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1. Introduction to the Course

Welcome to Part III Earth Sciences and the start of a new MSc-level course. Having built up the basics over the past three years, the focus now shifts to the application of those principles, and a more critical, interrogative and creative approach to understanding how the planet works. Increasingly, the important insights in Earth Sciences turn up in the territory between the conventional disciplines, and the course is designed to encourage a breadth of research-level experience, even as you focus on your own research project. By the end of the course you will be in a position to take on advanced academic research – or any other occupation requiring analytical ability, dexterity and experience.

There are three principal components to Part III Earth Sciences:

1) The research project. This is the centrepiece of the course, where you address a particular research question over the course of Michaelmas Term, and submit a report demonstrating your ability to generate new observations, data and ideas. Importantly, the success (and grading) of these projects is not measured in absolute results, but the approaches you take in pursuing them. Your project supervisor will be there for general guidance, but it is up to you to drive the work forward, and in the direction you think it should go. The key is to do lots of reading, attend lots of seminars, ask lots of questions.

2) Option courses. The Lent Term option courses are a further step up from Part II lectures, with an increasing focus on current research issues and debates. As such, the topics and content will vary from year to year, as will the structure of any particular course. At least 12 (usually more) four-week option courses are offered each year, from which you will officially take six. Easter Term exams will be individually tailored to a particular option, but they all will be looking for an advanced near-research level of understanding. The key is to do lots of reading, arrange supervisions, ask lots of questions.

3) Seminars and the Easter field trip. The Department hosts a broad range of seminars and seminar series, and you should make it your business to attend as many as possible. This is the best way of tracking the very latest research in your areas of interest, and seeing how it gets done (and presented). The Departmental Seminars (Tuesdays at noon) and Bullard Seminars (Wednesdays at 4pm) are particularly recommended. A short Pt III seminar series at the beginning of Easter Term will address issues and research broadly connected to the Easter field trip. The trip itself – to SE Spain – is in some sense a revision of the whole Pt III course – and one of its highlights. As ever, ask lots of questions, take lots of notes, do lots of reading …

Nick Butterfield (Part III course-coordinator)
njb1005@cam.ac.uk
2. Course Format and General Information

Part III - Course Synopses - 2017-18

Michaelmas Term:
- Project = 24 hours per week
- Seminars = two seminars per week
- Poster = 3–4 preparation days

Optional attendance of Part II Core courses and/or Part III Geophysics

Lent Term:
- Option courses = six @ 12-16 hours (two 1.5- or 2-hour sessions per week x 4 weeks)
- Seminars = two seminars per week
- Field Trip = Spain: 16–23 April 2018

Optional attendance of Part II Core courses

Easter Term:
- Pt III seminars = five-six invited seminars, 1–14 May

Student-organised supervisions and revision

MICHAELMAS TERM

Important Dates
Nick Butterfield will give an introductory session at 12.00pm on Monday 9 October in Harker 2 outlining the Part III course, how to get the most out of it, and how it is examined. The meeting will be followed by a buffet lunch with academic staff in the Common Room.

Simon Redfern will give a talk entitled: “How precise and accurate are your data? Do you know? Should you care?”- a guide to judging the reliability of your numbers. Taking place 12.30pm on Monday 23 October in the Tilley.

Thin Sections
If essential, the Department will prepare up to ten thin sections of key rocks associated with your project. Samples should be handed in to Reception by Tuesday 10 October at the latest, along with a completed thin-section form providing specific requirements. Please draw a line round the rock in felt tip pen to indicate how you wish the rock to be cut.

Weekly Seminars
Department Seminar Series, Tuesdays at noon in the Tilley Lecture Theatre.
Bullard Seminar Series, Wednesdays at 4.00 pm in in the Marine/Wolfson Building.
Details published online at http://talks.cam.ac.uk/show/index/15125).

