Department of Computer Science
School of Mathematical and Computer Sciences
Heriot-Watt University

4th YEAR DISSERTATION

2016/2017

Calendar, guidelines, and other snippets

BSc Honours in Computer Science

BSc Honours in Computer Systems

BSc Honours in Information Systems

MEng in Software Engineering

Honours Project Coordinators

Dubai: *Hani Ragab Hassen*
Email: `h.ragabhassen@hw.ac.uk`
Room: F-67 (2^{nd} floor)

Edinburgh: *Alasdair Gray*
Email: `A.J.G.Gray@hw.ac.uk`
Room: EM 1.39

A.J.G. Gray, September 2016

Previous versions
Alasdair Gray: 2014 revised 2015
Peter King: August 2008, revised August 2009, 2010, 2011, 2012

1 About this document

The purpose of this document is to:

- Explain how the final year dissertation works.
- Specify the complete calendar for your dissertation work.
- Provide guidelines about the main aspects of the dissertation.
- Summarise dissertation-related information in the final year.

2 Important dates at a glance

The table below summarises the milestones and their respective deadlines: those given as a specific week mean the end of the respective week. See Section 8 for details on deliverables.

Deadline	*Milestone*	*Submitted via*
Semester 1 week 2	Project allocation form completed	Project system
Semester 1 week 11	Ethics and Health & Safety forms submitted	Project system
24 Nov 2016 15:30(GMT)	Deliverable 1 submitted	Vision
Semester 1 week 14	Interview completed	
Semester 2 week 10	Draft dissertation to supervisor	Email or hardcopy to supervisor
24 Apr 2017 10:00(BST)	Dissertation submitted	Vision & project system
5 May 2017 15:30(BST)	Poster submitted (both campuses)	Vision
5 May 2017	Edinburgh Poster Session	Printed poster at session
8 May 2016	Dubai Poster Session	Printed poster at session

3 Online Project System

The honours projects are managed through an online system available at

`https://www.macs.hw.ac.uk/cs/project-system/index.php?group_id=ugcse`.

Your user name is the same as for other Heriot-Watt systems but you will have a different password which will have been sent to you at the start of the year[1].

The online project system allows you to modify the title and abstract of your project. Please ensure that these are as accurate as possible. Any changes you make to the title or abstract, or any changes to the supervisor or second reader (which would be made by the Project Coordinator) will be emailed to all parties concerned. Your application for ethical approval is also managed through the project system (see Section 5).

[1]The Honours Project Coordinator can reset your password if required.

An archive of past projects is available through the project management system. These are available for you to browse by clicking on the "Completed Projects" link on the "Project" menu. Distinction level projects are marked with a red asterisk. You can filter the list of projects by year, supervisor, or degree programme. As part of the submission of your dissertation, **you are required to upload a PDF of your dissertation together with the associated files to the project system**.

4 How are dissertation topics allocated?

Your choice of dissertation should reflect the educational aims of your degree programme and should enable you to demonstrate the subject mastery for your programme. These can be found in your programme handbook.

To be allocated a dissertation, you need a *supervisor* and a *topic*. There are two ways to get these.

4.1 Choosing a topic on offer

A list of dissertation topics (titles and abstracts) offered by staff members is available from the honours project system by clicking on the "View Proposals" link under the "Proposals" menu. Logging into the project system will show you a list of topics suitable for your degree. It will also allow you to contact the project proposers by email.

You should identify the projects that you find appealing and contact the staff members proposing them. The project system provides a link to allow you to email the proposer of a topic. Each staff member will discuss the project's availability with you.

Once both you and the staff member are satisfied, the project can be allocated by the supervisor. They need to log into the project system, click on the "My Proposals" link under the "Proposals" menu and then click on the "Allocate Project" button next to the relevant project. The student to be allocated can be selected from the drop down list.

4.2 Proposing your own topic

If you have your own idea for a dissertation, identify a member of staff who has the technical competence for supervising the project (ask your mentor, the Honours Project Coordinator, or the fourth year supervisor to help you here). Once you identify a potential supervisor, discuss your idea with them, especially:

- Is your idea suitable for a good final year dissertation?
- Is the necessary equipment available or can it be bought through the Student Equipment Fund[2]?
- If any company or body outside the Department is involved, do they guarantee to commit sufficient time and resources?

