

# CS3010 Individual Project – Assessment guidelines

## 1. General Principles

All projects will be assessed under five broad aspects that are relevant to all CS3010 project topics and embrace all of the work that such projects require. The five aspects are *contextual investigation/background research, project process and professionalism, the deliverable, evaluation and reflection*, and *exposition*. The meaning of these terms is elaborated in section (3).

A significant variability is to be expected, and indeed, encouraged amongst CS3010 project topics. Topics can range from the development of a practical software system to solve a particular problem or satisfy a user need, to more theoretical projects that make novel contributions to Computer Science questions. The defining characteristic that ensures that a project is relevant to the educational needs of CS3010, is that it must engage with at least one major software development lifecycle stage. The acknowledged software development lifecycle stages are Requirements, Design, Implementation, Verification and Maintenance. A project that falls within the scope of CS3010 is one that makes a significant contribution to at least one of these lifecycle stages for a particular piece of software or a class of software programs. For example a project that investigates theoretical aspects of user behaviour with a view to make recommendations for designing new software is a valid CS3010 project. Equally valid is a project that proposes a new methodology for improving software verification. Supervisors are expected to steer students towards valid projects. If any doubt arises about the suitability of particular topics, these must be referred to the module leader.

An assessor's mark for any particular aspect will be determined by reference to a set of descriptors that relate various characteristics that the work falling under the aspect may exhibit to applicable mark ranges. The overall mark reported by an assessor will be derived from a weighted sum of the marks for the five aspects. To allow for legitimate variation in the nature and orientation of CS3010 topics, a supervisor may (within specified limits) vary the weight attached to each aspect and communicate these adapted weightings to the second assessor. An assessor should, in the first instance, derive a mark from the descriptors for the five aspects (sections (5)-(9)) then compare their initial overall mark with the overall descriptors given in section (10). Any substantial inconsistency will suggest a need for further consideration of the assessment.

## 2. Operational Procedures

Two assessors will proceed independently. Each assessor will give a numerical mark for each of the five aspects, taking account of both the project report (including supporting material such as code listings on an accompanying CD) and the oral examination where the student will present their deliverable. By applying appropriate weights to the aspect marks, each assessor will then derive an overall mark. The standard aspect weights will be 0.2, **0.2**, **0.3**, 0.15, **0.15** (respectively). A supervisor may vary those weights where justified by the nature of the project, though not outside the ranges 0.15-0.30, 0.15-2.5, 0.25-0.35, 0.10-0.20, 0.10-0.20 (respectively); variations will be communicated to the student during the course of the project. Any such variation will be communicated to the second assessor and the module tutor prior to assessment of a project. A brief, written justification of the changes should be kept with the other assessment documents. The mark given for each aspect and the overall mark should be supported by brief written statements.

The two assessors will subsequently attempt to reconcile their views to produce an agreed overall mark recommendation. If there is a discrepancy of 7% or more in the original independent assessments or a fail mark is agreed, a written explanation will be given. If an agreed mark cannot be achieved, a third assessor (nominated by the Subject Group Convenor or the Associate Dean for Undergraduate Programmes) will be consulted. If the three assessors thus involved

remain unable to reach an agreed recommendation, the matter will be referred for resolution to the relevant examination board.

### 3. Project Aspects

All completed projects complying with the module specification for CS3010 will include activities falling under each of the five aspects, although the proportion and nature of the work under each aspect will properly vary between projects. For example, it is likely that projects with a real-world client will justify a higher proportion of work on contextual investigation, for instance, in order to carry out thorough business and requirements analysis. Similarly, it is likely that research-based projects will justify a higher proportion of work on background research and evaluation. Each of the five aspects corresponds to a specific question about the project (in the boxes after each aspect heading). The mark for each aspect depends on how satisfactorily that question has been answered by the student's work.

