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 responsibility 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 recognise and support this diversity on one hand, but, fundamentally, to reward work (of whatever type) with higher marks when it can be described as being of higher quality.

Demonstration of Intended Learning Outcomes (ILOs) *Every* unit has a set of ILOs which guide their content, and act as a benchmark wrt. 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] 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 bares equal responsibility.

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.

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 1 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 may be less clear, but is explained in detail by the following (which was 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 demonstrator of a product or service which has been produced in conjunction with, and tried out by, potential users. The demonstrator will have the potential to attract further support and investment. The students develop and present the justification for this, along with more detailed plans, in an associated enterprise unit. The plans can be entered into competitions and used to raise support. The product may involve hardware design, software design, or both. It may involve setting up a web-based service, the design of a robot or the release of 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. The project may draw on on-going research and technology development within the university or within an industrial sponsor. 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. The students prepare a project report along with a demonstration of their work for a 'Enterprise Project Day' to which external sponsors are invited. They also present the business plans they have developed within the enterprise unit to a group that includes potential sponsors and investors."*

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 in a specific area of computer science and to make a valuable and original scientific or technical contribution. It may involve the design and evaluation of experimental hardware or software, or be a theoretical study. 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. Alongside the project, students will undertake a study into the wider context of the work and its potential impact. This will lead to a Research Proposal suitable for submission to a research funder or to an industrial laboratory. The students present their work at a 'Research Project Day', which takes the form of a workshop. This will include oral presentations and poster discussions. They will also present their research proposal to a panel consisting of academics and industrial researchers."*

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 (iff. they are a topic-specific expert), plus help to judge how your work aligns with various academic requirements. You *may* also have a 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 resource.

  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 advise and guidance, rather than as an all-knowing oracle[2] or project manager.

[2] `http://en.wikipedia.org/wiki/Oracle`

- The project type imply distinct sets of assessment criteria, outlined in App A and App 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 (resp. 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 wlog. 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 (wrt. 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 which are then carefully explained. In most cases, however, a sensible reason to do X means X is allowed: there is an assumption that *you* can make a decision 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, CSE MEng project unit EENGM8889). Such instances will likely have different ILOs, and almost certainly differ wrt. their organisation.
- Beyond the above, some important rules and regulations are relevant:
  - Per [5, Section 26], 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 guideline 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) demands three phases of activity. Although concrete details (e.g., deadlines) are always available via the unit web-page, you should expect to carry out

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[1] and viva presentation so your work can be assessed.

Note that the MEng degree programme is *specifically* designed in order to accommodate these phases. For instance, the specification phase spans TB1 of the final year to allow refinement of and preparation for executing your selected project topic; 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.

2.1 Phase 2: execution

As noted, the execution phase is carried out full-time in TB2; this gives 12 weeks, bridged over the Easter vacation, to complete the project goals *and* produce any deliverables necessary. That said, however, you can start work on the aims and objectives from the point at which the project is specified onward. For example, undertaking some background research in TB1 can help clarify and plan activity in TB2.

This phase is hard to give generic advice about since the actual activity you engage in depends entirely on the project topic. However, keep these points in mind:

1. there is *no* taught content,
2. there is *no* formative assessment, and
3. there are *no* deadlines bar the submission of deliverables to support the (summative) assessment process, during the subsequent and final phase.

Take note of the common pitfalls in Sec 2.3.2, many of which relate to the execution phase. Specifically, the value of careful planning within your specification (even if that plan changes) will become apparent: without such a plan, you may become unfocused and hence "drift".

2.1.1 Interim poster presentation

An informal presentation event, based on a poster you produce (i.e., one per individual or group), will be scheduled roughly half-way through the execution phase. Organisational details will be made available via the unit web-page, but, in summary:

[1] 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.

- to match the poster boards available, you develop an A1 sized, portrait oriented PDF poster[2] which summarises your work,
- we organise some food and drink, print and display your posters somewhere, then
- you attend, eat, drink and discuss your work with anyone who is interested; typically this means spending some time with your poster to talk to people, and some time investigating the work of your peers.

The timing of the presentation will mean your project is still incomplete: this is by design, with the intention that any feedback can be acted upon *before* submission (cf. feedback after the assessment process, which is moot). More specifically, although there is some effort required by you to develop a poster, three reasons make this worthwhile: it

1. gives some practice for verbal presentation (e.g., by making you think about questions that could be asked, and how they could be answered),
2. gives some practice for written presentation (e.g., distilling your contribution into a poster already forces you to think clearly about how to explain the main contributions), and
3. provides early warning of any areas that could (or even should) be improved or focused on.

The aim is to invite the entire Department (staff *and* students) plus various external parties to see your work, however (in)complete; feedback from the people you engage with will be verbal only, so making a note of salient points is highly advisable.

2.2 Phase 3: assessment

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

individual-mode:

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

[a] The department will print a hard copy of the dissertation, however if you fail to submit your softcopy on time (late penalties apply as standard) you are responsible for submitting a printed and bounded copy of the dissertation to the school office. Any financial costs would then be covered by yourself

group-mode:

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

[a] The department will print a hard copy of the dissertation, however if you fail to submit your softcopy on time (late penalties apply as standard) you are responsible for submitting a printed and bounded copy of the dissertation to the school office. Any financial costs would then be covered by yourself

[b] except in late submissions - see *a*

Note that submission details will be made available via the unit web-page, and that the following (specifically Sec 2.2.1) provides an overview of the dissertation deliverable *only*: the cited group-mode report is *also* outlined via the unit web-page. In short, however, the rationale is that a group-mode dissertation *should* be compatible with an analogous individual-mode dissertation; the report, in contrast, is intended to clarify and reflect on the contributions and/or achievements of an individual group member.

