UNIVERSITY OF
LIVERPOOL

Guidance for MATH552 students and supervisors

1 General guidelines

MATH552 is a 30 credit module, with two components of assessment. The preliminary dissertation is worth 90% of the mark, and the seminar presentation is worth 10%. Full-time students write their preliminary dissertations during the second semester. The deadline for submission is in week 13. It is important that full-time students do not spend so much time on the preliminary dissertation that the lectured modules end up neglected. As a rough guide, the total time spent on the preliminary dissertation should be approximately double the time you would spend on a lectured module. Part-time students write their preliminary dissertations in the summer of year 1. In this case the deadline for submission is in the week before the start of the second year. Further details of the submission deadline, and the procedure for submission will be circulated by email, nearer the time.

2 Choosing a supervisor and a topic

There is no list of topics for dissertation work; it is up to you to find a supervisor and negotiate a topic. You are strongly encouraged to do some advance groundwork for this. During the semester before you start your dissertation, you should talk to a number of lecturers in the department (not only those teaching MSc modules), to find out who works in areas similar to your interests. Many staff maintain personal homepages that contain information about their work. Links to these can be reached from the Mathematical Sciences staff list,[1] by clicking on a staff member's name. Many students continue working with their preliminary dissertation supervisor for their main summer dissertation, so the choice of preliminary dissertation supervisor is an important one. Be careful not to attempt a topic which is too large in scope. More credit will be given for a smaller topic that is well presented, and less for a poorly presented preliminary dissertation which tries to cram in too much material.

> **Supervisor's note:** For the scope and difficulty level expected in a dissertation, please refer to to the comments under 'Quality of Content' in the marking scheme (§6). There is an expectation that dissertation students should begin to engage with research level material. Determining precisely what constitutes 'research level' in a particular area is a matter of academic judgement for the supervisor. Please note that a MATH552 dissertation is worth 90% of a 30 credit module. The amount of work required to complete a project should reflect this weighting.

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[1]www.liverpool.ac.uk/mathematical-sciences/staff

3 Dissertation presentation

The final submitted version of a dissertation must be an electronically typeset document in portable document format (pdf), with the text width and height set for printing on A4 paper. The type size must be either 11 or 12 point, and the margins should be set to sensible sizes (2–3.5cm). The recommended system for the production of dissertations in the Department of Mathematical Sciences is LaTeX (see §10). Students may choose to use other software, but should be aware that marks will be deducted for typesetting faults such as poorly formatted equations, inconsistent notation, inconsistent bibliography formatting, and low quality figures. Most mathematicians find that LaTeX helps to avoid all of these issues. Students whose dissertations include a large number of complex equations are strongly encouraged to use LaTeX.

4 Dissertation Length

There are no explicit minimum or maximum lengths for a MATH552 dissertation. However, a rough guide is that it should be approximately 30–40 pages in length (excluding any program listings), and experience has shown that it is difficult to score highly with a dissertation that is too short. Reports that exceed 40 pages in length will not be automatically penalised, though marks will be deducted for unnecessary padding, repetition, etc.

5 Penalty for late submission

Students who fail to submit their dissertation on time will have their mark reduced in accordance with the standard University system of penalties set out in section 6 of the Code of Practice on Assessment.[2] In particular:

- 5 marks per day will be deducted for each working day after the submission date, up to a maximum of five working days (the number of days will be rounded up, so 10 marks will be deducted from work that is 25 hours late, etc.).

- Work received more than five working days after the submission deadline will receive a mark of zero.

If you think that you may not be able to submit your dissertation by the deadline, it is essential that you discuss the situation with the Programme Director, at the first available opportunity.

Note: IT problems such as lost/stolen equipment, corrupted files, etc. **will not** be accepted as a valid reason for failure to submit on time. It is your responsibility to keep adequate backups of your work, and to ensure that you can make your submission before the deadline. In particular, you are strongly advised to store a copy of your work on the university `M:` drive, which is automatically backed up. Extensions will only be granted in exceptional circumstances, such as a large scale failure of university systems, confirmed by Computing Services.

