for any non-academic reason (e.g. illness), you consider your academic performance has not been as good as it might, you should submit such non- academic information to the Director of Studies preferably before, or immediately after, the examination. In cases of illness influencing your performance or making you unable to sit the examinations you must attend the Nurse Unit for examination immediately if at all possible. It would be to your advantage to inform the Director of Studies as soon as possible of illness or other extenuating circumstances, providing written evidence (e.g. medical notes) wherever possible prior to the examinations. If for any reason you feel you have been unfairly treated (e.g. during exams, or in particular courses) again inform the Director of Studies.

The following is a list of tips to help you with your examinations during Part 2. Please read it carefully as you could benefit substantially.

Graduates are expected to be capable of expressing themselves clearly in writing or in speech, and frequently to be able to organise facts and ideas quickly into a coherent argument. Examinations are a convenient, if not necessarily ideal, way of testing these skills and accumulated knowledge, at the same time as providing a goal for directed effort. You may find some of the following suggestions useful in meeting the challenge of examinations:-

i) In your revision do not simply learn facts. Virtually all examination questions will require the use of some facts, but they will ask you to apply knowledge in some way. So consider what are the main themes running through a course and how they integrate with each other and with themes in other courses. By thinking of these factors throughout the course, you will be prepared in advance to cope with a wide range of questions which usually relate to a limited number of themes. It is important that you look at past examination papers and know the type of question to expect; try constructing outline

answers to them.

ii) Read the whole question paper and think carefully about each question before you start writing, in order to ensure that you answer those questions that you can tackle best. Remember to turn the question paper over, there may be questions on the back!

iii) Read the question carefully to make sure that you are giving as precise and relevant an answer as possible. Pay particular attention to key words in questions like "compare and contrast", "give a number of examples", "derive an equation ..", etc. In our experience, answering the wrong question is an unfortunately common practice and is an easily avoided way of losing marks. It can also cause confusion when a student feels that he or she has produced a well structured, well written answer and then finds it gets a low mark.

iv) Do not say to yourself "who set this question; which of his/her lectures has to be poured out?" This may severely limit your interpretation of a question and/or cause you to include irrelevant material. Instead, consider what parts of your education have a bearing on the question stated on the exam paper. Show that you can see the relevance of material from several sources and can use it to form an argument bearing the signs of your originality. Vague "waffle" does not gain marks!

v) Plan your answer carefully before starting to write. Note the main points which have to be included to make your argument logical and thorough. Consider what examples to use to illustrate your argument. Sketch roughly the graphs or diagrams you intend to use.

vi) When you do start to write, your argument should already be mapped out. You can therefore afford to concentrate on getting it across clearly and unambiguously. A brief introduction and a brief conclusion can often be used to prevent your discussion beginning and ending in mid-air.

vii) Use diagrams, graphs or equations wherever appropriate but make them clear and properly labelled. Use them to replace rather than to duplicate writing. This can save a lot of words.

viii) Present examples in a way that makes it clear that you know something about them even if you can only refer to them briefly.

ix) It is better to attempt the right number of questions (and perhaps not complete them) rather than spend an excessive amount of time on any one question. The examiners do not expect more than can be reasonably written in the time available and will mark accordingly. Even a brief set of notes is better than nothing, because the examiners can see the trend of your argument but they are not a substitute for a properly presented answer.

x) The best scientific English found in clearly understandable papers and books is standard English, usually with quite simple sentences. It is common for readers (including examiners) to lose the thread of an argument when presented with sentences containing many conjunctions, many pronouns and few verbs. If you are dealing with an emotive issue, try to write about it in a rational, balanced way. Examiners appreciate a concise, well-written, legible script.

xi) Read your answer when complete and check that you really mean what you've written and have not made silly errors in the rush of writing. If you have time, check all calculations, units and the orders of magnitude of your answers. Are they reasonable?

4.4 Seminars

Research seminars (organised by individual research groups) are regularly held during term time, usually in the Small Lecture Theatre, and you are very welcome to attend. Some seminars are of course quite technical, but others are more popular in style, and many should be of interest to you. The organisers may be able to advise you about the level of any particular seminar if you are in doubt, but you are strongly advised to attend at least a few in Part 2. Do not expect to understand everything in detail; it is good practice to learn how to grasp the wood while not understanding every tree.

