

Department of Earth Sciences
University of Cambridge



PART II EARTH SCIENCES COURSE GUIDE 2020-21

Contents

1. Introduction to the Course	2
2. Course Format and General Information	3
3. Course documentation	5
4. Part II Physical Sciences Half Subject Earth Sciences	6
5. Part II Independent Project work	8
6. Reading a Scientific Paper	9
7. Examinations	10
8. Marking Criteria	13
9. NST Approved Calculators	14
10. Department Computing Facilities	15
11. Feedback processes and Complaint Procedures	16
12. Earth Sciences and Disability	18
13. Plagiarism Statement	19

1. Introduction to the Course

Welcome to Part II Earth Sciences!

The course in Part II differs from 1A and 1B in a few important ways:

1. Now you understand the fundamentals of Earth Sciences, Part II will take you towards the boundaries of the subject, and the areas of active research and controversies. As such, you will now be getting to grips with some of the primary scientific literature, and encountering subject areas where we do not yet know the definite answer. This is exciting and interesting, but will involve you making some changes to the way you work. We will talk about this in the Skills Course at the start of Michaelmas term.
2. You will have lots of contact time with your lecturers, who will be present in all of your practicals, and who will give you supervisions. It is important to take advantage of this time, and use the practicals to talk to us about the lecture you just saw, or other parts of the course, or how they relate to other things you know about. Talk to us about anything you like, not just the practical you are doing. Don't be shy – we like nothing more than talking about our subjects, and there is no such thing as a stupid question.
3. You now have a wide choice of subjects to study, and will do three courses from the five on offer. Regardless of which three you choose, try and keep your thinking broad, and pay attention to the connections between the different courses. Earth Sciences is a truly interconnected subject, and the division into separate courses is merely for administrative reasons. We all study the same planet, so pay attention to the multiple cross-overs that exist between the courses.

Above all, enjoy yourselves, you will be finding out about some great science!

Alex Copley (Part II course co-ordinator)
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2. Course Format and General Information

Part II - Course Synopses – 2020-21

Michaelmas Term:	2 courses available, each 24 lectures + 16 practicals + 4 seminars
Lent Term:	3 courses available, each 24 lectures + 16 practicals + 4 seminars
Easter Term:	Revision sessions, 4 hrs per course

You are required to take three courses. Two courses will be taught in Michaelmas term (Geophysics and Tectonics, Ancient Life and Environments), and three in Lent term (Petrology, Earth's Climate System, and Mineralogy). You may take any combination of courses, regardless of the term in which they are taught.

Each course has four seminars associated with it. These seminars give an insight into the cutting-edge research being undertaken in the subject areas you have been learning about in the main courses. There is an exam paper, taken by all students, that examines the content of the seminars associated with the courses the student has taken.

You are also encouraged to attend some the wide range of research seminars given in the Department. For 2020-21 these will be online, and details are published on the [Department of Earth Sciences seminar page](#).

Covid-related information

There are Standard Operating Procedures (SOPs) regarding use of labs, and rooms in the department during the Covid-19 pandemic. These, and more specifically, procedures for Part II lecture and practical will be on the Part II Moodle page. Please ensure adhere to the rules as laid out in these procedures.

Important dates

An introduction to Part II will be given by Alex Copley on **Thursday 8 October**, at the start of the Skills Course. The **Skills Course** comprises a series of lectures and practicals that will upgrade some of the core skills that you need to do Part II Earth Sciences successfully. The timetable is available on Moodle.

There will be an Introduction to Part II Independent Work on **Friday 9 October**, which will offer further details regarding what to expect in terms of project work for 2020-21.

Field Trips

We are hoping to run some day trips to look at a range of world-class local geology if this is possible under the Covid-related constraints. More details will be provided as the situation and plans evolve.

Supervisions

It is essential that you take advantage of the supervision system at Part II. Supervisions will be offered to you via doodle poll or Moodle and if not, take the initiative and request them from your Supervisor.