#### 3.1 Contextual Investigation / Background Research

*“What is the project trying to achieve, why that is important and how is it different from previous work?”*

This aspect is the *initial* exploration or research needed before a well-founded solution development or experimental/practical research activity can commence. The tasks involved will depend on the nature of the particular project. For example, projects with a real-world client will usually need a business analysis, which should motivate subsequent formal requirements elicitation. Similarly, research-based projects (including those investigating computing techniques) will need a review of previous academic research and any associated practical work in the relevant area, which should provide motivation for the design of subsequent research strategies/experiments aimed at achieving enhanced insight into the relevant areas and/or techniques. In either case, appropriate broad objectives for the remainder of the work should be established.

*Evidence for assessing contextual investigation/background research will be found primarily in the Background chapter of the project report.*

#### 3.2 Project Process & Professionalism

*“How did the student plan to achieve the deliverable?”*

Project process refers to the process by which the project was completed, and includes the management of the project. In the case of software development projects, for example, it typically will involve a range of software lifecycle activities, including: requirements analysis; architectural and user interface design; usability testing; etc. For such projects, a variety of formal artefacts may be produced – for example, requirements specification, use case analysis, domain model, class diagram, sequence diagrams, storyboard, navigation structure, and test plan. Similarly, for research-based or investigative projects, the process will typically involve identification of the research question or focus of investigation, experimental/study design, research tool design, and results analysis, discussion, and, where applicable, recommendations/guidelines.

- Evidence to support professionalism will be found in the project diary. The diary is a record of the project process and progress and should include: minutes or notes for each supervision meeting; dates when the Project Definition Form and the Interim Report were discussed with the supervisor and submitted; a record of a meeting where the Interim Report was discussed and the feedback given;
- notes about key decision points and decision rationale and outcomes; and dates when major stages of the work were initiated and completed – the major stages may be the requirements, design, implementation, etc., or iteration 1, iteration 2, etc. depending on

the methodology chosen for software development projects; for research-based or investigative projects, major stages are likely to reflect the key process activities.

*Evidence for assessing project process and professionalism will be found primarily in the Preparation chapter of the project report and the project diary.*

### 3.3 Deliverable

*“What did the project actually produce?”*

In general, this refers to the outcome or deliverable that arises as a result of the practical execution of either a software engineering process or research/investigative activities.

For software development projects, this is the implementation of an end product, including testing and some documentation. There may be one or more prototype iterations. The aspect may include experimental application of an end product derived from the lifecycle activities.

For research-based or investigative projects, this is the analysis of results obtained from practical experimental sessions or from other investigative procedures. Typically, this will return models, recommendations, or guidelines from which clients or future researchers can benefit.

*Evidence for assessing practical execution will be drawn from the project report (including documentation provided on CD and/or in appendices) and the project oral examination.*

### 3.4 Evaluation and Reflection

*“How do we know if the deliverable met its goals?”*

This aspect embraces all activities and thought aimed at gaining a well justified summation of what the project work has achieved and what may be learned from it. Systematic, evidence-based comparison of project outcomes with objectives and broad norms of quality is fundamental. Regardless of project type, the merit of methods/approaches employed (e.g., any particular software processes and tools used or research/investigative methods adopted) should be considered and compared with possible alternatives. Limitations of the project work achieved should be considered. Lessons learned should be outlined, along with scope for, and desirability of, further work/research. Where there is a client, wherever possible input should be obtained from the client, and an assessment made of the value that the client could derive from the project outcome.

For software development projects, the usability of an end product intended for a client or any other form of user should be assessed.

For research-based or investigative projects, the significance of results obtained should be evaluated.

*Evidence for assessing the evaluation and reflection aspect will be drawn from the Evaluation and Conclusion sections of the project report, and from material elsewhere that may or may not provide support for any claims made.*

### 3.5 Exposition

*“How well was the project work presented?”*

Exposition covers activities aimed at conveying information about and understanding of the project to others. The primary vehicle for exposition is the project report, which needs organised and cogent description, discussion, and justification of objectives, context, activities and outcomes, supported by suitable formal documentation (e.g., formal design artefacts or experimental design).