4.5 Departmental web pages

The 'Student Home Page' (http://www. student.es.lancs.ac.uk) provides links to a range of useful material, including: online course documents, career resources, etc. Students are encouraged to make use of the Discussion Forum (available through the above link – click on 'latest news') for Departmental discussion on university-related issues.

APPENDIX 5: THE DISSERTATION

All major ES students are required to produce a thesis based on original work, on a topic chosen by the student and completed by the middle of the Michaelmas term of the third year. Summer term is devoted to your dissertation. The work usually centres on 5 weeks laboratory or field work followed by analysis and interpretation of the data set. **It is essential that the preliminary analyses of your results are completed before the end of the summer term.** The dissertation is written up by the end of the Michaelmas term. The dissertation work is felt to be very important because it develops individual initiative, and provides constructive experience in the preparation of an extensive scientific report.

Mandatory Procedure

Students must arrange and keep to a useful schedule of consultations with their supervisor and prepare a detailed plan for approval. We strongly recommend you buy a diary to allow you to schedule dissertation related meetings and tasks.

Practical work must be arranged at times and places that are agreed with the supervisor to allow adequate personal supervision. Such work should normally be completed in the summer term, and should not continue into the Michaelmas term. If, in the judgement of the supervisor or Director of Studies, there is a serious risk of practical work remaining incomplete, a desk exercise may be substituted.

Lent Term (2nd Year)

Dissertation supervisors will hold tutorials during Lent Term to allow development of projects and give exposure to previous dissertations so that students are familiar with what is expected. Other aspects of the dissertation will also be covered during the tutorials, including: literature reviews, scientific methodologies, scientific writing. The

supervisor will also encourage the tutees to appreciate the subject specific and generic skills that they may expect to gain from their dissertation work.

By the end of Lent Term each student should submit a 500-word rationale, a work plan and a reading list for their dissertation.

Some students may undertake independent fieldwork for their dissertation, and in some cases the student may have a choice of field areas. The terrain, the nature of the work to be undertaken, and the student's outdoor ability will be taken into consideration before a decision is made as to whether a student can work alone, will share a base camp with another student working in an adjacent area, or whether the student requires a full time field assistant (which could be a fellow student, or another responsible adult and is the student's responsibility to organise. If a suitable field assistant cannot be found, the proposed field area will be considered unsuitable).

The department takes safety very seriously, and students undertaking independent fieldwork will be expected to attend a First Aid training day (to be held in the Summer Term, date to be notified). Failure to attend this training will result in an alternative project being assigned.

Summer term (2nd Year)

Many of the projects we see are excellent, but occasionally students submit projects that are unsatisfactory because of bad planning early on in the project. It is important that, (a) you have clear targets to aim for during the project development and, (b) you establish the aims and methods for your project early on, rather than leaving it too late. Since the Summer Term should be spent gathering results for the dissertation**, by the end of the Summer Term** you will submit a **1500 (maximum, excluding the reference list) word progress report** that states:

(i) Background to the project, including background reading (why you are doing the work).
(ii) Aims of the dissertation (what you are trying to achieve).
(iii) Methods used (how you collected your data).
(iv) A brief summary of the results.

Two copies of this report must be submitted to Sheila Roseman in the Teaching Office by **12 noon Friday 25 June 2010**. Your supervisor will mark the report and this mark will then be moderated. You will receive comments back on this interim report so that in your final dissertation you can correct for any problems that may exist. The mark will count **10% towards your total dissertation mark**. You will be able to use this interim report as the starting point for your final dissertation. Late submissions of the report will be penalised in the same manner as late submission of dissertations. The marking scheme we will use for this interim report is given at the end of this section.

This means that during Summer Term you must make progress on your dissertation. We hope you realise that this will help you organise your efforts better and should lead to an overall improvement in the final projects submitted.

Michaelmas Term (3rd Year)

The schedule of consultations with the supervisor must continue in the Michaelmas term of the third year. By the end of week 1 one (no more) chapter should be given to the supervisor for detailed comments. This should then provide you with sufficient information to write the whole dissertation according to these comments.