If a member of staff agrees to supervise you, and the answer to all questions above is yes, you can go on with your own dissertation. You will need to create a new project proposal and then have the staff member allocate the project to you.

5 Ethics

All projects are required to make an ethical approval application. Projects without appropriate ethical approval will be given a mark of 0.

[2] `https://www.hw.ac.uk/schools/mathematical-computer-sciences/departments/computer-science/student-equipment-fund-sef.htm` (alternative URL: `http://tiny.cc/hwsef`)

Ethical approval applications are made through the project system by completing the form available through the "Ethical Approval" menu. This form is also used to make a health and safety risk assessment about the project.

There are three levels of ethical screening, depending upon the project and its use of human subjects. **All students must complete the "Health and Safety Risk Assessment" section.**

No human subjects: For projects where there are no human subjects you need to

- State the aim of the evaluation mechanism and tick the check box stating that "None of the above" apply. Do not tick any of the other boxes.
- Complete the "Health and Safety Risk Assessment" section.

Interface only: For projects where the use of human subjects is to evaluate an interface then the following sections of the form should be completed. **Note that approval must be granted by your supervisor in the project system before any evaluations are conducted.**

- State the aim of the evaluation mechanism and tick the check box stating that Human subjects are involved. Do not tick any of the other boxes.
- Complete the "Interface Only Screening" section declaring that you will conduct your evaluation according to the criteria outlined
- Complete the "Health and Safety Risk Assessment" section.

Human subjects: For all other projects involving human subjects then the full ethical approval form must be completed prior to any work with the human subjects. **Approval must be granted by the School's Ethical Coordinator prior to any work with humans being conducted.**

- State the aim of the evaluation mechanism and tick the check box stating that Human subjects are involved. You should also consider whether you are using personal or sensitive information (as defined by the Data Protection Act[3]
- Check the "No" option in the "Interface Only Screening" section
- Complete the "Full Ethical Screening" section
- Complete the "Use of Human Subjects" section
- Upload the consent form to be handed out to participants; examples can be found on Vision
- Complete the "Data Protection Compliance" statement
- Complete the "Health and Safety Risk Assessment" section.

It is your responsibility to keep your ethical approval correct throughout the year. If your work changes to involve more work with human subjects, you will need to update your Ethical Approval application *and* wait until it is approved *before* any work with human subjects starts.

5.1 Consent Forms

In *all* cases involving human subjects you *must* give each subject a statement of what they are being asked to do and why. Sample consent forms are available on the F20PA Vision course.

You should keep a copy of all completed consent forms in a safe place, and a sample form included as an appendix to your dissertation. Each participant *must* sign and date a consent form that indicates that they understand why they are participating in the experiment and that they are free to leave the experiment at any time. You should keep these consent forms safely.

Any data gathered from experiments involving human subjects should be anonymised so that individuals cannot be identified. Only the anonymised form of data should be uploaded to the project system at the end of your dissertation.

[3] `https://www.jisc.ac.uk/guides/data-protection-and-research-data`

5.2 Health and Safety Risk Assessment

All projects are required to complete the "Health and Safety Risk Assessment" section of the ethical approval form. For many projects the assessment will be simple — only standard software is being used in an office environment and no special safeguards are needed. If you project requires the use of specialist equipment, e.g. robots, eye trackers, etc., or use of devices not in a standard office environment, e.g. use of mobile devices whilst moving around, then the risks should be identified and appropriate measures to mitigate these risks.

6 What are the different types of project?

There are broadly speaking two styles of project. These are

Research-based: focus on investigating some research hypothesis generally through surveys or observing human behaviour with some existing system.

Technical: focus on implementing some software and evaluating it or developing a formal framework and proving its correctness.

Table 1 gives a breakdown of the work to be conducted in each style of project. Additional guidance notes for research-based projects can be found in Appendix B.