Research Project
You are advised to spend around 24 hours per week on your research project in the Michaelmas Term.
The research report must be submitted by 4.00 pm on Tuesday 16 January 2018. Five per cent of the maximum mark available for the report will be subtracted for each day or part of a day that submission is delayed. Only under exceptional circumstances and with advance notification will any exceptions be considered.

You are strongly advised to back up your work at least daily to the server or a memory stick.

If you are doing a lab-based project, you need to fill in a hazard assessment form. Contact the relevant lab supervisor.

The research report must not exceed 7500 words. The original research proposal should be bound in as an appendix.

Draft Versions: You are welcome to submit ongoing drafts of your project via the assignments page on Moodle. These drafts will not be seen by the Examiners at any stage, but could be used for consultation in case of emergency (e.g., illness over the Christmas period or computer failure).

Posters
All Part III students are asked to prepare a poster about their project for public presentation in the Department Common Room on Wednesday 29 November 2017. This is a very enjoyable event, and will give you valuable feedback on your ideas and thinking. Although the poster itself is not examined, the exercise of putting it together will help in organizing your thoughts prior to writing your report. It is important not to underestimate the time that this will take. There is only six weeks to the submission deadline at this point.

Note – you should be spending no more than three or four days producing your poster.

Posters should be set up in the Department Common Room on Friday 24 November (no later than Monday 27 November), and taken down on Friday 1 December. The Departmental Poster evening takes place between 4.00 and 6.00 pm on Wednesday 29 November 2017. Please put this in your diary.
LENT TERM

**Students take six short option courses from a wide ranging choice**
These will be chosen from the list published by the department at the beginning of the year and can be combined with up to three NST Interdisciplinary courses, IDP1, IDP2, IDP3.

Before deciding on courses taught outside the Department (IDP1 and IDP3), please consult your Director of Studies as some require specific IA or IB knowledge.

Note - You are welcome to attend any Part II lectures that you might find useful.

**Supervision for option courses.**
Lecturers may arrange small group supervisions for their Part III courses, but students are encouraged to take advantage of the supervision system more generally. Feel free to approach lecturers for supervisions, or the names of available supervisors. You should be aiming for around two supervisions is entitled to supervisions per option, however there are no formal revision sessions organised and students are encouraged to arrange their own revision supervisions with appropriate people.

**Weekly Seminars**
Department Seminar Series, Tuesdays at noon in the Tilley Lecture Theatre.
Bullard Seminar Series, Wednesdays at 4.00 pm in the Marine/Wolfson Building.
Details published online at [http://talks.cam.ac.uk/show/index/15125](http://talks.cam.ac.uk/show/index/15125).

EASTER TERM

**Field Trip:**
Spain, Monday 16th – Monday 23rd April 2018

**Part III Seminars**
A series of seminars will be presented in the first two weeks of Easter Term – aimed broadly at issues relating to the Spanish field trip.

**Weekly Seminars**
Department Seminar Series, Tuesdays at noon in the Tilley Lecture Theatre.
Bullard Seminar Series, Wednesdays at 4.00 pm in the Marine/Wolfson Building.
Details published online at [http://talks.cam.ac.uk/show/index/15125](http://talks.cam.ac.uk/show/index/15125).
3. Part III Options and Timetables

The full Options list for Part III Earth Sciences, plus timetables can be found on the website at [https://www.esc.cam.ac.uk/teaching/earth-sciences-course/part-iii](https://www.esc.cam.ac.uk/teaching/earth-sciences-course/part-iii). You can also access the main university timetable at [https://www.admin.cam.ac.uk/timetable.html](https://www.admin.cam.ac.uk/timetable.html). Note: All Options lectures, practicals and seminars take place in Lent Term, with the exception of Nuclear Materials which takes place at the beginning of Michaelmas term.

Reading lists will be available on Moodle, and lecture notes and other course documentation will be added to Moodle throughout the year. The hosting site is at [https://www.vle.cam.ac.uk/](https://www.vle.cam.ac.uk/). Please speak to Helen Dingwall or Mitha Madhu if you are having any problems with access.

