UOW Malaysia KDU Penang University College

Computing Final Year Projects Handbook

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CCP3012: Individual Project 1
CCP3026: Individual Project 2

Department of Computing

2020

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INTRODUCTION

This Handbook
The project handbook gives you essential information about your final year project, including what you are expected to do to fulfil the requirements of the course, what support you will receive, and the project-marking scheme. You are advised to read it carefully and to do what it says.

Introduction to the Project
The project is an 8-credit course with a notional student workload of 320 hours. This means that it is your largest final-year course, and has a significant effect on the outcome of your degree. It takes place over two semesters.

Your project course will provide you with the opportunity to do a major computing-related project, which will make use of the skills you have gained on your course. It is 'major' in the sense that it is of significant size and intellectual challenge. You will be carrying out a substantial amount of practical work using your computing skills. This may comprise the development of a product, or investigative work that draws on your skills.

You will be provided with a supervisor for your project. This person will provide guidance during the project period on the progress of the work, the direction of the study, and the quality of work carried out. You have the opportunity to choose a supervisor: if you have no preference for a particular supervisor you will be allocated a supervisor early in semester 1.

One of your first tasks is to choose a topic for your project. Some supervisors will have suggested project ideas, or you may suggest a topic yourself. You will also decide between the two possible structures for your project, each of which has a different marking scheme. These are called "Application Project" and "Investigative Project". This gives you the opportunity to choose the type of project that best suits your topic.

Aims and Learning Outcomes
The project courses are designed to provide an opportunity for the expression of individual energy and ability in completing a significant item of work related to the aims and objectives of the course. For Application Projects, this must include the creation of a significant computing product and may also involve practical investigation of a research question. For Investigative Projects, it will focus on the practical investigation of a research question, using skills and knowledge relevant to the student's programme, and may also involve the creation of relevant deliverables.

On completion of their project course, students should be able to:
1. Construct a problem statement working from unstructured ideas.
2. Plan, schedule, monitor and control the conduct of a small project.
3. Identify and critically review relevant literature.
4. Create specification documents based on the analysis and design of a system.
5. Apply appropriate skills, methods and tools to the specification and execution of a significant piece of practical computing research or product development relevant to the student's programme.
6. Critically evaluate their own work.
7. Communicate the findings of a small project by verbal presentation / demonstration and written report.

OVERVIEW OF THE PROJECT PROCESS

Allocation of Time Between Semesters

You will take 4 credits in each semester. Choosing a good topic usually needs several weeks of thinking time and a good deal of discussion between student and supervisor. For this reason, a project briefing is held at the end of the previous academic year, so that students can start this thinking process in good time.

Semester 1

Your project begins when you find a supervisor, choose a topic, and record a few basic ideas about what you are going to do on a Project Initiation Document, which is really an agreement that you will work with that supervisor on that topic. (See the section on the Project Initiation Process.)

The work in Semester 1 will centre on planning the project, analysing the problem that you are working on, and establishing the requirements for a product or defining a research question and approach. Towards the end of the semester you will begin your practical work.

Early in the first semester you will produce a Project Proposal document, which will summarise what your project is all about. At this point, you must choose which project structure you are following. Your supervisor and a second marker will give you some feedback on the Project Proposal so that it can be revised if necessary. As part of the Project Proposal process, you will also gain ethical approval for your project, and carry out a risk analysis if this is needed.

Later in the first semester, you will submit to your supervisor a draft version of some early chapters of your project report, the "analysis" chapters, and the deliverables associated with this stage of the work, so that your supervisor can give you helpful feedback on your work to date.

The analysis includes a review of relevant literature, and other content, as required for your type of project. By the time your draft analysis is submitted, you should have a good understanding of the problem, and a vision of how to solve it. You will know in outline what your product will look like or the shape that your investigation will take. Product design or detailed planning of investigative work then begins, and you will agree with your supervisor what deliverables you will have completed by the start of semester 2. For example, you might aim to produce a draft of your software design, or a detailed plan for your investigative work, ready for feedback from your supervisor.

Semester 2

During the second semester you will finish solving your project problem, which will include producing and testing your product or carrying out your investigative work and analysing the results. You will also complete the project report.

Towards the end of your second semester, you will submit the project report for assessment. You also submit your product, if your project has one. Before the end of the semester, you will have a viva, given by your supervisor and a second marker and lasting 30-40 minutes. This consists of a short demonstration of your product or a presentation of investigative work, followed by a question and answer session to assess your understanding of the work. The viva is assessed; it is also an opportunity to assess a product or other practical work. Your viva will take place between report submission and the end of the end-of-semester assessment period. The assessment schedule is arranged so that, as far as possible, other assessments are not due at the same time as the project report.

See the section on Assessment for more details of the project deliverables, and the course schedule for submission dates. Further details of project activities will be given in later sections.

