

# Mathematics and Statistics Undergraduate Handbook

## Part C Dissertations in Statistics: Guidance Notes 2009–10

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## 1 Introduction

In Part C (the 4th year) of the MMath in Mathematics and Statistics, all students take the equivalent of three M-level 32-lecture units. *One of these three units must be a statistics project: for the examination all students must submit a dissertation on their project.* These notes provide some guidance for Part C students and supervisors.

### 1.1 The amount of work involved

A project is of one unit weight and should therefore be equivalent to two 16-lecture courses. Accordingly a student might think of the project as being the equivalent of two-thirds of a term's work. If some preparation has been done in the Summer Vacation, it should occupy between a quarter and one-third of his or her working time during Michaelmas Term, the Christmas Vacation and Hilary Term.

There is always a risk that a project might not succeed, especially if the original plan had involved some original research. Although this is a rare occurrence, examiners are aware of the possibility. They accept that a well-written account of the work done, with an explanation of why the original aims were not met, can nevertheless be worthy of high credit.

### 1.2 The amount of supervision

Students can expect to have up to about 8 hours of project supervision with their supervisor spread across Michaelmas and Hilary terms. Supervisors may strongly prefer that this supervision takes place during full term, so students should take this into account when planning their work.

Supervisors are only expected to read and comment on the draft dissertation once. It is reasonable to allow a week or so for work to be read, so it is particularly important that students take this into account when planning final writing.

Supervisors will be asked to keep a log of the amount and the nature of the project supervision that they give. This log will be passed on to the Part C Examiners.

### 1.3 Choice of subject

The dissertation can take the form of a data analysis or simulation project or a theoretical project in probability, statistics or operational research. It is important that it gives the student an opportunity to present his or her own work. It is understood that only in exceptional cases will this include original research. Sometimes it will be an analysis of a fresh dataset using a range of methods, some of which are new to the student. Sometimes it will be a matter of organising, presenting, or completing material culled (and understood) from advanced textbooks, monographs or journals.

### 1.4 Project approval

*All projects undertaken must have been approved in advance by the Statistics Projects Committee.* This should normally happen in the Trinity Term before the student starts Part C.

## 2 The dissertation

For formal regulations, see Section 3.

The examiners give credit for qualities such as content, accuracy, organisation, clarity and style. A dissertation should be self-contained except insofar as it cites material from Mods, Part A and Part B, and standard works or journals. Proper credit must be given to sources – see Sections 2.5 and 2.6. The dissertation must be typed. Computer-based facilities allow steady accumulation of material and effective editing. Moreover, although some word-processing and typesetting systems are very poor for mathematical work, others, such as dialects of  $\text{\TeX}$ , offer the possibility of very well presented output.

## 2.1 Submission information

Two copies of the dissertation, identified by the candidate's examination number only, must be submitted to

The Chairman of the Examiners  
Honour School of Mathematics and Statistics (Part C)  
Examination Schools  
Oxford

by *noon on the Friday of week 9 of Hilary Term.*

Both copies of the dissertation should be bound. Hard bindings are not required and cheaper forms of soft binding, such as thermal binding or comb binding, are in most cases perfectly adequate. Loose leaves in ring binders or held together by paper clips, are not acceptable.

Every candidate must complete and sign the declaration of authorship, available on the Department of Statistics website, to the effect that the dissertation is their own work, except where acknowledgement is made. The declaration should be placed in a sealed envelope bearing the candidate's examination number and submitted together with the dissertation.

## 2.2 Writing

Since it is the dissertation which is seen and considered by the examiners, its writing should be treated as a substantial part of the work involved and a suitable amount of time should be allocated to it.

You should put effort into presenting your work as clearly as possible. The paper by Ehrenberg [1] is only 4 pages long and contains good advice on technical writing. Strunk and White [11] is a guide to writing more generally. Katzoff [2] is an older report on technical writing – the following sentence, taken from early in the report, is excellent advice:

'If you remember nothing else of this pamphlet, you will have retained the essence if, when writing your report, you continuously bear in mind the busy reader, who has only a limited time to devote to your report and who, in addition, may not be very familiar with your subject.'