Semester	Research-based	Technical
1	• Conduct literature review of existing related work • Decide on research questions and style of research – exploratory or confirmatory (see Appendix B.1) • Identify appropriate research methods – qualitative or quantitative (see Appendix B.1) • Define scope of project	• Conduct literature review of existing related work • Identify system requirements • Outline initial system design and technology choices • Define evaluation strategy
2	• Design and implement research methodology • Conduct research methodology • Analyse results and discuss in relation to research hypothesis • Write up dissertation • Prepare poster	• Iteratively develop and improve prototype • Perform detailed evaluation • Analyse results with respect to original aim and objectives • Write up dissertation • Prepare poster

Table 1: Typical programme of work for the different types of project.

7 How are projects supervised?

Supervision of projects varies from member of staff to member of staff. However, you should meet regularly with your project supervisor; typically this will be for up to an hour each week during semester time. These meetings should commence as soon as your project is allocated; it is your responsibility to contact your supervisor to arrange these meetings. You may agree on a mutually convenient fixed slot which can be rearranged via email as required. If you are not going to attend a session, inform your supervisor via email.

Supervision meetings are your opportunity to update your supervisor on your progress and get guidance for the future direction of your work. You will receive verbal feedback on your progress at these meetings and may also receive written feedback on drafts of deliverables; this is at the discretion of your supervisor. You can expect written feedback on a draft of your dissertation provided it is given to your supervisor by the agreed date (see Section 2).

Important!

- You *must* agree a project timetable with your supervisor in time for inclusion in the first deliverable.
- You are *strongly* encouraged to ask your supervisor to identify examples of good dissertations from previous years; these are available through the "Projects → Completed Projects" section of the project system
- You *must* agree the dissertation contents with your supervisor.
- You *must* allow sufficient time to let your supervisor read a complete draft of your dissertation, incorporate their comments, and produce a final copy on or before the hand-in day (see deadlines, Section 2).

8 What are the dissertation deliverables?

The *deadlines* related to all deliverables are listed in Section 2. This section gives essential information about each deliverable. *All deliverables are assessed* by the supervisor and the second reader; all assessments are integrated in your final mark. The exact formula of your final assessment is given in Section 10. The marking rubrics for each deliverable are available through Vision associated with the appropriate assessment.

Note that projects without appropriate ethical approval will be awarded a mark of 0.

8.1 Deliverable 1: Research Report

What should it contain? At least the following sections:

- **Title page:** including the following details
  - Title of your project
  - Your full name
  - Your supervisor's name
  - The caption "Deliverable 1: Final Year Dissertation"
  - The degree programme for which you are studying
- **Declaration:** confirming that the dissertation is your own work (see Appendix C.1).
- **Abstract:** a short description of the project and the main work to be carried out – probably between one and two hundred words.
- **Table of Contents:** giving the main chapter and section titles and the pages on which they start

- **Introduction:** summarising the context of the dissertation project, stating the aim and objectives of the project, identifying the problems to be solved to achieve the objectives, and sketching the organisation of the dissertation.
- **Background:** discussing related work found in the technical literature and its relevance to your project.
- **Requirements/Research Questions:** Identification of the system requirements for the target system or research questions to be answered;
- *Design (optional):* an initial design of software or sketch of the research methodology
- **Evaluation Strategy:** Details of the evaluation and analysis to be conducted
- **Project Management:** This section should include:
  - A timetable for the whole year, agreed with your supervisor, and specifying activities, deliverables and deadlines.
  - An analysis of the risks for the project together with appropriate mitigation plans
  - Consideration of any Professional, Legal, Ethical, and Social Issues pertinent to the project
- **References:** listing complete details of all the documents cited in the text
- **Appendices:** to include additional material, consult with your supervisor

Please notice: this is a *minimum* set of requirements. If you have done more than what is suggested here, for instance a preliminary implementation or tests of existing software tools, by all means *report it*. Use the marking rubrics as guide to what you are being assessed on.

Any special format? The first deliverable should be about 20-30 pages[4] (excluding front matter and appendices) – research reports should be succinct and stick to relevant materials, with supplementary material in appendices. It should conform to the formatting specification given in Appendix C.2.