Part III options 2017-18:

**Geophysics:**
- GA  Continental Tectonics, Dr Alex Copley
- GB  Rifting and Magmatism, Prof. Bob White
- GC  Magma Dynamics, Dr John Rudge and Dr John Maclennan

**Petrology:**
- PA  Volcanology, Prof. Andy Woods
- PB  Evolution and Composition of the Earth’s Mantle, Dr Sally Gibson
- PC  Planetary Chemistry and Evolution, Dr Helen Williams and Dr Oli Shorttle

**Climate:**
- CA  Rapid Climate Change and its Biogeochemical Impacts, Dr Luke Skinner
- CB  Isotope Geochemistry, Dr Sasha Turchyn + Prof. David Hodell

**Palaeontology:**
- EA  Palaeobotany, Prof. Nick Butterfield
- EB  Records of Environmental Change in Earth History, Dr Alex Liu

**Mineralogy:**
- MA  Magnetism of Earth and Planetary Materials, Dr Rich Harrison and Dr James Bryson
- MB  Magnetoelastic Coupling, Prof. Michael Carpenter

**Nuclear Materials:**
- NM  M17/4I5 Nuclear Materials, Dr Ian Farnan (Michaelmas Term)

**IDP:**
- IDP1  Atmospheric Chemistry & Global Change, Prof. J. Pyle, Dr M. Kalberer, Dr Schmidt
- IDP2  Geological Carbon Cycle and Long Term Climate Change, Dr Sasha Turchyn
- IDP3  Renewable Energy: Concepts, Materials & Device Physics, Dr F. Deschler, Dr S. Dutton, Dr A. Rao
4. Part III Project and Managing Research Time

The Part III project is an opportunity for you to develop your own ways of planning and executing a research project. Whilst individual styles of research vary, there are some common features:

1. Most research projects have a number of components in common, for instance data gathering, data analysis, learning of techniques, library work, writing, drafting diagrams, ‘housekeeping’.

2. These components do not necessarily have to be done in sequence, but can be overlapped to make best use of time. In particular, it is usually a mistake to delay writing your report until you feel all your data have been fully analysed. Not until you try to explain your results to others will some of the gaps in your analytical reasoning be revealed.

3. Different research tasks require different levels of concentration, allowing less demanding tasks to be done when you might otherwise feel too tired to make progress. For instance, drafting diagrams typically requires less concentration that writing text.

4. Do not expect your research, however well planned, to proceed in a straight line towards your final report. Most ultimately successful projects involve a good number of blind alleys, backtracks, and technical hitches. Learn from these rather than get frustrated by them.
5. Reading a Scientific Paper

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.
6. Poster Preparation and Presentation

1. In the latter part of the Michaelmas Term each Part III student is expected to:
   - Produce a poster summarising progress in the research for their Part III project.
   - Display their poster for viewing by the rest of the Department.
   - Attend a ‘poster session’, and be available to discuss their poster with other members of the Department.

2. Each poster should be in the style of a conventional research poster, that is with data, analysis and interpretation represented pictorially and graphically as far as possible. There should be appropriate captions and a short text summary of the research.

3. Each display should fit on one A0 (1188 × 841 mm) sheet, preferably printed landscape (with shortest dimension vertical)

4. Being a research progress report, the poster may contain unfinished analyses or interpretations. A list of work still to be completed is a helpful feature.

5. The emphasis should be on informative content rather than on sophisticated presentation. In particular, time should only be invested in producing polished computer graphics if this material can be reused or amended for the project report.

6. It is recommended that the production of the poster should take no more than three or four days, in addition to the time required for ongoing data collection, analysis and interpretation.

7. Discussion at the poster session is intended to be entirely constructive, and to help each student improve the quality of their research work before it is written up as the project report.