## 2.3 Writing mathematics

Excellent brief advice on mathematical writing is to be found on the London Mathematical Society website [7]. The book of Krantz [4] is also recommended, as is the older book by Steenrod, Halmos, Schiffer and Dieudonné [10]. Section 1 of Knuth, Larrabee and Roberts [3] is a mini-course on technical writing and there is plenty of good advice in the rest of the book too.

## 2.4 Books and software

You are welcome to use the Department of Statistics library and to apply for a departmental computer account to use for your project, for example in order to use the R package and/or to use L<sup>A</sup>T<sub>E</sub>X to prepare your dissertation. If you would like to use the library or apply for a computer account, please contact the Academic Administrator in the Department.

Should you use L<sup>A</sup>T<sub>E</sub>X, the standard reference is Lamport [5], and an excellent online guide is *The Not So Short Introduction to L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>* [9]. If you have your own computer and are looking to install a version of T<sub>E</sub>X/L<sup>A</sup>T<sub>E</sub>X, the MiK<sub>T</sub>E<sub>X</sub> distribution [8] is excellent.

## 2.5 Referencing

You may be unsure of how you should reference the work of others. The University webpage at <http://www.admin.ox.ac.uk/epsc/plagiarism/electrores.shtml> mentions that Blackwell's Publishing provides a referencing style guide available on its 'Author Services' website at

[http://www.blackwellpublishing.com/authors/reference\\_text.asp?site=1](http://www.blackwellpublishing.com/authors/reference_text.asp?site=1). In particular the guide describes the Harvard and Vancouver reference systems: the Harvard system references via name and year (e.g., 'Smith (1998) showed that ...'), whereas the Vancouver system references via name and number (e.g., 'Smith [12] showed that ...'). Either of these systems is perfectly acceptable for you to use.

The London Mathematical Society's advice to its authors [6] explains a common version of the second system.

## 2.6 Plagiarism

The University definition of plagiarism is as follows.

“Plagiarism is the copying or paraphrasing of other people's work or ideas into your own work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition.

Collusion is another form of plagiarism involving the unauthorised collaboration of students (or others) in a piece of work.

Cases of suspected plagiarism in assessed work are investigated under the disciplinary regulations concerning conduct in examinations. Intentional or reckless plagiarism may incur severe penalties, including failure of your degree or expulsion from the university.”

So plagiarism is something that you must avoid.

It is of the utmost importance that your dissertation is your own work. Whenever you include a quotation, or paraphrase of the work of others, you should make this clear by giving a reference. Direct quotations should be within quotation marks, or indented. Such direct quotations should be rare, such as where you want to discuss another writer's opinion. Do not be tempted to construct large sections directly from sources: the examiners want to see evidence that you understand the material, not just that you are able to use Google and cut and paste. Your project supervisor will be able to give you advice about the style and format of references, and the extent to which they are needed when you describe the background to your work.

See Appendix A for a further general information on plagiarism and on the seriousness of plagiarism.

### 3 Regulations and marking

Dissertations will be assigned USMs according to the same principles as Mathematics/Statistics exam papers. In arriving at these marks, the relative weights for theoretical dissertations given to content, presentation and mathematics/statistics will be 25%, 25% and 50% respectively. For dissertations on data analyses, simulations or similar topics, the examiners will assign 25% for content, 25% for presentation and 50% for the quality and appropriateness of the data analysis/simulation (see Section 3.2 for further details).

#### 3.1 Regulations governing dissertations

##### (1) *Subject, authorship, and format*

The subject of the dissertation shall be a project which shall be supervised by a member of the Faculty of Statistics or, in exceptional circumstances, by some other person of equivalent seniority approved by the Chairman of the Statistics Projects Committee of the Academic Committee of the Department of Statistics.

The dissertation shall be the candidate's own work; it may, for example, be a computation based on known results or a critical review of publications in probability, statistics or operational research, or a data analysis or simulation project. The supervisor may discuss with the candidate the field of study, recommend references, and discuss what methods are appropriate; the supervisor may also read and comment on a first draft. Every candidate shall sign a declaration of authorship to the effect that the dissertation is their own work, except as permitted by this regulation or where acknowledgement is made, and this declaration shall be placed in a sealed envelope bearing the candidate's examination number and presented together with the dissertation.

