CS 408 Individual Project Information and Guidelines

Contents

Note - the information in this guide is believed to be accurate at the time of publication, but if you notice any typos or issues, please contact the project co-ordinator

1. Introduction

The information in this document is for the class CS 408 Individual Project (the official syllabus for CS 408 Individual Project is here). Each student taking CS 408 Individual Project is expected to complete a departmentally-approved project under the supervision of a member of staff. The sections below are organised in chronological order - the next section describes each of the deliverables and their due dates. Subsequent sections provide details regarding what you will need to do for each deliverable.

A student must obtain a mark of 40% or more for their project to qualify for consideration for an honours degree in Computer Science or a Computer Science related subject. This fourth-year class is worth 40 credits which means that each student taking this class is expected to spend a nominal **400 hours** on their project.

The British Computer Society (BCS) sets certain accreditation requirements for Individual Projects for both BSc (Hons) and MEng degrees (these can be found in the section 12. British Computer Society (BCS) Individual Project Accreditation Requirements

1.1. Seminars

There will be a series of seminars during Semesters 1 which will provide further information and advice regarding the different stages of the project. It is important you attend, they are designed to help you with your project. The seminars will take place during semester 1 typically every two weeks starting in week 3 on Thursdays at 3pm.

Seminar topics are likely to include:

- Project Management
- Evaluations and Ethics
- Writing your Report
- Library resources for your project

2. Project Timetable

Project Suggestions Released	14/08/2019
Self-suggested project definition sent to co-ordinator	20/09/2019
Project choices due	20/09/2019
Project allocation Available	25/09/2019
Project progress report due	25/11/2019
Project progress presentation	17/01/2020
Submission deadline	30/03/2020
Project Demo Day	01/04/2020

3. Choosing Your Project

There are two ways for you to choose your project.

1. By choosing projects that have been suggested by members of staff.
2. By suggesting your own project.

Each year, members of staff within the Department propose a number of different project suggestions which are listed on the project suggestions page
https://local.cis.strath.ac.uk/wp/extras/projects/showCS408.php

You may also suggest your own project. If you would like to suggest your own project, your suggestion should:

- Gain support of at least two members of staff willing to supervise your project
- Be approved by project co-ordinator for appropriateness. Projects which are too similar to those suggested by staff will not be considered appropriate.

Failure to gain approval and/or adequate support for a student-suggested project means that you will not be able to carry out the suggested project and will be required to follow the normal project choice process. Students considering suggesting a project of their own must obtain the support of two supervisors and email the project co-ordinator by the deadline indicated on the project timetable, copying in the potential supervisors.

The process for choosing your project from staff suggestions is as follows.

1. You will be expected to choose six projects from those listed on the project suggestions page, unless you have organised a student-suggested project and have formal approval from the project co-ordinator. In this case, only your student-suggested project needs to be submitted via the Project Choices web interface.
2. You must **not** choose projects that are clearly specified as inappropriate for your degree.
3. You must list no more than two projects suggested by the same member of staff.
4. For each project you choose, you are strongly advised to discuss it with the member of staff that suggested it. The reason for this is that your understanding of a project proposal may not be what the supervisor had in mind.
5. Your project choices should be submitted in order of preference. However, it is possible that you may not be allocated any of your choices.
6. If you do not comply with the above, you may be allocated a project at random.

There is no guarantee that the member of staff that suggested a project will end up supervising that project and although reasonable effort will be made to ensure that you are allocated one of your chosen projects, this cannot be guaranteed.

4. Progress Reporting and Version Control

4.1 Progress Reporting
The responsibility rests with you (rather than with your supervisor) to obtain regular guidance on what is appropriate.
You are required to keep your supervisor informed of your progress on a weekly basis. In person meetings are expected every two weeks, with email updates in the alternate weeks. It is essential that you do not lose contact with your supervisor. The supervisor is required to inform the project co-ordinator if contact is not made regularly.

Project development should use a suitable version control system to maintain a source code repository and organise the revisions that will be undertaken throughout the course of the project. Ideally this should be the Department provided GitLab.

5. Project Progress Report

Around week 10 of semester 1, a project progress report is due. This report is assessed by your supervisor, and provides an opportunity for structured feedback on your project progress and plans. It is worth 10% of your overall project mark. You can find the deadline for the progress report in 2. Project Timetable. You can find the marking rubric in Project Progress Report Assessment.

The purpose of this report is to present the background and scope of your project, and with feedback at this point, allow for adjustments to be made to ensure you have the most opportunity to refine and achieve the best you can for the project.

Submission of this is completed through the appropriate assessment activity on MyPlace. The submission should contain the following:

A report (maximum 12 pages) covering:

- Project Aims and Objectives (approximately 1 page)
- Related Work Chapter (approximately 5 pages)
- Project Specification (approximately 2 pages)
- Project Plan including summary of progress – ideally includes some prototype development (approximately 2 pages)
- Brief summary of proposals for Development Methodology, Design, Implementation, Testing and Evaluation including proposed technologies to be used (approximately 2 pages).

The page count of 12 is exclusive of bibliography and appendices.

The text should be the default font for latex (computer modern) or Word (Calibri light) and should be size 11, which is the default for both latex and Word. An equivalent san serif font in size 11 from alternative word processing software is acceptable.

Supervisors will be encouraged to provide some high level feedback prior to submission.