Use of time

An important part of doing a project is monitoring your progress and managing your use of time. One tool to help you is the project plan that you will draw up when you write your Project Proposal. As your project develops, you will be using your logbook to track the work that you have done, and comparing your progress to your project plan. When you meet with your supervisor each week, you will review the past week and set objectives for the week to come. Make sure that you record in your logbook the amount of time you have spent each week and the tasks that you have completed. This will be very useful when you evaluate how you have managed your project. You should also keep an eye on your project plan and revise it if this proves necessary.

Try not to let your project get behind schedule in Semester 1. The formative submissions in Semester 1 are essential to the smooth running and successful completion of your project, and opportunities for valuable feedback. The submission dates given are a guide to where you ought to be at each point if you are not to be short of time later in the project. You are advised to treat all dates given in Semester 1 as the *latest* by which you should complete that part of the work: aim to hand in your documents as soon as possible and move on.

It is to your advantage to complete semester 1 deliverables as early as possible, as this will give you more time on the later stages. Late completion of the Project Proposal or analysis chapters should be considered as a serious threat to the success of your project. Failure to complete the analysis on schedule and begin the practical work as planned is the most common cause of problems later in the project, as your other courses will give you very little spare time in which to catch up on late work.

COURSE SCHEDULE

Semester 1

Teaching Week	Key Events & Deliverables
1	**Induction week.**
2	**Notify projects lecturer of supervisor choice by 25th September 2020**
3	**Upload Project Initiation Document (signed and scanned) to Canvas by 2nd October 2020, before 3PM.** *Students without a supervisor will be assigned one by the start of week 3 and may submit their PID as soon as possible afterwards.
4	Second markers will be allocated by **9th October 2020.**
5-7	**Project proposal preparation**
8	Submit **Project Proposal** to supervisor/lecturer by **2nd November 2020, before 3PM**
9 & 10	**Project Proposal reviews*** *Send drafts of Project Proposal to second marker at least 2 working days before the Project Proposal review.
11	**Project proposal revision after proposal review**
12	**Upload revised Project Proposal to Canvas by 30th November 2020 before 3PM**

Semester 2:

Teaching Week	Key Events & Deliverables
1 - 8	Work on project according to project plan.
3-4	This is a good time to review your project objectives and marking criteria with your supervisor, and make any necessary revisions.
9	Arrange with supervisor when you will get feedback on final chapters.
11	Submit **project report and CD** by **4pm, Thursday Week 12.** (Two copies of report and CD to the submissions office, and report uploaded to Turnitin.)
On/After Week 12	**Viva session** to be completed by **Week 13-14**. Hand in **evidence file** at viva. Arrange with supervisor how they will give you marks and feedback.
	Marks* and feedback available from supervisor: **from Week 18**

*All marks are provisional until approved by the Examination Board.

LECTURE SCHEDULE

Semester 1

Teaching Week	Topic
1	Project Proposal
2	Working on the project
3-4	No lectures
5	Research methods
6	The Literature Review
7	Analysis topics including requirements specification
8-12	No lectures

Semester 2

Teaching Week	Topic
1	Semester 2 briefing
2	Synthesis
3	Software Testing
4	Evaluation
5-10	No lectures
11	Preparing for the viva
12	No lecture

ASSESSMENT AND DELIVERABLES

Deliverables
The deliverables required for project marking are:
- A project report (including relevant product documentation or other deliverables as appendices),
- A product (for Application projects only), *or*
- Agreed deliverables to support and illustrate investigative work (Investigative project only)
- A viva.

The contribution of these to the course mark is shown in the marking scheme for each type of project. Full details of the requirements for the project report can be found in the marking schemes and further advice is given in the sections of this handbook that deal with the report.

The standard formatively assessed and deliverables are:
- A Project Initiation Document,
- A Project Proposal document,
- A draft of the analysis part of the project report and associated deliverables (e.g. a requirements specification).
- An evidence folder containing your logbook, all copies of data etc.

These are required to provide formative feedback, for effective project management.

What to Submit:
The dates for these submissions are shown in your course schedule.

By the due date early in Semester 1, upload a copy of the Project Initiation Document, signed by you and your supervisor, to Canvas.

After the Project Proposal Review and before the due date, please upload the following to Canvas:
- The final agreed version of your proposal. This should contain any changes requested at your Project Proposal review and should have been signed to show that it has been reviewed and agreed.

Main Report Submission

When submitting the project report and any product, you should submit the following:

- **Two bound copies** of your project report, in the standard covers available for printing on the elp (print on card or add a see through plastic cover page if you want a firmer cover)
- **Two copies of a CD/DVD** containing (in separate, clearly labelled directories):
  - An electronic copy of your report
  - The product, or agreed deliverables from Investigative projects.
  - Any supporting data or other evidence not included in the printed report.
  - A copy of your logbook

The above are handed in at the submission desk. You must also submit

- An electronic copy of your report (including appendices) to Turnitin, using the link on Canvas. This is used for checking originality. You will be able to get an originality report of your work before uploading the final version.