The objectives of supervisions vary between courses, supervisors, and groups of students. Some common objectives in Earth Sciences teaching are:

- To clarify specific difficulties with material in the current lectures and practicals.
- To consolidate lecture topics already covered, for example by working through problems and case studies.
- To develop practical skills such as interpreting maps, specimens and thin sections.
- To expand students' interests beyond the course material, if appropriate.
- To discuss student work done for supervisions. This might comprise solutions to example sheets or map exercises, or answers to old exam questions.
- To develop students' scientific writing skills, particularly for exam purposes.
- To advise on study skills, particularly on use of textbooks and the scientific literature.
- To give students practice in talking about Earth Science, communicating scientific ideas and arguing hypotheses.
- To revise material for examinations.
- To advise on exam technique.

3. Course documentation

Full lecture lists for the Part II options, plus timetables can be found on Part II Course on [Moodle](#). You can also set up your own personal timetable based on your option choices, using the online University [Timetable](#).

Reading lists will be available on Moodle, and lecture notes and other course documentation will be added to Moodle throughout the year. Please speak to Helen Averill or Mitha Madhu if you are having any problems with access although everyone should have access to the course pages from the beginning of Michaelmas Term.

4. Part II Physical Sciences Half Subject Earth Sciences

Part II Physical Sciences half subject Earth Sciences is examined in two courses, the seminar paper, and a dissertation. The candidates are also examined in a IB subject.

The dissertation should be a critical literature review and the topic should not substantially overlap with topics specifically taught in the Part II course.

Some examples of titles of previous dissertation titles:

- *Understanding mid-Holocene suppression of the El Nino-Southern Oscillation*
- *What we have learnt about the Mw 9.1 2004 Sumatra earthquake and the causative fault*
- *Seismological evidence for deep mantle heterogeneity*
- *How do minerals preserve evidence of shock associated with meteorite impacts and how useful are these effects in determining the pressure of impact?*

In order to decide on a topic, you should first contact a potential supervisor in a field of interest. The supervisor can suggest some papers to get started with and offer some supervisions to discuss potential subject areas. You can then devise a topic or have one suggested to you. In either case the topic would need to be approved by the Part II Course Co-ordinator or Director of Teaching.

Each student will be given guidance on science and strategy by an appropriate advisor, enough to ensure that they can competently address the problems involved in the review. However, the project should be executed independently as far as possible. Students will be given advice on the structure and format of their project report but should not expect help with its writing, editing or compilation.

The deadline for submission is 4.00pm on **Wednesday 28 April 2021**. The dissertation should be submitted as follows:

- The dissertation should be presented in the format of a published article in the journal *Geological Magazine*. It should be submitted on single-sided A4 paper in font size 11 or larger.
- The length of the dissertation should not exceed 5000 words. This limit excludes a list of relevant references but citations within the review are included in the word count as they are an integral part of the running text. Figure captions are also included but should be short.
- The abstract is not included in the word limit but should be a maximum of 250 words.
- The dissertation should have a separate cover sheet giving the candidate number, the supervisor's name, the title of the review, its word length, and the following signed statement: "I declare that the submitted work is my own, except where acknowledgement is given to the work of others or to work done in collaboration. I

declare that I have read and understood the Department of Earth Sciences statement on plagiarism and that my work could be tested using automated plagiarism software.”

- The dissertation should bear the supervisor’s signature and be submitted in a slim A4 binder or similar.
- An electronic copy should also be submitted on USB or CD. The examiners reserve the right to check this material for possible plagiarism.

Assessment criteria:

The dissertation counts for 15% of the marks for Part II Physical Sciences. In marking the dissertation, the examiners are looking for evidence of the following:

- The technical ability to identify and retrieve relevant literature on a specified topic.
- The intellectual ability to read the available literature critically, to sift what is important from what is peripheral, and to organise the material in a logical way.
- The skill to summarise a geological topic in a coherent and informative account.
- The discipline and flair to write concise and lucid prose, to produce neat and legible figures, and to integrate these into a well-designed report.
- The technical aptitude to use computer text-processing and drafting techniques to format a report in a specified style.

For details on examination structure, see section 7.

5. Part II Independent Project work

You will each complete two projects and a literature review. Please see the Part II Project Guide 2020-21 and at the session on **Friday 9 October 2020**.

PROJECTS: you will each do 2 projects. The hand-in date for both is **Friday 19 March** (i.e. the final day of Lent term). Each project will be worth 7% of your overall Part 2 mark. Each project has a word limit of 3,000, not including figure captions and the reference list.