An accurate reference list is essential, with further bibliography where applicable. A high standard of presentation and clarity is important and should be secured through good choice of methods of exposition and accurate use of language. A well organised and informative demonstration/presentation will also contribute to this aspect.

*Evidence for assessing exposition will be drawn from all sections of the project report and relevant qualities of the project demonstration/presentation (e.g., clarity/organisation, ability to give clear answers to questions, etc.).*

#### **4. Detailed Descriptors: Preamble**

In the following, the statement against the specific mark of 40 is an attempt to identify the pass threshold standard for the particular aspect. A mark of 30-38 should be given for an aspect where the relevant threshold is demonstrably missed but there is sufficient merit that the failure to reach the expected standard may reasonably be compensated by strength in other areas. Work more substantially short of a threshold should be given a mark below 30 that reflects the extent of the failure, having regard to the overall descriptors given for the ranges 0-19 and 20-38.

Descriptors pertaining to higher marks should be taken to include (at least) the level of achievement implied by descriptors given for lower marks for the same aspect.

#### **5. Descriptors for Contextual Investigation/Background Research**

40 The origins and purpose of the deliverable are coherently described. Any previous work or research that the project directly relies on is cited. Any client associated with the work is identified.

41-49 There is evidence of an investigative element, but the outcome is presented in a purely descriptive and/or unstructured manner with little or no indication of critical thought, and/or is excessively limited in scope, having regard to the project topic.

50-59 Related practical and/or academic work is reviewed, with some evidence of systematic and/or critical thought, with relevant references cited. Where applicable, the business context and processes of a client are set out in sufficient depth to motivate the work in general and a range of specific objectives. For research and investigative projects, aims and objectives are clearly stated. There will be a suitable description of the motivation behind the project.

60-69 There is substantial evidence of systematic investigation and critical thought, whether in reviewing previous work/research or in pursuing business analysis or in motivating subsequent work/research, as applicable. How the results of the contextual investigation/background research relate to and influence the development of the deliverable is clearly established.

70-79 There is evidence of both thoroughness (e.g., in attention to detail and scope) and depth of insight into the problems raised by the development of the deliverable and the range of objectives that the development pursued.

80+ Most of the accessible, recent, and substantial precursor work or research is formally cited and critically reviewed, probably with some original insights that augment the motivation for the present work/research. Business analysis (where relevant) shows a detailed understanding of a client's business and the related wider business environment, with the project work placed in the context of critical review of existing processes, preferably coupled with suggestions for process improvement or new processes. Background research analysis shows a deep understanding of the research space and the related 'bigger picture', with the proposed research placed in context and its need well justified. In summary, evidence of work at the forefront of current knowledge and/or professional practice.

90+ In terms of style of presentation, thoroughness and insights offered, the section would not be out of place in a very good PhD thesis.

## 6. Descriptors for Project Process & Professionalism

*The record of the project process, including the artefacts, should be consistent with the deliverable and provide evidence of the key stages occurring in the project.*

*For a mark in one of the higher ranges to be awarded, the material submitted should show that an organised process (be it software development or research/investigative) has been pursued and contain relevant (formal) artefacts which provide direct evidence of the nature and quality of the work done.*

40 Normally: in the case of software development projects, at least two software lifecycle stages towards the project objectives have been completed with significant success; in the case of research/investigative projects, at least research/investigative question identification and process design have been completed with significant success.

41-49 There is work towards the design of a deliverable showing significant knowledge of, and ability with, recognised lifecycle activities drawn from at least two lifecycle stages or understanding of, and ability with, recognised research practice.

The relationship between processes and artefacts and any theoretical material included in the report is likely to be limited and weakly evidenced.

50-59 Work leading to the deliverable has followed recognised stages – e.g., analysis, design and implementation for software development projects and experimental/study design and application for research projects – but probably with errors or omissions in application. Relevant formal artefacts (e.g., design documents, method descriptions) have been produced, though probably with significant flaws.

