Department of Computer Science

COMSM0111/COMSM0014 Handbook

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Chapter 1: Introduction

1.1 Principles and design

A final-year project is designed to represent the pinnacle of an associated degree programme. It offers numerous positives which combine to complement the goals of standard taught units, typically exercising all experience and technical skills accumulated over previous years. The same positives also imply challenges of course, but the outcome is almost always something you as a student, and we as a Department, can be proud of. From an academic perspective, several core principles act as a guide:

Engagement in self-directed, independent work: *You*[1] are responsible for every aspect of the project: numerous sources of support and advice are clearly available, but *you* should take ultimate ownership of and therefore drive the project organisation and delivery. This aspect can be both challenging *and* exciting. On one hand you must cope with this responsibility, but, on the other, it allows a level of freedom that rarely exists elsewhere in the degree programme.

In-depth investigation of topics with significant challenge: Our expectation is that MEng projects will focus on a topic with some challenge: the topic will ideally capture a focused set of problems or objectives, whose difficulty and value are carefully identified and clearly articulated.

MEng and BSc projects are typically distinguished by this requirement, the depth (and sometimes volume) of resulting work, and also by added emphasis on higher-level understanding and critical analysis. However, it remains important that the *type* of challenge can legitimately differ between project topics: this fact stems naturally from the vast diversity within Computer Science as a subject. Our goal is to recognise and support this diversity while still rewarding higher-quality work (of whatever type) with higher marks.

Demonstration of Intended Learning Outcomes (ILOs): *Every* unit has a set of ILOs which guide their content, and act as a benchmark with respect to quality. In relation to MEng projects, we expect students to:

- work autonomously, planning your own work and meeting deadlines, but also developing your own, novel views and ideas;
- demonstrate a broad awareness of current problems and insight at the forefront of academic and industrial thinking;
- have a comprehensive understanding of theories and techniques specific to the project topic;
- apply said theories and techniques in your own research and development;
- deal with complex issues, both systematic and creative, and make robust decisions (even in the absence of complete data);
- critically evaluate your own work and that of others; and
- communicate your work clearly through a variety of mediums, and to both expert and non-expert audiences.

By design, these align with *exactly* the sorts of skills required of students by future employers, whether in an academic or industrial, Computer Science or non-Computer Science context.

1.2 Organisation and delivery

Your MEng project is delivered via two units, which combine to satisfy the principles outlined above. You will take:

1. a 40 CP major unit, whose focus is on the work carried out during execution of the project topic; plus
2. a 20 CP minor unit whose focus is on exploring the project topic within a wider context.

[1] From here on, "you" should be interpreted as either you individually or collectively (i.e., a group) as need be. In this specific example, responsibility for an individual-mode project clearly rests with that individual but, equally, responsibility for a group-mode project rests with the group as a whole: each individual in said group bears equal responsibility.

More specifically, the major and minor units are determined by the project mode (or plurality, i.e., individual or group) and type (i.e., research or enterprise) as follows:

mode	type	major unit	minor unit
individual	research	COMSM0111	COMSM0011
individual	enterprise	COMSM0111	COMSM0121
group	enterprise	COMSM0014	COMSM0121

The project mode should be self-explanatory: an individual-mode project is undertaken by one student working alone, whereas in a group-mode project it is possible for *n* students (*typically*, but not necessarily, for an $n \in \{2, 3, 4\}$) to work collaboratively. The project type is explained in detail by the following, based on descriptions produced by the Department as part of the unit development process.

An enterprise-type project: This type of project is suitable for students who want to go on to design and develop innovative products, or who may want to start their own companies in the future. The aim is to develop a demonstration of a product or service which has been produced in conjunction with, and tried out by, potential users. The demonstration will have the potential to attract further support and investment – the students will develop and present their justification for this, along with more detailed plans, in the associated enterprise unit COMSM0121. The students will prepare a project report and a demonstration of their work for an "Enterprise Project Day" to which external sponsors are invited. They will also present the business plans they have developed within COMSM0121 to a group that includes potential sponsors and investors. The plans can be entered into competitions and used to raise support.

The project itself may involve hardware design, software design, or both. The project may draw on ongoing research and technology development within the university or within an industrial sponsor. It may involve setting up a web-based service, designing a robot or releasing some open-source software. In fact, anything with a technology base in computing and a potential for business or social impact is a potential topic.

This type of project provides an excellent opportunity for students to work with external companies and organisations, possibly based full-time at the company, and at the same time enables companies and organisations to work with the university and to engage with its students.

A research-type project: This type of project is aimed at students who are interested in pursuing research in a university or in industry. The aim is to carry out an in-depth investigation into a specific area of computer science and to make a valuable and original scientific or technical contribution. In the associated research unit COMSM0011, alongside the project, students will undertake a study into the wider context of the work and its potential impact. This will ultimately lead to the production of a proposal for further research, which the students will present at a "Research Project Day" workshop including oral presentations and poster discussions. They will also present their research proposal to a panel consisting of academics and industrial researchers. The project is done in collaboration either with a university research group, or an industrial partner, or both. This may involve working at an external company, in the form of an internship, or within a university research group.

The project itself may involve the design and evaluation of experimental hardware or software, or it may be a theoretical study. It may involve proving new results, or it may involve fixing an expository gap in the literature – giving a detailed technical exposition of a difficult piece of theory previously split across multiple sources. Anything focused on developing an original scientific or technical contribution is a potential topic.

This type of project provides an excellent opportunity for students to learn skills important in academic or industrial research.

To be completely clear, keep in mind the following points:

- You must have at least one academic Supervisor based in the Department. They provide a first point of contact throughout the project duration, offer technical advice (if and only if they are a topic-specific expert), and help to judge how your work aligns with various academic requirements. You *may* also have an external Advisor. They typically represent a collaborative contact (e.g., within a given company, or another Department), potentially defining requirements and providing topic-specific expertise or resources.
- The type and volume of interaction with the people filling these roles may differ, and vary over the project duration, but keep in mind that responsibility for the project is *yours*: your Supervisor(s) or Advisor should be treated as a source of advice and guidance, rather than as an all-knowing oracle or project manager.

- The project types imply distinct sets of assessment criteria, outlined in Appendix A and Appendix B (which replace the generic criteria in [5, Section 16]). Or, put another way, keep in mind that the minor unit you select will impact to some extent on how the major unit is assessed.
- We require you to select a mode and type during project specification, and, bar exceptional cases, stick with it through the execution phase. The rationale for doing so is to ensure focus and, in particular, to avoid "sitting on the fence" between project types: history suggests that doing so often produces output that aligns poorly with either set of assessment criteria.
- Do *not* read hidden meaning into any of the terminology used: it is definitively not true that any mode or type is better (or worse) than another. More specifically, each combination of mode and type is designed to satisfy the *same* high-level ILOs.
- Note in particular that a group (as a whole) has no advantage over an individual (or vice versa). For instance, the expectation is that a group with n members will produce n-times as much output; working in this mode simply allows a larger challenge to be addressed via collaboration, with each group member assessed in a compatible way to the individual (even if the precise deliverables differ).