The progress report will be assessed and feedback provided within 3 working weeks. All feedback and marks will be released at the same time through MyPlace. Feedback will take the form of a filled in rubric, and a short paragraph aiming to indicate what was done well and what could be improved.

It is important to note that late submissions, with the exception of those where mitigating circumstances apply, are not accepted. If you submit late with no or insufficient personal circumstances, then a mark of 0 will be applied for the progress report.

6. Project Progress Presentation

6.1 Guidelines for Preparing Your Progress Presentation
The purpose of this submission is to demonstrate that progress has been made with your project, your plans, and to highlight any changes that may have been made as a result of feedback on the

interim report submitted in Semester 1. It also explores your ability to present your project and demonstrate depth of understanding.

The presentation is worth 10% of the project mark, and is assessed by the second marker. The date of the presentation can be found in 2. Project Timetable . Details of the marking rubric can be found in Project Progress Presentation Assessment

This deliverable takes the form of an electronic presentation with a maximum of 10 slides. The presentations will be presented on the computers in the 11th or 12th floor lab. The slides should briefly summarise the following information:

- Aims and Objectives
- Summary of Related Work
- Project Specification
- Progress to-date
- Approach to Development – Methodology, Design, Implementation and Technology ideas
- Testing and Evaluation plans

In addition, the slides must contain your name, the title of the project, the name of your project supervisor, and the name of your second marker.

The slides should be submitted through MyPlace, as a single PDF file, using the appropriate assessment activity by 9am on the day of the presentation.

When thinking about how you will evaluate your project, you should also consider whether or not you will require ethical approval for your evaluation (see the section 7. Evaluation and Ethics Approval) and ensure you take this into account within your project plan.

The Project Progress Presentation should be submitted by the date of the progress presentation day *in electronic form* through the Projects MyPlace page. Your second marker will provide feedback on the day, and will also provide feedback via MyPlace.

6.2 The Project Progress Presentation Day
Each student will be required to be present either during the morning or afternoon (although you may wish also to be present for the other half of the day, to see what your classmates have done for their projects).

- The morning presentations typically take place between *11am* and *1pm*.
- The afternoon presentations typically take place between *2pm* and *4pm*.

You will be allocated a 20-minute slot during which the presentation will be assessed by your second marker. It is advised you aim for 10 minutes presenting, and 10 minutes for discussion.

The purpose of the progress presentation day is for you and your second marker to review the progress, understanding and plans for the project. The slides are just used as a visual aid to facilitate discussion. The review aims to discuss:

- The appropriateness of the proposed design for your project with respect to your project aims and objectives.
- Your technical understanding of the project, including the main challenges involved and the risks associated with it.
- Your progress and plans for the execution of the project.

Other staff and students may also wish to view the presentation and investigate the projects currently being undertaken in the department. For this reason, you should be prepared to talk about your project with a variety of visitors.

It is important to remember that your progress presentation day performance is part of the overall assessment (see the section 11. How Your Project is Assessed) of the project.

During the project presentation day, comments will be provided by your second marker, giving their overall impression of the approach taken, your understanding, the progression to date, and work plan, and including advice on the maintenance or revision of existing patterns of work or on possible alternative lines of development.

The progress presentation will be assessed and written feedback provided within 3 working weeks. All feedback and marks will be released at the same time through MyPlace. Feedback will take the form of a filled in rubric, and a short paragraph aiming to indicate what was done well and what could be improved.

It is important to note that late submissions, with the exception of those where mitigating circumstances apply, are not accepted. If you submit late with no or insufficient personal circumstances, then a mark of 0 will be applied for the progress presentation.

Some Presentation Hints, adapted from Dr. David Harle, EEE:

- Discuss your project with your supervisor. They are there to help.
- Use a mix of diagrams and text in your presentation.
- Do not be afraid to use colour, but use it sparingly.
- Choose presentation font sizes and styles so that your presentation is readable at arm's length.
- Review the overall effect of your presentation with your supervisor, and perhaps friends and family members.
- Take time to become very familiar and comfortable with your presentation before the presentation day. Prepare a brief description of your project that answers the question "What is your project about?"
- You may also find it beneficial to prepare notes that you can use to elaborate on your presentation. Past students have reported that this has been very helpful to them.

7. Evaluation and Ethics Approval

As part of the evaluation of a project, you may want to involve a community of users or pseudo-users. Before testing which involves human subjects can be undertaken, you must obtain clearance from the Departmental Ethics Committee.

In order to obtain ethics approval you should use the Ethics Approval system to provide the following information:

- Title of research:
- Summary of research:
- How will participants be recruited?
- What will the participants be told about the conduct of the research?
- How will consent be demonstrated?
- What will participants be expected to do?
- How will data be collected, and how will it be captured and stored?
- How will data be processed?

- How and when will data be disposed of?

The form should be submitted well in advance of any planned study. Requests are normally processed within one working week, but may take longer than this for more complex studies or at certain times of the year.

The following list gives additional guidance for answering (some of) the above questions. Further guidance can be found via the Ethics in CIS web page.

1. You should say who will be asked to participate and how subjects will be selected.
2. You should say what will be asked. The only effective way to convey this information is to submit the information, release forms, and/or questionnaires that the subjects will get when they agree to participate in your evaluation.
3. You should say whether the subjects will be filling in questionnaires or giving verbal responses during the evaluation, and whether or not there are any pressures or obligations for the participants to complete the evaluation study (there should be none);
4. You should say how the results will be published. No personal data should be published, and results should only be used anonymously and in the project report.