Where do I hand it in? Through Vision – there is a Turnitin assignment in Vision (F20PA) to allow this. You may submit as often as you like before the deadline. A plagiarism report will only be generated after the submission deadline.

When do I hand it in? See timetable in Section 2.

8.2 Draft Dissertation

If you submit a draft of your final dissertation by the end of week 10 of semester 2, or by some other date agreed in advance with your supervisor, then your supervisor will provide written feedback based on the criteria that are used to assess the dissertation before the end of week 12.

8.3 Dissertation

What should it contain? At least the following sections:

- **Title page:** including the following details
  - Title of your project
  - Your full name
  - Your supervisor's name
  - The caption "Final Year Dissertation"
  - The degree programme for which you are studying
- **Declaration:** confirming that the dissertation is your own work (see Appendix C.1).

[4] If you are going over 30 pages consult with your supervisor.

- **Abstract:** a short description of the project and the main conclusions – probably between two and three hundred words.
- **Table of Contents:** giving the main chapter and section titles and the pages on which they start
- **Introduction:** summarising objectives, problems solved to achieve the objectives, methods, results, achievements and limits, and sketching the organisation of the dissertation.
- **Background:** discussing related work found in the technical literature and its relevance to your project.
- **A central part** in several sections, describing the work carried out as part of the dissertation
- **Testing and performance assessment** reporting on performance evaluation and any experimental work carried out;
- **Conclusions:** summarising
  - the main achievements of your work, in relation to the initial objectives as well as similar work by others;
  - the main limitations of your work;
  - possible extensions and future work.
- **References:** listing complete details of all the documents cited in the text.
- **Bibliography:** listing documents related to your work but not cited in the text (if applicable).
- **Appendices:** consult with your supervisor on what to include in the appendices.

There is no recipe for a "perfect" dissertation; the above is a set of good-practice guidelines to structure your document. You are strongly encouraged to ask your supervisor for examples of good-quality dissertations from previous years or to browse the past projects available through the project system. Use the marking rubrics as guide to what you are being assessed on.

Any special format? The dissertation should be about 50-70 pages (excluding front matter and appendices) – dissertations should be succinct and stick to relevant materials, with supplementary material in appendices. It should conform to the formatting specification given in Appendix C.2. should conform to the following:

Where do I hand it in? Through Vision and the project system:

- A copy of your dissertation text as a PDF or Word Document through the TurnItIn assignment in the F20PA Vision course. A plagiarism report will only be generated after the submission deadline.
- A copy of your dissertation text together with a zip file containing your electronic files (see Section 8.3.1 for details) through the project management system.

When do I hand it in? See timetable in Section 2.

8.3.1 Electronic Copy

What should it contain? Machine readable copies of your documents, your code, your experiments, your anonymised data, and your analysis.

Any special format? The electronic version should be compressed with ZIP or similar compression format and readable on a standard departmental PC.

Where do I hand it in? Through the honours project system (`https://www.macs.hw.ac.uk/cs/project-system/index.php?group_id=ugcse`).

8.4 Poster

At the end of the exams in semester 2 a session is held with each student producing an A1 sized poster in portrait format summarising the project undertaken and the results obtained. Dates of the poster session on the different campuses is given in the timetable in Section 2.

During the session you stand beside your poster and explain it to anyone who asks about your project. Your poster marker[5] will mark your poster during this session. Software can also be demonstrated during this session, although space is limited.

What should it contain? A summary of your project highlighting the key contributions

Any special format? A1 portrait either as

- Single printed sheet: see Vision for suggestions on printing services
- 4 x A3 sheets mounted on A1 card avaialble from the school office
- 8 x A4 sheets mounted on A1 card avaialble from the school office

Where do I hand it in? Through Vision – there is a Grade Centre assignment in Vision (F20PA) to allow this. You also need to bring a printed copy to the poster session.

When do I hand it in? See timetable in Section 2.

9 What are the dissertation courses?

There are 3 dissertation-related courses coordinated by Alasdair Gray (`A.J.G.Gray@hw.ac.uk`) in Edinburgh and Hani Ragab Hassen (`h.ragabhassen@hw.ac.uk`) in Dubai.