1.3 Handbook content

This handbook relates to the major units COMSM0111 and COMSM0014 *only*, which will be referred to as "the unit" from here on: organisation of and requirements for the associated minor units COMSM0121 and COMSM0011 are described elsewhere. The goal is to overview the unit from staff *and* student perspectives, ensuring as much clarity and transparency as possible (with respect to the assessment process in particular). Although it may take some time and effort to do so, understanding the content is vitally important so you are strongly advised to read the *whole* document. Note that:

- As a result of the diversity of project topics and valid approaches to work, the handbook focuses on guidelines rather than rules. In a few cases there is no room for exception, the rationale for these rules is then carefully explained. In most cases, however, a sensible reason to do X means that X is allowed: there is an assumption that *you* can decide whether X makes sense or not, whatever X actually is.
- One cannot and so should not directly compare the unit to what might *seem* similar instances in other Programmes (e.g., the G400, BSc project unit COMS30500) or Departments (e.g., the GH46 or the CSE MEng project unit EENGM8889). Such instances will likely have different ILOs, and almost certainly differ in organisation.
- Beyond the above, some important rules and regulations are relevant:
  - Per [5, Section 38], for example, note that:
    1. the pass mark for level-M units is 50%,
    2. the unit *must* be passed before an MEng degree is awarded, but
    3. resits *are* possible (although they imply a capped mark).
  - *You* must understand and adhere the current regulations on
    1. plagiarism [5, Annex 5],
    2. ethics [3], and
    3. intellectual property [4].
- The unit web page houses a set of LaTeX-based templates for various deliverables, which also act as structural guidelines for the associated content. However, there is definitively no requirement to use them (or even LaTeX itself).

Chapter 2: A student perspective

From a student perspective, the unit (and project as a whole) is split into three phases of activity:

1. a specification phase (during TB1, part-time), in which you first select a project topic and Supervisor(s), then construct a document which outlines the topic and specific work involved,
2. an execution phase (during TB2, full-time), in which you actually carry out the work specified, and
3. an assessment phase (during TB2 examination period), in which you deliver a dissertation[2] and viva presentation so your work can be assessed.

Note that the MEng degree programme is specifically designed in order to accommodate these phases. The specification phase spans TB1 of the final year to allow refinement of and preparation for executing your selected project topic, and the execution phase is full-time in TB2 (i.e., no level-M taught units) to support greater focus, plus industrial visits and/or placements where they are appropriate. Concrete details such as deadlines are available from the unit web page, and details of the specification phase will be highly project-dependent, so here we focus on the execution and assessment phases.

2.1 Phase 2: execution

The execution phase is carried out full-time in TB2; this gives you 12 weeks of dedicated work (not including the Easter vacation) to complete and hand in the whole project. That said, you can always start work earlier – for example, undertaking some background research in TB1 can help you plan what to do in TB2.

What you actually do during this phase will depend entirely on the project topic, so generic advice can only go so far. That said, bear in mind:

1. there is *no* taught content;
2. there is *no* formative assessment; and
3. there are *no* absolute deadlines before the final hand-in deadline at the end of TB2.

You should also read the common pitfalls in Sec 2.3.2, most of which are based on this phase. The most important advice, though, is to *have a plan* based on the specification phase, with specific milestones that you expect to achieve at specific times. (Even if it changes!) Without one, you're vulnerable to procrastination, you're likely to end up rushing things at the end, and you can very easily find yourself staring at a collection of unrelated experiments and trying to will them together into a coherent dissertation.

2.1.1 Interim poster presentation

Roughly halfway through the execution phase, there will be an informal event where you will be able to present a poster based on your work. Organisational details will be made available via the unit web page, but, in summary:

- you develop an A1 sized and portrait-oriented[3] poster in PDF format which summarises your work;
- we organise some refreshments, print and display your poster at the poster session[4]; then
- you attend the poster session and discuss your work with anyone who is interested; this typically means spending some time with your poster to talk to people, and some time investigating the work of your peers.

[2] Per `http://en.wikipedia.org/wiki/Thesis`, use of the term dissertation is debatable. Some may prefer thesis, and (certainly for enterprise-type projects) referring to the same deliverable as a report may be more appropriate. Keep in mind that we opt for dissertation for consistency with UoB terminology alone: there is no hidden meaning implied.

[3] This is to match the available poster boards.

[4] If you meet the associated deadline, we can print the poster for you at no cost. Alternatively, you can print the poster yourself (e.g., via UoB Print Services): this means you will have to pay for it, but it will allow you to make last minute changes after the deadline.

The timing of the presentation will mean your project is still incomplete: this is by design, so that you have plenty of time before the deadline to act on any important feedback. Although developing a poster will require some effort on your part, it is worthwhile for four reasons:

1. it gives you an opportunity to practice explaining to people why your work is interesting and what it's about, a skill that's useful in almost any career;
2. it forces you to think clearly about the "big picture" view of your project as you distil it down into a poster;
3. it allows Department staff to give you an early warning of any problems with your project while there is still time to fix them.
4. it gives you an opportunity to form connections with people outside the university, including people from companies you might want to work for.

The aim is to invite the entire Department (staff and students) plus various external parties to see your work in progress; no-one will give you feedback in writing, so it's a good idea to write down anything particularly important yourself.

2.2 Phase 3: assessment

To support the assessment process, you must submit various "deliverables":

individual mode
1. a dissertation, electronic form only, and
2. any auxiliary or supporting material, in electronic form only

group mode
1. an (informal) report, in electronic form only, for each group member,
2. a (formal) dissertation, in electronic form only, for the whole group, and
3. any auxiliary or supporting material, in electronic form only

In this section, we focus on the assessment criteria for individual projects. Full details of the submission process, as well as assessment criteria for group projects, will be made available on the unit web page. In brief, though, the group project dissertation should be comparable with an analogous individual project dissertation, while the group individual reports should clarify and reflect on the contributions and achievements of individual group members.

Note that *only* the written deliverable(s) are formally marked. The auxiliary material[5] and viva presentation are important, and do factor into assessment, but only insofar as they support your dissertation – for example, they don't represent a fixed percentage of your final mark.

2.2.1 Final dissertation

Structure and content

Although many good technical writing guides exist, such as [1, 2], it is difficult to give generic advice because the challenges involved are personal to each student and specific to each topic. As such, most of what we can say consists of

[5] This auxiliary material, such as software developed over the course of the project, is intended to allow verification of claims made in the associated dissertation. It is not assessed directly because, in many cases, it will be hard or impossible for the markers (and particularly the External Examiner) to fully access the material themselves given the wide variety of project topics available.

guidelines rather than rules – for more topic-specific advice, you should talk to both your Supervisor(s) and any other proof-readers you can find.

To provide some points of reference, the unit web page houses a range of sample dissertations. The structural guidelines provided outline a dissertation in terms of the following sections:

- some compulsory preliminaries (e.g., cover, declaration of authorship, contents, executive summary, supporting technologies), and optional preliminaries (e.g. a notation section), often called front matter;
- a contextual background, which explains and motivates the underlying problem or challenge;
- a technical background, which gives enough background on related work[6] that the reader can understand what you have done;
- an overview of project execution, which details the work you carried out; and
- a critical evaluation, which presents and analyses any results and comparison.

Note that these sections are not appropriate for all dissertations and, with the exception of the compulsory front matter, are not required. For example, an expository research project intended to present a unified view of a suite of techniques would probably be structured more like a technical research paper, with an introduction followed by different aspects of the theory being developed in different sections.