8. Neither the poster nor a student’s performance at the poster session will be formally assessed.

9. Posters should go up on the preceding Friday and be displayed in the Common Room and Reception areas on the Monday, Tuesday and Wednesday of the last week of Full Michaelmas Term. The poster session is planned for Wednesday 4.00 to 6.00 pm, when refreshments will be available. Teaching and research staff, together with Part II students, will be encouraged to attend.

10. Students are actively encouraged to approach members of staff, postdocs or PhD students during the poster session and the days surrounding it to discuss their work with them. This is part of “selling” your research to others and is when most fruitful discussion normally occurs.
The ability to design and produce an effective poster is now an essential research skill, because poster displays are a standard feature of most scientific conferences. The following offers some guidelines for successful poster production.

**Poster format and purpose**

- Your poster must fit on a vertical display board of a specified size. Those in the Earth Sciences department are typical, about 1200 mm wide by 900 mm high, with posters fixed by Velcro tabs on to a fabric surface. This size of display board can accommodate an A0 (1188 × 841 mm) sheet, arranged landscape (shortest dimension vertical)
- For conferences, your poster must be portable: normally flexible enough to be rolled
- The poster should have all the necessary text and graphics to make it self-explanatory. However, it should also be suitable for use at a formal ‘poster session’ where you might either have to summarise or field questions about your research in front of your poster.
- Your poster should offer something to two contrasting types of user: the ‘browser’, who may only give your work a brief look from a distance, and the ‘ingestor’ who pours in detail over every word and picture. Browsers need at least to see a clear title and one graphic that encapsulates the work and may attract them to look in more detail.
- Regard your poster as an advertisement for you and your work. A successful poster relies as much on effective design as it does on good science. Be proactive in asking people to come and look at your poster and to discuss the science with you.

**The components of a poster**

Your poster will comprise some or all of the following design components:

- The **heading** comprises a title for the research, together with your name and affiliation. These items should be in a large enough font to be read at a distance of a couple of metres – at least 72 points (about 1"or 2.5 cm) for the title and 36 points for your name.
- Your **contact details** should be included on a conference poster: a postal and Email address at least. This should be prominent, but in a smaller font than the heading. You can include your photograph to help people seek you out at a large conference.
- **Graphics** are the essential ingredient of any effective poster. They may comprise maps, charts, graphs, line drawings, photos, or any other relevant two-dimensional format. If possible, most graphics should be understandable without recourse to a detailed text caption. If possible, at least one graphic should be particularly eye-catching. Appropriate use of colour is essential.
- **Captions** are usually necessary adjacent to each graphic, to amplify its content for the detailed reader. However, captions should still be easily visible: use at least a 14 or 16 point font size.
- The **text summary** or **abstract** of the research has the same purpose as the abstract of a scientific paper, summarising the main results succinctly enough to be read in a minute or two. This is the first and maybe the only component that browsers will read after they have been attracted by your title and graphics. The body text should be at least 16 or 18 point, with a larger or bolder title.
- The **body text** of the poster will describe methodology, data, results and interpretation. It should never dominate a poster – no more than a third of the poster should be text.
The text should guide the reader logically through the graphics. The text is more digestible if it is split into logical sections interspersed with the graphics, rather than presented in one chunk. Use at least a 16 or 18 point font.

Planning the poster

- Decide the overall logic of the poster. Most posters have sequential sections, for instance aims > methodology > results > interpretation. However, other logical arrangements can be successful. A radial structure might have a hub comprising a text and graphic summary, surrounded by the discrete components of the project. Parenthetic boxes of text and graphics can amplify peripheral points in either a sequential or radial structure.
- List the graphics that you will need for the chosen structure. Do this before you write any text. You will then be forced to see the poster in the same way as the browsers who comprise the majority of your audience. You will almost certainly discover the need for a number of interpretative or schematic graphics (‘schematics’) to link and summarise the data and results that you already have available.
- Make preliminary pencil-and-paper sketches to explore how your graphics might fit your proposed poster layout. Allow some space for text at this stage.
- Make a physical or digital mock-up of the poster. Rearrange components until you have a satisfactory layout.