LITERATURE REVIEWS: you will each write a single literature review. The hand-in date is **Wednesday 28 April** (i.e. the second day of Easter term). It will be worth 11% of your overall Part 2 mark. The word limit is 4,500, not including figure captions and the reference list.

6. Reading a Scientific Paper

Structure of a scientific paper

- Title, authors, affiliations
- Journal, volume, page numbers
- Abstract
- Introduction
- Techniques
- Observations
- Interpretation
- Discussion
- Summary or Conclusions
- Acknowledgements
- References
- Figures and captions

Why read this paper?

How you tackle a paper depends largely on your reasons for reading it. Some possible reasons are:

- as background reading for a mapping or research project.
- for abstracting specific data or results for a project.
- as part of a series of related papers to distil into a report or essay.
- for further reading around lectures.

Reading strategies

Adopt a strategy consistent with your reasons for reading the paper. The strategies are ranked in order of speed, and you can start with a rapid strategy and move down the list to a more time-consuming one if the paper warrants it.

- read the abstract only
- *skimming*: as above plus a glance at the figures and any concluding summary.
- *scanning*: as above plus reading the first lines of each section or paragraph, together with appropriate figure captions.
- *reading*: essentially word-by-word.

Summarizing strategies

Choose a strategy for summarizing the essentials of the paper, which is appropriate to your purpose:

- summary notes on a record card or database.
- highlighting or underlining on a photocopy of the paper.
- diagrammatic notes.
- full notes.

Moving on

- The reference list provides a guide to relevant past papers.
- A citation index (e.g. Web of Knowledge, Scopus) lists later papers that cite the one you've read.

7. Examinations

EARTH SCIENCES PART II EXAM STRUCTURE

exam component	duration (hours)	marks %	notes
Seminar paper	3	9	Answer 1 question from each of 3 sections (1 section per course, each with 2 questions)
Theory paper 1	2	14	Theory paper, one associated with each of the options courses (students take 3 out of 5)
Theory paper 2	2	14	
Theory paper 3	2	14	
Practical paper 1*	3	8	Take practical papers for 3 courses
Practical paper 2*	3	8	
Practical paper 3*	3	8	
Project Report 1	-	7	3,000 words
Project Report 2	-	7	3,000 words
Literature Review	-	11	4,500 words
Viva	0.5		No formal mark %. Used mainly to assess project mark and borderline marks overall
TOTAL	18.5	100	

*Examiners can, with due notice, substitute assessed practicals for practical exams in any one course.

Practical marks count 36.4% of the marks for each course (excluding seminars).

All candidates must submit records of field work and practical classwork, to be submitted by the last day of the practical examination.

PHYSICAL SCIENCES / "HALF" SUBJECT EARTH SCIENCES PART II EXAM STRUCTURE

exam component	duration (hours)	marks %	notes
Seminar paper	2	6	Answer 1 question from each of 2 sections (1 section per course, each with 2 questions)
Theory paper 1	2	14	Theory paper, one associated with each of the options courses (students take 2 out of 5)
Theory paper 2	2	14	
Practical paper 1*	3	8	Take practical papers for 2 courses
Practical paper 2*	3	8	
Dissertation	-	15**	5,000 words
Viva	0.5		No formal mark %. Used mainly to assess project mark and borderline marks overall
TOTAL	12.5	50	

*Examiners can, with due notice, substitute assessed practicals for practical exams in any one course.**The dissertation mark is worth 15% however in terms of the total mark, this is not included in the total 50% marks for the examination papers.

Practical marks count 36.4% of the marks for each course (excluding seminars).

All candidates must submit records of field work and practical classwork, to be submitted by the last day of the practical examination.

Physical Sciences

The papers set for the Half Subjects shall either be those set for the Part II subject of the same name, or contain a subset of questions from those papers. The maximum marks allocated to each component shall be as follows: Half Subject 60% (rounded up from the 50% marks as stated above), Part IB Subject 25%, Dissertation 15%.