Fundamentally, the written deliverable(s) *alone* are assessed by the marking panel: both the auxiliary material[3] and viva presentation exist to inform and clarify aspects of your work, rather than represent some fixed percentage of the mark. By marking and ranking your work against a set of well-defined assessment criteria, this approach allows us to assess a diverse range of topics in as consistent a manner as possible (while *also* placing value on the artefact of greatest long term use, e.g., in a job interview).

[2] 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): on one hand you will have to pay for this yourself, but on the other hand it will means you can make last minute changes after the deadline.

[3] History suggests that the diversity of topics, combined with operational requirements, will often make it hard (or even impossible) for the marking panel to use your work themselves (e.g., execute any software developed); this problem is even *more* apparent for the External Examiner. So, the rationale for submitting auxiliary material might seem odd: if it is not assessed and cannot be used, why submit it? Put simply, the purpose is to allow verification of claims made in the associated dissertation. That is, for each claim or result in your dissertation, iff. appropriate evidence exists in an electronic form then you should submit it.

2.2.1 Final dissertation

Although many good technical writing guides exist, e.g., [2, 1], it remains difficult to give generic advice because the process and challenge is personal to each student and specific to a given topic.

What follows is an attempt to guide the structure, content and presentation of your dissertation. The best policy is to read and absorb this, then make alterations where it makes sense to, and seek regular input from both your Supervisor(s) and any third-party proof readers you can engage. As a rule of thumb, if your dissertation can be read and understood by one of your peers (e.g., someone taking the same degree programme) then you can be reasonably confident a marker can do the same.

Structure and content

To provide at least some guidance and 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 (e.g., cover, declaration of authorship, contents, executive summary, supporting technologies) and optional (e.g., notation) preliminaries, 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[4] that the reader can understand what you have done,
- a overview of project execution, which details the work you carried out, and
- a critical evaluation, which presents and analyses any results and comparison.

To add more detail, keep in mind some general points:

- In the case of resubmission (i.e., a resit), the compulsory front matter must include a 1-page overview of all non-trivial changes made to the initial submission. Ideally this should be used to clearly highlight additional work completed, and address points made by the original feedback.
- The standard cover and declaration of authorship are compulsory. The latter, in particular, is analogous to the electronic version signed during submission of work via SAFE: in both cases, the rationale is to provide a clear statement that the work you submit is your own except where allowed and specified.

  If you opt not to use the template provided, you can produce these components online via

  `http://www.cs.bris.ac.uk/Teaching/Resources/cover.html`

  and, in either case, you *must* digitally sign the softcopy submitted[5].
- Bar the few compulsory sections, there is *no* requirement to replicate the structural guidelines: they exist simply as generic advice, meaning you are free to adapt them to suit.
- The structural guidelines include a rough indication of the length of each section; again, this represents generic advice rather than a strict limit. However, *if* the body of your dissertation exceeds 50 pages (i.e., ignoring the front- and back-matter) then you are strongly advised to consider if/how you might move any more peripheral material into one or more appendices.
- The marking panel are not necessarily experts in your topic, meaning the clarity and quality of your presentation is therefore at least as important as the technical challenge or quality of your work. Put another way, if the reader cannot understand your contribution it does not matter how good it is: they will be unable to comprehend the level of quality or the associated value.
- Clear citations to relevant third-party work are a hallmark of good technical writing: they provide credit to the original author (which is a pre-requisite where their material has been reproduced), allow the reader to find extra information where required, and also demonstrate your understanding of the topic.

  You should make an effort to find, read and cite the *original* sources of such material, for example focusing on research papers rather than web-based alternatives (e.g., Wikipedia).

[4] 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 simple goal is to explain just those techniques or technologies used later in the project execution.

[5] 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`

Preparation and printing

Whether or not you use the template provided, there are some preparation and printing guidelines you *must* adhere to as diligently as possible:

- The text should be single (or at most 1.5) line spaced, using a 10 point serif font (e.g., Times, Times New Roman, Garamond or similar).
- Pages should be numbered consecutively; the preferred position for page numbers is the bottom centre of each page. The top, bottom and side margins should be at least $2cm$.
- Anything you can refer to, including floating content, should 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".
- The preferred form of citations is numerical (i.e., [1] rather, for example, than author-date or author-title), referring to a complete bibliography at the end of the dissertation (before any appendices). When referring to a particular part of a book or long paper, it is helpful to indicate the specific sections or pages (e.g., [Section 7, 1] meaning section seven of reference one).
- When limited use of direct quotations is appropriate, they must be clearly delineated using quote marks *and* an associated citation to the original text.
- For the electronic submission, PDF is the only acceptable format: the submission of Word documents is not acceptable, for example, even if you author the document using such an application.

It is important to understand there are sensible rationale for each of the above. For example, the requirements are designed to

- minimise problems during the print and binding processes,
- ensure markers have space to write notes and can refer consistently to specific features where appropriate, and
- allow us to archive your work as well as support external examination and accreditation processes.

2.2.2 Final viva presentation

In addition to the dissertation, you will deliver a viva-based presentation to the marking panel. The rationale for including a viva in the assessment process is the form of communication it allows. For example, some project topics are difficult to convey in writing alone, and, even then, reading the dissertation offers no chance to question and/or challenge the author. By enabling interaction, the viva helps to resolve such issues. 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 marking panel can/will direct a specific viva to suit whatever information they need to gather. However, it is expected that in a "standard" viva

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

meaning you should prepare specifically for the first two items. Keep in mind some general points:

- 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 at a high-level rather than on technical detail (which the dissertation will inevitably contain).

- Towards the end of TB2 the Unit Director will email you to gather any specific requirements for the 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 iff. you let us know in plenty of time.

- Although you are free to bring pre-prepared hand-outs or equipment to aid explanation or support a demonstration, take note of the specific *non*-requirement for a set of slides: the viva is meant to be interactive, meaning you talk *with* the marking panel 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 time effectively for an alternative purpose.