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[2] www.liverpool.ac.uk/tqsd/code-of-practice-on-assessment/

6 Dissertation Marking Scheme

Academic Content

- **Introduction & Conclusion** [10 marks]

  The introduction should clearly set out what the dissertation contains. It should put the work into context, explaining why it is interesting and/or important. A summary of relevant literature should be included, and references to background material should be given where appropriate. The conclusion should summarise what has been achieved, and clearly explain the salient points established by the dissertation. It may also be appropriate to suggest possible avenues for further work on the topic.

- **Quality of Content (scope of material, level of difficulty)** [20 marks]

  A dissertation must reach a level of difficulty beyond what is easily accessible in a textbook or from the notes provided in a taught MSc course. A dissertation must also consider a topic that is sufficiently broad in scope, given the length of the project and the level at which the work is being assessed. It should be evident that the student is beginning to engage with research level material. Students are *not* required to produce publishable results, though this does sometimes happen.

- **Evidence of Understanding** [20 marks]

  A dissertation should clearly establish that the author understands the material, which must be at the appropriate level and of sufficient scope (see Quality of Content, above). High marks cannot be awarded under this heading for elementary work, or work that is too narrow. A mathematically correct, well-structured and organised report that covers all the salient points, and (where appropriate) includes examples that add to the exposition, should be viewed as evidence of understanding. Depending on the subject area, further evidence of understanding might include filling in details of calculations, assessment of different methodologies and coherent presentation and discussion of original results. On the other hand, egregious mathematical errors, incoherent explanations and serious omissions should be viewed as evidence of a lack of understanding.

  > **Marker's note:** Minor mathematical errors which are likely to be typographical in nature should be addressed under Clarity of Presentation, below.

- **Originality of Treatment** [20 marks]

  An MSc dissertation should contain a coherent account of the topic at hand, in the student's own words. High marks cannot be awarded under this heading for elementary work, or work that is too narrow in scope (see Quality of Content, above). The dissertation should also show that the student has contributed something to the topic. Evidence of this may include (but is not limited to) the following.

  - Assembly of material from disparate sources.
  - Calculation of new examples.
  - Creation of a sophisticated program code.
  - Extension of a theorem to a new context.
  - A substantial improvement on an exposition.

- **Bibliography** [5 marks]

  A dissertation should contain references to books and papers directly related to the topic at hand, and also to background material where appropriate. In particular, references must be given in situations where the dissertation depends on little known or very advanced literature.

  > **Marker's note:** Formatting errors in the bibliography should be addressed under Clarity of Presentation, below.

- **Initiative & Diligence** [10 marks]

  An MSc student is expected to work independently, consult relevant literature, and to make progress throughout the duration of the project. Important tasks should not be left until the last minute, and supervision meetings should not be cancelled without good reason.

  > **Marker's note:** The mark given under this heading should accurately reflect the amount of assistance the student has required. Only students who have worked through most material independently should be awarded high marks. However, marks need not be deducted for assistance with difficult or technical points.

Written Presentation

- **Clarity of Presentation** [10 marks]

  A dissertation should read well, be properly structured, and free from repetition. Sectioning should be used appropriately, and equations should be worked into the text. The notation used for mathematical content must be well chosen, properly defined and consistent. Equations, figures and text must fit within the margins, and there should be no spurious line, paragraph or page breaks. The bibliography must be formatted consistently and correctly. Where figures are included, these must be sharp and clear. If program code is included in the report, this must accompanied by explanatory comments or documentation.

- **Grammar, Spelling and Punctuation** [5 marks]

  A dissertation should be written in correct English, and free from spelling and punctuation errors, particularly spelling errors that can be eliminated by a spell checker.