Please write whether this is an Investigative Project or Application Project on the report cover, under the title.

One copy of the CD/DVD should be firmly and safely secured (for example in a wallet) inside the back cover of each copy of the report.

For a software product or software which is an investigative project deliverable, your CD/DVD should contain the source code, plus any relevant data files and other product deliverables, together with anything else that you needed to give your demonstration of the product; excluding system software such as operating systems, compilers, web servers, etc. The product directory should include a "readme.txt" file that specifies the environment in which your product is meant to run and any other relevant information. Include in the "readme" file instructions on how to load and start your product. If you can create an executable version of your product that can be set up to automatically self-load and run from its directory, you should do so.

One copy of the report will be returned to you with your feedback; the other is retained by the Department.

At the Viva

The viva must take place before the end of your second semester assessment period. It is your responsibility to arrange to meet your supervisor and second marker for the viva at a mutually convenient time during the weeks indicated in the schedule.

You are not expected to make major changes to your product or deliverables between submission of the report and the viva, but minor fixes to a product (e.g. to enable it to be demonstrated) are acceptable. These should be pointed out to the markers at the viva. Investigative project deliverables should be demonstrated in the same state as when the investigation was carried out.

Please note: if you do not attend your viva, it may not be possible to assess the product or practical work, and you may receive a product mark of zero or marks may be lost from other sections of the marking scheme.

At the viva, you should give your **evidence folder** to your supervisor. This is a binder or folder that contains:

- Any consent forms given by project participants,
- All copies of all data derived from or relating to individuals, other than anonymised copies that are bound into your project report, and any other data that could be considered confidential in any way. This includes any data on CD etc.

At the front of the folder, you should include a checklist of contents; a copy will be found at the end of this report.

The **viva** is typically a 30 to 40-minute session. In the first 15-20 minutes you will demonstrate and explain what you have achieved in your project. In the remaining time you will answer questions from your supervisor and second marker about the work you have done and your project report. One of the aims of the viva is to prove that the work is your own.

The exact content of the demonstration/viva will depend on the project topic.

For Application projects, the focus will be on demonstrating the product in a way appropriate to that product. For software products, this must be a demonstration of the software. You may wish to give a brief overview of what you are about to demonstrate, but long introductory talks and the use of many PowerPoint slides are strongly discouraged. Your supervisor and second marker will usually appreciate the chance to try the product themselves. Other products should be demonstrated in an appropriate way, e.g. a walkthrough of design documents.

For Investigative projects, the first part of the viva may be a 15-20minute presentation, optionally with slides, covering the research question / subject of the investigation, the approach taken, and the results and conclusions. Alternatively, you may explain the work that you did by means of a demonstration. This will cover your experimental setup, deliverables constructed, how you used tools, or other aspects as appropriate to your project. In some cases, a combination of these approaches may be appropriate. You should discuss the form of the viva with your supervisor.

Project marking is subject to internal moderation: a small sample of vivas are attended by a moderator in addition to the supervisor and second marker. The moderator is an observer whose purpose is to ensure consistency between markers: he or she does not participate in the viva and is not there to assess you.

Deadlines and Extensions

The submission date for the project report and the final date for the viva are formal assessment deadlines. If you are unable to hand in your report due to extenuating circumstances, you should apply for an extension at the Student Office in the usual way, before the deadline. If you are unable to complete the viva by the deadline given in your schedule, an extension is also required unless the delay was at the markers' request. Such extensions are subject to the normal rules governing extensions for assessed work. If you need to make a claim for Personal Extenuating Circumstances, you should be sure to do so before the deadline for claims, which will be publicised by the Office.

Other submissions are informal but late submission must be agreed with the supervisor, and you should consider yourself behind schedule if you are late.

As a computing student, you are expected to take regular backups of *everything* that you produce into multiple backup options (cloud, HDD, flash drives, DVDs etc.), whether it is part of your project report or

your product, or data or deliverables related to investigative work. You should make fall-back arrangements to cope with emergencies such as printers failing when printing out a vital document.

The loss of any part of your project report or product immediately prior to a hand-in deadline will <u>not</u> be accepted as a reason for extenuating circumstances or a postponement of the hand-in.

SUPPORT AND SUPERVISION

Staff involved in the project
- ***Supervisor***. Each student is assigned a supervisor, whom they will see on a regular weekly basis to discuss the project. It is this person to whom the student should direct all their questions, problems and concerns, and who will provide the student with support, guidance and direction.
- ***Second Marker***. The student will usually meet with this person twice: when the Project Proposal are reviewed, and during the viva. Their function is to ensure that the project is appropriate and well-balanced, and to do this they must be distant from the project in order to keep things in perspective. They will often not be specialists in the topic area of the project since this is unnecessary, and may even be counter-productive. Their specialist knowledge is the "effective execution of good projects".
- ***Projects Lecturer***. Their duty is to manage the overall process of final year projects, and to handle any particular problems that may arise, such as ensuring that a student has supervision in the event of their supervisor leaving the University. The Projects Lecturer also delivers the project induction and organises other lectures during the year.
- ***Internal Moderator.*** As with other courses, assessment of projects is subject to moderation. A sample of vivas will be observed by internal moderators.