- The goal of the demonstration is to a) illustrate aspects which are difficult to describe in writing or verbally, and b) give confidence to your ideas and implementation work as described. Provided there is a clearly motivated reason, it is permissible to present a pre-recorded demonstration (i.e., a video) rather than a live one. Examples might include demonstrations that require a long time to complete, require equipment that cannot be transported, or need to be performed in a particular environment (e.g., outdoors).

2.3 Hints, tips and common pitfalls

2.3.1 Frequently Asked Questions (FAQs)

"I'm confused between enterprise- and research-type projects." Sec 1.2 attempts to differentiate the project types. However, keeping in mind the descriptions over-generalises a little, it may be helpful to think along the following lines:

- Enterprise-type projects will *typically* focus on challenges related to the design and implementation of a product of value to some end-user(s); the approaches used (or at least a small set of choices) and intended outcomes are *usually* clear before the project starts.
- Research-type projects will, in contrast, *typically* focus on addressing a clearly defined and well motivated research hypothesis; the approaches used and results produced will *usually* be partially known or even unknown, which is the *often* the justification for exploring them.

"Eh? For the research I want to do, I need to implement something! A research-type project does not rule out, but, equally, need not imply, some implementation activity: do not read research to mean theoretical or impractical!

There may be cases where you can guide a specific topic into either type, simply by changing the emphasis. However, being clear about that emphasis (i.e., the project goals) is important. For example, imagine you aim to develop a research *platform*, e.g., a simulator for X, or optimised implementation of a software kernel for X (where X could be a field *outside* CS). This is more aligned to an enterprise-type project: the outcome is clearly a product. In contrast, imagine you develop the same platform simple as a way to realise another goal, e.g., a simulator for X required to perform experiment Y. The project still includes some development (of X), but now there is a research hypothesis involved (relating to Y) so is probably more aligned to a research-type project.

"I'm not interested in a start-up: why are business plans etc. relevant to me" 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 certainly transferable. Example: IBM operate an "enterprise crowd-funding" model[6] to first identify and evaluate potential *internal*

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

project ideas; Kickstarter-like[7] proposals are made, with bids made by IBM staff from a virtual $100 allocation. The format and content of such proposals will be similar to a business plan for a start-up, and hence 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 clearly includes 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. Either way, keep in mind your individual contribution is of utmost importance, not whether you work in a group or not.

"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, the meaning of health and safety should at least be fairly obvious. Ethics, in contrast, might be less so. The simple explanation is that the (or any) University is governed by a set of rules which ensure specific activities are carried out in an ethical manner. One may imagine this is less of an issue in Computer Science than Medicine for example, but, even so, *all* projects must adhere to the *same* set of rules.

A detailed overview of the requirements and process can be found at

`http://www.cs.bris.ac.uk/Teaching/hse.pdf`

An important point to remember is that dealing with this issue can take time and effort: careful planning (e.g., to minimise impact on execution of your project) is therefore vital.

"I need to buy an X, will the Department pay for this?" 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 is best first point of contact, the Department has a dedicated Teaching Technologist, namely Richard Grafton (`richard.grafton@bristol.ac.uk`, MVB-2.07), who can help.

Part of the Teaching Technologist remit is to act as an intermediate between you and IT services, providing a) a single point of contact with domain-specific (i.e., CS-specific) knowledge for you, and b) a layer above IT services (who often do the work) that allows greater efficiency through identification 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. Rather, we assume you know how to do that (based on experience gained in said projects). You clearly cannot neglect this, however, since it remains an *implicit* requirement: effective management of the group is an important element of successful projects.

"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 it not crucial to understanding the dissertation. In line with most research conferences, the marking panel is not obliged to read appendices. As such, it makes sense to populate one with content *only* if it is not important enough to include in the main body.

A common question of this type regards source code. Since there is a separate deliverable capturing source code, printing it out as an appendix is not a good idea: it seems quite unlikely someone would gain much by reading it as a whole. On the other hand, it *can* be sensible to include short source code fragments when discussing some aspect of your implementation. For example, if there was a particular challenge or subtle feature worth discussing, making reference to the source code in question (much like you would a diagram, or algorithm) can help a reader understand your explanation.

"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.

[7] `http://www.kickstarter.com/`

2.3.2 Common pitfalls

Over or under ambition in project topic or execution plan An ideal project is typically a careful balance between

1. less ambitious (so less risky) goals relating to clear, achievable topics whose solution and hence outcome is usually known beforehand, and
2. more ambitious (so more risky) goals relating to challenging, potentially novel topics whose solution and hence outcome may be unknown beforehand.

Too little of the former can represent over ambition: too much risk can be problematic if the goals are not fully achieved. Too little of the latter can represent under ambition: too much incremental development can limit the potential for marks.

Spreading your effort too thinly Although careful compromise is clearly required, and it is hard to generalise, focusing on a limited set of goals is a strong indicator for how successful you will be. Put another way, fewer (resp. many), goals that are more (resp. less) complete and of a higher (resp. lower) level of quality will typically lead to a higher (resp. lower) mark.

Poor planning wrt. time Time management is a challenging task in various respects. A common example is failure to allocate enough time to write your dissertation. On one hand, this often necessarily left until close to the deadline: some aspects are hard or impossible to write until you have done the associated work. On the other hand, this strategy will inevitably compress the amount of available time. The dissertation carries a high weight wrt. assessment, so it can make sense to

- write incrementally throughout the project duration (e.g., by developing and expanding a set of notes), and
- compromise carefully between doing more work and the writing associated with completed work: the value of that extra work is moot, even destructive, if the work *overall* is not presented clearly.

Poor planning wt. contingency A serious approach to project management includes some form of risk assessment, coupled with thought about contingency. There is no need to necessarily do this formally, but it *does* make sense to plan for events that could have a major impact on the project.