Note that supervisors will provide feedback on only one chapter of your dissertation

Dissertation Submission

1) Two properly completed **unbound** copies of your Dissertation as detailed later in this section, must be submitted to the Teaching Office (A507) by the **start of week 10** of Michaelmas Term (**2 pm on Monday 13 December 2010)**
2) If you submit after this time without acceptable excuse, your eventual Dissertation assessment will be reduced by the following amounts

Up to 7 days late:	Deduct 10 marks
over 7 days late:	Zero mark recorded

   In order to have an excuse for lateness considered for acceptance, you must contact your supervisor as soon as the difficulty becomes apparent (in any case before the submission deadline), following this with a written note explaining the problem, which will be forwarded by your supervisor to the Director of Studies. The Director of Studies will advise you if the excuse is being accepted and what special arrangements may then apply. Acceptable excuses may include certifiable illness, failure of equipment outside your control *etc.* Delay caused by failure to make back up copies during word-processing is not an acceptable excuse, nor is failure to allow a reasonable time for typing by a third party.
3) We will require you to prepare graphical material to bring to your dissertation viva to assist you in the introductory presentation of your work.

International and Socrates Submission dates

International Students

The submission date for the dissertation progress report should be negotiated with your supervisor. The dissertation report submission date will be the **start of week 11** Lent Term (**2 pm on Monday, 17 January 2011**).

Socrates

The submission date of dissertation progress report will be about half way through your placement and should be negotiated with your Lancaster supervisor. The dissertation report submission date will be the **start of week 10** (**2 pm on Monday 13 December 2010).**

Dissertation viva

After submission of the dissertation you will have an oral examination (viva) in January or February with the member of staff who will moderate the supervisor's marking. The viva will last a minimum of 15 minutes and a maximum of 30 minutes and in that time the first five minutes will be given to you to summarise your work, focusing on the aims and their achievement and your contribution to any research project. Following that, you will be asked more detailed questions. You are advised to prepare a few pages of figures, maps, etc that will help your presentation. Keep in mind, however, that you are only expected

to present your work for a period of 5 minutes. Please remember that the list of moderators will be provided in January, following which you will need to contact your moderator to arrange the viva.

Dissertation Advice

Good, detailed preparation for any practical work is essential to give yourself a reasonable chance of getting through a useful amount of work in the few intensive weeks available in the summer term.

Keep in close touch with your supervisor and give early advice of difficulties being encountered, but do not expect to be shepherded as in school. If you ignore your supervisor you run the risk of re-inventing wheels and giving the impression that you are doing and caring even less about your work than may actually be the case.

Make sure you get your supervisor's reactions to your thesis structure and sample section: this will probably be your first major written report, and your inexperience may show in many ways which are not obvious to you if you fail to take detailed advice.

Supervisors will typically provide around 4-6 hours student contact time during the Summer Term and about 4 hours during Michaelmas Term. Do not expect more than this level of support. If you feel that you are not receiving this level of help then first discuss this issue with your supervisor and, if necessary, raise it with the Director of Study.

Do not underestimate the time required to prepare neat diagrams and tables and to properly format your work. In fact all stages of your dissertation comprise an extensive and testing exercise in self-management, and each year some students fail to cope with this aspect at the expense of otherwise quite satisfactory scientific work.

Dissertation Assessment

Your submitted dissertation is read by your supervisor and another member of the Department's academic staff. Your work is assigned a provisional mark by the supervisor and ratified by the moderator (see dissertation marking scheme at the end of this section). You will receive feedback on your dissertation and the provisional marks during the Lent term of your third year. The supervisor and moderator will use the dissertation marking scheme at the end of this section to help decide an appropriate mark for the dissertation. In addition, the general marking criteria below will also be used to assess the overall quality of the dissertation.