Production

- Electronic production of posters in a computer-graphics program has mostly superseded the scissors-and-paste method, where each component is physically stuck down on a poster board. You can still use the second method for your Part III poster if you prefer.
- The two production methods differ little until their final stages, because most poster components are, in either case, produced by word-processing, graphics or presentation software.
- Prepare all the individual components of the poster before pasting anything in its final position. This phase is the most time-consuming part of poster production. Getting the text to fit in the available space is a particular challenge. Always reduce the number of words rather than being tempted to reduce the font size below what is legible.
- For scissors-and-paste posters, use white A1 mounting board, available from Tyndalls Graphics Shop on King Street.
- Finalise the arrangement of components either onscreen or on the board. Position them using onscreen guidelines or, on a board, accurately measured feint blue crayon guide marks at two corners of each component.
- On poster board, stick down the components using spray glue. Lay the components, a few at a time, face down on a large desk-protecting sheet of plain paper. Spray components to their edges, leave for a minute or so, place in position, then press down firmly with a clean dry cloth or pad. Any traces of dried glue can be removed with a clean pencil rubber.
- If the finished poster is going to be used repeatedly, it can be laminated with a plastic film. Enquire at print shops for costs. This is not necessary for a Part III poster.
Design hints

- Use a limited range of fonts and sizes. Two fonts, one for headings and one for blocks of text, are adequate. Use bold or italic versions of the same font in preference to a new font.
- Continuous text or figure captions can be read more rapidly in a serif font such as Times New Roman or Garamond. Headings have more impact in a sans serif font such as Arial, suitably emboldened. More informal fonts such as Comic Sans can be effective for text, but don’t pick a fussy font.
- Use clear numbering or arrows to guide the viewer logically through a sequential poster.
- Use some colour on graphs, maps and other line drawings. Even limited use of highlighting to emphasise key information makes a poster more lively and informative.
- The fashion for putting an outline box around every graphic, caption or block of text can look excessively busy. Boxes are better used to group related elements of the poster, such as data, methodology or results. Avoid the confusion of nested boxes-within-boxes.
- Avoid using an image as wallpaper behind the poster elements. Such wallpaper can be more distracting than appealing, and can hugely increase the size of the poster file. If in doubt, a plain white or pastel background is usually elegant and effective.
- Don’t fill every square centimetre of the poster board. Use ‘white space’ as a design element in its own right, to separate components and logical sections.
- In summary, aim for simplicity not complexity, use graphics in preference to words, and remember that good content and design will always be more effective than sophisticated production techniques alone.

6. Technical advice for successful poster printing

- Printing to the A0 plotter in Room 316 is costly (£3 per poster). Follow the guidelines here or risk making expensive and time-consuming errors, or not getting your work to print at all.
- Prepare the poster in a drawing programme (such as Inkscape or Illustrator), a DTP programme (such as Scribus) or a presentation programme (such as MS PowerPoint). CorelDraw files give more problems at the print stage, and you use this program at your own risk.
- When you print, the system expands the file significantly. Keep the size of your print file to a minimum by:
  - Using a plain background rather than a complex graphics background.
  - Reducing the resolution of any bitmap graphics file to a maximum of 300dpi.
  - Importing images/graphics from .jpeg files rather than from .tiff files.
  - Using fonts from the standard font sets.
- Create a PDF file first. On most department printers, you should do Print then choose the pdf ‘printer’ such as CutePDF. Then print the PDF file from a PDF reader, such as Adobe Acrobat. If this is problematic, print directly from the programme of your choice.
- Proof your map/poster on an A4 printer, before any attempt to print it to the A0 plotter.
- You will block the print queue if you don't prepare well. The computer officers reserve the right to cancel your job any time if it is found to be problematic.
• Do not leave your map/poster printing until the last moment. A print job can take up to half an hour and there is always a long queue before a submission deadline.
• Printing is supported between 08:00 and 17:00, Monday to Friday.
• You can cancel your printing by pressing the CANCEL button on the plotter, if your print job is going wrong.
• Contact the Computer Office (at helpdesk@esc.cam.ac.uk) if you have any technical questions.
7. Examinations