8. Project Report Writing Guidelines

8.1 Introduction

The report of the work which you have done in your final year project is the principal means by which that project is assessed. Whilst your supervisor will have fairly detailed knowledge of your work, this is not true of other examiners. They have only your description of the work to go on. It is therefore essential that you spend time in producing a good report which presents your work in the best light possible.

It is most important that your report documents an engineering or scientific approach. The reader must be convinced that you have solved a practical problem in a professional and methodical manner, making appropriate and justified use of computer science techniques and technologies throughout.

A good final year project report should be detailed enough to allow the examiner to assess your work, and yet should not be so detailed that it is excessively tedious to read. You should make a point of outlining your general approach to the problem you are solving, as well as describing your solution in enough detail that the reader can verify that your solution *is* a solution and understand why it is a *good* solution. You should also highlight key or innovative work in the body of the report. Details not needed to understand your overall solution or its significance (e.g., detailed design documentation and test cases) should be relegated to your report's appendices.

8.2 General Advice

Obviously, the report which you produce is highly dependent on the work which you have done. No two reports will be the same or have exactly the same structure. However, the general guidelines set out below will tell you what should normally be included.

For your particular project, it may be appropriate to include chapters or appendices other than those indicated below. The general structure described should not be taken as the only possible one. If you have any questions about the structure of your report you should discuss them with your project supervisor. You are strongly advised to let your supervisor read and comment on your report before you submit it.

Whilst writing style – even scientific writing style – is a very personal attribute, remember that your style should be such that the reader will find your work reasonably interesting and understandable.

It is important that you avoid turgid prose and convoluted constructs. When you have written something, read it back to yourself and, if it sounds confusing, pompous, or otherwise suboptimal, change it! It is almost impossible to write a perfect report the first time around, so make sure you leave yourself plenty of time to revise it. To write a good report, you will almost certainly have to re-draft it several times.

You must make appropriate use of a spell-checker (and, probably, of a grammar checker) – but do remember that such tools are no more than imperfect aids. You should therefore read over your report carefully before handing it in for assessment.

You may find these slides on writing a project report both interesting and helpful.

8.3 Specific Rules

There are specific requirements you *must* meet for the report on your final honours project.

1. *Title Page* You must prepare a title page. The title page must include the following, in the order shown:
   - "Submitted for the Degree of B.Sc. in Computer Science" and the academic year. If you are a SE, BIS, CSL or MCS student, or on an MEng degree, you should adjust the title of the degree accordingly.
   - The project title
   - Your registration number
   - Your name
   - "Except where explicitly stated all the work in this report, including appendices, is my own and was carried out during my final year. It has not been submitted for assessment in any other context." followed by your signature.

2. *Disclaimer* You are also *asked* to add a second, signed disclaimer, namely

   "I agree to this material being made available in whole or in part to benefit the education of future students."

   It is possible that you will have been helped in your project by use of material from a similar project in the past, or by having the opportunity to study one or more reports from previous years. This will not be possible, unless you sign a disclaimer which will let your work be used in the education of future generations of students. This is action under the Data Protection Act. It does not affect any possible benefit which may subsequently be gained by you or the Department in terms of commercial exploitation.

3. *Imported Material* You *must* highlight in the body of the report any work, particularly code that is not your own (see the disclaimer associated with the title page). It is essential that no suspicion of plagiarism attaches to your report. It is unlikely in the extreme that the examiners will award a passing mark to any project where plagiarism (as opposed to referenced reporting) is suspected. If you have questions about the difference between referenced reporting and plagiarism in any particular situation, check carefully with your supervisor. See also the University's Student Information Booklet about Plagiarism.

4. *Length* A project report should not exceed 50 pages of main text (1.5 spacing, plus or minus 10%) plus appendices, using a san serif font 11 point, e.g. Calibri with default margins (A4 size with 1 inch edge on every side). There is no restriction on the total length including appendices. **These 50 pages should include the aims and objectives, specification, and background. This can be altered from the submission of the progress report, but will not be marked again.**

5. *Final Submission* Your final submission should be electronic, and submitted to MyPlace by the appropriate deadline as detailed in [2. Project Timetable](#).

8.4 Typical Report Format

The following presents a typical report format. Note that while you should cover these aspects, it is not necessary to name the chapters precisely as follows, they can be adapted to reflect your project.

1. *Introductory Pages* Before the chapters of your report, there should be a number of introductory pages. These should include:
   - o   the title page (see the format described above)
   - o   a page giving an abstract of your work,
   - o   an acknowledgements page, and
   - o   a table of contents.

2. *Introduction* This should briefly describe the problem which you set out to solve and should essentially summarise the rest of your report. The aim of an introduction is to convince the reader that they should read on, so it is very important that excessive detail is avoided at this stage.

   The introduction should include the list of objectives that you identified for the project, as well as a brief overview of the outcome. In its final part, the introduction will usually outline the structure of the rest of the report.

3. *Problem Description and Specification* Describe in detail, with examples if appropriate, the problem which you are trying to solve. You should clearly and concisely specify the problem and should say how the specification was arrived at. You should also provide a general discussion of your approach to solving the project problem.

4. *System Design* In this chapter, you should describe how the project was designed. You should include discussions of the design method, design process, and final design outcome. This is where you include the high level description of the architecture of your project's product and, if appropriate, the design of the user interface and data management.