Dissertation Format

The following are important points which should be scanned now and followed in detail as soon as you pass the data collecting phase of your dissertation.

i) Two unbound copies of the thesis are required for examination purposes, and must be submitted by the specified deadline. One must be the top copy (the original printout) and this becomes the permanent property of the Department, being archived with all Dissertation theses and are available to staff and future students. You may recover the second copy of your thesis after the Final Examiners' Meeting.

ii) The thesis should not exceed 5,000 words in the main text (ignoring tabular appendices).

iii) It should be typed one sided on A4 sheets, using 1.5 spacing (or double spacing if 1.5 is not available on your P.C.) and a left hand margin of width 38 mm. You

should use the provided dissertation template, which takes these requirements into account. The dissertation template is available for download on the Part 2 LUVLE pages.

iv) It will be bound in a semi-stiff cover. This binding will be organised by the Teaching Office (A507). The thesis will generally be less than 50 pages. If, in exceptional cases, a thesis exceeds 75 pages, it should be divided between two such covers.

v) The title and author's name should be laid out on the title page as follows, and positioned so as to be visible through the window in the cover.

Title
Name of author

The title page should also contain the following formal statement, positioned well below the cover window.

> This thesis is submitted in part fulfilment of the requirements for the B.Sc. degree in (*enter your degree e.g. Environmental Science*) at the University of Lancaster.
>
> December 2010

A sample of the cover template is on display in the Student Enquiry Point, room A505.

vi) The thesis should be laid out in the following conventional manner:

a) Title page (see v)
b) Abstract - a summary in not more than 300 words of the work described in the thesis, including the major results and conclusions.
c) A list of contents, with chapter and section headings and page numbers.
d) The main body of the thesis (see vii).
e) List of references (see viii).
f) Appendices - tables of results and certain other sections which would clutter the main body of the text but are nevertheless an essential part of a full description of the work.

vii) Take care in organising the layout of the main body of the thesis. The following chapter list can be tailored to fit most types of work:

Introduction - stating the problem, discussing previous work.
Discussion of methods and techniques involved.
Presentation of results.
Theoretical treatment and analysis of results, including, where appropriate a discussion of experimental errors.
Discussion of results.
Summary of conclusions.
Suggestions for further work.
Acknowledgements.

viii) References: sources should be quoted for all non-trivial material which is taken from published sources, whether or not it is fully argued in your text. Although you should try to consult all significant references at first hand, it is useful to reference important sources even though you have read about them only at second hand in later reviews or textbooks, the reviews and textbooks being referenced as well.

ix) Numerical values and graphs' axes should be clearly labelled and associated with units in the usual manner. Try wherever possible to keep to the SI system of units.
x) Diagrams and tables (not Appendices of course) should be placed as close as possible to the relevant part of the text.
xi) Make sure that all the useful work done is mentioned somewhere in the thesis, and that all useful data is listed in Appendices if not in the main text.
xii) An acknowledgement section may be included.
xiii) You may wish to include a CD with your thesis containing electronic versions of the text, together with spreadsheets, Matlab code etc. However, you should include a table of contents for the CD within the hardcopy dissertation.

Further remarks

All discussion, but especially that of the results, should be as critical as possible. It is unusual for undergraduate work to be novel, but you can show your academic mettle by exercising your critical faculty on even the humblest work. Pay particular attention to possible sources of error, both in data and in their interpretation. Remember that negative or inconclusive results are still potentially very useful results, and should be written up as fully as the most positive outcome.

The technical level of your writing is best pitched to suit readers who are competent scientists but unfamiliar with the particular field in which you are working; this may well apply to the external examiner who reads your thesis.

Dissertation theses are potentially valuable, their value to yourself and others probably being directly proportional to the effort put into their production. Many produced in the Department in the past play useful roles in the total research programme, and some have led directly to publications in the technical literature.

You will find that the planning, organisation and execution of the Dissertation project is a major task which takes time and intelligent effort far in excess of that spent on pure scientific measurement, analysis and discussion, and far beyond anything you could have envisaged in advance. If you do not plan ahead, to ensure that all phases are completed in the right order and at a sensible pace, you run the grave risk of wasting the purely scientific part of the enterprise in a last-minute panic. If you do plan ahead, then even if the science of the project runs into difficulties (and this we expect and allow for within reason), you will still end up with a comprehensive and informative report that will attract satisfactory assessment. You will also have learned a valuable lesson about writing technical reports.

Dissertation Charges

Year 3 students are required to pay for the binding of their dissertations, which will be arranged by the Teaching Office.