Obvious instances include best practice working habits, such as a regular back-up and anti-virus processes as a *bare minimum*; failure of your hard disk, for example, *cannot* be cited as a reasonable excuse. Less obvious instances, which still occur more often than you might expect, include

- failure of non-existence of, or delays/limits wrt. access to required equipment,
- selected non-availability of your Supervisor(s) and/or Advisor,
- assumption that some data-set is available,
- needing to perform an evaluation involving long-running computation but not securing the resource or allocating enough time to do so, or
- needing to perform an evaluation involving test subjects, but failing to find enough of them.

Imagine, for example, the equipment in the first case is a sensor required to capture data that is then processed in some way; one might plan to allow simulation of the processing step using synthetic data as a contingency.

Lack of contact with Supervisor (and/or Advisor) The Unit Director will *always* 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.

History suggests that regular meetings with with your Supervisor are a strong indicator for how successful you will be. Such meetings to not have to be lengthy (a 5 minute progress check in which you say "I am working on X but have not finished it" is fine), but can be crucial in guiding and checking your work and overall direction.

Lack of continuous work If a deadline is in the distant future, procrastination is easily justifiable. History, however, suggests continuous work through the project duration, rather than in a more compressed period at the end, results in higher quality output. This is partly to do with basic workload balancing, but also gives you more time to *think* about problems and solutions and investigate (potentially unsuitable) alternatives.

Lack of reprodicibity wrt. thoughts or results Two key issues are important, but often only obvious in hindsight:

1. Writing a clear description of your work demands you consider the reader, who may not have a background in the topic. You potentially started with the same background, but by the time you write the dissertation, this perspective is often lost: you will inevitably understand things much better! As such, a good approach is to develop a set of working notes that act as a skeleton. In certain Departments, this is formalised by forcing students to submit an additional laboratory notebook.
2. It can be useful to reproduce a set of results from earlier in your work for your dissertation, or perform an experiment again to check something. Doing so may imply the use of an old(er) version of any software or hardware developed, and so maintaining access to this (e.g., using version control) can be important.

Chapter 3

A staff perspective

A marking panel, whose overall size depends on the number of projects, is drawn from members of staff in the Department. Each project is assessed directly by a *minimum*[1] of two assigned markers from the marking panel, and indirectly by the whole panel. The assigned markers are associated Supervisor(s) cannot overlap, and the specific assignment of markers will aim (where possible) to include one topic-specific expert and one non-expert; this is intended to balance scientific rigour with external perspective. The overarching goals of the marking panel are to

1. follow the assessment process and criteria outlined within the following Sections, ensuring as much transparency as possible,
2. produce a robust mark for and ranking of projects, with clear indications wrt. classification boundaries,
3. ensure a level of fairness and consistency wrt. marks both across a given cohort and in reference to history, and
4. minimise bias caused by over- or under-enthusiastic supervisors and/or markers.

3.1 The assessment process

Modulo any minor deviations (e.g., due to deadline extensions, or impact of a mitigating circumstance), the intended assessment process[2] is outlined by the following:

1. The markers assigned to a given project will inspect the associated deliverables closely, the dissertation in particular, and attend the relevant presentations. A set of marking criteria in allow each of them to independently but consistently arrive at an initial mark, supported by some written justification. Note the University operates *two* sanctioned marking scales, namely $0--100$ and $0--20$, with a clear mapping from one to the other: the former is used.
2. The Supervisor of each project is asked to provide (with input from the associated Advisor where appropriate) an assessment which the marking panel can later use to guide decisions. This assessment is limited to factual information *only*, and deliberately excludes mitigating circumstances which are dealt with via a separate Departmental process.
3. For each combination of project mode and type, an independent marking panel meeting[3] is convened: the aim is essentially to treat each combination as a separate cohort. Each meeting is chaired by the Unit Director, with the goal of producing a set of final marks and overall ranking for said cohort. Various fundamental principles are adhered to during each meeting:
   - every project is discussed, typically starting with projects whose initial marks are most disparate,
   - marks are never arrived at via averaging, but rather through discussion of merits and failings wrt. the marking criteria, and
   - the marking panel as a whole is responsible for arriving at the final marks and ranking (for example, the dissertation for every project will be available to the whole panel to allow discussion and comparison).

[1] In some cases, we might opt to include additional members of the marking panel in a given viva presentation; they would act as observers only, so not directly assess a given project. The rationale for doing so relates to the robustness of the assessment process: with a greater overview of the cohort of a whole (i.e., more overlap between projects the markers have seen), ranking is more informed and therefore typically easier.

[2] As an aside, note that the process has clear parallels with peer review process in most research conferences, and funding review schemes such as that of EPSRC; these typically rely on collective opinion and discussion rather than the absolute opinion of one reviewer.

[3] Independent in the sense they are run separately even if co-located, for example.

More specifically, the meeting consists of three distinct phases:

(a) Based on initial marks provided by the assigned markers, and discussion within the whole panel which may amend them, a preliminary mark is agreed for each project; these imply a preliminary ranking.

(b) The projects are considered pair- or cluster-wise to further amend the marks with the aim of agreeing on a final ranking; this process should attempt to retain the ranking made by individual markers, and also consider degree classification boundaries.

(c) The final marks are agreed, and the marking panel as a whole produce some justification for their decision; this helps to form written feedback to the student, including both negative *and* positive aspects.

Note that if the Supervisor of a project is a member of the marking panel, they are prevented from engaging in the associated discussion.

4. The unit marks are derived by merging the final marks associated with each project type (i.e., without additional, cross-type comparison). For example, the unit marks for COMSM0111 would be formed by merging the two sets of final marks for individual-mode, research-type and enterprise-type projects. The Departmental exam board later ratifies said marks, before they are released alongside any written feedback.