5. *Detailed Design and Implementation* In this chapter you should describe your design in more detail, taking the most interesting aspects right down to the implementation details. You should include detailed design decisions and trade-offs considered and made, such as the selection of algorithms, data structures, implementation languages, and appropriate tools to support the development process. It should also include your justifications for these choices. In addition, you should describe how you have tried to address relevant qualities of the product produced, such as maintainability, reliability, and user-friendliness. It is not necessary to describe every aspect of your system in excruciating detail, but you should describe each in enough detail that the reader of your report can understand the overall project, and you should thoroughly discuss the most demanding and interesting aspects of your design and implementation.

6. *Verification and Validation* In this section you should outline the verification and validation procedures that you've adopted throughout the project to ensure that the final product satisfies its specification. In particular, you should outline the test procedures that you adopted during and after implementation. Your aim here is to convince the reader that the product has been thoroughly and appropriately verified. Detailed test results should, however, form a separate appendix at the end of the report.

7. *Results and Evaluation* The aim of this chapter is twofold. On one hand, it aims to present the final outcome of the project – i.e., the system developed – in an appropriate way so that

readers of your report can form a clear picture of the system operation and provided functionality without the need for a live demo. This would normally require the inclusion of screenshots and/or images of the system in operation, and indicative results generated by the system. On the other hand, this chapter also aims to present an appropriate evaluation of the project as whole, both in terms of the outcome and in terms of the process followed.

The evaluation of the outcome is expected to be primarily evidence-based, i.e., the result of either an experimental process, like usability tests and evaluations, performance-related measurements, etc., or a formal analysis, such as algorithmic and mathematical analysis of system properties, etc. The precise nature of the evaluation will depend on the project requirements. Please note that if you intend to carry out usability tests, you will need to first obtain approval from the Department's Ethics Committee - the section on [7. Evaluation and Ethics Approval](#) provides further detail.

The evaluation of the process is expected to be primarily a reflective examination of the planning, organisation, implementation and evaluation of the project. This will normally include the lessons learnt and explanations of any significant deviations from the original project plan.

8. *Summary and Conclusions* In the final chapter of your report, you should summarise how successful you were in achieving the original project objectives, what problems arose in the course of the project which could not be readily solved in the time available, and how your work could be developed in future to enhance its utility. It is OK to be upbeat, especially if you are pleased with what you have achieved!

9. *References/Bibliography* The references should consist of a list of papers and books referred to in the body of your report. These should be formatted as for scholarly computer science publications. Most text- and word- processors provide useful assistance with referencing - for example latex uses bibtex. As you know, there are two principal reference schemes.
    - In one, the list is ordered alphabetically on author's surname and within the text references take the form (Surname, Date). For example, a reference to a 2014 work by Zobel would be written (Zobel, 2014).
    - In the other, the list is ordered in the sequence in which a reference first appears in the report.

For both schemes, each reference in the reference list should contain the following information: author, title, journal or publisher (if book), volume and part, and date. Depending of the style of references you use, Zobel's 2014 book might be listed in the references of your report as follows:

[Justin Zobel. Writing for Computer Science. Springer-Verlag, 2014](#).

For more examples of the first style, see the way in which references are laid out in "Software Engineering: A Practitioner's Approach" by Roger Pressman. Note carefully that your references should not just be a list of URLs! Web pages are not scholarly publications. In particular, they are not peer reviewed, and so could contain erroneous or inaccurate information.

10. *Appendix A - Detailed Specification and Design* This appendix should contain the details of your project specification that were not included in the main body of your report.

11. *Appendix B - Detailed Test Strategy and Test Cases* This appendix should contain the details of the strategy you used to test your software, together with your tabulated and commented test results.

12. *Appendix C - User Guide* This appendix should provide a detailed description of how to use your system. In some cases, it may also be appropriate to include a second guide dealing with maintenance and updating issues.

Acknowledgement: These notes have mostly been developed by Mr P. Goldfinch and are based on earlier versions by Dr M. I. Wood and Dr S. Terzis.

9. Project Submission Guidelines

Project Submission Deadline

The deadline for the electronic submission of your project report and code is provided in section 2. Project Timetable .

You should submit **two** files using the submission slot on MyPlace

1. Your **complete project report**, including appendices. This should be in **pdf**.
2. A **single .zip file**. Please create a directory/folder called fourth_year_project. In this directory/folder you should place the items below. You should then create a single .zip file of this directory/folder.
   o   The **entire source code** of the project.
   o   Suitable makefiles (or similar) to enable the complete program to be reconstructed whenever required.
   o   **Any special data files needed** by the project.
   o   **A 'readme' file** which tells the markers **how to run your code** to allow them to better assess it

9.1. Late Projects

Any final project report and code which is submitted after the final Project Report Submission deadline is subject to a **late submission penalty.** The mark for late projects is calculated as in accordance with University policy follows:

Submission up to 1 working day late – reduction of 10% off the mark for the project

Submission greater than 1 working day late, but not later than 7 calendar days after the original submission (see project timetable for precise dates)- a reduction of 5% off the mark for the project per day or part thereof

Any project later than 7 calendar days after the original Monday deadline for submission (without prior extension or personal circumstances) will receive a mark of 0. **Note that this is according to University Policy** see https://www.strath.ac.uk/staff/policies/academic/ for details

The final mark is the result of this calculation, rounded to the nearest integer.