(Total 100)

7 Seminar presentation

This takes place toward the end of the second semester, in week 11 or week 12. Each student gives a presentation about his/her preliminary dissertation. You should aim for a length of 45 minutes for your talk, plus about a further 5 minutes for questions at the end. Students significantly overrunning (talk time of more than 50 minutes), or with presentations that are too short (less than 35 minutes) will have marks deducted. We strongly suggest that you prepare the main skeleton of your talk using presentation software, ideally the BEAMER class for LaTeX.[3] Different people speak at different rates, and use slides in slightly different ways, but one slide per two minutes is a good way to roughly estimate the length of a presentation. It is advisable to have a few 'optional' slides near the end of the talk (that is, slides that can be omitted without damaging the logical flow of the talk). These can be either included or excluded depending on whether you have time to spare or are running out of time. You can make additions/elaborations on the board. When writing on the board, be sure not to spend too much time continuously with your back to the audience (if you have to do a lot of writing on the board, take frequent breaks from writing to face and talk to the audience). There will be a presentation skills session specifically for Mathematics MSc students during semester 2. This will be scheduled to avoid clashes with lectures and tutorials, and you are strongly encouraged to attend.

We try to make the audience for the MSc seminars as unintimidating as possible. There will be two lecturers marking the presentations, and the other MSc students will be invited to attend. Depending on the number of students in the cohort, the presentations may be organised together, or individually. Where possible, you should try to attend talks by other students working on projects in similar areas to your own.

8 Seminar presentation marking scheme

- **Clarity and Ability to Communicate** [15 marks]

  The presentation must be clearly delivered in correct English. The speaker should address the audience, and should avoid talking when facing in the opposite direction. The delivery should be engaging, and should communicate the presenter's interest in the subject. Spoken material and other media should fit together to form a coherent whole. All specialist notation and terminology must be clearly defined, so that the presentation is accessible to a general (MSc level) audience.

- **Level of Understanding (including ability to handle questions)** [15 marks]

  The presentation should clearly establish that the speaker understands the material, which must be at the appropriate level. High marks cannot be awarded under this heading for elementary work, or work that is too narrow. Elementary material and historical details may appear in the introduction, to motivate the work, but must not form the bulk of the presentation. A mathematically correct, well-structured and organised presentation that covers all the salient points, and (where appropriate) includes examples that add to the exposition, should be viewed as evidence of understanding. On the other hand, egregious mathematical errors, incoherent explanations and serious omissions should be viewed as evidence of a lack of understanding.

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[3]www.ctan.org/pkg/beamer

> **Marker's note:** Minor mathematical errors which are likely to be typographical in nature should be addressed under Technical Presentation, below.

Students can be expected to answer questions directly related to the presentation (e.g. to fill in details of proofs or calculations that have been omitted from slides). Students are also expected to answer more general questions, concerning the applications, importance or novelty of the work. Students are not *expected* to answer questions that are not directly related to the work (e.g. concerning alternative approaches to the same problem), but members of the audience may ask such questions, and credit will be given for informative answers that demonstrate the speaker's wider knowledge.

- **Technical Presentation (including quality of slides)**   [20 marks]

  An MSc presentation should be timed at approximately 45 minutes. Marks will be deducted for presentations that are too short, or too long. The presentation should be delivered at a smooth pace, not rushed or drawn out, using an appropriate number of slides. The slides themselves must be free from typographical errors, and should contain sufficient material to convey the important points, but should not be crowded with unnecessary detail. Effects such as overlays and transitions should not be overused. Where the board is used, it should add something to the presentation (e.g. showing a key proof or calculation in detail). Where figures or diagrams are included, these must be sharp and clear.

(Total 50)