All that having been said, the following points apply to *any* project:

- In the case of resubmission (i.e., a resit), the compulsory front matter *must* include a one-page overview of all non-trivial changes made to the initial submission. Ideally this should also clearly highlight additional work completed, and issues raised by the original feedback.
- You *must* include the standard cover and declaration of authorship, which provides a clear statement that the work you submit is your own except where allowed and specified.
- You *must* digitally sign the softcopy submitted[7].
- The structural guidelines on the unit web page include a rough indication of the length of each section; again, this represents generic advice rather than a strict limit. However, there is a "soft maximum" of 50 pages for the entire body of your dissertation (i.e. ignoring the front- and back-matter). Exceeding this maximum will not directly cost you marks, but if you do exceed it then it is very likely that either your dissertation is badly written, or you have included material in the body which should be moved to an appendix (such as long program listings), or you have done significantly more work than is necessary.
- The Markers are not necessarily experts in your topic, although we will try to assign markers working in an appropriate area. This means the clarity and quality of your presentation is at least as important as the technical challenge or quality of your work. If they cannot understand your contribution, then you are likely to receive a poor mark no matter how good it is. As a rule of thumb, if one of your peers taking the same degree programme can read and understand your dissertation, then a Marker can probably do the same.
- Clear citations to relevant third-party work are a hallmark of good technical writing: they provide credit to the original author, allow the reader to find extra information where required, and also demonstrate your understanding of the topic.
- You should try hard to find, read and cite either the original sources of such material or high-quality secondary sources. For example, if you are using a mathematical result, you should cite the original paper in which it is proved or (if it is sufficiently old and established) a textbook containing it. You should not cite e.g. the result's page on

[6] It is important to distinguish this from a literature review (or survey) per `http://en.wikipedia.org/wiki/Literature_review`, which is potentially more aligned with COMSM0121 and COMSM0011. Rather than summarise all related work (however peripheral) or offer any major insight (as might be required in a review), the goal is simply to explain those techniques or technologies used later in the project execution.

[7] You can input your signature in LATEX as an image or sign the PDF electronically afterwards – see `https://acrobatusers.com/assets/uploads/public_downloads/2221/adobe-acrobat-xi-esign-pdf-file-tutorial-ue.pdf`.

Wikipedia or a relevant answer on Stack Exchange.

Preparation and printing

Whether or not you use the template provided, there are some important formatting requirements:

- The line spacing *must* be between single and 1.5, ideally single.
- Text *must* be written in a serif font (such as Times, Times New Roman or Garamond) and in at least a 10 point size.
- Pages *must* be numbered consecutively, ideally with the page numbers at the bottom centre of each page.
- The top, bottom and side margins *must* be at least 2cm.
- Anything you can refer to, including floating content, *must* be captioned and numbered relative to the chapter they are typeset within. For example,
  - the second definition within chapter one would be captioned "Definition 1.2",
  - the second diagram, image or graph within chapter one would be captioned "Figure 1.2",
  - the first table of numeric data within chapter three would be captioned "Table 3.1",
  - the third machine readable input or output within chapter four would be captioned "Listing 4.3", and
  - the only algorithm within chapter five would be captioned "Algorithm 5.1".
- You *must* write your citations numerically, e.g. writing "in [1], the authors prove" rather than "in [Gates 1995], the authors prove".
- You *must* include a complete bibliography at the end of the dissertation (before any appendices).
- When referring to a particular part of a book or long paper, you should ideally indicate the specific sections or pages by writing e.g. [Section 7, 1] to mean section 7 of reference 1.
- When limited use of direct quotations is appropriate, they *must* be clearly delineated using quote marks *and* an associated citation to the original text.
- You *must* submit the electronic copy of your dissertation in PDF format. In particular, if you write your dissertation in Word, you must convert it to PDF format before submission.

These requirements are not arbitrary – they are designed to:

- minimise problems during the print and binding processes;
- ensure that Markers have space to write notes and can refer consistently to specific features where appropriate; and
- allow us to archive your work and easily send it to the External Examiner.

2.2.2 Final viva presentation

In addition to the dissertation, you will deliver a viva-based presentation to the Markers. This both allows the Markers to test your understanding of the project material and gives you a chance to correct any misconceptions on their part. As such, you should treat it as a means of adding clarity and explanation to the written dissertation, rather than simply duplicating it.

Organisational details will be made available via the unit web page, but the viva format is intentionally left open. The Markers can and will direct a specific viva to suit whatever information they need to gather. However, it is expected that in a "standard" viva:

1. you will spend roughly 5 minutes giving a clear, concise overview of the project motivation, goals and main contributions;
2. you will spend roughly 5 minutes demonstrating the project outputs (e.g. running software or sketching results);
3. you will spend the remaining time defending your work based on questions posed by the Markers.

You should prepare specific presentations for the first two items, and make sure you have a good understanding of the material your project covers for the third. You should keep the following general points in mind:

- In the case of resubmission (i.e., a resit), the overview presented should detail all non-trivial changes made to the initial submission.
- Each allocated slot is fairly short in duration; this is by design and intended to focus the presentation on high-level content rather than on technical detail (which should be contained in the dissertation itself).
- Towards the end of TB2 the Unit Director will email you to gather any specific requirements for your viva slot, which we will *try* (but cannot guarantee) to accommodate. A *strict* deadline will be set for return of this information, as all other aspects of the assessment process (e.g., constructing the schedule) depend on it.
- The most important requirement relates to the demonstration you intend to present, since this (in part) dictates the venue. By default, the viva will take place in an office (rather than meeting room or lecture theatre): this means the only equipment available will be a whiteboard (or equivalent), and, specifically, that you *cannot* depend on there being a workstation available. Viable alternatives include the CS Linux (MVB-2.11) or Faculty Windows (MVB-1.07) lab if you require a specific workstation, or elsewhere within the MVB. For example, if you need to demonstrate non-portable equipment or use equipment that requires an extended setup period, we can *try* to accommodate bespoke requirements if and only if you let us know a sufficiently long time in advance.
- Although you are free to bring pre-prepared hand-outs or equipment to aid explanation or support a demonstration, note that you are specifically *not* required to bring slides: the viva is interactive, so you will be talking *with* the Markers rather than *at* them.
- For enterprise-type projects, a demonstration is important since the marking criteria place a higher weight on concrete outputs (e.g., any software developed). However, for some research-type projects, traditional demonstrations may be inappropriate or nonsensical. In this case, *you* should consider how to use the five-minute slot effectively for an alternative purpose.
- The goal of the demonstration is to a) illustrate aspects of your project which are difficult to describe in words, and b) give the Markers confidence that your ideas and implementation work as described. You can present a pre-recorded video demonstration if and only if there is a good reason not to do a live demonstration. For example, your demonstration might require a long time to complete, or require equipment that cannot be transported, or need to be performed outdoors.

2.3 Hints, tips and common pitfalls

2.3.1 Frequently Asked Questions (FAQs)

"I'm confused about the difference between enterprise- and research-type projects." Sec 1.2 tries to explain the difference in detail, but the following may be a useful rule of thumb:

- Enterprise-type projects will *usually* focus on challenges related to the design and implementation of a product of value to some end-user(s); the intended outcomes are *usually* clear in detail before the project starts (e.g. writing software to do a specific job). A very good enterprise project could lead to a start-up company or a useful new open source program.
- Research-type projects will, in contrast, *usually* focus on addressing a well-motivated research problem in a clearly defined area. The intended outcomes are *usually* partially or fully unknown at the start of the project and uncovering them will *usually* form a major part of the project (e.g. proving results, testing a hypothesis). A very good research project could lead to a patent or an academic paper.

Note that a research-type project may still involve implementing software, and an enterprise-type project may still involve theoretical work! The lines between the project types are fuzzy enough that some project topics may be suited to either an enterprise-type project or a research-type project, depending on the project goals.