Note that if you pass the project before lateness, then you will be awarded your degree (assuming a pass in all other classes) but the mark with the penalty applied will contribute to your final classification

Projects submitted after the late project report submission deadline (7 calendar days after the deadline) without sufficient submitted personal circumstances will not be considered by the Honours

Exam Board. There is no opportunity to resubmit. This deadline can be found via the 2. Project Timetable.

9.2. Illness and Personal Circumstances

Medical evidence for illness or other personal circumstances can only be accepted if it explicitly states that the illness/personal circumstances has significantly affected your ability to complete the project. All medical evidence and personal circumstances should be brought to the attention of the project co-ordinator as promptly as possible. Request for extensions must be received with accompanying evidence prior to the final project submission deadline.

Please see the University Guidelines on what you should do if you are absent, as well as what you should do if personal circumstances have affected your ability to study.

10. Project Demonstration and Demo Day

Each student is required to demonstrate their project to the second assessor, normally in the presence of their supervisor. The demonstration is expected to last *approximately 30 minutes*. Project demonstrations normally take place on **Demo Day** (see 2. Project Timetable for the date) - a day during which almost all students are scheduled to demonstrate their projects in one of the labs (normally in the 11th floor lab) within the Department. Representatives from industry will be invited to attend Demo Day so the Department can showcase students' projects and to give students the opportunity to talk to different companies about employment opportunities.

It is essential that each student is present for the duration of their allocated slot for their project presentation and Demo day.

It is important to remember that the project demonstration is taken into consideration as part of the overall project assessment (see 11. How Your Project is Assessed*).*

As part of the demonstration, you will be required to give a brief (approximately 5 minutes) informal introductory presentation of your project. This presentation should identify what the project set out to achieve; what its outcome was; what the main challenges faced were; what its main achievements are; and what the areas for future improvement and development are.

The following guidelines apply to project demonstrations:

1. You will demonstrate your project to your supervisor and to your second marker. Normally this will be a single demonstration.
2. Your supervisor may moderate the questions asked by your second marker. Your answers should not be influenced by your supervisor, nor may your supervisor answer questions on your behalf.
3. The demonstration will usually last for thirty minutes.
4. The demonstration will be in two parts:
    o Initially, you will provide a *brief* (about 5 minutes) introductory presentation of your project.
    o Subsequently, you will demonstrate the functionality of the system created, while the examiners may ask questions (and request further demonstrations as required) about the work and its context.
5. The demonstration is to be of the project *as submitted*. Program code, report, etc., *must not* be altered in any way after submission. However, for the purposes of or during the demonstration, you may produce a page or so of new output results to support the presentation.

You should be aware that different markers approach demonstrations in different ways. Some prefer not to have looked at the report at all; some like to have skimmed quickly through some or all of it; some prefer to have studied it in depth. Regardless of the type of markers assigned to a project, you should remember that it is your demonstration, and that you set out to show off the best points of your work.

11. How Your Project is Assessed

Projects are assessed on the basis of the product, process, results and evaluation, presentation, and student performance. They are assessed in three parts; the project progress report marked by the project supervisor, the project progress presentation marked by the second marker, and the final project submission. The progress report and presentation are worth 10% each, and the final submission is worth 80% - totalling 100% of the assessment of the project.

The assessment of the final submission is normally carried out by the project supervisor and a second marker from the department, in two stages. In the first stage, the two assessors independently assess the project. In the second, the two assessors follow a prescribed process for reaching agreement on the overall project mark to be returned (see 11.3. The Project Assessment Process

The assessment is based on a marking scheme (see 11.2. Marking Schemes) that the student and the project supervisor agree on at the start of the project. The marking scheme to be used is included in the Project Scope and Outline Plan submission. There are three alternative marking schemes to choose from, each aimed at a different type of project. Each of these marking schemes is described in 11.2. Marking Schemes . Both the project supervisor and the second marker use the *same* marking scheme.

The three marking schemes include *all* of the components detailed in 11.1. Assessment Criteria. Each of the components is assessed according to the *same* criteria and on the basis of the kind of evidence specified.

Each individual marking criterion is weighted by an associated percentage. The weights of some of the criteria differ between the three marking schemes.

11.1. Assessment Criteria

Student Performance

Student performance is evaluated on the basis of their thoroughness and devotion to work, initiative, organisation, planning and progress, appreciation of project achievement (strengths, weaknesses, and limitations), and potential for further development and extension.

Assessment can be based on aspects such as supervision meetings, the project progress presentation, and the project demonstration.

Project Product

The project product is evaluated on the basis of its functionality and overall quality, as well as on the basis of the supporting documentation produced. More specifically:

1. Design

   The design is evaluated on the appropriateness of design choices such as use of design patterns. How extensible the design is, and how easily it is understood as well as following best practice design principles. It should also demonstrate consideration of alternative designs and justify any choices made. Note this is at the architectural and detailed design level.

2. Implementation

   The implementation is evaluated on the basis of how well it meets the project requirements, the extent to which it incorporates the required functionality, its look and feel, and the organisation and quality of the code produced. This also incorporates project documentation. Documentation can include aspects such as code comments e.g. using JavaDoc, a user manual, and a maintenance guide. The documentation should be comprehensive, of sufficient quality and provide a useful user guide and maintenance documentation.

3. Verification and validation is evaluated based on the quality and appropriateness of the adopted testing strategy, the extent of testing carried out, and the extent to which product reliability and robustness are verified.