9 Qualitative marking descriptors

Grade	Description	Key Features
Outstanding (A*) 80%+	**Outstanding work.** Factually almost faultless. Clearly directed and logical. Comprehensive coverage of topic. Strong evidence of reading/research outside the material presented in the programme. Substantial elements of originality and/or independent thought. Very well written.	**Distinction:** Originality. Well-directed. Independent thought.
Excellent (A) 70–79%	**Excellent work.** Logical, enlightening. Originality of thought or approach. Good coverage of topic. Clear, in-depth understanding of material. Good evidence of outside reading/research. Very well written and directed.	
Very good (B) 60–69%	**Very good work.** Logical, thorough. Factually sound (no serious errors). Good understanding of material. Evidence of outside reading/research, exercise of critical judgement. Some originality of thought or approach. Well written and directed.	**Pass:** Essentially correct and complete. Competence, critical judgement.
Good (C) 50–59%	**Good work.** Worthy effort, but undistinguished outcome. Essentially correct, but possibly missing important points. Largely derived from material delivered in the programme, but with some evidence of outside reading/research. Some evidence of critical judgement. Some weaknesses in expression.	
Marginal Fail (D) 40–49%	**Inadequate work.** Incomplete coverage of topic. Evidence of poor understanding of material. Poor presentation, lack of coherent argument.	**Compensatable fail:** Significant weaknesses,but serious effort.
Fail (F) <40%	**Unsatisfactory work.** Serious omissions, significant errors/misconceptions. Poorly directed at targets. Evidence of inadequate effort.	**Fail:** Little or no achievement of learning outcomes.

10 Guidance on LaTeX

LaTeX is widely used for the production of mathematical documents, and is the recommended system for students writing dissertations in the Department of Mathematical Sciences. As with many computer languages (especially those that have been in existence for a long time), there is a huge amount of information about LaTeX on the internet, but not all of it is good. The guidance below includes links to reliable resources.

10.1 Introductory worksheets

The course materials for MATH549 include some introductory worksheets on LaTeX. Copies are available from the MATH552 Vital page. Please do not contact the MATH549 lecturer for help typesetting your dissertation. Talk to your supervisor in the first instance, and see §10.5 if (s)he is unable to help.

10.2 Books and guides

The Not so Short Guide to LaTeX 2_ε is freely available,[4] and is a good starting point for learning LaTeX. However, it is very basic, and lacking in certain areas, particularly bibliographies (see §10.4, below). Some books that are more thorough are available from the library, including:

- *LaTeX: A Document Preparation System* by Leslie Lamport (second edition)

- *The LaTeX Companion* by Michel Goossens, Frank Mittelbach and Alexander Samarin

Although these are rather old (in computing terms), LaTeX itself has not changed since they were written. However, many packages have been updated, and many new packages have been created. Manuals for most packages can be obtained from the Comprehensive TeX Archive Network (ctan).[5] These are usually written by the package author him/herself, and are therefore definitive.

10.3 Graphics

There are several software packages capable of creating high quality graphics for inclusion in mathematical documents. For plotting functions and data, Gnuplot (free), Maple, Mathematica and Matlab are good options. For diagrams, you can try geogebra or xfig (both free). A very common error is to use the wrong file format for storing graphics. Diagrams and plots should be stored as eps or pdf files.[6] Using a bitmap format such as jpg or png may lead to blurring, especially if the diagram contains text (axis labels, etc.).

It is also possible to create diagrams and plots from within a LaTeX document, using the `tikz` package[7] and the `pgfplots` package,[8] respectively. These take some time to learn, but they do produce very good results.

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[4] www.ctan.org/pkg/lshort

[5] www.ctan.org

[6] Note that modern installations of pdflatex will automatically convert eps files to pdf during typesetting. You may find websites or other resources that say eps files cannot be used with pdflatex; these are outdated.

[7] www.ctan.org/pkg/pgf

[8] www.ctan.org/pkg/pgfplots

10.4 Bibliography

Manually formatting a bibliography is generally inadvisable. An automated system will produce consistent, error-free results in far less time. For a bibliography consisting of books and papers, the simple BiBTeX system is more than adequate. See pages 70–71 and 155–164 of the book by Leslie Lamport (§10.2, above) for more details. There is also the newer biber/biblatex system, but this is much more complicated.

10.5 If all else fails

There is a Q&A site for LaTeX and related software at tex.stackexchange.com. Many LaTeX experts (including package maintainers and some of the LaTeX3 programming team) are active on the site, and a lot of frequently asked questions already have answers there. Well-posed questions are usually answered within hours.