The dissertation should be typed, and must be held firmly in a stiff cover. Its length should not exceed the equivalent of 10,000 words (excluding diagrams, tables, references and texts of computer programs). Unnecessarily lengthy projects may be penalised.

##### (2) *Approval and allocation of topic*

Candidates shall, after consultation with their tutors, submit to the Chairman of the Statistics Projects Committee of the Academic Committee of the Department of Statistics,

- *either* (I) the title that they propose together with
  - a brief description (of at least 100 words) of the project which will be the subject of the dissertation. This should be sufficiently detailed for the members of the committee to judge whether the project is of appropriate depth and whether it is possible to find a suitable assessor in the University. If possible, candidates should include details of the main references books, papers, etc.;
  - a statement of approval from the person who has agreed to act as supervisor (a potential supervisor may be approached either by the candidate or through the candidate's tutor: alternatively, advice may be sought at an earlier stage from the Statistics Projects Committee).
- *or* (II) a ranked list of suggestions from a list compiled by the Statistics Projects Committee for which the candidate has the prerequisites required. Candidates who do not provide a list will be given low priority in the allocation of popular projects.

No dissertation will be accepted if it has already been submitted, wholly or substantially, for a degree of this University, or for a degree of any other institution.

The application (I) shall be made not earlier than the first day of Trinity Full Term in the year preceding the examination and not later than Monday of the sixth week of the Trinity Full Term in the year preceding the examination. The Statistics Projects Committee of the Department of Statistics will decide, as soon as possible, whether or not to approve the proposal and will advise the candidate forthwith.

Candidates whose proposal (I) was not approved by the Statistics Projects Committee must choose an alternative project from a list of suggestions compiled by the Statistics Projects Committee as explained under (II).

Details of approved projects shall be forwarded by the Chairman of the Committee to the Chairman of the Examiners not later than the first day of the following Hilary Full Term.

### (3) *Submission*

Dissertations (two copies), identified by the candidate's examination number only, must be submitted to *The Chairman of the Examiners, Honour School of Mathematics and Statistics (Part C), Examination Schools, Oxford*, by **noon on the Friday of the first week following the end of the Hilary Full Term preceding the examination**. At the same time, the supervisor shall submit to the Chairman of the Examiners a confidential report, which includes a record of meetings with the candidate, the purpose of which is to assist the examiners to determine how much assistance the candidate has received in the preparation of the dissertation; this report will be on a form supplied for the purpose by the Chairman of the Examiners.

Both copies of the dissertation should be bound. Hard bindings are not required and cheaper forms of soft binding, such as thermal binding or comb binding, are in most cases perfectly adequate. Loose leaves in ring binders or held together by paper clips, are not acceptable.

## 3.2 General information on assessment and marking

When writing your dissertation, you should be aware of how the examiners will assess it and mark it. The most important point is that the project is in probability, statistics or operational research. In fact, marks will be awarded in the following proportions:

- Mathematics/Statistics or Data analysis/simulation 50%
- Content 25%
- Presentation 25%.

Here is a brief explanation of these terms:

*Mathematics/Statistics*: Proofs and assertions should all be correct. In applied topics, the derivation of the model should be properly justified.

*Data analysis/simulation*: The data analysis has to be correctly and suitably done, including the choice of model. Similar comments apply to simulation.

*Content*: You must do more than rehash text books and lecture notes, and you should use original sources. The examiners are looking for some of your own thoughts and contributions. In particular you must not plagiarise (see Section 2.6 and Appendix A).

*Presentation*: The mathematics must be clear and well laid out; formulae must be clearly presented, tables and graphs properly referenced in the text; an abstract and a bibliography must be provided; the English should be clear and grammatically correct. Give some thought to notation, choice of typeface, and numbering of equations and sections. Do not fail to number the pages. Finally, be sure to supply complete and accurate

references for all the sources used in completing the project, and be sure to cite them properly in the text. Section 2 above gives detailed advice on this, and Appendix A below gives further general information on plagiarism and on the seriousness of plagiarism.

### 3.3 Late submission of, or failure to submit, coursework

Rules governing late submission and any consequent penalties are set out in the ‘Late submission of work’ sub-section of the ‘Regulations for the Conduct of University Examinations’ section of the Examination Regulations 2009.