Supervision
Throughout the project, you are expected to see your supervisor every week during the teaching periods. You will be expected to keep a log of progress of the project. This is done in the logbook which you will find bound together with this handbook. One logbook page is completed for each meeting. Before the meeting, you should record in the logbook what you have done since the last meeting, and how long you have spent on the project. In the meeting, you and your supervisor will use the logbook to record your next set of agreed tasks and any other points of note.

Responsibilities of Supervisor and Student
The basic principle is that it is the student's project, and the student is responsible for achieving a good standard of work.

Specific responsibilities of the student are:
1. To agree on a schedule of weekly meetings with the supervisor and to attend those meetings;
2. To read the project handbook and marking schemes, attend project lectures, and understand the requirements of the course.
3. To keep the project Log Book up to date and to take it to every meeting with the supervisor;
4. To give the supervisor drafts of work for feedback throughout the project;
5. To submit by the due dates all project deliverables;
6. To inform the supervisor of any problems arising out of the work;
7. To arrange the Project Proposal review meeting and the final project viva with the supervisor and second marker;
8. To follow and observe good practice in the use of computing facilities, the handling of data, and in dealing with anyone who participates in the project.

The responsibilities of the supervisor are:
1. To give guidance about the nature of the project and the standard expected, about the production of the Project Proposal, about literature research, about techniques and methods, and about any problems of plagiarism.
2. To ensure that the proposed project exhibits the appropriate attributes expected of a final year honours project on a computing degree.
3. To hold ***weekly*** tutorials with the student at a regular agreed time.

4. To record the student's attendance at project meetings and inform the Faculty Office of any attendance issues.
5. To ensure that the logbook is kept up to date.
6. To be accessible, within reason, at other times for giving advice to the student.
7. To request evidence of progress and to ensure that the student is aware of any inadequacy of progress or of standards of work below those expected.
8. To provide constructive criticism on any work presented, including advice on how it may be improved. Note that it is not possible to predict grades reliably from individual components of a project or before the project is complete, and that neither the supervisor nor the second marker will be 'marking' draft submissions.
9. To encourage the student to produce early draft chapters of the project report, to comment on them critically and return them promptly. (However it is the student's responsibility to write draft material; if they do not do so they lose an opportunity for formative feedback).
10. To communicate the agreed marks and written feedback to the student.

The management of the project is ultimately the responsibility of the student.

Project Lectures
The course includes a series of supporting lectures covering aspects of the project process. These will answer many of your questions about the project and provide guidance about important topics, such as how to write a literature review, software testing, and research methods.

Note that these classes do not run every week. A lecture schedule is included with the Course Schedule; any revisions will be published on Canvas.

Feedback
Feedback on draft deliverables is given throughout the project, as you show them to your supervisor. This may be in the form of verbal comments, annotations to your documents, or comments in your logbook.

Two particularly important points at which formative feedback is received are the Project Proposal review, when your supervisor and second marker will give you written and verbal feedback on your Project Proposal document, and when you submit the draft of your whole analysis section to your supervisor. These are important deliverables as they show that your work has a firm foundation.

Your marks and feedback will be available from your supervisor, who will prepare a feedback sheet for you. A date will be set shortly after the end of the assessment period for return of feedback: we do not release marks until everyone has completed their viva. The exact date will be announced in Semester 2. Please do not ask your supervisor for marks before this date.

RESOURCES

Many students develop products on their own computers or at a client site. Remember that you will need to be able to demonstrate the product at your viva. Alternatively, you may wish to work in one of the labs. Any software that is to be installed on lab machines must be cleared with the IMC department. If you need specialist equipment, you should discuss its availability with your supervisor as soon as possible.

TYPES OF PROJECT

The Project Structures

Each project must be in an area directly related to computing. All projects must involve the use of practical skills related to your course, and either the development or a computing-related product or practical investigative work. ***Pure written reviews are not acceptable***. Depending on the nature of the project, the focus of the work may vary. The type of work allowed includes a range of possibilities, including the production of software, the construction of hardware, the development of process models, methods and algorithms, the design of computer games, forensic investigations and experimental work.

To allow the widest possible choice of appropriate projects to be assessed, there are two possible structures for your project, each of which has its own marking scheme. They are equivalent in difficulty but have different emphases. This allows you to choose a project that suits your particular interests and strengths. You will need to make a firm decision between them in your Project Proposal.