For example, suppose your project is based around developing a simulator for a process X. One approach would be to create the simulator with an eye towards being useful for all academics in the field and to release it as open source. A successful project would therefore result in a polished, easy-to-use, widely-applicable simulator which fulfils the needs of academics in the field. This would be well-suited to the assessment criteria of an enterprise-type project. Another approach would be to develop the simulator to perform a specific experiment Y and thereby make a novel contribution to research in the area. Here, the project's success would have nothing to do with the polish or general applicability of the simulator – it would instead be concerned with successfully carrying out experiment Y and evaluating its results. This would be well-suited to the assessment criteria of a research-type project.

"I'm not interested in a start-up, so why do I need to write a business plan?" It is tempting to classify enterprise-type projects as relating to specific types of business start-up; this is (arguably) reinforced by the assessed deliverable for COMSM0121 being a business plan. However, it is crucial to understand that the goals are much wider, and that the skills involved are highly transferable.

For example: IBM operate an "enterprise crowd-funding" model[8] to first identify and evaluate potential *internal* project ideas; Kickstarter-like[9] proposals are made, with bids made by IBM staff from a virtual $100 allocation. The format and content of such proposals are similar to business plans for start-ups, so they align with the emphasis of an enterprise-type project: one must articulate the concept and added-value, plus develop a plan to resource and deliver the proposed solution.

"I want to do a group-mode project, but don't have a group to work with!" As with all project ideas, we advise you to discuss your ideas and what you want to do with as many people as possible: this includes both Staff (e.g., potential Supervisors) and other students (e.g., potential group-members). By doing so, we hope that if your ideas require the effort of a group and are attractive to other students, a group will emerge naturally; history suggests such groups are more likely to succeed than artificial groupings of our construction. Bear in mind that whether you work in a group or not, your individual contribution will be of utmost importance.

"I'm confused about the issues of health and safety, and ethics: what do I need to do?!" Although you might not have considered it as an issue in the context of your project, all projects must adhere to the same set of University-wide rules. (One might expect many of these rules to be more applicable to e.g. Medicine, but they are nevertheless binding.) A detailed overview of health and safety requirements and processes can be found at

http://www.bristol.ac.uk/engineering/health-safety/

Any queries about research ethics should be directed to the Faculty Research Ethics Committee at

https://www.bris.ac.uk/engineering/currentstudents/committees/ethics/

Dealing with these issues is likely to take both time and effort. If you feel they may arise in the course of your project, then careful planning is vital to minimise impact on execution of your project. We are currently attempting to streamline the application process for "obviously innocuous" experiments with human subjects (such as running usability tests on your software); meanwhile you are *strongly* advised to apply for approval early. While many applications go through quickly, if your application needs to be referred to a full panel, a delay of three weeks or more is common – so if you put off your application until near the end of TB2, you may not be able to run your tests at all.

"I need to buy an X, will the Department pay for it?" The unit itself holds no budget to support resources beyond those in the Department already; if you need equipment, software, licenses or data, for example, your Supervisor(s) should help to arrange this.

"I have some specific IT needs, who should I contact?" Although your Supervisor is typically your best first point of contact, the Department has a dedicated Teaching Technologist who can help, namely Beth Cotterell (beth.cotterell@bristol.ac.uk). Part of her remit is to act as an intermediate between you and IT services – this provides you with a single point of contact specific to CS, while also providing IT services with a

[8] http://www.research.ibm.com/social/projects_1x5.shtml

[9] http://www.kickstarter.com

"big picture" view of shared problems or requirements.

"Do you assess how well groups work for group-mode projects?" Unlike previous group projects in the 2nd (COMS20805) and 3rd (COMS30400) Year, we do not *explicitly* assess how well you work as a group – we assume that previous projects have taught you this already. However, it remains an implicit requirement: if your group doesn't work well together, your project is unlikely to be successful.

"Should I include an Appendix for X in my dissertation?" The best way to think of an appendix is as content that could be of use, but which is not crucial to understanding the dissertation. In line with most research conferences, the Markers are not obliged to read appendices. As such, you should never move material to an appendix which you would like to be directly assessed.

A common question of this type regards source code. Since your source code should already be made available in electronic form as part of your auxiliary supporting material, including it all as an appendix is usually not a good idea. On the other hand, it can be sensible to include specific source code fragments, either as appendices or in the main body of your project, when discussing the details of your implementation. For example, if you were discussing a particular algorithm you developed in detail, it would make sense to include your implementation of the algorithm in question for easy reference (as you would a diagram).

"Can I bring a demonstration to the poster presentation?" Yes, this is a great idea. However, the volume of people in one place at the same time will make it hard to accommodate a lot of equipment. The best approach would be to prepare a pre-recorded or laptop-based demonstration; if you need support of some form in doing so, contact the Unit Director.

2.3.2 Common pitfalls

Over- or under-ambition in project topic or execution plan: An ideal project is typically a careful balance between less ambitious goals, which are clearly achievable, and more ambitious goals, which will be difficult to achieve and which therefore carry a risk of failure. Too few of the former, i.e. overambition, can lead to a project which fails at its goals and doesn't get anywhere. Too few of the latter, i.e. underambition, can lead to a project which succeeds at its goals but still doesn't contribute anything of value. In either case, the potential for marks will be sharply limited.

Spreading your effort too thinly: Although careful compromise is required, and it is hard to generalise, focusing on a limited set of goals is a strong indicator of likely success. Partially accomplishing a large set of easy goals will typically lead to a much lower mark than fully accomplishing a small set of hard goals.

Poor time planning: Time management is hard. One of the most common failure modes is not putting aside enough time to write your dissertation. Parts of this will often have to be left until close to the deadline, since they will be hard or impossible to write until you have done the associated work. On the other hand, if you leave all of it until close to the deadline, you will probably end up with a rushed mess that earns a low mark. Often, it makes sense to write incrementally throughout the project duration (e.g., by developing and expanding a set of notes), and to focus on writing up the work you've already done before extending it further. If the cost of including an extra experiment in your dissertation is that your dissertation as a whole is poorly written, it will have cost you marks rather than gained you marks.

Poor contingency planning: Any serious project management includes some form of risk assessment, complete with contingency plans for likely issues. You don't have to write this up formally, but you do have to think about it, or your entire project could come crashing down around you. Most obviously: use current anti-virus software and back up your work regularly, including an off-site backup in case of fire! (Dropbox and Onedrive are your friends.) You will *not* be granted an extension due to data loss, and the penalties for late submission are severe. Less obvious risks, which still occur more often than you might expect, include:

- inability to access vital equipment due to it breaking, due to you not having permission to use it, or due to the university not having it to begin with;
- prolonged inability to contact your Supervisor(s) and/or Advisor, e.g. due to severe illness on their part;
- finding out that a dataset you were planning to use doesn't exist;
- finding out two weeks before the project deadline that your code will need three weeks to run;

- needing to perform behavioural testing for an enterprise project but failing to find enough test subjects.

As an example, if the vital equipment of the first bullet point were a sensor required to capture data for later processing, a good first step would be to source both a main sensor and a backup sensor early in the project, and possibly also set up the processing step to accept synthetic data as an additional fallback.

Lack of contact with Supervisor (and/or Advisor): The Unit Director will be willing to give a second opinion on your work and answer questions about the organisational aspects of the unit, but for topic-specific advice your Supervisor should remain your first point of contact for the entire duration of the project.

History suggests that regular meetings with your Supervisor are a strong indicator for how successful you will be. Such meetings do not have to be lengthy (a five-minute progress check in which you say "I am working on X but have not finished it" is fine), but without them you can easily find yourself spending weeks on something which is either a dead end or which will add very little value to your project.