5. The unit marks and assessment process itself, in common with *all* units within the Department, are checked by the External Examiner, a role filled by a senior member of staff from another University (who is changed periodically). In order to check and calibrate quality and ensure fairness, the External Examiner inspects (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 if and when applicable.
- As early as possible after their electronic submission via SAFE, the Unit Director uses the TurnItIn system

  `http://submit.ac.uk`

  to check all dissertations, then, later, collates specific concerns identified by the marking panel.
- 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 inevitable produces exceptions to seemingly perfect, codified criteria.

Even so, in an attempt to combat this problem App A and App B outline indicative characteristics that enterprise- and research-type projects might respectively exhibit to meet the associated marks range. However imperfect, these characteristics will be used by the marking panel to calibrate their opinion of your work. Keep in mind that

1. at least some of the assessment process is, necessarily, based on opinion by individual markers drawn from their understanding of the work, and

2. it is common for a project to exhibit characteristics relating to a high mark in one category and a lower mark in others: the final mark is a composite rather than selective assessment.

Bibliography

[1] W. Strunk Jr. and E.B. White. *Elements of Style*. Longman, 4th edition, 1999.

[2] D.E. Knuth, T.L. Larrabee, and P.M. Roberts. *Mathematical Writing*. Mathematical Association of America, 1989. `http://www-cs-faculty.stanford.edu/~uno/klr.html`.

[3] University of Bristol. Ethics of research policy and procedure. `http://www.bris.ac.uk/red/research-governance/ethics/`.

[4] University of Bristol. Intellectual property policy for students. `http://www.bristol.ac.uk/secretary/studentrulesregs/intelprop.html`.

[5] University of Bristol. Regulations and code of practice for taught programmes. `http://www.bristol.ac.uk/academic-quality/assessment/codeonline.html`.

Appendix A

Assessment criteria: enterprise-type project

Class	Mark	Indicative Characteristics				
		Challenges and Contributions	Depth and Rigour	Design and Implementation	Testing and Evaluation	Organisation and Communication
1st	80 to 100	topic and goals are ambitious and/or imply significant challenge; project as a whole is usually on par with requirements on early-stage graduate-level student or employee; work often of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS and often going beyond scope of degree programme; outstanding volume of work irrespective of goals; work represents a significant breakthrough in CS and/or is comparable to a commercial product; outcome has substantial value as either a stand-alone product (e.g., as part of an open-source dissemination, or a start-up company) and/or in follow-up work	specification, execution and evaluation all with no obvious omissions, meaning a high level of breadth/depth in the work; all of the stated project aims and objectives have been achieved; intelligent, totally self-directed exploration of the topic (meaning minimal direction required from Supervisor/Advisor), based on well considered decisions and robust planning and/or organisation; exceptionally high volume and quality of background research and citations; covers all relevant literature and beyond	appropriate methodologies and formalisms used in all aspects of design; exhaustive comparison with and consideration of alternative designs or approaches; extensive consideration of stake-holder requirements, plus future extensibility; clear evidence of feasibility and risk assessment; clearly caters for any standards- or patent-compliance; clear structured development process is evident; appropriate development tools selected and used; appropriate selection and deployment of, and integration with third-party technologies; exceptionally high Engineering quality evident in all aspects of implementation, with "polished" and professional project outputs; exceptionally good attention to user-experience	comprehensive, well-planned functional testing strategy documented; includes a broad suite of reasonable techniques and foci (e.g., unit testing, fuzz testing, formal verification); functional testing fosters high confidence in robustness; comprehensive, well-planned behavioural testing strategy documented; includes a broad suite of reasonable techniques and foci (e.g., performance analysis, stress testing); clearly illustrates added-value of project output over alternatives or competitors; comprehensive, well-planned evaluation of project output within target context (e.g., deployment and use by stated end-users); rigorous analysis aligns result with stated project aims and objectives	clear, articulate and accurate written work, demonstrating high quality of presentation and mastery of topic; no identifiable problems with content or presentation, often of a quality suitable for wider publication in some way; creative and effective use of visualisation and illustration; usually, material is self-developed and visually consistent; able to answer advanced topic-specific questions, and understand work in a wider context; usually, clear interest and passion for topic and field exhibited
	70 to 79	topic and goals are ambitious and/or imply major challenge; project as a whole is often on par with requirements on early-stage graduate-level student or employee; work often of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS and occasionally going beyond scope of degree programme; volume of work is more than adequate given goals, and/or above average given unit CP weight; completing or resolving problems with work would require minor effort alone; outcome has some value as either a stand-alone product (e.g., as part of an open-source dissemination, or a start-up company) or in follow-up work	specification, execution and evaluation all with only minor and/or superficial omissions, meaning a high level of breadth/depth in the work; most of the stated project aims and objectives have been achieved, with any incompleteness well explained and incidental; intelligent, largely self-directed exploration of the topic (meaning limited direction required from Supervisor/Advisor), based on well considered decisions and robust planning and/or organisation; high volume and quality of background research and citations; covers all relevant literature	appropriate methodologies and formalisms used in most aspects of design; comparison with and consideration of alternative designs or approaches; consideration of stake-holder requirements, plus future extensibility; some evidence of feasibility and risk assessment; usually caters for any standards- or patent-compliance; clear structured development process is evident; appropriate development tools selected and used; appropriate selection and deployment of, and integration with third-party technologies; high Engineering quality evident in all aspects of implementation, with "polished" and professional project outputs; exceptionally good attention to user-experience	well-planned functional testing strategy documented; includes an adequate suite of reasonable techniques and foci (e.g., unit testing, fuzz testing, formal verification); functional testing fosters confidence in robustness with minor caveats only; well-planned behavioural testing strategy documented; includes an adequate suite of reasonable techniques and foci (e.g., performance analysis, stress testing); illustrates added-value of project output over alternatives or competitors; well-planned evaluation of project output within target context (e.g., deployment and use by stated end-users); analysis aligns result with stated project aims and objectives with minor caveats only	clear, accurate written work, demonstrating high quality of presentation and thorough knowledge of topic; any problems are minor or somewhat superficial; effective use of visualisation and illustration; often, material is self-developed and visually consistent; able to answer detailed topic-specific questions, and understand work in a wider context; often, clear interest and passion for topic and field exhibited