There is evidence that processes and artefacts have taken account of any theoretical material included in the report (though probably not entirely successfully or accurately).

60-69 Recognised development or research/experimental processes have been proficiently applied. Artefacts are in good style, showing consistent and effective attention to the need for quality. For research/investigative projects with an experimental element, experimental design is well reasoned and sound.

There is clear evidence that processes and artefacts accurately reflect the recommendations of any theoretical material included in the report.

70-79 The development or research/experimental process shows insight and innovation. There is strong evidence of consistent attention to quality.

80+ Artefacts or research methods are of a near-professional standard. It is likely that the work has led to insights allowing the original expectations of the work to be exceeded.

90+ Exceptionally high levels of professionalism that approach those of a senior IT professional or an experienced post-doctoral researcher.

## 7. Descriptors for Deliverable

*What has been achieved should in broad terms be confirmed by both the report and the demonstration/presentation, and both should be taken into account in deriving a mark for this aspect.*

40      *Normally*, some major objectives of the work have been achieved, resulting in a functional or research/investigative deliverable. *Exceptionally*, a rational, credible explanation for failure to achieve a functioning or research/investigative deliverable has been adduced.

41-49   In the case of a software development project there is a deliverable with functionality exceeding the threshold expectation; in the case of a research/investigative project, there is a deliverable with usefulness/insight exceeding the threshold expectation.

50-59   There is a deliverable that broadly meets the objectives of the work, though probably compromised by a range of factors such as (for software development projects) usability flaws, poor reliability, or gaps in functionality or (for research/investigative projects) gaps in coverage, limited analysis, poor level of recommendation.

60-69   There is a deliverable that substantially meets the objectives of the work, normally with minor flaws only. For research projects, research/experimental design is well reasoned and sound.

70-79   The deliverable shows insight and innovation. There is strong evidence of consistent attention to quality.

80+      There is a deliverable characterised by, for software development projects, a very high standard of functionality and usability, coupled with originality, and for research/investigative projects, a very high standard of analysis. It is likely that the work has led to insights allowing the original expectations of the work to be exceeded.

90+      The project far exceeds ordinary professional standards. For software development projects the deliverable is a unique, finely crafted piece of software, indispensable for its user base. For research projects the results are of publishable quality to a top tier Computer Science journal or conference.

*Note:* If the (properly agreed) deliverable of the project is other than a software implementation or research results analysis and associated recommendation (e.g., a formal IT strategy), the above descriptors should be modified appropriately (e.g., replace ‘functionality’ with ‘utility’).

## 8. Descriptors for Evaluation and Reflection

40      The outcome of the work has been reviewed, with opinions expressed as to the successfulness of the work as a whole.

41-49   There is some evidence of systematic evaluation, e.g., comparison of outcome against objectives for a number of requirements or against research hypotheses or goals in the case of research projects.

50-59   There is, for software development projects, evidence of systematic evaluation, e.g., comparison of outcome against objectives over a broad range of requirements, and attention to a wider range of issues, e.g., usability and process, as well as functionality. Client-based projects cite client views. For research/investigative projects, there is evidence of systematic evaluation such as comparison of outcomes against research objectives and/or research hypotheses, critical reflection on the research methods used, comparison of data sets, etc.

60-69   Evaluation is systematic and conducted in a manner consistent with any theoretical discussion included in the report. Evaluation is evidence-based, e.g., includes user or client feedback obtained in a systematic manner, statistical investigation of reliability or other matters, comparison of research data sets, etc. There is evidence of reflection on project processes and outcomes, including (where applicable) the value of the outcome to a client.

70-79   Evaluation processes show evidence of careful design. There is substantial evidence of reflection on the processes and outcomes of the work, leading to exposition of insights gained from the work.

80+ All the above has been undertaken to a high standard of rigour and thoroughness. Insights gained are substantial and show innovative thought.

90+ Evaluation exceeds best practice in professional engineering or international state-of-the-art research.