Lack of continuous work: Procrastination is all too easy when the project deadline is a whole term away. But if you give in to the temptation, not only will you have a deeply miserable last week of term as you scramble to finish, you will also end up with a low-quality project and a poor mark anyway. There is no substitute for being able to take the time to properly think through a problem rather than grabbing at the first available solution, or for being able to go back and revise an assumption which has proved unproductive. Conversely, don't work *too* hard! You can think of working late nights as borrowing from the future at a highly punitive interest rate – it might help initially, but in the long run you'll be far less productive than you would have been if you'd worked at a slower and more even pace. Every student is different, but as a general guideline, if you consistently put in forty hours per week (across both the major unit and the minor unit) then you should be fine.

Failure to write comprehensibly: Over the course of writing the dissertation, you will inevitably become more and more familiar with the area you are working in, and things you once considered difficult will seem simple. It is surprisingly easy to forget that you ever found them difficult, and to assume that they will be easy for a reader as well. This is emphatically not the case, especially if they don't have a background in the topic already (as one of your Markers may not). To put it another way: by this point in your academic degree you have probably developed a long-standing grudge against people who use words like "obviously", "clearly", and "exercise for the reader". Don't become those people. One useful technique to avoid doing so is to keep a set of working notes as you go.

Inability to reproduce old results: It is often very useful to be able reproduce a set of results from earlier in your work, or to perform an experiment again to check something. For example, you may come up with a quick informal experiment that leads you away from a particular approach, and then a week or two later start wondering whether the result was accurate, or whether it would be a good idea to include the experiment in your dissertation. Or you may want to check two versions of your code against each other to see if you have introduced any bugs. For this reason, it is very helpful to maintain access to all the software and hardware you have developed over the course of the project, even if it seems to be outdated. We recommend the use of version control.

Chapter 3: A staff perspective

Each project is assessed by two Markers, one of whom is the project Supervisor. The Supervisor acts as a topic-specific expert who assesses the project on scientific rigour, and the second Marker may be a non-expert who provides an external perspective. In what follows the Supervisor and the second Marker are together referred to as the *marking panel.*

The overarching goals of the marking panel are to:

1. follow the assessment process and criteria outlined below as transparently as possible;
2. produce a robust mark for the project, suitable for use in ranking projects across the year and paying close attention to the classification boundaries;
3. ensure the mark is fair and consistent when compared to other projects within the cohort; and
4. minimise bias caused by over- or under-enthusiastic Supervisors and/or Markers.

3.1 The assessment process

Barring minor deviations (e.g., due to deadline extensions or mitigating circumstances), the intended assessment process is as follows:

1. The Markers assigned to a given project inspect the associated deliverables closely, particularly the dissertation, and attend the relevant presentations. They each independently use the marking criteria detailed in Appendices A and B to arrive at an initial mark on the University's 0–100 scale, supported by a written justification.
2. The two Markers then exchange their marks and justifications and agree on a single consolidated mark. Differences in initial marks are to be expected and usually arise from a different weighting of factors contributing to the mark, rather than outright disagreement. Importantly, the markers do not simply average their two marks, but instead discuss the merits and failings of the project with respect to the marking criteria. If they are unable to agree on a mark, they may involve a third Marker.
3. Once they have agreed a consolidated mark, the Markers produce written feedback for the student by merging and editing their original written assessments. They also produce a written explanation of they arrived at the consolidated mark for the benefit of the Unit Director and the External Examiner (see below). The supervisor is responsible for finalising the agreed feedback.
4. Once all marks are available, the Unit Director provides oversight of the marking process by checking all marks and feedback for consistency and, if necessary, proposing minor adjustments to specific Markers.
5. As with all units within the Department, the unit marks and assessment process itself are then checked by the External Examiner, who will be a senior member of staff from another University. As part of the process of checking quality and fairness, they will inspect (a sample of) project deliverables; they may additionally viva (a sample of) students to check whether our assessment matches their own.

3.2 Plagiarism checks

Checking for plagiarism is a difficult challenge, especially when a Marker is unfamiliar with the associated topic. A centralised, consistent approach is therefore applied to ensure as fair an outcome to the assessment process as possible:

- The marking panel marks each project as normal, i.e., assuming there is no issue with plagiarism, but noting specific concerns as and when applicable.
- As early as possible after their electronic submission via Blackboard, the Unit Director uses the TurnItIn system to

check all dissertations, then later collates any specific concerns identified by the Markers.

- Any cases that warrant further investigation and/or penalty are then passed to and managed by a separate Departmental process.

3.3 Assessment criteria

From both the student and staff perspectives, it is important to have a clear set of criteria to which the assessment process can refer. Such criteria are notoriously hard to construct: the diversity of project topics inevitably produces exceptions to any set of criteria, no matter how seemingly perfect. Our attempt at a set of criteria valid for most projects is given in Appendices A (for enterprise-type projects) and B (for research-type projects). For each mark range, we outline characteristics that we might expect projects in that range to exhibit.

It is very important to note that *most* projects in a given mark range will not exhibit every characteristic we list – generally they will be better in some aspects and worse in others. The final mark should be based on the project as a whole, not on any single characteristic. That said, for a project to be awarded a given grade class, it should usually match the described characteristics in that range (or above) in *most* respects. For example, a project with roughly half its criteria in the 50–59 range, roughly half its criteria in the 60–69 range, and one or two in the 70–79 range should be awarded a 2.ii, not a 2.i or a 1st.

As a general rule of thumb:

- A project should get marks in the 80–100 range (i.e. a high First) if it is outstanding work. Most enterprise-type projects in this range should have produced a useful product likely to gain popularity outside the university; most research-type projects in this range should have produced either a novel piece of research suitable for academic publication or a piece of exposition that will be a useful reference even for established academics. We expect that in most years, a small proportion of projects earning Firsts will fall into this range.

- A project should get marks in the 70–79 range (i.e. a First) if it is very good work. An enterprise-type project in this range should demonstrate that the student is a viable candidate for a good software development job, and a research-type project in this range should demonstrate that the student is a viable candidate for a good industrial research job or PhD position. We expect in most years, about 30-40% of projects will earn Firsts (in line with the BSc project unit).

- A project should get marks in the 60–69 range (i.e. a 2.i) if it is good work but not exceptional. An enterprise-type project in this range should demonstrate that the student is capable of working in the industry, and a research-type project in this range should demonstrate that the student has a solid grasp of the subject. We expect that in most years, about 35-45% of projects will earn 2.is (again in line with the BSc project unit).

- A project should get marks in the 50–59 range (i.e. a 2.ii) if it is mediocre work, or if it is good work marred by serious flaws (such as a major hole in a proof, a serious defect in an experimental procedure, or a piece of software that is not useful to its target audience due to a failure to gather stakeholder requirements). We expect that in most years, all but a small proportion of projects will earn a 2.ii or above.

- A project should get marks in the 40–49 range (i.e. a 3rd) if it is poor work but has some redeeming features. Examples might include an otherwise-acceptable project which is of a length and scope more appropriate for a one- or two-week coursework project, or an overambitious enterprise project where the student had some promising ideas but failed to implement them in any meaningful way.

- A project should get marks in the 0–39 range (i.e. a fail) if it contains little to nothing of value.