Dissertation Marking Scheme

The final dissertation mark is made up from three components: (1) A progress report which is submitted in week 10 of Summer term (International students by negotiation with supervisor) which counts 10% of the total dissertation assessment, and (2) the dissertation itself, which counts 90% of the total dissertation assessment.

Overleaf are the marking criteria used for this work, followed by the marking schemes. Refer to these carefully to help you prepare your work.

Criteria for assessing dissertations.

Mark range	*Criteria*
First Class	
100	Primary publication standard in all but journal-specific formatting.
90-99	Could form the basis of a primary publication both scientifically and in presentation.
80-89	Exceptional, showing elements of scientific originality; with a little extra work, could form the basis of a primary publication.
70-79	Excellent, meriting only minor criticisms in any or all of the characteristics of the work. Significant advancement over supervised aspects of the project. Initiative demonstrated. Interpretation and discussion are carried out in depth and link back to established literature. Sufficient information provided for marker to confirm or refute conclusions.
Upper Second Class	
60-69	Good, thorough competent work. Understanding and an ability to marshal information are shown. Arguments are supported with own results, appropriate evidence and examples, e.g. from the literature. Engagement with all supervised aspects of the project. Good English. Well presented and structured.
Lower Second Class	
50-59	Satisfactory. Most of the important points are covered, but not always in depth, or short of evidence or examples. Information presented clearly. Some lapses of accuracy or logic are present. May be some weakness in the project implementation. Engaged with some of the supervision. Presentation may be weak in places.
Third Class	
40-49	Weak. Some serious lapses in accuracy and logic are apparent. Evidence of knowledge and understanding of the subject are shown, but literature review limited. Presentation may be poor. Scientific methodology flawed. Quality and quantity of results are insufficient to support the interpretive process. Minimal engagement with the supervisor.
Fail	
35-39	Poor. Weakness in several aspects of the work. Major errors. Few results. Limited use of literature. Fails to identify significant aims of the work. Negligible interaction with supervisor. Presentation and English poor.
20-34	Inadequate. Little or no scientific methodology. A major section missing. Serious scientific errors. Little evidence of work. Presentation unsatisfactory. English poor.
1-19	Absence of two or more major aspects, e.g., literature review, results, interpretation and discussion, combined with very poor scientific presentation and use of English.
0	Failure to submit.

Dissertation Progress Report Marking Scheme

Dissertation Progress Report Marking Scheme (Supervisor)

Name of student: **Degree scheme:**
Dissertation title:

Categories *(There may be some progress reports that are difficult to mark using this scheme. In these rare cases, the mark scheme may be modified to reflect this.)*	**Comments** *(Supervisors should also comment if a student has received more or less than the 'normal' level of help for each 'category'*
1. Dissertation aims Are the aims of the dissertation clearly defined?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
2. Background to project Has a satisfactory literature review been carried out? Have the references been cited correctly according to context/contents?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
3. Methods Are the methods to be used clearly stated? Is the choice of the experimental, field and/or mathematical methods correctly argued? Do they appear appropriate?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
4. Plan of research Is a logical and realistic plan of research defined? Are milestones identified?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
5. Presentation Is the progress report presented satisfactorily in terms of grammar, scientific style and structure? Is the reference list correctly formatted? Have the references been cited in the text in the correct format?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
	SUPERVISOR'S MARK = %

Signature:…… **Date:**……..

Please return this to the Teaching Office

Teaching Office Only	Final mark %	

Final Dissertation Assessment

Dissertation Assessment (Supervisor)