Seminar Paper
The ‘Seminar paper’ will be divided into two sections. Students answer two questions, one from each section. Section A will consist of a wide range of questions, using the Department and Bullard seminars as thematic guides. Questions for section B will be based broadly on aspects of the Easter field trip and the associated Easter Term seminars. Students are advised to read around a substantial range of seminar topics.

Option Papers
The majority of options will have a 90-minute examination during the main exam period. The exact format of these exams will be made known at the start of the year. Exam formats may include written answers, calculations or the description and discussion of specimens, thin-sections, etc.

Some courses will also run assessed practicals related to their course. The division of marks between theory and practical will be made known at the start of the year. The format of these may be a timed exercise at the end of the Lent or beginning of the Easter term, or assessed exercises taken during the course. They may involve specimen description and discussion, calculation, map exercises, writing short reports, or computer based exercises but the exact format of these assessments will be made known at the start of each course.

General Points
- All examination questions and projects will be marked by the separate Part III Board of Examiners.
- Each student will have a viva with an External Examiner as for Part II on the project and on any aspect of the course.
- As for Part II, practical class notebooks and records of field work should be handed in to Reception before the last day of the practical papers.

EXAM STRUCTURE
Each candidate must enter a Research Project, the Seminar paper and six option papers

<table>
<thead>
<tr>
<th>Exam component</th>
<th>Duration (hours)</th>
<th>Marks</th>
<th>Number of exams</th>
<th>Total marks</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar paper</td>
<td>3</td>
<td>6%</td>
<td>1</td>
<td>6%</td>
<td>Two answers; one from each section. Section A: Topics covering a wide range of issues in the Earth Sciences. Section B: Topics based broadly on the Easter field trip and seminars</td>
</tr>
<tr>
<td>Option papers</td>
<td>1.5</td>
<td>9%</td>
<td>6 each</td>
<td>54%</td>
<td>Six papers from a choice of 15, one for each option course. Some courses have associated assessed practicals</td>
</tr>
<tr>
<td>Research project report</td>
<td></td>
<td>40%</td>
<td>1</td>
<td>40%</td>
<td>Maximum 7,500 words</td>
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</tr>
<tr>
<td>Viva</td>
<td>0.5</td>
<td>1</td>
<td></td>
<td></td>
<td>No formal mark. Used primarily to assess student engagement</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

**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; e.g., Deer, Howie & Zussman, 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 Section 10 below for specifications), as appropriate.

The examination requirements and any practical work associated with each paper shall be announced by the Head of the Department of Earth Sciences not later than the beginning of the Michaelmas Term. The Examiners shall be provided by the Head of the Department of Earth Sciences with assessments of any assessed practicals; in assigning marks for the examination the Examiners shall take account of these assessments.

The report of a research project shall be on a subject which may be either proposed by the candidate and approved by the Head of the Department of Earth Sciences, or chosen by the candidate from a list of approved subjects announced by the Head of the Department by the beginning of the Lent Term in the academic year immediately preceding the examination. Each candidate shall either obtain the approval of the Head of the Department for the subject proposed or notify the Head of the Department of the subject chosen from the list not later than the division of the Lent Term immediately preceding the examination. The report shall be submitted to the Examiners not later than the first day (Tuesday) of Full Lent Term.