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Appendix A: Assessment criteria for enterprise-type projects

		Indicative Characteristics			
Class	Mark	Challenges and Contributions	Design and Implementation	Testing and Evaluation	Organisation and Communication
1st	80 to 100	• topic and goals are ambitious and/or imply extraordinary challenge; • all of the stated project aims and objectives have been achieved; • project as a whole is on par with requirements on an early-stage PhD student or employee at a high-ranking institution; • the work is an intelligent, largely self-directed exploration of the topic with only limited direction required from the Supervisor/Advisor; • the work goes substantially beyond the scope of the degree programme and may be of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS; • outstanding volume of work irrespective of goals.	• appropriate methodologies and formalisms used in almost all aspects of design; • enterprise-level consideration of alternative designs or approaches, stake-holder requirements, future extensibility, feasibility and risk assessment, and standards- and patent-compliance (where applicable). • development process is almost always clear, structured, and well-documented; • appropriate development tools and third-party technologies are almost always selected and used, and their use is clearly explained; • exceptionally high Engineering quality evident in almost all aspects of implementation, with polished project outputs of near-professional quality; • project is a pleasure to use; • project has significant potential for independent value as a stand-alone product (e.g., as part of an open source dissemination, or a start-up company).	• comprehensive, well-planned functional testing strategy documented which includes a broad suite of reasonable techniques and foci (e.g., unit testing, fuzz testing and formal verification for functional testing, performance analysis and stress testing for behavioural testing); • testing fosters high confidence in robustness; • comprehensive, well-planned evaluation of project output within target context (e.g., deployment and use by stated end-users); • evaluation illustrates added value of project output over alternatives in some use cases; • rigorous analysis aligns result with stated project aims and objectives almost completely.	• clear, accurate and engaging written work, demonstrating extremely high quality of presentation and mastery of the topic while being enjoyable to read; • almost no identifiable problems with presentation; • creative and effective use of (typically self-developed) visualisation and illustration, with visual consistency maintained almost throughout; • able to answer advanced topic-specific questions without significant prompts; • very strong understanding of wider context of work, giving a very high volume and quality of citations covering almost all relevant literature.
	70 to 79	• topic and goals are ambitious and/or imply significant challenge; • most of the stated project aims and objectives have been achieved, with any incompleteness well-explained and incidental; • project as a whole is often on par with requirements on a starting PhD student or employee at a high-ranking institution; • the work is an intelligent, largely self-directed exploration of the topic with only limited direction required from the Supervisor/Advisor; • work goes beyond the scope of the degree programme in places and may be of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS; • volume of work is more than adequate given goals, and/or above average given unit CP weight.	• appropriate methodologies and formalisms used in almost all aspects of design; • no significant omissions relating to selected cases of alternative designs or approaches, stake-holder requirements, future extensibility, and any standards- or patent-compliance; • development process is almost always clear, structured, and well-documented; • appropriate development tools and third-party technologies are almost always selected and used, and their use is clearly explained; • very high Engineering quality evident in most aspects of implementation, with polished project outputs; • careful attention has been paid to user-experience. • project has some potential for independent value as a stand-alone product (e.g., as part of an open source dissemination, or a start-up company). • resolving problems with work would require minor effort alone.	• well-planned functional testing strategy documented and includes multiple reasonable techniques and foci (e.g., unit testing, fuzz testing and formal verification for functional testing, performance analysis and stress testing for behavioural testing); • testing fosters confidence in robustness with minor caveats only; • well-planned evaluation of project output within target context (e.g., deployment and use by stated end-users); • evaluation illustrates that project output is on par with alternatives in some use cases; • analysis aligns result with stated project aims and objectives well.	• clear and accurate written work, demonstrating high quality of presentation and thorough knowledge of the topic; • only minor or superficial problems with presentation with very low impact on overall clarity; • effective use of (typically self-developed) visualisation and illustration, with visual consistency usually maintained; • able to consistently answer basic topic-specific questions without significant prompts, and often able to answer advanced topic-specific questions with significant prompts; • strong understanding of wider context of work, giving a high volume and quality of citations with no significant omissions.

		Indicative Characteristics			
Class	Mark	Challenges and Contributions	Design and Implementation	Testing and Evaluation	Organisation and Communication
2.i	60 to 69	• topic and goals imply reasonable challenge; • most of the stated project aims and objectives have been achieved, with any incompleteness having only modest impact; • some elements of the work were self-directed with significant direction required from the Supervisor/Advisor; • work stays largely within the scope of the degree programme; • volume of work is reasonable given goals, and/or in line with unit CP weight.	• appropriate methodologies or formalisms used in most aspects of design, with perhaps some missing detail which raises only minor questions; • one or two significant omissions relating to alternative designs or approaches, stake-holder requirements, future extensibility, and any standards- or patent-compliance, but with modest impact only. • development process is usually clear, structured, and well-documented, with any omissions raising only minor concerns wrt. realisation of project outputs; • selection of development and third-party tools and technologies is usually appropriate, and clearly explained, and any omissions or errors have modest impact only. • high Engineering quality evident in most aspects of implementation, with the project output fit for purpose wrt. the initial aims and objectives; • suitable user documentation is provided; • project is likely only of value within the unit remit; • resolving problems with work would require minor effort and/or changes in approach.	• reasonable functional and behavioural testing strategies documented; • testing usually convincing, with any missing techniques or foci raising only minor concerns; • reasonable evaluation of project output within target context (e.g., deployment and use by stated end-users); • project output may be inferior to available alternatives in some respects, or the comparison may be inconclusive, but evaluation explains and justifies this well; • analysis usually aligns result with stated project aims and objectives, with one or two minor deficiencies.	• readily understandable written work demonstrating good quality of presentation and solid knowledge of the topic; • few substantive presentation problems which do not seriously damage overall clarity; • visualisation and illustration are present where necessary and of reasonable quality, and largely effective in complementing text; • usually able to answer basic topic-specific questions without significant prompts, but usually unable to extend answers to a more advanced level; • acceptable understanding of wider context of work, giving a reasonable volume and quality of citations with perhaps some significant omissions having modest impact only.
2.ii	50 to 59	• topic and goals imply somewhat reasonable challenge; • some of the stated project aims and objectives have been achieved, with incompleteness having significant impact; • little of the work was self-directed, and the author was reliant on direction from the Supervisor/Advisor; • work stays largely within the scope of the degree programme, and failure to look further afield substantially affects the overall quality of the project; • volume of work is barely adequate given goals, and/or below average given unit CP weight.	• inappropriate design methodologies and formalisms are often evident, or there is missing detail raising major questions; • significant omissions relating to alternative designs or approaches, stake-holder requirements, future extensibility, and any standards- or patent-compliance, which have a major impact on the project; • development process is limited but adequately described, perhaps with omissions raising major concerns wrt. realisation of project outputs; • selection of development and third-party tools and technologies is often inappropriate, or implied rather than explained; • mediocre Engineering quality evident in many aspects of implementation, with the project output often falling short of the initial aims and objectives; • user documentation is often unsuitable, and there is a notable lack of polish; • outcome of limited use even within the unit remit; • resolving problems with work would require substantial effort and/or changes in approach.	• patchy, incomplete and/or inconclusive functional and behavioural testing strategies documented; • testing often ad hoc or unconvincing, perhaps with missing techniques or foci raising major concerns; • limited evaluation of project output within target context (e.g., deployment and use by stated end-users); • project output is inferior to available alternatives in some respects, and the evaluation explains this poorly or fails to discuss it. • any issues not addressed convincingly by evaluation may be obvious, and major in their nature and/or impact.	• often unclear written work demonstrating mediocre quality of presentation and patchy knowledge of the topic; • several substantive presentation problems which seriously damage overall clarity; • visualisation and illustration are often missing, of mediocre quality, and often ineffective in complementing text; • often unable to answer basic topic-specific questions without significant prompts, and unable to extend answers to a more advanced level; • lacking understanding of wider context of work, giving a somewhat reasonable volume and quality of citations with serious omissions of direct relevance to the topic.