Form and Conduct Notice

Each candidate will choose three courses from a choice of five. These will be examined as follows:

- (a) Three written papers, one associated with each of the three courses offered. The papers are of two hours duration.
- (b) One written paper of three hours, which will examine material taught in the seminars associated with each course. The paper will contain one section on each course; each section will contain two questions. Candidates will be required to answer three questions, including not more than one question from any one section.
- (c) In association with each of the courses, either a practical examination of three hours will be set, in which candidates are to attempt all the questions set, or candidates will be required to undertake continuously assessed practical work in place of a practical examination. Candidates will be required to take three practical examinations/assessed practical assignments.

Candidates will also be required to submit the following:

- (i) Two project reports of not more than 3,000 words each (excluding footnotes), to be submitted not later than Friday 19 March 2021.
- (ii) Literature review of not more than 4,500 words (excluding footnotes), to be submitted not later than Wednesday 28 April 2021.
- (iii) Records of field work and practical classwork, to be submitted on the last day of the practical examination.

Records of class and fieldwork

The records of classwork and fieldwork shall be submitted to the Examiners through the Head of the Department of Earth Sciences not later than the last day of the written examinations and shall bear the signatures of the teachers under whose direction the work was performed. The types of classwork and fieldwork shall be announced by the Head of the Department not later than the beginning of the Michaelmas Term.

Viva

The Viva takes place during the last week of Easter term. It is a formal requirement for Part II and Part III, however it is not assessed and is relatively informal. The viva is an opportunity to talk about your mapping project and to discuss with the external examiner details which you may not have included in your report.

Past papers

Copies of examination papers from the past 5 years are in the Library, on Moodle, and also available from the Teaching Support Manager, Helen Averill. However, because the course structure changed in summer 2015, lecturers will need to advise you as to how relevant past papers are. Questions in the examinations may involve some general knowledge from previous years' teaching. The marking criteria are given in Section 8.

Notice about materials which may be taken into practical examinations

Candidates are reminded that no written or printed materials may be taken into the examinations. For appropriate practical examinations mineralogical and palaeontological reference material will be made available, i.e. Deer, Howie & Zussman and Palaeontological Monographs. Candidates are allowed to take in their own copy of DHZ to the practical examination in Petrology.

Candidates are advised to bring writing and drawing instruments, lens, calculator (See also Section 9 below), as appropriate.

8. Marking Criteria for Answers in Earth Sciences Written Papers

%	Class	Criteria
90-100	1	Brilliant answer. Exceptional understanding of subject and relevant literature. Outstanding critical analysis, full of insight Excellent organized, expressed and illustrated
80-89		Excellent understanding of subject. Answer goes well beyond lectures. Effective critical analysis and grasp of relevant literature Well organized, expressed and illustrated.
70-79		Very good understanding of course material. Sound evidence of outside reading. Some critical analysis. Well organized, expressed and illustrated.
60-69	2.1	Sound to good understanding of course material. Limited use of extra-course material. May contain minor factual errors or omissions. Well organized, coherent and adequately illustrated.
50-59	2.2	Based entirely on course material. Lacks some detail in content. Contains significant factual errors or omissions. Some deficiencies in organization, style or illustration.
40-49	3	Based imperfectly on course material. Contains numerous factual errors or omissions Answer has merit but lacks a sound structure. Concepts poorly expressed and illustrated..
30-39	Fail	Inadequate content, some maybe irrelevant. Poorly organized, expressed and illustrated
20-29		An attempt at the question, but lacking most relevant content.
10-19		An answer with only isolated glimpses of relevant content.
0-9		A nearly worthless or irrelevant answer.
<i>Expectations of appropriate 'critical analysis' and 'relevant literature' will vary from year to year of the Tripos</i>		

9. NST Approved Calculators

For Natural Sciences Tripos examinations Parts IA, IB, II and III (where a calculator is allowed), you will be permitted to use only the standard University calculator: CASIO fx 115 (any version), CASIO fx 570 (any version) or CASIO fx 991 (any version). Each such calculator must be marked in the approved fashion.

Approved calculators for the Natural Sciences Tripos can be purchased from the the Department of Chemistry or the Department of Physics (Bragg Building, Cavendish Laboratory) (Note: these will be marked in the approved fashion).

Approved calculators bought elsewhere will need to have the approved marking applied by the relevant Department, and you are strongly advised to purchase a calculator at the beginning of term.

10. Department Computing Facilities

The [Computing Code of Conduct](#) covers the use of computing equipment by staff and other authorized persons in the Department of Earth Sciences. Please familiarize yourself with it.