2.1	60 to 69	topic and goals imply modest challenge; scope of work is reasonable, but often limited to a single and/or narrow field or unit in CS; usually, the limited scope has little or no impact on the project output; volume of work is adequate given goals, and/or in line with unit CP weight; completing or resolving problems with work would require minor effort and/or changes in approach; outcome likely only of use within the unit remit	one of specification, execution and evaluation is lacking in some way, or has obvious omissions; often, some unexplored options, implying minor lack of breadth/depth; some of the stated project aims and objectives have been achieved, with any incompleteness having only modest impact; exploration of the topic somewhat narrow, often based on influence and ideas of Supervisor/Advisor; motivation for decisions often poorly explained; usually exhibits good planning and/or organisation; background research has minor omissions, with minor impact only	design methodologies and formalisms evident, and any missing detail only raises minor questions; minor, usually subtle omissions relating to selected cases of alternative designs or approaches, stakeholder requirements, future extensibility, and any standards- or patent-compliance; development process is adequately described, and omissions only raise minor concerns wrt. realisation of project outputs; selection of development and third-party tools and technologies is always appropriate, but sometimes implied rather than explained; adequate Engineering quality evident in all aspects of implementation, with the project output lacking in only minor aspects; usually fit for purpose wrt. the initial aims and objectives	adequate functional testing strategy documented; any documented activity often convincing, with any missing techniques or foci raising minor concerns only; some behavioural testing evident, but with room for improvement; any missing elements of analysis likely to be of minor significance; any inconclusive or negative aspects of comparison with alternatives or competitors well explained and/or justified; some evaluation evident, but with room for improvement; any issues not addressed convincingly by evaluation are subtle, and minor in their nature and/or impact; sometimes with a sample of users selected for convenience rather than alignment with stated end-users	written work of an above average quality, and with any problems implying only a minor overall impact; demonstrates solid knowledge of the topic; few substantive and/or presentation problems which have minor impact on overall clarity; use of visualisation and illustration is of above average quality, and largely effective in complementing text; often able to answer basic topic-specific questions without the need for prompts, but unable to extend answers to a more advanced level; clarity of explanation is above average; limited understanding of work in a wider context
2.2	50 to 59	topic and goals imply minor challenge; scope of work is reasonable, but usually limited to a single and/or narrow field or unit in CS; often, the limited scope has a discernible impact on the project output; volume of work is less than adequate given goals, and/or below average given unit CP weight; completing or resolving problems with work would require major effort and/or changes in approach; outcome likely only of use within the unit remit	one or more of specification, execution and evaluation is lacking in some way, or has obvious omissions; often, several unexplored options, implying modest lack of breadth/depth; few of the stated project aims and objectives have been achieved, with any incompleteness having significant impact; exploration of the topic fairly narrow, often based heavily on influence and ideas of Supervisor/Advisor; motivation for decisions often lacking entirely; sometimes let down by poor planning and/or organisation; background research has minor omissions, potentially with major impact	design methodologies and formalisms evident, but any missing detail potentially raises major questions; major, often obvious omissions relating to selected cases of alternative designs or approaches, stake-holder requirements, future extensibility, and any standards- or patent-compliance; development process limited but adequately described, but omissions often raise major concerns wrt. realisation of project outputs; selection of development and third-party tools and technologies is largely appropriate, but often implied rather than explained; implementation is often incomplete in some respects, with the resulting lack of "polish" significant; often unfit for purpose wrt. the initial aims and objectives	limited functional testing strategy documented; any documented activity often ad hoc or unconvincing, with any missing techniques or foci raising major concerns; any behavioural testing evident is patchy and/or incomplete, or inconclusive; any missing elements of analysis likely to be of major significance; any inconclusive or negative aspects of comparison with alternatives or competitors poorly explained or ignored; any evaluation evident is patchy and/or incomplete, or inconclusive; any issues not addressed convincingly by evaluation may be obvious, and major in their nature and/or impact; often with a sample of users selected for convenience rather than alignment with stated end-users	written work of an below average quality, but with any problems potentially implying a major overall impact; demonstrates partial or patchy knowledge of the topic; some substantive and/or presentation problems which potentially have major impact on overall clarity; use of visualisation and illustration is of below average quality, and often ineffective in complementing text; often unable to answer basic topic-specific questions or requires significant prompts to do so, and unable to extend answers to a more advanced level; clarity of explanation is below average; limited understanding of work in a wider context