		Indicative Characteristics			
Class	Mark	Challenges and Contributions	Design and Implementation	Testing and Evaluation	Organisation and Communication
3rd	40 to 49[10]	• topic and goals imply little challenge; • very few or none of the stated project aims and objectives have been achieved, but some significant progress has been made; • very little of the work was self-directed, and the author was heavily reliant on direction from the Supervisor/Advisor or worked to a pre-prescribed set of decisions; • scope of work is overly constrained or vague to the point of maybe overlapping substantially with taught content, or aligning poorly to CS as a whole, and this seriously damages the overall quality of the project; • volume of work is inadequate given goals and/or unit CP weight, and the project feels more like a short-term coursework assignment than a deep investigation of the selected topic.	• lack of clear design methodology, with design and approach often ad hoc, unmotivated, and/or very poorly communicated; • often little consideration of alternative designs or approaches, stakeholder requirements, future extensibility, or standards- or patent-compliance, with several obvious omissions that seriously damage the project; • development process is weak and often ad hoc; • choices and use of development tools or third-party tools and technologies are often inappropriate, lack clear motivation, and/or are not documented at all; • poor Engineering quality evident in almost most aspects of implementation, with the project output largely unfit for purpose wrt. the initial aims and objectives; • user documentation and polish are so lacking that it would be difficult for anyone unfamiliar with the outcome to learn to use it; • some part of outcome may be of limited use within the unit remit; • resolving problems with work would require large parts of the project to be redone.	• severely lacking functional and behavioural testing strategies are documented, or the documentation is very incomplete; • testing is usually ad hoc, unconvincing, and/or fundamentally flawed, and gives very little confidence in robustness of project outputs; • testing fails to sensibly evaluate project output within target context (e.g., deployment and use by stated end-users); • evaluation is lacking in one or more significant and obvious ways, leading to an unconvincing or superficial demonstration of project output within target context.	• very unclear written work, to the point of being difficult to understand, which demonstrates some knowledge of the topic; • many substantive presentation problems which make the dissertation as a whole difficult to read; • visualisation and illustration are absent or totally ineffective; • often, material is externally sourced and/or visually inconsistent; • usually unable to answer basic topic-specific questions without significant prompts, and often unable to answer them at all; • very limited understanding of wider context of work, giving a low volume and quality of citations with vital omissions of direct relevance to the topic.
Fail	0 to 39	• topic and goals imply only trivial challenge; • very few or none of the stated project aims and objectives have been achieved, and very little or no significant progress has been made; • the author was almost totally unable to work independently from the Supervisor/Advisor; • scope of work is wholly unsuitable, and may either be incoherent or overlap almost entirely with taught content; • volume of work is totally inadequate given goals and/or unit CP weight, and the project feels like it was thrown together at the last moment.	• little to no design methodology evident, or methodology is nonsensical; • usually no consideration of alternative designs or approaches, stakeholder requirements, future extensibility, or standards- or patent-compliance, perhaps leading to a duplication of previously existing work or an output wholly unfit for purpose; • development process is ad hoc or non-existent; • choices and use of development tools or third-party technologies are wildly inappropriate and lack any motivation; • outcome is useless and contains very little of value; • resolving problems with work would be equivalent to starting again.	• little to no documented functional or behavioural testing; • Any documented testing is almost totally unconvincing or fraudulent; • almost no evaluation, or evaluation is disconnected from target context.	• written work is often prohibitively difficult to understand and demonstrates very little knowledge of the topic; • many substantive presentation problems which make the dissertation almost unreadable; • visualisation and illustration are absent or actively confusing or misleading; • usually unable to answer basic topic-specific questions even with significant prompts; • almost no understanding of wider context of work, with a list of citations that omits more key references than it includes.

[10] Per [5, Section 38], despite nominally translating to a 3rd, a mark in this range does not count as passing the unit.

Appendix B: Assessment criteria for research-type projects

		Indicative Characteristics			
Class	Mark	Challenges and Contributions	Design and Implementation	Testing and Evaluation[11]	Organisation and Communication
1st	80 to 100	• topic and goals are ambitious and/or imply extraordinary challenge; • all of the stated project aims and objectives have been achieved; • project as a whole is on par with requirements on an early-stage PhD student or employee at a high-ranking institution; • the work is an intelligent, largely self-directed exploration of the topic with only limited direction required from the Supervisor/Advisor; • the work goes substantially beyond the scope of the degree programme and may be of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS; • outstanding volume of work irrespective of goals.	• completed work represents a genuine improvement over the previous state-of-the-art; • The project is almost entirely novel, introducing new results, concepts or designs and perhaps introducing new methods to the field; if it is expository in nature, then it adds substantial value to the existing publications on which it is based, e.g. by placing them within a novel unifying framework; • proofs, where appropriate, are correct and rigorous to a standard appropriate for submission to a journal; • work is of significant interest outside the unit remit and could form the basis for an academic publication in a reputable venue, lead to material benefits, and/or become a useful reference for established researchers in the field.	• perfectly designed and executed evaluation (experimental or otherwise), using appropriate metrics and techniques; • sometimes difficulty of evaluation adds to project challenge; • fair, comprehensive comparison with suitable state-of-the-art and/or a multitude of alternative options; • interesting and well-reasoned conclusions, borne from effective analysis; • abundant critical appraisal of results and related work; • clearly defined open problems and identification of future work.	• clear, accurate and engaging written work, demonstrating extremely high quality of presentation and mastery of the topic while being enjoyable to read; • almost no identifiable problems with presentation; • creative and effective use of (typically self-developed) visualisation and illustration, with visual consistency maintained almost throughout; • able to answer advanced topic-specific questions without significant prompts; • very strong understanding of wider context of work, giving a very high volume and quality of citations covering almost all relevant literature.
	70 to 79	• topic and goals are ambitious and/or imply significant challenge; • most of the stated project aims and objectives have been achieved, with any incompleteness well-explained and incidental; • project as a whole is often on par with requirements on a starting PhD student or employee at a high-ranking institution; • the work is an intelligent, largely self-directed exploration of the topic with only limited direction required from the Supervisor/Advisor; • work goes beyond the scope of the degree programme in places and may be of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS; • volume of work is more than adequate given goals, and/or above average given unit CP weight.	• completed work represents a genuine but incremental improvement over the previous state-of-the-art; • The project is largely novel, introducing new results, concepts or designs; if it is expository in nature, then it adds genuine value to the existing publications on which it is based, e.g. by substantially improving their motivation and clarity or fixing technical defects. • tools and techniques selected and applied well, with some motivation and consideration for alternatives where appropriate; • proofs, where appropriate, are almost always correct and rigorous, and any issues are easy to fix; • work is of some interest outside the unit remit, and is of sufficient quality to either form a good basis for later research or (for more expository projects) to be useful to researchers new to the area; • resolving problems with work would require minor effort alone.	• suitably designed and executed evaluation (experimental or otherwise), using appropriate metrics and techniques; • sometimes difficulty of evaluation adds to project challenge; • fair, extensive comparison with suitable state-of-the-art and/or some alternative options; • well-reasoned conclusions, borne from effective analysis; critical appraisal of results and/or related work; • well-defined open problems and/or identification of future work.	• clear and accurate written work, demonstrating high quality of presentation and thorough knowledge of the topic; • only minor or superficial problems with presentation with low impact on overall clarity; • effective use of (typically self-developed) visualisation and illustration, with visual consistency usually maintained; • able to consistently answer basic topic-specific questions without significant prompts, and often able to answer advanced topic-specific questions with significant prompts; • strong understanding of wider context of work, giving a high volume and quality of citations with no significant omissions.