Details of Department computing facilities usually available to students are listed below. Due to Covid-19, access to some of the hardware components will be restricted. Please check with the [Computer Office](#) for further information:

	Library	Galson Sciences Lab (N312)	Printer Room (S212)	Part 1B Lab (S213)	Part II Lab (S322)
HARDWARE					
Windows/Linux PCs	X	X			
Linux PCs, Macs		X			
Windows Only PCs				X	X
Colour Printer (up to A3)	X		X		
Colour Plotter (up to A0 poster size)		X			
Black and White Printer (up to A4)		X			
Scanner	X (Copier plus two scanner 9600×4800)	X (Scanner 9600×4800)	X (Copier)		
SOFTWARE					
MS Office	X	X		X	X
Arc GIS	X	X		X	X
Origin	X	X		X	X
Matlab	X	X		X	X
Mathematica	X	X		X	X
Igor	X	X		X	X
Inkscape(drawing), GIMP(image manipulation), Scribus(poster making)	X	X		X	X
Libre Office, Open Office	X	X		X	X
Standard Linux Applications (including GMT and R)	X	X			

11. Feedback Processes and Complaint Procedures

If you are concerned specifically about the quality or style of teaching that you are receiving, there are a number of additional avenues for your comments:

- **Comments books** are available in the laboratories, mainly for suggested improvements to the content and format of practical classes. The comments are acted on by the class organiser.
- **Online course questionnaires** are issued via Moodle at the end of each part of the course for you to assess the various components; lectures, practicals and supervisions pertaining to that subject. **Please take the time to fill them in.** They are evaluated by the course coordinator, who suggests improvements to individual lecturers or practical organizers or passes on comments on more strategic issues to the Department's Teaching Committee. Positive and negative feedback are both useful to us in assessing the effectiveness of courses.
- **A student representative** from each NST course taught by the Department sits on the Teaching Liaison Committee along with members of the Teaching Committee. Your representative will be appointed and introduced to your class before the end of the Michaelmas Term. The Teaching Liaison Committee discusses general teaching issues such as re-organisation of whole courses, provision of teaching resources, and co-ordination of University and College teaching. It passes recommendations on to the Teaching Committee, which has the central role in undergraduate teaching matters in the Department.
- **Feedback** on supervisions should be directed primarily through your College system. Concerns about your supervision arrangements should be voiced to your subject Director of Studies (ie in Earth Sciences or possibly Physical Sciences) or to your NST Director of Studies. Your Tutor may be able to advise you, if there are personal as well as academic issues involved. However, issues of supervision content and style are most effectively raised directly with supervisors themselves. Supervisions are meant to be individually tailored, and supervisors expect you to say if you are not getting the best value from them.
- **College questionnaires** provide another route for commenting on the supervision system. The Department will try to resolve major issues concerning supervisions, if College structures have failed to do so. Problems in particular Colleges can be dealt with by the Teaching Liaison Committee, although sensitive issues involving individual supervisors may be best discussed with the Chair of the Teaching Committee.
- If none of these routes seems satisfactory, please feel free to contact the Part II Course Coordinator, Alex Copley (Bullard Labs, 48937, acc41@cam.ac.uk), the Teaching Support Manager, Helen Averill (Room N14, 68330, hpd20@cam.ac.uk) or the Director of Teaching, Nick Butterfield (Room E320, 33379, njb1005@cam.ac.uk).

Complaint procedures

If you are unhappy with the experience you have received from the department, faculty, service or staff member, the University has a Student Complaint Procedure for you to use in order to try

and resolve the situation. All information regarding the Student Complaint Procedure can be found on the [Student Complaints web page](#).

At a local level if any issues arise which need action details should be passed on to the Teaching Support Manager or discussed with your Director of Studies in the department.

Examination review procedure

The University has robust policies in place to ensure that all examination results are accurate. However, something unusual may have taken place in the examination and you may want to check that the examiners were aware of the circumstances and that they have been taken into account. If you have any concerns about examination results you can request a review using the Examination Review Procedure, details of which can be found on the [Examination reviews web page](#).

12. Earth Sciences and Disability

Having done IA and 1B Earth Sciences, you will know that we aim to make our courses accessible to all students as far as possible. You should have received help or advice about any disability that might have a substantial and long-term adverse effect on your ability to follow the course or take the examinations; for instance, dyslexia or colour blindness.