Name of Student: **Degree Scheme:**

Title of dissertation

Supervisor: **Moderator:**

Categories	Comments
1. Introduction and project design Does the abstract summarise the entire report, including the conclusions? Does the introduction contain enough background material and cite the relevant references? Is it clear why the problem has been studied?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
2. Methods Are the methods appropriate and fully described? Is a scientific approach adopted?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
3. Results. Are there sufficient and appropriate results from the field experimental or mathematical study to support the interpretive process? Are the data presented in the clearest possible way? Is the sequence of results presented logically? Are all the results available from the report so that you can confirm or refute the author's interpretation?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
4. Interpretation of results. Has the significance of the results been explained? Are the limitations of the work identified? If appropriate, has any statistical or error analysis of the results been carried out to support the hypotheses? Are the interpretations placed in the context of the reviewed literature in the introduction? Are the interpretations exhaustive?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
5. Conclusions Do the conclusions represent the interpretation and discussion? Are the conclusions justified by the results and any statistical and error analysis techniques used? Are the conclusions related to the original aims? Are the conclusions written in a concise manner? Can you reach independent conclusions from the results and interpretations presented, and if so do these coincide with the student's? Are suggestions for further work made?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
6. Presentation Has the report been written in a scientific style? Is the grammar satisfactory? Is the report well-structured? Are the figures and tables of good quality? Are figure/table captions used and referenced? Is citing within the text and the reference list satisfactory in format, and do they tally? If appropriate, are appendices used correctly? Does the report exceed the maximum word count?	Poor – 1 ? 2 ? 3 ? 4 ? 5 ? - Excellent
Summary of strengths and weaknesses of the dissertation and a detailed justification for the mark awarded Also comment if the dissertation shows elements of originality and creativity	
Supervisor's mark (%)	

Signature: **Date:**

Appendix 6: Code of Practice for Undergraduate Teaching and Administration

Please note this Code refers frequently to the University Undergraduate Student Handbook. This document can be found at:
http://www.lancs.ac.uk/depts/studreg/docs/UGHandbook.pdf

Information and help

1. You must continually update the Department with your current home and term addresses, so that any important information can be sent to you without delay. In communicating with staff and the Department by email, **you must use only your @lancaster.ac.uk address**. Emails from the Division to you will only be sent to this address, including replies to your e-mails.
2. Teaching and associated administrative staff are obliged to provide you with such academic and related help as you may reasonably require, and will try to be readily available to you for this purpose. Remember, however, that they all have other work commitments, and be prepared to make an appointment with the Teaching Office.
3. You will be provided with the relevant Student Handbook Part II. This give the outline syllabus for each module, together with information on assessment procedures, how to contact staff, and on the Dissertation project.
4. Since these handbooks are produced well in advance of the modules they describe, they do not contain many aspects of timetables, class lists, changes to existing arrangements, and other aspects of day-to-day running. You are, therefore, expected to examine the Notice Boards and your Lancaster email on a daily basis. Note that lectures and other classes are often used for giving out course material and information that may not be posted on the Notice Boards.
5. Messages for Part 2 lecturers should be sent via email or via the ES Part 2 Teaching Office.
6. The Lancaster University Virtual Learning Environment (LUVLE) is another source of current information specific to courses and modules.

Lectures

7. Attendance at lectures is compulsory. Lectures are an important part of the ES style of teaching; you should attend all relevant lectures and take full notes. Do not expect to receive handouts unless you attend the lectures.
8. Though no register of attendance is normally kept (unless required on the basis of poor performance), you should be aware that conspicuous absence or inattention is often noticed by lecturing staff, and treated as supplementary evidence in Examiners' Meetings where your degree classification is discussed. If you miss several lectures together because you are unwell, you should submit a Self-Certification Note to the Part 2 Teaching Office.
9. **You are expected to read in parallel with each module.** Although some reading material is mentioned in the Handbooks (e.g. course texts), most of it is specified and explained in lectures and practicals. You should contact the Module Lecturer if you have difficulty in getting access to the reading material, or are not clear about the level of reading required.
10. Come to lectures in good time and enter quietly if you are late. **You are NOT permitted to bring food or drink into lecture theatres.** Do not talk during the lecture unless you are addressing the lecturer. Lectures are meant to end at ten

minutes to the hour, but if the lecture continues to the point where you have only just enough time to reach another class, you should leave quietly.

11. Large lectures may seem formal, but you should nevertheless feel free to ask relevant questions during the lecture, unless asked not to. Likewise you should advise lecturers about inaudibility, illegibility, excessive speed, etc. Matters of more individual concern should be raised at the end of the lecture, or by later appointment. Smaller lectures are usually less formal, and many staff welcome exchanges during lectures to ensure optimum communication.
12. You will be given formal opportunity to comment on how helpful you find the lectures and other course elements at the end of each module. You can also, through your representative, bring such matters to the attention of the Staff/Student Consultative Committee, which meets normally once per term.