The **Application Project** places emphasis on the development of a product to a high standard, using appropriate tools and techniques and following a particular process model. You will produce a significant application product. The product is a piece of software with thorough supporting analysis and design deliverables. For example,

- Production-quality software or an advanced prototype, solving a real world problem.
- A challenging piece of design or implementation that can be solved by standard techniques without needing a wide literature review.

The product will normally involve you in the following aspect of development: requirements specification & analysis, design, implementation, testing. A high standard of work is required throughout the development lifecycle. You will carry out a *short* review of literature relevant to a problem you are solving or its context, justify your choice of tools and techniques, and perhaps investigate similar products that already exist. You should be able to identify a clear topic for the literature review. Appropriate tools and techniques should be chosen, and these will vary according to the nature of the product and the general approach taken to development – there is a wide range of possibilities.

For an Application project, the product itself is an important way of demonstrating your understanding of the established techniques that you are using. You will need both to follow good application processes throughout the development process, and to show understanding of what you are doing through the discussion in your report. The product will include an extensive set of requirements, analysis, design and testing deliverables as well as the software, and the higher weighting of the product in the marking scheme reflects this effort. The deliverables to be produced are agreed in the Project Proposal. The project report is shorter than the other project types, and has a strong focus on discussing and justifying the product deliverables. Further information about the type and extent of deliverables required is given in the section on Software Products.

Choose this type of project if the main focus is on producing an excellent software product using established techniques and sound application practices. Students whose programmes do not give the necessary analysis, design and development skills are advised not to choose this type of project. This may be a good choice for projects carried out for an employer or other real-world client. You will need to carry out a focused literature review on a topic that will help you to create your product.

The **Investigative Project** is designed to support research or investigative work that does not involve making a significant product. You will need to define a research question, hypothesis or problem to be investigated. Formulating a good question or problem is vital to a successful project. You will also carry

out a substantial review of relevant academic or technical literature, aimed at helping you to define your research question or your approach. You will then design a piece of research or an investigation and carry out the necessary practical work to investigate your question, using skills that are relevant to your course. Examples of this kind of project might include the design and execution of an experiment to compare algorithms or test the performance of a network protocol, a usability study, a forensic investigation, or similar. Note that you may not do an entirely written review: there must be significant practical work using computing skills relevant to your course. You are also not permitted to carry out research that consists entirely of survey work, though this may form part of your investigation along with other approaches. (This is to ensure that the course will meet the learning objectives of your programme and the requirements of our professional bodies.)

If you choose this option, you should expect to put a significant amount of effort into the practical investigative work. You will need to look into research / investigative methods and select those suitable for your project. You may need to become acquainted with the issues involved in the design of experiments, including ethical issues. Whatever kind of investigation you undertake, you will need to conduct it to a good standard, following any relevant guidelines for good practice and ethical conduct. You are likely to acquire a significant amount of data, and must consider how this is to be analysed to produce meaningful findings, and how you can acquire the skills to do this if you do not already have them. You are likely to create deliverables to be used in the research, e.g. a test rig, a small piece of software or database, etc. These are not a separate element in the marking scheme: they are assessed as part of the 'synthesis' element of the report, and you will define what they are in the Project Proposal.

If the necessary deliverables that you will make to support your investigation will comprise a significant computing product, you should choose the Application Project instead, to reflect the effort involved in this part of the work. If you are considering an Investigative project in order to avoid doing any practical work – think again!

Marking Scheme Comparison

The next page shows a comparison of the main elements of the two marking schemes. Note that the Investigative Project does not have a separate 'Product' mark: practical work is included in the report marking scheme.
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MAIN COMPONENTS:

Application Project		Investigative Project	
Semester 1 (Weighted @ 20%)		**Semester 1 (Weighted @ 20%)**	
Project Proposal	100%	Project Proposal	100%
Semester 2 (Weighted @ 80%)		**Semester 2 (Weighted @ 80%)**	
Report	40%	Report & Practical Work	90%
Project Outcome	50%	Viva	10%
Viva	10%		
Total	100%	Total	100%

For Semester 2, Each of these elements is further broken down as follows:

Report		Report	
Abstract & Introduction	5%	Abstract & Introduction	5%
Analysis	30%	Analysis	20%
Synthesis	30%	Synthesis: Discussion	20%
Evaluation & Conclusions	30%	Synthesis: Practical Work	30%
Presentation	5%	Evaluation & Conclusions	20%
Total	100	Presentation	5%
		Total	100%

Product	
Fitness for Purpose	40%
Build Quality	60%
Total	100%

Viva		Viva	
Presentation / Demonstration	50%	Presentation / Demonstration	50%
Discussion	50%	Discussion	50%
Total	100	Total	100

FINDING AN IDEA

There are three main sources of project ideas:
- Your own idea;
- A potential supervisor's idea;
- An idea from a client.