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.
# 8. Marking Criteria for Answers in Earth Sciences Written Papers

<table>
<thead>
<tr>
<th>%</th>
<th>Class</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| 90-100  | 1     | Brilliant answer.  
Exceptional understanding of subject and relevant literature.  
Outstanding critical analysis, full of insight  
Excellently 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. |

*Expectations of appropriate ‘critical analysis’ and ‘relevant literature’ will vary from year to year of the Tripos*
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.

Standard University calculators, marked in the approved fashion, will be on sale at the beginning of Full Michaelmas Term 2017 at £20 for the fx991ES plus from the Department of Chemistry, Part IA Laboratory preparation room or from the Main Stores in the Bragg Building at the Cavendish for £19.50. You are strongly advised to purchase a calculator at the beginning of term.

Students already possessing a CASIO fx 115 (any version) or CASIO fx 570 (any version) or Casio fx991 (any version) will be able to have it marked appropriately, at no cost in the Department of Chemistry, Part IA Laboratory. Calculators meeting these criteria can be marked in term time from Thursday 5 October right up to the beginning of the exam period, not just in the Michaelmas term.
10. Working Out of Hours

Working hours for the Downing Site are: 08.45-13.00, and 14.00-17.00 Monday to Friday. Outside these hours (including lunchtimes and evenings) and at all times at weekends, the following conditions apply:

General rules
If working in the Department late at night or at weekends, tell others of the time you intend working to. Time and working restrictions also apply to areas remote from the Department: these are identified in the safety procedures of the individual area. The Head of Section and/or your Supervisor must also be informed of your intention.

Equipment/working in evenings and at weekends
(a) Checks before leaving work at night and at weekends.
It is important to check laboratories before leaving at night:
(i) as much apparatus as possible should be switched off and unplugged
(ii) individual gas appliances should be turned off locally as well as at the main supply.
(iii) doors and windows should be closed.

(b) Equipment running at night and at weekends. The permission of the academic staff member in charge of a facility must be obtained before apparatus is left running overnight. All appropriate procedures laid down in the code of practice for the section must be followed, and a sign must be posted in a prominent position showing instructions for switching off the equipment in case of emergency.

(c) Working in laboratories out of hours is allowed only with the specific prior written permission of the Head of Section. Particular care must be taken when using any equipment, or electrical testing of equipment or buildings, changing any pressure line, and cylinders or prototype experimental work. NOTE: Rock cutting out of hours is strictly forbidden.

Out of hours, the research worker must:
• be accompanied by another person whilst working in the laboratory,
• be fully aware of the safety procedures of the laboratory concerned, and be able to turn off and make safe,
• be fully aware of the emergency exists,
• be fully aware of the location of first aid boxes,
• be fully aware of the location of a telephone in case of an emergency.

(d) Out of hours Chemistry Laboratory use
In addition to all points in part (c) above:
• The use of any of the chemistry facilities requires compliance with the regulations in the respective laboratory.
• There must be no use of HF acid.
• There must be no decanting of acids from large to small containers.
• There must be no movement of dangerous acids around the Department.
11. Department Computing Facilities and Training

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 the document which can be found here: https://info.esc.cam.ac.uk/helpdesk/?page_id=439.

Details of the computing facilities available for student use are as follows:

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

At the beginning of your Part II year, you had a course on presentation and computer skills, including report writing, bibliographic skills, computer graphics, stereo-plotting, map drawing and GIS. You will have further developed many of these skills in compiling the report on your Part II mapping project. With the Part III project giving a more specialised flavour to your fourth year, extra training in computer skills needs to be targeted to your individual needs.

For this purpose, the University Computer Service offers a portfolio of courses throughout the year. You are strongly advised to attend relevant courses, either to upgrade your own capabilities in a particular area, or to learn a new skill in an area appropriate to your project. Courses are free to students, but you must book in advance – most courses get booked up days ahead. You can register online at http://www.cam.ac.uk/cs/courses/, where a full timetable and description of courses is available. You must explicitly cancel your booking in advance if you cannot attend. Most courses assume some prior knowledge of basic computing skills, but no more than you should have from your Part II experience.