9.1 Semester 1: F20PA

The course in semester 1 (Research Methods and Requirements Engineering) consist of a series of talks, usually given by

- Departmental lecturers: illustrating various aspects of the dissertation-related work (e.g. writing introductions, researching literature, presenting your work, managing your project, writing tools);
- Staff from various services within the university covering topics such as the use of the library services for research, student welfare, and careers advice.

The talks may not take place every week. Details are circulated through Vision and email.

9.2 Semester 2: F20PB and F20PC

Both courses in semester 2 are allocated to full-time, individual work on the dissertation.

10 How is my work assessed?

10.1 Who are the assessors?

All deliverables (research report, dissertation, poster) are assessed by your supervisor and second reader. The dissertation, which counts more than any other deliverable, is assessed by

Your supervisor: who is familiar with your work;

[5] Your poster marker is normally your second reader unless they are located on a different campus in which case another academic will be assigned.

The second reader: who knows your work only through the interview in semester 1, deliverable 1, and the poster. They assess you mostly on the basis of the dissertation;

The external examiner: (for a few dissertations only) who does not know either you or your work at all, and bases their judgement entirely on your dissertation.

Important!

Given the above, it is *vital* that your dissertation can be understood by a competent academic in the department with little or no specific knowledge of your dissertation subject. Avoid unnecessary details and excessive jargon. The more the assessors find your dissertation hard to read, the more negative their judgement.

10.2 How exactly is my final mark calculated?

Your *overall* mark for your honours project is determined as follows:

- 15% Deliverable 1
- 75% Dissertation report
- 10% Poster

Your *overall* degree mark is determined as follows:

- BSc Computer Science, BSc Computer Systems, & BSc Information Systems
  - 30% dissertation project
  - 50% fourth-year taught courses
  - 20% third-year courses
- MEng Software Engineering
  - 40% fifth-year courses
  - 25% fourth-year taught courses
  - 25% dissertation project
  - 10% third-year courses

10.3 What criteria do the assessors follow when marking?

The following are the main categories on the assessment forms of each deliverable; each contributes to your mark for that deliverable. The assessment forms are available through Vision.

10.3.1 Deliverable 1

- Background literature: thoroughness of review, appropriateness of references, organisation, presentation and use of references, conclusions reached.
- Requirements section: amount of detail, organisation, thoroughness.
- Schedule of work: detail, realism.
- General presentation, organisation, length.

10.3.2 Dissertation

- Organisation and structure.
- Conciseness and understandability.
- Amount of work achieved.
- Quality of outcome.
- Originality and initiative.

10.3.3 Poster

- Layout and presentation of project focus and outcomes
- Ability to communicate ideas, whether verbally or through poster
- Aesthetic quality of poster
- Quality of any software demonstration

10.4 Do I get feedback on my deliverables?

Yes. You get a copy of the assessment forms filled in by your supervisor and second reader for first deliverable which will include feedback from the interview. You do not receive feedback for the dissertation or the poster. However, if you submit a draft of you final dissertation by the Monday of week 11, your supervisor should give you feedback to improve the final version.

A FAQs

How long should my dissertation be? See Section 8.3.

Should I include my code or not? See Section 8.3.

Do I need a special cover or first page? See Section 8.3.

Can I have an extension on deadlines? *No.* You are told the exact deadlines for the whole year in week 1, semester 1; you have plenty of time to get organised. *Late submissions will be penalised* according to the departmental policy published in your Undergraduate Programme Handbook[6], unless special circumstances can be proven.

How much is the dissertation worth in my final evaluation? See Section 10.2.

[6] Up-to-date electronic versions are available from `http://www.macs.hw.ac.uk/students/cs/ug-programmes/`

B Additional Guidance for Research-based Projects

The text for this appenix was put together by Judy Robertson in July 2011 with input from Greg Michaelson, Rob Pooley, and Mike Chantler. It has subsequently been refined with input from Jeeny Coady and Tessa Berg.

The aim is to provide additional guidance notes for students embarking on a research-based project.

B.1 Research Method

There are a number of choices to be made in the course of your dissertation. One of the most important is deciding which research methods you will use. This depends on whether you are conducting exploratory or confirmatory research.