Under the provisions permitted by the 2009 regulation, late submission of coursework for Mathematics and Statistics examinations will normally result in the following penalties:

- With permission from the Proctors under clause (2) of para 16.8, no penalty.
- With permission from the Proctors under clauses (3) + (4) of para 16.8, a penalty of a reduction in the mark for the coursework in question of at least 5 USMs (or at least 5% of the maximum mark available for the piece of work); the exact penalty to be set by the Examiners with due consideration to the advice given in the document ‘Academic Penalties for Late Submission of a thesis or other exercise: Proctors Notes for Guidance’, dated 1/11/06.
- Where the candidate is not permitted by the Proctors to remain in the examination he or she will be deemed to have failed the examination as a whole.
- Where no work is submitted or it is proffered so late that it would be impractical to accept it for assessment the Proctors may, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case the Examiners will award a mark of zero for the piece of coursework in question.

## References

- [1] A. S. C. Ehrenberg, *Writing Technical Papers or Reports*, The American Statistician **36** (1982), no. 4, 326–329. <http://www.jstor.org/stable/2683079?origin=JSTOR-pdf>.
- [2] S. Katzoff, *Clarity in Technical Writing*, Second Edition, NASA, 1964. <http://ntrs.nasa.gov/search.jsp?N=4294965273>.
- [3] D. E. Knuth, T. Larrabee, and P. M. Roberts, *Mathematical Writing*, Mathematical Association of America, 1989. Available at <http://tex.loria.fr/typographie/mathwriting.pdf>.
- [4] S. G. Krantz, *A Primer of Mathematical Writing*, American Mathematical Society, 1997.
- [5] L. Lamport, *L<sup>A</sup>T<sub>E</sub>X: A Document Preparation System*, Second Edition, Addison Wesley, 1994.
- [6] London Mathematical Society, *References*. <http://www.lms.ac.uk/publications/documents/references.pdf>.
- [7] London Mathematical Society, *Writing Mathematics*. <http://www.lms.ac.uk/publications/documents/writing.pdf>.
- [8] *MiK<sub>T</sub>E<sub>X</sub>*. <http://www.miktex.org/>.

- [9] T. Oetiker, H. Partl, I. Hyna, and E. Schlegl, *The Not So Short Introduction to L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>*. <http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>.
- [10] N. E. Steenrod, P. R. Halmos, M. M. Schiffer, and J. R. Dieudonné, *How to Write Mathematics*, American Mathematical Society, 1973. Second Edition, 1981.
- [11] W. Strunk Jr. and E. B. White, *The Elements of Style*, Fourth Edition, Longman, 1999. First Edition, 1918 available at <http://www.bartleby.com/141/>.

## A Plagiarism

The following information applies to all aspects of assessment during the course.

### A.1 Disciplinary regulations

In their Memorandum, *Essential Information for Students*, the Proctors and Assessors draw attention to the disciplinary regulations relating to plagiarism that must be observed by both undergraduate and graduate students:

- “3. No candidate shall cheat or act dishonestly, or attempt to do so, in any way, whether before, during or after an examination, so as to obtain or seek to obtain an unfair advantage in an examination.
4. No candidate shall present for an examination as his or her own work any part or the substance of any part of another person’s work.
5. In any written work (whether thesis, dissertation, essay, coursework, or written examinations) passages quoted or closely paraphrased from another person’s work must be identified as quotations or paraphrases, and the source of the quoted or paraphrased material must be clearly acknowledged.”

See the Proctors’ and Assessor’s Memorandum, Section 9.6, at <http://www.admin.ox.ac.uk/proctors/info/pam/index.shtml>.

Also, in the preceding Section 9.5, the Proctors and Assessor write:

“All undergraduate and graduate students must carefully read regulations 3, 4 and 5 in the Proctors’ Disciplinary Regulations for University Examinations below. These make it clear that you must always indicate to the examiners when you have drawn on the work of others; other people’s original ideas and methods should be clearly distinguished from your own, and other people’s words, illustrations, diagrams etc. should be clearly indicated regardless of whether they are copied exactly, paraphrased, or adapted. Failure to acknowledge your sources by clear citation and referencing constitutes *plagiarism*. The University reserves the right to use software applications to screen any individual’s submitted work for matches either to published sources or to other submitted work. In some examinations, all candidates are asked to submit an electronic copy of essays, dissertations etc. for screening by ‘Turnitin’. Any matches might indicate either plagiarism or collusion. Although the use of electronic resources by students in their academic work is encouraged, you should remember that the regulations on plagiarism apply to on-line material and other digital material just as much as to printed material.”