## 9. Descriptors for Exposition

*Submissions at all mark levels are expected to comply with the rules on quoted material defined for CS3010 (see Appendix A). All direct quotations of English text must appear in quote marks. All quotations of any kind must be referenced.*

*Where the characteristics of a report generally fall into a particular descriptor range but the report suffers from deficiencies in identification of quotations or referencing, e.g., failure to reference a limited amount of non-original material, the matter may be dealt with by a separately stated deduction from the mark for the exposition aspect, in the range **10 to 35**. The assessor should give specific reasons for the mark deduction, which should include identification of representative examples of relevant failings.*

*However, if the assessor believes the extent or nature of the failings may indicate a deliberate attempt to gain unfair advantage, or are so substantial as to amount to “reckless disregard” of expected academic practice, the assessor is required to report the work for investigation under the University’s Regulations on Student Discipline and Assessment Offences.*

40 The report secures meaningful communication of the content and outcome of the work, notwithstanding the presence of major defects, e.g., some or all of the following: regular errors of English (possibly occurring on every page); numerous spelling or typographical errors (typically on every page); substantial repetition and/or irrelevance; substantial gaps in the account; poor ordering of material; a standard of presentation (e.g., layout, fonts, headings) so poor as to actively detract from communication.

*The student attended and engaged with a project oral examination.*

41-49 The report has an apparent structure and addresses all major areas of activity, though it may be unbalanced in the attention given to particular aspects and is likely to exhibit many of the flaws given in the threshold descriptor.

Some theoretical material may be included, but is likely to show only limited relevance to practical work or research evidenced in the material provided for assessment (report, CD, demonstration).

50-59 The report presents the work/research in a logical order with reasonably balanced attention given to all major areas of activity. Some of the flaws listed in the threshold descriptor are likely to be present, though with a lower frequency of errors. Presentation is clear with only occasional flaws. There are some useful examples and diagrams. Use is made of formal references and bibliography.

Any theoretical material included is broadly relevant to practical work/research evidenced in the material provided for assessment.

*In the project demonstration/presentation, the student was able to explain the broad purpose of the project and some detailed aspects.*

60-69 The report includes substantial reasoned argument as well as statement of facts. The style of writing is appropriate to formal scientific or business communication. There may be occasional English or spelling errors, but not such as to hinder clear communication. Examples and diagrams are employed as a systematic aid to effective communication. Use of formal references, bibliography and appendices is appropriate.

Any theoretical material included is well chosen and shows a high standard of relevance to practical work/research evidenced in the material provided for assessment.

*In the project oral examination, the student showed a good grasp of the work/research at overview and detail levels and was able to give reasoned answers to questions.*

70-79 The report can be described as very well written: all the expected material is expounded in a well organised manner, with repetition and irrelevance avoided. Supporting arguments show evidence of careful, systematic and/or innovative thought. The presentation of the report is of a consistently high standard.

80+ Writing is concise (even elegant) as well as thorough and precise. There are essentially no flaws in English, typography or presentation. Examples and diagrams are truly illuminating. Use of formal references and bibliography is meticulous.

90+ Overall quality of report in all respects resembles a very good PhD thesis.

*The demonstration confirmed the student's depth of insight into the work/research and capacity for innovation and/or original thought.*

## 10. Overall Descriptors

0-19 Fragmentary or almost wholly ineffective activity.

20-38 Work/research that provides evidence of relevant knowledge and skills, but deployed on such a limited scale or in such an ineffective manner that the threshold standard for the module has not been achieved. For example, software lifecycle activities have been undertaken, but there is no functional deliverable or any other form of appropriately reasoned outcome, or there is an operational deliverable but it satisfies few or none of the identified objectives and/or is totally compromised by lack of usability. For example, standard research activities have been undertaken but there is no meaningful deliverable or any other form of appropriately reasoned outcome, or there is evidence of applied research methods but the deliverable satisfies few or none of the research objectives and/or makes no contribution to scientific knowledge. Alternatively, the report lacks any coherent structure or totally fails to address major areas of activity. 36-38: See notes below.