B.1.1 Exploratory research

Exploratory research is conducted on problems where there has been little previous research. In the field of technology, this often occurs because a new product has emerged which changes how people perform tasks. The aim of an exploratory study is to raise and provide initial answers to research questions, perhaps with a view to developing a new theory. For example, in 2006 when the Wii game console was introduced, a student might have conducted exploratory research to investigate the ways in which the Wii games console changed interactions between family members in the living room. There would have been no prior theory about this as that particular technology didnt exist. The student could have formulated sensible research questions to ask based on the previous academic studies about the impact of other sorts of consoles on the family group though.

B.1.2 Confirmatory Research

Confirmatory research, on the other hand, starts with an existing theory and aims to test hypotheses relating to it. This is appropriate where more prior research has been conducted in the area. For example, if there was a theory which predicted that left handed users would be disadvantaged by using the play station game controller then a confirmatory study would ask both right and left handed users to use the game controller for a period and evaluate whether left-handers performance did indeed suffer. Again, a thorough literature review will help you to decide what theory might be appropriate to test and what other empirical results have been found in the area recently.

B.1.3 Qualitative versus Quantitative methods

There is a whole toolbox of research methods which you can use to answer your research questions, whether they are exploratory or confirmatory. There are no right and wrong answers about which method you should use – one method is not "better" than another. It depends on what you are trying to find out. There may be multiple valid ways of approaching the same set of questions (see below for some methods commonly used in research projects). The point is that the methods you use should be appropriate and you should apply them rigorously and honestly. *Qualitative methods* refer to research methods which attempt to answer questions by collecting data in the form of words, pictures, video and artefacts and analysing these data sources in a systematic way based on your interpretation of their meaning. *Quantitative methods* involve the collection and rigorous statistical analysis of numerical data in an objective way. Often (but not always) qualitative methods are used in exploratory work, and quantitative methods are used for confirmatory research. It is often effective to use complementary qualitative and quantitative techniques together, such as following up trends indicated by analysis of questionnaire data with in-depth qualitative analysis on interviews.

Collecting data for qualitative analysis.

- Interviews with subject experts
- Diaries kept by users
- Observation of technology used in a real environment (such as an office or class)
- Interviews or focus groups with users

Collecting data for quantitative analysis.

- Counts of user errors
- Timing users as they attempt to complete tasks
- User satisfaction questionnaires
- Automatic log files recording users' interface actions

B.2 What makes a good research-based project?

Here are some of the things markers are looking for in a good project:

- A thorough and up to date literature review consisting of respectable academic articles rather than just web pages.
- A coherent argument about why your research will contribute to what has already been discovered by previous researchers
- A discussion of why you chose your research methods, and how you developed your research instruments. Here "instruments" means the tools you use to make measurements, such as a user satisfaction questionnaire or a set of interview questions. If you choose to create your own instrument rather than using one previously published in the literature, you should make sure you construct it correctly and pilot test it.
- If you conducted an experiment you should explain your reasoning behind the choice of experimental design (e.g. why you chose within-subjects rather than between-subjects).
- If you are doing quantitative analysis you should report descriptive statistics at the very least. If you are hypothesis testing, you should make sure you have picked the right form of statistical test for the type of data and experimental design you have (see books listed on Vision for this). You should report the test results thoroughly, including effect size.
- If you are doing qualitative analysis you should describe which coding scheme you used (either from the literature or one you devised).

C Document Preparation

C.1 Declaration

The following declaration statement should be included in both the first deliverable and the final dissertation.

> DECLARATION
>
> I, *your name* confirm that this work submitted for assessment is my own and is expressed in my own words. Any uses made within it of the works of other authors in any form (e.g., ideas, equations, figures, text, tables, programs) are properly acknowledged at any point of their use. A list of the references employed is included.
>
> Signed: *your signature*
> Date: *date of submission*

C.2 Formatting

- Typed, single sided, double spaced, point size 11, 1-inch margins on A4 sheets. Excerpts of code or pseudo-code, captions and the like should be single spaced.
- Pages should be numbered, as should chapters and sections within chapters.
- Chapters should start on a new page.