Practicals, fieldwork and tutorials

13. **Attendance at workshops, laboratory and fieldwork classes, tutorials and scheduled dissertation work is compulsory.** You must submit a Self-Certification Note to the Teaching Office if you are absent from any practical. **Registers of attendance will be kept in every practical, and students lax in attendance and/or submission of coursework will be reported to the relevant year Director.** A written warning may be issued and filed for possible mention in Examiners' Meetings. If specified remedial action is not taken, the written warning may be used in the referral of a student to the Standing Academic Committee, initially for probation and eventually for exclusion from the University.
14. Work in laboratories and in the field can be dangerous if carried out unwisely. On entering Part 1 you will be given a copy of the Departmental Safety Handbook to study and certify receipt. You will need to keep this handbook in a safe place, as you will need to refer to it throughout your degree. If in doubt about the safety of any procedure, consult qualified staff before proceeding. Develop a sense of responsibility for your own safety as part of your scientific training. **Note that you are absolutely forbidden to eat or drink in any laboratory including the computer laboratories,** or to work in ES1 or Lab J in the absence of qualified staff.
15. Residential field courses and afternoon field trips can involve quite informal teaching, allowing good staff-student interaction. We do, however, expect students and staff to act in a responsible manner and not compromise the reputation of the Division or University.
16. We expect students to behave responsibly in both practicals and lectures. Students who are aggressive towards staff or who attend classes while under the influence of drugs or alcohol may be excluded from the session.

Coursework and assessment

17. The weighting of any particular piece of coursework is defined in the Handbook, and should be clearly understood when the work is undertaken.
18. Coursework and submission dates are usually defined by individual Lecturers, and any uncertainty or difficulty should be resolved immediately by direct discussion, with appeal to your Director of Studies if this fails. Late submission of coursework, including your dissertation, will be subject to the following standard University penalties:

Up to 7 days late:	Deduct 10 marks (absolute marks on % scale)
More than 7 days late:	Zero mark recorded

19. In Part 2, requests for late submission on the grounds of extenuating circumstances require the completion of a 'Request for Extension Form' (available from the Teaching Office). Completed forms must be submitted to the your Director of Studies for consideration. In a serious or contentious matter, involving sickness etc., you must request on your self-certification form that the Teaching Office seek a Doctor's Note.
20. **Coursework must be submitted with a completed coversheet to the Part 2 Teaching Office (A507),** where it will be logged in. Work must not be submitted to staff pigeonholes or offices. If electronic submission (through the LUVLE system) is requested by the module organiser, this must be accompanied by a hard-copy submission to the Teaching Office as above. All assessed work must be signed for in person upon collection**.**
21. Assessed Coursework will be returned within four weeks of the "hand-in" deadline, or at the beginning of the term if a vacation intervenes. You are then entitled to discuss it with the Lecturer, to see how it could have been improved. If you experience unreasonable delay in the return of coursework, consult the Lecturer, and if necessary the Teaching Office. Consult the Teaching Office if you wish to review the current status of your assessed coursework and examinations at any time. **Please note that neither resubmission of failed coursework nor retaking failed end-of-module tests are permitted, except as part of the formal resit process in August.**

Academic Progress Monitoring

22. If your academic progress is so poor that we consider you to be in danger of failing your ES Part 1 or 2, we will contact you directly or through your College to see what can be done to improve your standing. Any stipulations about your work that we then make will be presented in writing, and must be acted on to avoid intervention and possible referral to the University Standing Academic Committee for exclusion. In order to proceed to Part 2, you must first fulfil the progression rules for your chosen degree course (see relevant Part 1 Handbook). **If you are worried by your progress at any stage (whether or not we have contacted you), you should make an appointment with the Part 1 or Part 2 Teaching Office to meet with the year Director.**
23. All Part 1 and Part 2 marks are provisional, being dependent upon the validation and change by departmental and University Examination Boards.

Dissertation

24. The Part 2 Dissertation is such a significant part of your degree that detailed rules about its presentation, submission and assessment are specified in the Part 2 Student Handbooks.
25. The University rules on intellectual property and inventions associated with Dissertation and other undergraduate work are given in the University Undergraduate Student Handbook.