### A.2 University information on plagiarism

The text of this section is taken from <http://www.admin.ox.ac.uk/epsc/plagiarism/index.shtml>. Please see that webpage for further information.

#### What is plagiarism?

Plagiarism is the copying or paraphrasing of other people’s work or ideas into your own work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition.

Collusion is another form of plagiarism involving the unauthorised collaboration of students (or others) in a piece of work.

Cases of suspected plagiarism in assessed work are investigated under the disciplinary regulations concerning conduct in examinations. Intentional or reckless plagiarism may incur severe penalties, including failure of your degree or expulsion from the university.

### **Why does plagiarism matter?**

It would be wrong to describe plagiarism as only a minor form of cheating, or as merely a matter of academic etiquette. On the contrary, it is important to understand that plagiarism is *a breach of academic integrity*. It is a principle of intellectual honesty that all members of the academic community should acknowledge their debt to the originators of the ideas, words, and data which form the basis for their own work. Passing off another's work as your own is not only poor scholarship, but also means that you have failed to complete the learning process. Deliberate plagiarism is unethical and can have serious consequences for your future career; it also undermines the standards of your institution and of the degrees it issues.

### **What forms can plagiarism take?**

- Verbatim quotation of other people's intellectual work without clear acknowledgement. Quotations must always be identified as such by the use of either quotation marks or indentation, with adequate citation. It must always be apparent to the reader which parts are your own independent work and where you have drawn on someone else's ideas and language.
- Paraphrasing the work of others by altering a few words and changing their order, or by closely following the structure of their argument, is plagiarism because you are deriving your words and ideas from their work without giving due acknowledgement. Even if you include a reference to the original author in your own text you are still creating a misleading impression that the paraphrased wording is entirely your own. It is better to write a brief summary of the author's overall argument in your own words than to paraphrase particular sections of his or her writing. This will ensure you have a genuine grasp of the argument and will avoid the difficulty of paraphrasing without plagiarising. You must also properly attribute all material you derive from lectures.
- Cutting and pasting from the Internet. Information derived from the Internet must be adequately referenced and included in the bibliography. It is important to evaluate carefully all material found on the Internet, as it is less likely to have been through the same process of scholarly peer review as published sources.
- Collusion. This can involve unauthorised collaboration between students, failure to attribute assistance received, or failure to follow precisely regulations on group work projects. It is your responsibility to ensure that you are entirely clear about the extent of collaboration permitted, and which parts of the work must be your own.
- Inaccurate citation. It is important to cite correctly, according to the conventions of your discipline. Additionally, you should not include anything in a footnote or bibliography that you have not actually consulted. If you cannot gain access to a primary source you must make it clear in your citation that your knowledge of the work has been derived from a secondary text (e.g. Bradshaw, D. *Title of Book*, discussed in Wilson, E., *Title of Book* (London, 2004), p. 189).

- Failure to acknowledge. You must clearly acknowledge all assistance which has contributed to the production of your work, such as advice from fellow students, laboratory technicians, and other external sources. This need not apply to the assistance provided by your tutor or supervisor, nor to ordinary proofreading, but it is necessary to acknowledge other guidance which leads to substantive changes of content or approach.
- Professional agencies. You should neither make use of professional agencies in the production of your work nor submit material which has been written for you. It is vital to your intellectual training and development that you should undertake the research process unaided.
- Autoplagiarism. You must not submit work for assessment which you have already submitted (partially or in full) to fulfil the requirements of another degree course or examination.

### **Not just printed text!**

The necessity to reference applies not only to text, but also to other media, such as computer code, illustrations, graphs etc. It applies equally to published text drawn from books and journals, and to unpublished text, whether from lecture handouts, theses or other students' essays. You must also attribute text or other resources downloaded from web sites.