Fail	40 to 49	topic and goals are unambitious and/or imply only trivial challenge; project as a whole feels more like a short-term coursework assignment than deeper, longer-term investigation of selected topic; scope of work is constrained, i.e., narrow, and maybe hard to align with a particular field or unit in CS; volume of work is totally inadequate given goals, and/or out of line with unit CP weight; completing or resolving problems with work would require significant effort and/or changes in approach; outcome is not clearly of much use to anyone	significant omissions in most phases of specification, execution and evaluation; one or few explored options, implying major lack of breadth/depth; most of the stated project aims and objectives remain incomplete; lack of exploration within the topic, sticking mainly to an obvious and/or pre-prescribed set of decisions; planning and/or organisation often inadequate or ill conceived; background research is patchy	lack of clear design methodology, with design and approach often ad hoc unmotivated, and/or poorly communicated; often little or no comparison or consideration of alternative designs or approaches little evidence of design considering requirements of stake-holders; often unaware of any standards- or patent-compliance requirements; development process is weak and/or ad hoc; choices and use of development tools or third-party technologies lacks clear motivation; implementation is usually incomplete in many respects, with the resulting lack of "polish" significant; usually unfit for purpose wrt. the initial aims and objectives	lack of significant, structured functional testing; any documented activity usually ad hoc and unconvincing, and may be fundamentally flawed in one or more ways; lack of significant, structured behavioural testing; any documented activity usually ad hoc and unconvincing, and may be fundamentally flawed in one or more ways; evaluation is lacking in one or more significant and obvious ways, leading to unconvincing superficial or flawed demonstration of project output within target context	writing style and presentation such that understanding the work is difficult, and demonstrates limited knowledge of the topic; resulting dissertation is unsuitable for public dissemination; many substantive and/or presentation problems which potentially have major impact on overall clarity; ineffective use of visualisation and illustration; often, material is externally sourced and/or visually inconsistent; unable to clearly answer many topic-specific questions, and/or unaware of wider field or context; often dispassionate about or unenthused by work, topic or field
	0 to 30	topic and goals are unambitious and/or imply no clear challenge project as a whole feels more like a short-term coursework assignment than deeper, longer-term investigation of selected topic; scope of work is constrained, i.e., narrow, and often hard to align with a particular field or unit in CS; difficult to align work with any significant effort; completing or resolving problems with work would be equivalent to starting again	all phases of specification, execution and evaluation totally lacking; very few explored options, implying significant lack of breadth/depth; all of the stated project aims and objectives remain incomplete; total lack of exploration within the topic, sticking entirely to an obvious and/or pre-prescribed set of decisions planning and/or organisation often totally inadequate or ill conceived; there is little or no evidence of any significant background research	no design methodology evident; usually no comparison or consideration of alternative designs or approaches; no evidence of design considering requirements of stake-holders; usually unaware of any standards- or patent-compliance requirements; development process is ad hoc or non-existent; choices and use of development tools or third-party technologies lacks any motivation; little or no evidence of an implementation relating to the initial aims and objectives and/or design (if any)	total lack of significant, structured functional testing; total lack of significant, structured behavioural testing; total lack of evaluation; no demonstration of project output within target context	writing style and presentation such that understanding the work is prohibitively difficult, and demonstrates very limited knowledge of the topic; resulting dissertation is unsuitable for public dissemination; many substantive and/or presentation problems which potentially have significant impact on overall clarity; ineffective and/or confused use of visualisation and illustration; usually, material is externally sourced and/or visually inconsistent; unable to clearly answer any topic-specific questions, and/or unaware of wider field or context; usually dispassionate about or unenthused by work, topic or field

Appendix B

Assessment criteria: research-type project

Class	Mark	Indicative Characteristics				
		Challenges and Contributions	Depth and Rigour	Design and Implementation	Testing and Evaluation	Organisation and Communication
1st	80 to 100	topic and goals are ambitious and/or imply significant challenge; project as a whole is usually on par with requirements on early-stage graduate-level student or employee; work often of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS and often going beyond scope of degree programme; outstanding volume of work irrespective of goals; work represents a significant breakthrough in CS and/or is comparable to a commercial product; outcome has substantial value as either a stand-alone product (e.g., as part of an open-source dissemination, or a start-up company) and/or in follow-up work	specification, execution and evaluation all with no obvious omissions, meaning a high level of breadth/depth in the work; all of the stated project aims and objectives have been achieved; intelligent, totally self-directed exploration of the topic (meaning minimal direction required from Supervisor/Advisor), based on well considered decisions and robust planning and/or organisation; exceptionally high volume and quality of background research and citations; covers all relevant literature and beyond	completed work represents a genuine and significant improvement on the state-of-the-art; clear application outside the unit remit, for significant benefit; novel results, concepts or designs conceived entirely by student; tools and techniques selected and applied perfectly, with clear motivation and consideration for alternatives	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, articulate and accurate written work, demonstrating high quality of presentation and mastery of topic; no identifiable problems with content or presentation, often of a quality suitable for wider publication in some way; creative and effective use of visualisation and illustration; usually, material is self-developed and visually consistent; able to answer advanced topic-specific questions, and understand work in a wider context; usually, clear interest and passion for topic and field exhibited
	70 to 79	topic and goals are ambitious and/or imply major challenge; project as a whole is often on par with requirements on early-stage graduate-level student or employee; work often of an inter-disciplinary (e.g., both hardware and software) nature, potentially spanning more than one field in CS and occasionally going beyond scope of degree programme; volume of work is more than adequate given goals, and/or above average given unit CP weight; completing or resolving problems with work would require minor effort alone; outcome has some value as either a stand-alone product (e.g., as part of an open-source dissemination, or a start-up company) or in follow-up work	specification, execution and evaluation all with only minor and/or superficial omissions, meaning a high level of breadth/depth in the work; most of the stated project aims and objectives have been achieved, with any incompleteness well explained and incidental; intelligent, largely self-directed exploration of the topic (meaning limited direction required from Supervisor/Advisor), based on well considered decisions and robust planning and/or organisation; high volume and quality of background research and citations; covers all relevant literature	completed work represents a genuine improvement on the state-of-the-art, but perhaps incremental in nature; clear application outside the unit remit, for marginal benefit; novel results, concepts or designs conceived partly by student; tools and techniques selected and applied satisfactorily, with some motivation and consideration for alternatives	suitably 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 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, accurate written work, demonstrating high quality of presentation and thorough knowledge of topic; any problems are minor or somewhat superficial; effective use of visualisation and illustration; often, material is self-developed and visually consistent; able to answer detailed topic-specific questions, and understand work in a wider context; often, clear interest and passion for topic and field exhibited