Project Process

The project process is evaluated on the extent to which a well-planned and well-organised approach has been followed throughout, on the extent to which alternatives have been considered, and on the extent to which a process informed by best practices has been followed throughout.

Project Results and Evaluation

The project process is evaluated on the extent to which the project product and process are appropriately and critically evaluated, and the appropriateness and quality of the experimental evaluation methodology identified, implemented, and presented.

Report Presentation

The report presentation is evaluated based on how well it presents and communicates the achievements and challenges of the project, as well as on its structure, readability, and language.

The section CS408 Project Mark Descriptors gives a further breakdown of the criteria, and the typical aspects of a performance in each of the classification brackets.

It should be noted that a performance of different classification can be achieved in each of the criteria. The final mark considers the weighting of the criteria for the specific marking scheme selected. This document is provided for guidance only.

11.2. Marking Schemes

There are three marking schemes which weight the assessment criteria as follows.

	Software Development Based	Experimentation-based with Significant Software Development	Experiment-based
Project progress report	10%	10%	10%
Project progress presentation	10%	10%	10%
Product			
Implementation (including documentation as this indicates maintainability)	25	20	10
Verification and Validation	10	5	5
Product Total:	35%	25%	15%
Process			
Methodology, analysis and documentation	5	10	10
Design	10	5	5
Process Total	15%	15%	15%
Results and Evaluation			
	15%	25%	35%
Report Presentation			
	10%	10%	10%
Student Performance			
	5%	5%	5%

11.3. The Final Project Assessment Process

The final project submission is marked by both the supervisor and second marker according to the following procedures.

1. Each assessor assesses the project independently using the agreed marking scheme.

2. The two assessors meet to try to agree an overall mark to be returned for the project. This meeting is moderated by a member of the departmental Teaching Committee in the following cases:

   o The overall marks given by the two assessors differ by 10% or more.

   o The overall marks given by the two assessors cross the 2.1/1st or fail/3rd classification boundaries.

   o If either of the two assessors requests it.

3. If after the meeting the two assessors fail to agree an overall mark to be returned for the project, then the project is marked by a third assessor from the department. This assessor marks the project independently of the original two assessors.

4. A meeting is held between the three assessors, moderated by a member of the departmental Teaching Committee to try to agree an overall mark to be returned for the project.

5. If after the meeting the three assessors fail to agree an overall mark to be returned for the project, then the overall mark returned is at the discretion of the Head of the Department.

6. The External Examiners spend time prior to the Honours and Integrated Masters Examination Board looking at the projects and the marking sheets to ensure that the marking process has been fair.

11.4 CS408 Project Mark Descriptors

Project Progress Report Assessment

Criteria	0 Points	1 Point	2 Points	3 Points	4 Points
Overview of project aims and objectives	No attempt at providing an overview of the aims and objective	A limited attempt at providing aims and objectives, but these are not sufficiently clear or appropriate	A good attempt at aims and objectives, but with clear scope for improvement	A very good attempt at aims and objectives, perhaps one or two small areas for improvement	An excellent attempt at the aims and objectives – they are clearly attainable and are highly appropriate
Background and related work	No attempt at providing a background	A limited attempt at a background and related work has been provided but the depth is very weak. There is no evidence of independent critique and ideas, and many main aspects of the background have been missed out or not covered to sufficient depth.	The depth of background study and analysis of the problem is satisfactory. There is likely limited evidence of independent critique and ideas, but the main aspects have been covered.	The depth of background study and analysis of the problem is comprehensive – demonstrating some evidence of independent critique and ideas.	The depth of background study and analysis of the problem is outstanding – demonstrating high levels of independent critique and ideas.
Project Specification	No attempt at providing a project specification	The project specification is minimal, and not informed by background reading or interviews.	The project specification covers basic requirements, but these require further work e.g. by refinement or additional requirements.	The project specification is very good, it covers the key functionality and there are only one or two small areas for refinement.	The project specification is excellent, the requirements are concise, precise and clearly appropriate for the project.
Project Plan	No attempt at providing a plan for the rest of the project	Some attempt at providing a plan for the rest of the project, but it is limited on multiple fronts such as lack of clarity, inappropriate choices of tasks, or scheduling is unrealistic.	A plan has been provided, but has room for improvement on one or two areas such as lack of clarity, inappropriate choices of tasks, or scheduling is unrealistic.	A clear and appropriate plan has been provided, but there are small aspects which could have been improved.	A highly clear and appropriate plan has been provided, no obvious areas for improvement.
Student Performance	Student has not engaged at all with the supervisor	Student has met with the supervisor, but perhaps only once and they were disengaged	Student has met with the supervisor a few times, but they have required significant direction	Student has met with the supervisor regularly, and has mostly taken responsibility for their project's direction but has required some direction	Student has met with the supervisor regularly and has taken responsibility for their project's direction