Plagiarism and improper practice

26. Plagiarism is the formal word used to describe various forms of academic cheating. Plagiarism is very serious as it can ultimately result in exclusion from the University and the non-award of a degree. The range of activities that constitutes academic plagiarism is diverse and not necessarily self-evident. A full description of plagiarism and the rules that relate to it are given in the University Undergraduate Student

Handbook. Ignorance of this information is unacceptable as a defence or as a mitigating factor in cases of plagiarism, and therefore it is absolutely essential that you read carefully the relevant section of the University Undergraduate Student Handbook.

27. If you have any doubt about how to deal with including the work of others in your own written work then consult any member of staff in the Department and they will be happy to advise you. Submission of plagiarised work in dissertations, coursework, examinations or any other form of assessed work is a breach of University Statute and may result in exclusion from the University (see the University Undergraduate Student Handbook for full details of penalties and procedures).

Examinations

28. University examinations contribute a significant part of your Part 1 and final Degree assessments, and are governed by regulations set out in the University Undergraduate Student Handbook and in the Registry web pages at http://www.lancs.ac.uk/depts/studreg/undergrads/exams.htm. **Attendance at examinations, including resits, is compulsory. If you fail to attend, the Student Registry by default will deem you withdrawn from the University.** Programmable calculators, electronic dictionaries and PDAs are not permitted in any tests or examinations. Non-programmable calculators are allowed in specific tests and examinations. **Tests and examinations must be written in ink, not pencil. Work not written in ink (with the exception of diagrams) will be given a zero mark.** Detailed weightings of exams and associated coursework are given in the relevant Departmental Handbooks. The Student Registry will notify you of your registered exams and examination timetable well in advance, and it is your responsibility to check and note them carefully, including the *Viva Voce* examination for Part 2 students to which you may be called just before the publication of your Degree result. If you know of any difficulty arising from clashes with other courses, sickness etc., you must tell the Student Registry at once.
29. Module Lecturers can advise on the nature and scope of exam questions relating to their modules, usually by referring you to past exam papers available on line via the Registry web pages (http://www.lancs.ac.uk/depts/studreg/undergrads/exams.htm) or in the Library.
30. After publication of Year 2 exam results you are entitled to discuss your performance with the year Director, but note that all results are provisional until finalised by the Final Examiners' Meeting and ratified by Senate. The University Registry sends you a transcript of your Degree results some time after the Degree is awarded, listing classifications in the main components of the course.
31. If you fail units of assessment in Years 1 and 2, you may be required or given the opportunity to resit the formal exam component of the units. You are advised that these resits take place in August, and therefore will have a significant impact on your summer plans. The following is taken from the University Undergraduate Student Handbook:
    You will be expected to be in Lancaster to take your resit examinations on the days and times specified by the University in the resit examination timetable. You must take this into account when making your summer vacation plans.

References

32. Academic references are provided by agreement with individual members of academic staff (usually including your Dissertation supervisor), provided that (i) a

comprehensive *Curriculum Vitae* has been lodged in the Part 2 Teaching Office, (ii) you have signed the form allowing us to release your marks to a third party and (iii) you have asked the member of staff concerned. References can be provided similarly after leaving the University, provided you keep your lodged CV up-to-date and ask the staff member concerned.

Disputes

33. In the event of a dispute between a student and a member of staff that cannot be personally resolved, the matter should be referred in the first instance to the relevant year Director. Referral to the Head of Department may be necessary in exceptional cases.

Other relevant University-wide documents and resources:

Student Charter: explains the rights and duties of Lancaster University students
http://www.lancs.ac.uk/gap/studchart/ar285r.htm

Plagiarism:
http://www.lancs.ac.uk/depts/studreg/facts/plagiarism.htm

Code of Conduct for Users of Computers at Lancaster University:
http://www.lancs.ac.uk/iss/rules/conduct.htm

Freedom of Information Act 2000:
http://www.lancs.ac.uk/iss/foi/default.htm

Data Protection Act 1998:
http://www.lancs.ac.uk/depts/studreg/facts/data.htm

Student Support Network:
http://www.lancs.ac.uk/studentsupport/all/
http://www.lancs.ac.uk/users/studentsupport/network/index.htm