The topics likely to be of most interest to Part III students will be:
- Bibliographic software (EndNote)
- Databases
- Desktop Publishing
- Graphics and photo/image processing
- Multimedia
- Presentation software (PowerPoint)
- Programming
- Spreadsheets
- Statistical and mathematical software
- Unix (inc. Linux)
- Web page authoring

As well as these taught courses, there are Self-Teach Courses available for some popular applications. These courses are mostly on CD-ROM, borrowable from the Computing Service against a deposit. Full details from the Computer Service website at http://www.cam.ac.uk/cs/courses/coursedesc/tys.html.
12. Feedback Processes

- Your most productive route for criticisms of the course is through the current lecturer or demonstrators. This particularly applies to day-to-day hitches, which can then be rectified immediately.

- You will have the individual opportunity to comment on the courses through the on-line questionnaires after each course component. Please use this opportunity. Your responses do significantly affect our planning of the following years’ course.

- The Teaching Liaison Committee has a representative from each of the courses taught in Earth Sciences, and meets about once a term. These meetings concentrate on broader problems of the structure, content and operation of courses.

- If none of these routes seems satisfactory, please feel free to contact the Earth Sciences Part III Course Coordinator, Nick Butterfield (Room E320, 33379, njb1005@esc.cam.ac.uk), the Teaching Support Manager, Helen Dingwall (Room N14, 68330, hpd20@cam.ac.uk) or the Director of Teaching, Richard Harrison (Room M25, 33380, rjh40@esc.cam.ac.uk).
13. Earth Sciences and Disability

Having studied 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 Administrator, Helen Dingwall hpd20@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.
14. Careers following a Degree in Earth Sciences

There are a wide range of careers open to Earth Scientists, and a shortage of well-qualified applicants. As a Cambridge graduate you would be highly sought after, because you have a better basic science and maths training than geologists from most universities, and because the Cambridge Earth Sciences Department is known to be one of the best in the world.

There is a misconception that almost all careers in Earth Sciences are in the petroleum industry. In fact, less than half of geologists work in this field. The full range of job areas is as follows:

- **Petroleum exploration & production**: finding new oil & gas fields and CO\textsubscript{2} storage sites.
- **Energy and mineral extraction**: exploring for coal, metallic and industrial minerals.
- **Hydrogeology**: finding and maintaining subsurface water supply.
- **Geotechnics**: detailing rock & soil strength for engineering projects.
- **Environmental geology & geochemistry**: natural and industrial risk assessment, nuclear waste disposal.
- **School teaching**: teaching science in schools.
- **University research & teaching**: degree-level teaching and research.
- **Museums and libraries**: managing collections of geological material.
- **Publishing**: commissioning and editing geological books and journals.
- **Science in society**: science research and policy in public sector institutes.
- **Finance and consulting**: assessing natural resource investment for banks etc.

Earth Scientists are very well qualified for careers outside geology. Earth Sciences graduates have particularly good problem-solving abilities and a wide range of transferable skills. These qualities are valued by most employers. Earth Scientists are therefore highly competitive in the job market, even where specific geological skills are not required.

Salaries for Earth Scientists vary widely between professions. The salaries for UK jobs advertised for ‘geologist’ average £45,000. The petroleum and mining industries pay higher-than-average salaries, with US pay being the benchmark: starting salaries of £60,000 and pay after 10 years of £90,000. Salaries in the finance sector are even higher than in the petroleum sector.

The Sedgwick Club hold career-oriented talks to which you will be very welcome. There will be a careers evening on **Tuesday 21 November, 5.00-7.00pm** in the common room, with the first half hour for first years only. Please come along.
15. Department of Earth Sciences: Plagiarism Statement

(This is a shortened and more subject-specific version of the University statement at http://www.admin.cam.ac.uk/univ/plagiarism/students/statement.html)

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.