39 See notes below.

40-59 Work meeting the threshold standard required by the module, but by reason of lack of scope or proportion or scale of flaws, not achieving the target standard.

40-49 Expected activities have been undertaken, but at a minimal standard of competence and understanding leading to barely acceptable outcomes: e.g., expected software lifecycle activities are pursued, but in such a way as to lead to an end product that meets a limited subset of the original objectives and is seriously flawed in its usability; e.g., research activities are pursued, but in such a way as to lead to a deliverable that meets objectives in a limited fashion and makes no meaningful contribution to knowledge. The work has been meaningfully described.

50-59 Expected activities have been undertaken in a manner that shows a clear grasp of what is required and leads to a broadly acceptable outcome that has undergone evaluation. The work/research has been systematically reported. However, the practical work/research and/or the report show significant weaknesses, e.g., limited scope, unsatisfactory usability, unsatisfactory analysis, poor organisation, etc.

60-79 Work of the target standard for the module spanning a range from good to excellent.

60-69 Work producing a sound outcome: for example, in the case of software development projects, a deliverable substantially meeting project objectives, with no major flaws in usability; for example, in the case of research/investigative projects, a deliverable and analysis that



substantially meet project objectives, with no major flaws in practical application. The scope of the work reasonably reflects the student hours appropriate to a 40-credit module. The outcome has undergone evidence-based evaluation. The work has been carefully reported, with observation supported by reasoning.

70-79 Work/research distinguished by evidence of a deeper level of understanding, insight and innovation, and with very few (if any) clear flaws.

80+ Exceptional work/research approximating a professional standard (either academic or practitioner) that a member of academic staff would be satisfied to have produced themselves.

90+ The quality of the project in all aspects exceeds professional standards. In research projects the findings are publishable to international top-tier journals or conferences and have significant impact to state-of-the-art.

## Notes

Having selected a particular descriptor as giving the most accurate reflection of what has been achieved for a particular aspect, the assessor should choose an appropriate numerical mark by judging where the work falls in the range covered by the descriptor. A central or “standard” rating should be recorded as a mark ending in 5. Where work is judged to lie exactly on the boundary between adjacent descriptors, the mark given should be the lower end point of the range for the higher descriptor (e.g., 60, if the relevant ranges are 50-59 and 60-69).

In accordance with School rules, an overall mark of 39 should not be given. Any case for a mark in the range 36-38 should be carefully reviewed to determine whether, on balance, there is in fact sufficient evidence of suitable work to justify a threshold pass mark (40).

The 40 threshold is intended to correspond to work approximating the **threshold honours standard** identified in the QAA Computing Benchmark. Similarly 60 is intended to reflect work at the Benchmark’s **modal honours standard**.

## Appendix A – Extract from CS3010 student guidance

### Quotations and referencing

Any material in your report that comes from an external source is called a **quotation**. The nature of the material does not matter – whether it is English text, program code, diagrams, or a mixture, if it is taken from an external source, it is a quotation. The nature of the external source does not matter – it may be a textbook, a website, a reference manual, whatever – if material in the report comes from anywhere except your own mind, it is a quotation. All quotations **must** be clearly identified as such. English text quotations **must** be enclosed in double quote marks “...”, whether the text is a short phrase, or one or more sentences or paragraphs. Quotations of a paragraph or more should preferably be made to stand out better by indenting the text from the left margin and/or putting in the text in italics, as well as enclosing it in “...”.

Near to (usually immediately after) a quotation of any kind, you must include a reference code which links to full details of the source of the quotation, which must appear in the **References** section of the report. In the preferred *Harvard* system, a reference code usually takes the form (Author date), e.g., (Barnes 2004). It is **not** sufficient simply to list your sources in the **References** section – **all** quoted material must have an appropriate reference code close to where it is used and preferably include the page number from which the quotation was sourced.