Project Progress Presentation Assessment

Criteria	0 points	1 point	2 points	3 points	4 points
Progress to date	Student has made little or no progress to date.	Some progress has been made, but this is very limited, e.g. only completing a background study	Good progress has been made, but there are perhaps one or two areas where further work could have been achieved in the given time.	Very good progress has been made, but with perhaps one area which could have been addressed in the timeframe such as an attempt at a prototype.	Excellent progress has been made, a solid background, requirements, and prototype of some form has been completed
Depth of understanding of material	The student demonstrates extremely limited understanding of the relevant material	Some understanding of the material is demonstrated by the student, but it is limited on a number of fronts such as presenting material which isn't relevant, inaccurate material, or not sufficiently detailed	The student demonstrates a good understanding of the material, but there is definite room for improvement for example in terms of detail, relevance or accuracy	The student demonstrates a thorough understanding of the material, but this could be a little more detailed or relevant to the project in one or two small areas	The student demonstrates an exceedingly strong understanding of the material which is detailed, accurate, and relevant
Project Plan	No significant attempt at the project plan	Plan is very unclear and not appropriate for the project	Plan is clear in places, and somewhat appropriate for the project, but it has significant room for improvement	The plan is clear and mostly appropriate, but there is perhaps one or two small areas for improvement	The plan is very clear and highly appropriate for the project. No obvious room for improvement.
Presentation skills	No significant attempt has been made to present the progress and plan well	The presentation was clear and concise in places, but mostly it could have been improved e.g. better use of visual aids, or better articulation of aspects such as aims and objectives.	The presentation was mostly clear and concise, but had clear areas for improvement	The presentation was very clear and concise, but with one or two small areas for improvement such as better use of visual aids	The presentation was extremely clear and concise, well-articulated, with excellent use of visual aids.

Criteria	0 points	1 point	2 points	3 points	4 points
Ability to answer questions	No significant attempt made to respond to questions	The student made attempts at responding questions, but responses could have been much improved, e.g. answers were inaccurate in places or unclear	The student's answers were mostly appropriate, but with some clear areas for improvement such as improved accuracy and evidence of critical thought	Student answers questions with some confidence, but there's small areas for improvement such as clearer evidence of critical thought	Student answers questions with confidence and accuracy, with clear evidence of independent and critical thought

Project Final Submission Mark Descriptors

Project mark descriptors are presented in the following matrix. Each project aspect has a description which is likely to reflect the sort of performance we would expect at each percentage range in marking.

%	70-100	60-69	50-59	40-49	< 40
Classification	1st	2:1	2:2	3rd	Fail
Student Performance	Student engaged with the project and supervisor in a highly professional manner. They were dedicated to their work and approached all aspects in a methodical and thorough manner. The student demonstrated that they were self-motivated and could critically evaluate their own work.	Student engaged with the project and supervisor in a mostly professional manner. They were generally dedicated to their work and approached many aspects in a methodical and thorough manner. The student demonstrated that they were self-motivated and could critically evaluate their own work.	Student has engaged with the supervisor in a satisfactory manner. There is significant room for improvement. For example, they could seek the supervisor's advice more, arrive on time to meetings, initiate more discussion and take more responsibility for their performance.	Student's engagement with the supervisor is likely to have been limited.	Student did not engage with the supervisor.

%	70-100	60-69	50-59	40-49	< 40
Project Product	The functionality of the product matches the requirements and the functionality demonstrates a high depth of understanding and capability as well as clear original thought. All software produced is of excellent quality – it is highly robust, reusable, secure, easily extendable, correct, well designed and follows best practice. It is accompanied by thorough and useful documentation such as a clear user guide and maintenance documentation.	The functionality of the product mostly matches the requirements and the functionality demonstrates some depth of understanding and capability. Any software produced is of very good quality – it is mostly robust, reusable, secure, easily extendable, correct, well designed and mostly follows best practice. However, there is room for improvement in these areas. It is accompanied by mostly thorough and useful documentation such as a user guide and maintenance documentation.	The functionality of the product matches the requirements in places and the functionality demonstrates some understanding and capability. All software produced is of satisfactory quality. Whilst it is likely to be mostly functional, its quality could be substantially improved. It may be substantially improved in areas such as its robustness, design, reusability, security, extensibility, correctness and use of best practice. It is accompanied by some documentation such as a user guide and maintenance documentation.	The quality of the final product and supporting documentation produced is limited. There is likely a limited implementation which may not adequately match the requirements. The functionality demonstrates limited understanding, only sufficient to warrant a pass mark. It is unlikely to follow best practice. A limited understanding of the material is demonstrated.	The quality of the final product and supporting documentation produced is inadequate to demonstrate sufficient depth of understanding. The functionality is inadequate, and documentation is likely to be minimal.

%	70-100	60-69	50-59	40-49	< 40
Project Process	The depth of background study and analysis of the problem is outstanding – demonstrating high levels of independent critique and ideas. The project specification is appropriate, clear and the background study clearly informs the rest of the project. The architectural high level design and detailed design are of very high quality and choices made are well considered and justified. The testing strategy is appropriate, extensive and has resulted in reliability and robustness being well verified.	The depth of background study and analysis of the problem is comprehensive – demonstrating some evidence of independent critique and ideas. The project specification is appropriate, mostly clear and the background study informs the project in most areas. The architectural high level design and detailed design are of comprehensive quality and choices made are considered and justified. However, there was definite room for improvement in some areas. The testing strategy is appropriate, and has very good coverage but this could have been more extensive. The software has been verified to a comprehensive level.	The depth of background study and analysis of the problem is satisfactory. There is likely limited evidence of independent critique and ideas, but the main aspects have been covered. There is satisfactory evidence of independent critique and ideas. The project specification is appropriate, mostly clear and the background study informs the project in most areas. The architectural high level design and detailed design are of satisfactory quality and choices made are sometimes considered and justified. There is definite room for improvement in some areas. The testing strategy is mostly appropriate, and has satisfactory coverage but this could have been substantially more extensive. The software has been verified to a satisfactory level.	The depth of background study and analysis of the problem is limited. There is likely no evidence of independent critique and ideas, and some main aspects of the background have been missed out. The project specification is not entirely appropriate or clear and the background study only marginally informs the project. The architectural high level design and detailed design are of limited quality and choices made are not often considered or justified. The testing strategy is limited, with a restricted range of coverage. The software has been insufficiently verified and is likely to be insufficiently robust and/or correct.	The depth of background study and analysis of the problem is very weak. There is no evidence of independent critique and ideas, and many main aspects of the background have been missed out or not covered to sufficient depth. The project specification is not appropriate or clear and the background study is unlikely to inform the project. The architectural high level design and detailed design are of weak quality and choices made are not considered or justified. The testing strategy is extremely weak or nonexistent. The software is unlikely to be verified or validated.