If there is any new information about any relevant disability that we should know, please inform your Tutor, your College Director of Studies or Supervisor in Earth Sciences and the Teaching Support Manager, Helen Averill at hp20@cam.ac.uk soon as possible. They will discuss with the course organisers the appropriate ways in which you can be helped to get the most out of this year's teaching.

13. Department of Earth Sciences: Plagiarism Statement

(This is a shortened and more subject-specific version of the University statement, the full version of which can be found on the [University website](#)).

Definition and scope

Plagiarism is defined as submitting as one's own work, irrespective of intent to deceive, that which derives in part or in its entirety from the work of others without due acknowledgement.

Plagiarism is the unacknowledged use of the work of others as if this were your own original work. It is always wrong and a breach of academic integrity, whether in supervision exercises, project reports, exam answers or published papers. The University regards plagiarism as a serious offence. The penalties for plagiarism may be severe and may lead to failure to obtain your degree. The University reserves the right to check any submitted work for plagiarism, and can do so with increasingly sophisticated software.

The golden rule is that there should be no doubt as to which parts of your work are your own original work and which are the rightful intellectual property of someone else.

Plagiarism may be due to copying (using another person's language or ideas as if they are your own) or collusion (where collaboration is concealed to gain unfair advantage).

Methods and media

Methods of plagiarism include:

- Quoting directly another person's language, data or illustrations without clear indication that the authorship is not your own and without due acknowledgement of the source.
- Paraphrasing the critical work of others without due acknowledgement. Changing words or their order does not avoid plagiarism, if you are using someone else's original ideas without acknowledgement.
- Using ideas taken from someone else without reference to the originator.
- Cutting and pasting from the Internet to make a pastiche of online sources.
- Colluding with another person, including another candidate (other than as explicitly permitted for joint project work).
- Submitting as your own work research that has been contributed by others to a joint project.
- Submitting work that has been done in whole or in part by someone else on your behalf (such as commissioning work from a professional agency);
- Submitting work that you have already submitted for a qualification at another institution or for a publication without declaring it and clearly indicating the extent of overlap.
- Deliberately reproducing someone else's work in a written examination.

Plagiarism can occur with respect to all types of sources and in all media:

- not just text, but also figures, photographs, computer code etc,
- not just material published in books and journals, but also downloaded from websites or drawn from other media,
- not just published material but also unpublished works, including lecture handouts and the work of other students.

Avoiding plagiarism

The conventions for avoiding plagiarism in the Earth Sciences are as follows:

- When presenting the views and work of others, cite the source in ways such as ‘...as shown by Jones (1938)’.
- If quoting a secondary source, to which you have not gained access, make this clear in ways such as ‘...Hailstone (1802) as discussed by Marr (1916, p. 176).’
- If quoting text verbatim, use quotation marks or indented text and a citation; e.g. “Many of the great movements above described, appear to have been produced by an action both violent and of short duration.” (Sedgwick 1836).
- If using an exact or redrawn copy of a figure from another work, cite the work in the figure caption; e.g. ‘redrawn from Hughes (1866).’
- If incorporating data into a figure from another source, cite the source in the figure caption; e.g. ‘orientation data taken from Whittington (1938).’
- Collaboration with staff or other students during project research may arise during, for instance, Part II or Part III projects. If there is likely to be any doubt as to who contributed which parts of submitted work, make this clear in the text wherever necessary; e.g. ‘Prof. I.N. McCave supplied the comparative data on contourites in table 3.’
- Wherever a source is cited, the full bibliographic reference – including title, journal, volume and page numbers – must be given at the end of the report or essay, except in an essay done in exam conditions. Candidates are not required to make full citations in written examinations but should reference where appropriate.

Checking for Plagiarism

The University subscribes to Turnitin UK software which provides an electronic means of checking work for originality and is widely used in UK universities. Visit the Departmental website to find the document explaining how Turnitin UK will be used by the Department of Earth Sciences and which explains the implications of submitting your work to the software. Written work will only be checked if a candidate is suspected of plagiarism.

Any graduate student submitting written work suspected of plagiarism may also have their material checked using Turnitin.