Your Own Idea

You may have a very general idea about the type of thing you want to do, or maybe something very specific. In either case, you should identify a potential supervisor and talk with them. The two of you may then be able to refine the notion into a valid project. The supervisor will guide you in producing a sound project idea, or may refer you to a colleague who has a particular interest or expertise in the area that you have chosen. The Project Lecturer will provide a list of potential supervisors on Canvas. There is a repository of past projects on Canvas, and the Library has some older reports; these may give you an idea of the sort of thing that can be tackled successfully.

Supervisor's Idea

Very often supervisors have their own project ideas. These are typically well thought out and will be acceptable projects. Most supervisors will have experience of running projects and so will be aware of the requirements for a good project. Supervisors are encouraged to post their ideas and interests on Canvas at the start of the year. If you are not sure about what you want to do, talk to a supervisor with interests in areas that match your own.

Ideas from Clients

You may have contacts with organisations or companies who have ideas for potential projects – usually, these are for software development projects. Occasionally clients are found within the University. Generally, it is always an advantage to have a real client for a project. You will then have true requirements for your software. The client will insist upon aspects of the software you may have been tempted to avoid. Clients may support you in terms of resources - software or hardware. However, you should always bear in mind the additional ethical and professional requirements that working with an outside organisation may impose.

You are advised to be careful about the client's expectations. For example, they may have different timescales to yours, or the product they want might not be achievable or suitable as the outcome of an academic project. *You must ensure that the product is suitable for a university project*, even if it differs from what the client wants. (Students have sometimes resolved this dilemma by producing a suitable product for their university project, and then after the project's completion, developing it further to what the client wants.) If the client's requirements change, they may drop your project. (This has happened, even with clients who appeared totally committed to the project at the start.) *You should always have a fallback plan that allows you to continue with a suitable project even if the client has to withdraw from the project, partially or fully.* The client needs to be aware of your main purpose in undertaking the work, namely to get a high project mark!

DEFINING YOUR PROJECT TOPIC

Test your project ideas by discussing them with potential supervisors and colleagues; be prepared to listen and take their advice if necessary.

The project should stretch your abilities. The type of work you undertook for projects and assignments at lower levels of your degree or diploma is not going to be appropriate. There must be a level of difficulty for this project that reflects the expectations of a final year honours degree. You need to find a balance between a topic which is too difficult to attempt in the time and with your particular skills and abilities, and one that is too simple to gain you good marks.

Choose a topic with which you have some familiarity. You are expected to accept the burden of learning new techniques/skills/knowledge, but if you know little of the topic or take on too much new learning you may not be able to generate a reliable plan or learn the requisite skills in the time available. It's quite in order, for example, to learn a new programming language, but you will need to build time to do this into your project plan. If you have any doubts, consult your supervisor.

Be clear with your aims and objectives: these form the yardstick against which your work will be judged. Your project should support, complement, and/or extend your other final year studies. You will need to identify the key decisions that you will have to make and/or the main technical or other problems that you expect to have to solve. If you cannot identify any, it is likely that the project is either not sufficiently challenging to lead to a good report, or too difficult for a project of this scale. Your supervisor can advise you about this.

You will need to be able to identity what you are investigating in the project. All projects include a critical review of literature relevant to the topic or the problem being solved: you will need to be able to define the subject of this review and it is advisable to start identifying relevant literature as soon as possible – if only to make sure that there is some! Make sure that you can explain how your literature review will support the project work.

Ensure that you plan to evaluate your work in a rigorous fashion. Your evaluation should be of both the technical merits of your product **and** the way you undertook the project (e.g. the progress you made with respect to your project plan). Investigative projects will include evaluation of the work done and of the significance of the findings.

Remember that the project is more than just the creation of a piece of software or other product. Ensure that the topic offers room for the development of an academic report. You need to be able to show a deeper understanding of what you are doing. This means that you need to be able to put the work into context, to think about alternative ways of doing things, to justify choices and to evaluate your work. Any idea for the project must provide a vehicle for you to do these things. You should choose the project type that best suits your topic.

Application Project
Even though this type of project places more emphasis on the product itself than on the report, the product you choose should present you with enough challenge to enable you to write a report that demonstrates your ability to choose between alternative design and implementation solutions and gives scope to comment on matters of technical interest. It should have a technical problem to solve or other interesting aspect requiring investigation that can be the subject of a brief investigation in the literature. Trivial applications should be avoided; this needs to be a significant application in terms of scope or difficulty.

Tackling a real world problem often adds to the level of challenge. See also 'Further comments on software products' below.

Investigative Project

An investigative project must have a defined problem, research question or hypothesis that you will be investigating. You will need to put thought into defining exactly what this will be, and consider what will be involved in carrying out a meaningful investigation or piece of research. You should make sure that any specific equipment that you need will be available.