[11] Most of this column is only applicable to research projects in which a large part of the dissertation is e.g. an algorithm whose performance must be tested (such as most computer vision projects), and should not be applied to a research project focused entirely on theoretical work (such as most graph theory or computability projects).

		Indicative Characteristics			
Class	Mark	Challenges and Contributions	Design and Implementation	Testing and Evaluation	Organisation and Communication
2.i	60 to 69	• topic and goals imply reasonable challenge; • most of the stated project aims and objectives have been achieved, with any incompleteness having only modest impact; • some elements of the work were self-directed with significant direction required from the Supervisor/Advisor; • work stays largely within the scope of the degree programme; • volume of work is reasonable given goals, and/or in line with unit CP weight.	• completed work is likely to confirm or replicate the state-of-the-art, but does not improve it; • the project is partially novel; if it is expository in nature, it adds little value to the existing publications on which it is based, but nevertheless forms a clear account of the area presented in a novel way; • tools and techniques selected and applied reasonably, although some minor improvements (e.g. slightly better results, shorter or clearer proofs) could have been made with a different selection; • proofs, where appropriate, are largely correct and while perhaps somewhat lacking in rigour, any issues are relatively easy to fix; • outcome likely only of interest within the unit remit; • resolving problems with work would require minor effort and/or changes in approach.	• design and execution of evaluation is often lacking in a few areas, but such problems potentially have minor implications only; • sometimes, evaluation is mistaken for functional testing alone; • above average comparison with state-of-the-art and/or alternative options but lacking in some, often minor ways (e.g., breadth and/or depth alone); • critical appraisal of results and/or related work often limited, impacting in a minor but potentially obvious way overall; • often, conclusions tend toward simple statements of fact; • some open problems and topics for future work identified.	• readily understandable written work demonstrating good quality of presentation and solid knowledge of the topic; • few substantive presentation problems which do not seriously damage overall clarity; • visualisation and illustration are present where necessary and of reasonable quality, and largely effective in complementing text; • usually able to answer basic topic-specific questions without significant prompts, but usually unable to extend answers to a more advanced level; • acceptable understanding of wider context of work, giving a reasonable volume and quality of citations with perhaps some significant omissions having modest impact only.
2.ii	50 to 59	• topic and goals imply somewhat reasonable challenge; • some of the stated project aims and objectives have been achieved, with incompleteness having significant impact; • little of the work was self-directed, and the author was reliant on direction from the Supervisor/Advisor; • work stays largely within the scope of the degree programme, and failure to look further afield substantially affects the overall quality of the project; • volume of work is barely adequate given goals, and/or below average given unit CP weight.	• completed work is likely to only partially confirm or replicate the existing state-of-the-art or a less advanced alternative; • the project exhibits limited novelty; if it is expository in nature, then its presentation is likely to closely follow the existing publications on which it is based without simply mimicking them; • tools and techniques selected and applied somewhat reasonably, but some significant improvements (e.g. substantially better results, main proof half as long) could have been made with a different selection; • proofs, where appropriate, contain serious errors which are fixable with substantial effort and/or are significantly lacking in rigour; • outcome of limited interest even within the unit remit; • resolving problems with work would require major effort and/or changes in approach.	• design and execution of evaluation is often lacking in many areas, even fundamentally flawed, and such problems potentially have major implications; • often, evaluation is mistaken for functional testing alone; • below average comparison with state-of-the-art and/or alternative options and lacking in some, often major ways (e.g., breadth and/or depth and approach itself); • critical appraisal of results and/or related work often limited, impacting in a major and obvious way overall; • often, conclusions are simple statements of fact; • few open problems or topics for future work identified.	• often unclear written work demonstrating mediocre quality of presentation and patchy knowledge of the topic; • several substantive presentation problems which seriously damage overall clarity; • visualisation and illustration are often missing, of mediocre quality, and often ineffective in complementing text; • often unable to answer basic topic-specific questions without significant prompts, and unable to extend answers to a more advanced level; • lacking understanding of wider context of work, giving a somewhat reasonable volume and quality of citations with serious omissions of direct relevance to the topic.

		Indicative Characteristics			
Class	Mark	Challenges and Contributions	Design and Implementation	Testing and Evaluation	Organisation and Communication
3rd	40 to 49[12]	• topic and goals imply little challenge; • very few or none of the stated project aims and objectives have been achieved, but some significant progress has been made; • very little of the work was self-directed, and the author was heavily reliant on direction from the Supervisor/Advisor or worked to a pre-prescribed set of decisions; • scope of work is overly constrained or vague to the point of maybe overlapping substantially with taught content, or aligning poorly to CS as a whole, and this seriously damages the overall quality of the project; • volume of work is inadequate given goals and/or unit CP weight, and the project feels more like a short-term coursework assignment than a deep investigation of the selected topic.	• completed work is likely to fall far short of confirming or replicating the existing state-of-the-art; • the project exhibits little to no novelty; if it is expository in nature, then its presentation is likely to largely mimic the existing publications on which it is based; • tools and techniques selected and applied poorly, and some vital improvements (e.g. project would work rather than failing, main proof would become trivial) could have been made with a different selection; • proofs, where appropriate, are sometimes entirely absent or contain foundational errors which render the argument useless; • some part of outcome may be of limited interest within the unit remit; • resolving problems with work would require substantial portions of the project to be redone.	• an evaluation is absent or so limited as to be without value; • often comparison with state-of-the-art and/or alternative options is of marginal quality or missing; • often lacking any critical appraisal of results and/or related work; • usually lacking description of open problems, and any topics for future work based on aspects of incompleteness only.	• very unclear written work, to the point of being difficult to understand, which demonstrates some knowledge of the topic; • many substantive presentation problems which make the dissertation as a whole difficult to read; • visualisation and illustration are absent or totally ineffective; • often, material is externally sourced and/or visually inconsistent; • usually unable to answer basic topic-specific questions without significant prompts, and often unable to answer them at all; • very limited understanding of wider context of work, giving a low volume and quality of citations with vital omissions of direct relevance to the topic.
Fail	0 to 39	• topic and goals imply only trivial challenge; • very few or none of the stated project aims and objectives have been achieved, and very little or no significant progress has been made; • the author was almost totally unable to work independently from the Supervisor/Advisor; • scope of work is wholly unsuitable, and may either be incoherent or overlap almost entirely with taught content; • volume of work is totally inadequate given goals and/or unit CP weight, and the project feels like it was thrown together at the last moment.	• completed work is of almost no value; • the project exhibits little to no novelty; if it is expository in nature, its presentation is likely to almost entirely mimic the existing publications on which it is based, to the level of e.g. failing to unify notation between different papers; • tools and techniques selected and applied wildly inappropriately or in nonsensical ways; • proofs, where appropriate, are either usually entirely absent or contain obvious foundational errors, and this leads to false results being stated as true; • outcome contains almost nothing of merit; • resolving problems with work would be equivalent to starting again.	• an evaluation is totally absent; • usually no comparison with state-of-the-art and/or alternative options; • totally lacking any critical appraisal of results and/or related work; • usually lacking description of open problems, and any topics for future work based on aspects of incompleteness only.	• written work is often prohibitively difficult to understand and demonstrates very little knowledge of the topic; • many substantive presentation problems which make the dissertation almost unreadable; • visualisation and illustration are absent or actively confusing or misleading; • usually unable to answer basic topic-specific questions even with significant prompts; • almost no understanding of wider context of work, with a list of citations that omits more key references than it includes.

[12] Per [5, Section 38], despite nominally translating to a 3rd, a mark in this range does not count as passing the unit.