%	70-100	60-69	50-59	40-49	< 40
Project Results and Evaluation	The project results and evaluation are in-depth, appropriate and demonstrate critical and independent thought. The evaluation methodology identified is the best approach for the project and it has been implemented and presented to an outstanding standard. The evaluation is extremely thorough and the quality of the analysis is very high.	The project results and evaluation have some depth to them, but it is unlikely to be consistent. Some critical thought has been displayed, but this is likely to be limited. There are likely to be a few areas for improvement. The evaluation methodology identified is an appropriate approach for the project and it has been implemented and presented to a comprehensive standard. However, there are likely to be clear aspects for improvement. The evaluation is thorough in places and the quality of the analysis is very good. There are likely to be clear areas for improvement.	The project results and evaluation are of satisfactory depth, with one or two substantial clear aspects for improvement. The evaluation methodology identified is a satisfactory approach for the project and it has been implemented and presented to an acceptable standard. The evaluation is limited in its scope, and analysis leaves room for improvement.	The project results and evaluation are of limited depth, with many substantial clear aspects for improvement. The evaluation methodology identified is likely to be unsatisfactory or insufficient. The evaluation and analysis is very limited in scope.	The project results and evaluation are weak. A minimal attempt is likely. The evaluation and analysis are inadequate in scope and may not be appropriate for the project.

%	70-100	60-69	50-59	40-49	< 40
Report Presentation	The report communicates all appropriate aspects of the project in a clear and organised manner. It demonstrates a clear, critical and reflective thought process. It is also highly literate and very easy to read.	The report communicates most appropriate aspects of the project in a mostly clear and organised manner. It demonstrates a critical and reflective thought process. It is also literate and relatively easy to read. There are likely to be one or two larger aspects which could have been improved.	The report communicates most appropriate aspects of the project in a somewhat clear and organised manner. It demonstrates satisfactory critical and reflective thought processes. It is also mostly literate. There are clear areas for improvement.	The report is likely to have missed appropriate aspects of the project and is likely to be somewhat disorganised and often unclear. It is unlikely to demonstrate a critical and reflective thought process. It is illiterate in places. There are clear areas for substantial improvement.	The report is likely to have missed many appropriate aspects of the project and is likely to be very disorganised and unclear. It demonstrates no critical and reflective thought processes. It is often illiterate. There are many areas for substantial improvement.

12. British Computer Society (BCS) Individual Project Accreditation Requirements

12.1 Individual projects

An individual project is an expectation within undergraduate, integrated masters, and Postgraduate Masters programmes. Students must be provided with written guidance on all aspects of the project, including selection, conduct, supervision, milestones, format of the report and the criteria for assessment.

All projects should reflect the aims and learning outcomes which characterise the programme to which they contribute as set out in the programme specification.

12.2 Project reports

Projects must involve the production of a report which should include:

- elucidation of the problem and the objectives of the project
- an in-depth investigation of the context and literature, and where appropriate, other similar products (this section is likely to be emphasised less for an IEng project)
- where appropriate, a clear description of the stages of the life cycle undertaken
- where appropriate, a description of how verification and validation were applied at these stages
- where appropriate, a description of the use of tools to support the development process
- a critical appraisal of the project, indicating the rationale for any design/implementation decisions, lessons learnt during the course of the project, and evaluation (with hindsight) of the project outcome and the process of its production (including a review of the plan and any deviations from it)
- a description of any research hypothesis
- In the event that the individual work is part of a group enterprise, a clear indication of the part played by the author in achieving the goals of the project and its effectiveness
- references

12.3 Undergraduate individual project requirements

It is expected that within an undergraduate programme, students will undertake a major computing project, normally in their final year and normally as an individual activity, giving them the opportunity to demonstrate:

- their ability to apply practical and analytical skills present in the programme as a whole
- innovation and/or creativity
- synthesis of information, ideas and practices to provide a quality solution together with an evaluation of that solution
- that their project meets a real need in a wider context
- the ability to self-manage a significant piece of work
- critical self-evaluation of the process

In the event of this major activity being undertaken as part of a group enterprise, there is a requirement that the assessment is such that the individual contribution of each student is measured against all the above learning outcomes.

For accreditation for CITP or CEng, the individual project should be worth at least 30 credit points at level 6 or above. The project must be passed without compensation.

For accreditation for IEng the individual project should be worth at least 20 credit points at level 5 or above. The project must be passed without compensation.