It is important that there will be sufficient practical work for you to do, whether hands-on use of tools, creation of a test environment, usability-focused work with a number of experimental participants, or other investigative tasks. Remember that your study *must* involve practical work on your part using skills related to your course. It is not acceptable just to write a 'dissertation' based on the literature about your topic – you actually have to do something. Any survey work or other questionnaire must be only part of the work that you are doing: projects where survey work is the main focus are not permitted.

If your plans involve other people as participants in your research, you will need to be able to find these people. You should consider whether you will need a DBS check (sometimes necessary if you will have contact with children or vulnerable adults) or approval from any official body (often needed for projects related to the NHS, or local authorities). Both these processes take time, and may well make a project infeasible or too risky if they are only begun at the start of Semester 1. Some companies also have lengthy processes for approving projects, so if you have a client organisation, be sure to ask about this.

You must ensure that this is a Computing project. A particular source of difficulty is where projects slip into areas that have more to do with related disciplines, such as psychology, sociology or even health. Checking the type of literature that you will be reading may be a useful indicator, and if you are in any doubt, you should discuss the matter with your supervisor.

What is a hypothesis?

If yours is an Investigative project, you may decide to define one or more hypotheses in the course of planning your work. A hypothesis is a statement that is related to your research question, and that can be tested. Researchers define hypotheses that reflect theoretical ideas or explanations for something that they have observed, so that they can investigate whether these ideas are valid. For example, in investigating the research question 'How do coding standards help programmers?' you might suspect that 'programmers will locate variables in code more rapidly if a consistent naming standard is followed,' and devise a series of experiments to test this hypothesis. Or you may be investigating the best design for buttons in user interfaces, and set up an experiment to test the hypothesis that 'buttons with visible borders are identified more quickly than those without'. In computing, a lot of research effectively uses the hypothesis 'doing x can solve problem y' – or perhaps, 'technique x can be used to build products of type y' - whether this is stated or not! Hypotheses are often written so that they can be refuted (disproved), as this can be simpler than proving that something is always true.

Typically, a hypothesis will describe a relationship between something that we can manipulate in our research, called an **independent** variable, and a **dependent** variable that we believe is affected by it. In the second example, we can manipulate the border design, and the time to identify the button would be the dependent variable that we would measure. We might also have a **null hypothesis** that 'there is no relationship between the presence of a visible border and the time taken to identify a button.' A null hypothesis is disproved if a significant relationship is found.

Your project lectures will discuss issues to do with designing research, but you should also be prepared to read about this.

SOFTWARE PRODUCTS

All application projects will have a software product. A software product is not only a working program. ***The deliverables from your requirements, analysis, design and testing processes are also part of your product.***

You are expected to use an appropriate life cycle model in producing the product. This will normally involve requirements specification, design, implementation and testing. A sound set of requirements and a good design are essential for the success of the work. The details of the approach, e.g. what models are built, will be chosen to suit the problem. Whilst all products should be engineered to a good standard and be fit for their purpose, the product for an Application Project must demonstrate a particularly thorough engineering process, carried out to a high standard. The marking scheme reflects this additional engineering effort. (See 'Application Product Deliverables) below.)

Note on Web-Based Projects
Web-based development projects must involve the application of a variety of computing skills. A web-based project whose main focus is the development of a software product must include the use of other software tools, e.g. programming in an appropriate server-side or client-side language, extending default CMS functionality by writing custom code components, or linking to a significant database application. In such projects the non-web aspects should normally dominate. Merely presenting a set of information in static web pages is not an acceptable project; neither is an application that consists solely of simple data retrieval, or developing a product entirely by using standard facilities of a content management system. (A simpler website may be an appropriate deliverable for an Investigative Project, as challenge and academic rigour are provided by the investigative work.)

Note on Projects Involving Prototypes
In a project involving only 320 hours of effort, it is usually impossible to produce a fully functional product. Thus almost all project products are in some sense a prototype. However, the work should be complete in that it demonstrates the feasibility of the idea and must implement the major functionality identified in the analysis phase.

Some students use the term prototype as an excuse for producing a trivial or poor quality product, and for avoiding the formal requirements and design phases of the product production. This is not permitted. All products should be produced using an appropriate development process and must involve the student in a task of suitable complexity. You should ensure that any documentation produced is of an acceptable quality.

Students who wish to develop their software using an agile, iterative or prototyping approach must clearly indicate and describe the development process, and are expected to use appropriate agile techniques, including client involvement and well managed iterative / incremental development. They will produce several different prototypes, stating the purpose of each one and how well each achieved its purpose. Simply creating something without proper engineering and showing it to someone for feedback does not constitute good agile development. The deliverables to be produced must be identified and agreed in the Project Proposal.

If a very simple prototype is required for use in investigative work, it may be best to use the Investigative Project marking scheme. In this case, the investigation, rather than developing the prototype, will form the bulk of the work.

Application Product Deliverables

The product consists of the software and supporting deliverables. Supporting deliverables must be of a high standard, and for an Application project they will be more extensive than for other projects. (This is why a much shorter report is possible for Application Projects.)