2.1	60 to 69	topic and goals imply modest challenge; scope of work is reasonable, but often limited to a single and/or narrow field or unit in CS; usually, the limited scope has little or no impact on the project output; volume of work is adequate given goals, and/or in line with unit CP weight; completing or resolving problems with work would require minor effort and/or changes in approach; outcome likely only of use within the unit remit	one of specification, execution and evaluation is lacking in some way, or has obvious omissions; often, some unexplored options, implying minor lack of breadth/depth; some of the stated project aims and objectives have been achieved, with any incompleteness having only modest impact; exploration of the topic somewhat narrow, often based on influence and ideas of Supervisor/Advisor; motivation for decisions often poorly explained; usually exhibits good planning and/or organisation; background research has minor omissions, with minor impact only	often limited but existing novelty, and may fail to produce an interesting (positive or negative) outcome wrt. state-of-the-art; often, completed work confirms or replicates existing state-of-the-art; novel results, concepts or designs conceived mainly by supervisor; the selection and application of tools and techniques is more than adequate; although improvements (e.g., better results, less effort) could have been realised with alternatives, any impact was marginal	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	written work of an above average quality, and with any problems implying only a minor overall impact; demonstrates solid knowledge of the topic; few substantive and/or presentation problems which have minor impact on overall clarity; use of visualisation and illustration is of above average quality, and largely effective in complementing text; often able to answer basic topic-specific questions without the need for prompts, but unable to extend answers to a more advanced level; clarity of explanation is above average; limited understanding of work in a wider context
2.2	50 to 59	topic and goals imply minor challenge; scope of work is reasonable, but usually limited to a single and/or narrow field or unit in CS; often, the limited scope has a discernible impact on the project output; volume of work is less than adequate given goals, and/or below average given unit CP weight; completing or resolving problems with work would require major effort and/or changes in approach; outcome likely only of use within the unit remit	one or more of specification, execution and evaluation is lacking in some way, or has obvious omissions; often, several unexplored options, implying modest lack of breadth/depth; few of the stated project aims and objectives have been achieved, with any incompleteness having significant impact; exploration of the topic fairly narrow, often based heavily on influence and ideas of Supervisor/Advisor; motivation for decisions often lacking entirely; sometimes let down by poor planning and/or organisation; background research has minor omissions, potentially with major impact	usually very limited novelty, and often fails to produce an interesting (positive or negative) outcome wrt. state-of-the-art; often, completed work confirms or replicates existing state-of-the-art or even less advanced alternative; novel results, concepts or designs conceived entirely by supervisor	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	written work of an below average quality, but with any problems potentially implying a major overall impact; demonstrates partial or patchy knowledge of the topic; some substantive and/or presentation problems which potentially have major impact on overall clarity; use of visualisation and illustration is of below average quality, and often ineffective in complementing text; often unable to answer basic topic-specific questions or requires significant prompts to do so, and unable to extend answers to a more advanced level; clarity of explanation is below average; limited understanding of work in a wider context
Fail	40 to 49	topic and goals are unambitious and/or imply only trivial challenge; project as a whole feels more like a short-term coursework assignment than deeper, longer-term investigation of selected topic; scope of work is constrained, i.e., narrow, and maybe hard to align with a particular field or unit in CS; volume of work is totally inadequate given goals, and/or out of line with unit CP weight; completing or resolving problems with work would require significant effort and/or changes in approach; outcome is not clearly of much use to anyone	significant omissions in most phases of specification, execution and evaluation; one or few explored options, implying major lack of breadth/depth; most of the stated project aims and objectives remain incomplete; lack of exploration within the topic, sticking mainly to an obvious and/or pre-prescribed set of decisions; planning and/or organisation often inadequate or ill conceived; background research is patchy	few or no identifiably novel aspects, nor any significant value wrt. state-of-the-art; no obvious value or application outside the unit remit; lack of identifiable novel results, concepts or designs; choice of tools and techniques somewhat inappropriate and/or ill considered; merits of alternatives often not well considered	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	writing style and presentation such that understanding the work is difficult, and demonstrates limited knowledge of the topic; resulting dissertation is unsuitable for public dissemination; many substantive and/or presentation problems which potentially have major impact on overall clarity; ineffective use of visualisation and illustration; often, material is externally sourced and/or visually inconsistent; unable to clearly answer many topic-specific questions, and/or unaware of wider field or context; often dispassionate about or unenthused by work, topic or field

	0 to 30	topic and goals are unambitious and/or imply no clear challenge project as a whole feels more like a short-term coursework assignment than deeper, longer-term investigation of selected topic; scope of work is constrained, i.e., narrow, and often hard to align with a particular field or unit in CS; difficult to align work with any significant effort; completing or resolving problems with work would be equivalent to starting again	all phases of specification, execution and evaluation totally lacking; very few explored options, implying significant lack of breadth/depth; all of the stated project aims and objectives remain incomplete; total lack of exploration within the topic, sticking entirely to an obvious and/or pre-prescribed set of decisions planning and/or organisation often totally inadequate or ill conceived; there is little or no evidence of any significant background research	no identifiably novel aspects, nor any value wrt. state-of-the-art no value or application outside the unit remit; complete lack of identifiable novel results, concepts or designs; choice of tools and techniques somewhat inappropriate and/or ill considered; merits of alternatives often not considered at all	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	writing style and presentation such that understanding the work is prohibitively difficult, and demonstrates very limited knowledge of the topic; resulting dissertation is unsuitable for public dissemination; many substantive and/or presentation problems which potentially have significant impact on overall clarity; ineffective and/or confused use of visualisation and illustration; usually, material is externally sourced and/or visually inconsistent; unable to clearly answer any topic-specific questions, and/or unaware of wider field or context; usually dispassionate about or unenthused by work, topic or field