What is to be produced will be specified in the Project Proposal and should be appropriate to the product. The exact deliverables will depend on the approach taken, and there is a great deal of choice. Many students will be following an object-oriented approach to development and their deliverables will include many UML diagrams. However, the use of other methods is possible.

The supporting deliverables should allow the product requirements to be defined and analysed. Design deliverables support the design of the software and the user interface (if there is one). Implementation deliverables will include some form of program code or equivalent; there will often be a database; and there may be other items such as HTML, CSS, and multimedia assets, user documentation, etc. Testing must be systematic, and should be planned, executed and documented. It will normally include several levels – unit test, system test etc. – and may cover aspects of system behaviour other than correct functionality, e.g. performance. Usability testing is appropriate for many products.

Examples of typical sets of deliverables for particular types of software product follow. These are not intended to be prescriptive, but indicate the kind of deliverables that are required in addition to the code and the level of effort that is needed. Further examples of possible deliverables can be found on Canvas.

For a game:	For a typical web-based application:	For a typical Java application with GUI:

• A requirements document
• A thorough game design document
• A representation of the static structure of the software appropriate to the approach taken, e.g. a class diagram.
• Representations of the dynamic behaviour, such as pseudocode, state machine diagrams and/or sequence diagrams, or other representations appropriate to the development approach taken.
• Sketches or storyboards representing the user interface.
• Program code and other elements required for implementation
• Testing – a detailed list of functional tests, with expected and actual results.
• Evidence of play testing – tests carried out, results.
	• Prioritised requirements list
	• Use case diagram and descriptions
	• Benchmarking document for site feature comparisons
	• Personas
	• Wireframes – low and high fidelity, annotated
	• Representations of the system logic appropriate to the tools and development approach used, e.g. sequence diagrams with web application extensions; activity diagrams or flowcharts.
	• Site map / navigation diagram
	• Database design
	• Entity-relationship diagrams
	• Data dictionary
	• SQL scripts to create database
	• Program code or scripts
	• HTML, CSS
	• Animations or other media assets.
	• Configuration files.
	• Validation results – HTML, CSS, and Accessibility
	• Test plans, test cases and results
	   o Functional testing
	   o Cross-browser testing
	   o Vulnerability testing
	• Usability testing – workshop plans, test artefacts, results (e.g. timings and comments)
		• Prioritised requirements list
		• Use case diagram and descriptions
		• Class diagrams – analysis and design
		• Class & attribute definitions (data dictionary) – perhaps from modelling tool
		• Interaction diagrams – analysis and design
		• State machine diagrams for selected classes (i.e. where useful)
		• Activity diagrams for selected methods
		• Interface designs - wireframes, storyboards or similar.
		• Database design / a representation of file structure
		• SQL to create the database, if applicable
		• Program code
		• Test plans, test cases and test results
		• Usability testing (if done) - workshop plans, test artefacts, results (e.g. timings and comments)

The above are not definitive: you are advised to discuss the deliverables for your specific product with your supervisor.

PROJECT INITIATION PROCESS

Your first task is to find a supervisor and a topic. The induction week sessions will tell you how to do this, and how to tell the Projects Lecturer who has agreed to supervise you. If you can't find a supervisor by the date in your schedule, the Projects Lecturer will find one for you – so don't worry.

Once you have reviewed initial ideas for your project with your supervisor, you will summarise your chosen idea on a simple **Project Initiation Document** (**PID**). A copy of the form will be found at the end of this handbook; you should download an electronic copy from Canvas.

State the main **aim** of the project. For an Application Project, it is likely to be the construction of your product using your chosen tools or methods. For an Investigative Project, it will be to investigate your research question / problem / hypothesis.

The **rationale** could explain the question that will be answered by the project and why it is of interest, the reason why the system to be developed is required or interesting, etc.

Asking for the **main challenge** encourages you to reflect on the areas of the project that will stretch you. If there isn't any challenge, you probably need a different topic!

Type of product to be produced or investigative work to be undertaken:
For projects that have a product, this should indicate not only what is to be built but an indication of how it is to be built e.g. "A system to solve Sudoku puzzles, built in Java." For Investigative projects, indicate the type of work to be done, e.g. 'A field experiment to test the delivery of navigation information to mobile phone users' or 'A live forensic examination of computer memory using standard tools and the analysis of the data files produced.'

The form also includes space to list the **resources** needed, which should have been checked to ensure that they are all legally available.

If any **external body** is involved, e.g. a client or someone who is providing resources, indicate this.
The initiation document should be completed and the form submitted by the date shown in the course schedule. The form must be signed by you and your supervisor before submission, to show that there is an agreement between you. Project initiation forms are reviewed by the Projects Lecturer, who may query any project that appears unsuitable.

The initial idea should then be developed into a fuller vision of the project, in consultation with the supervisor, and written up in a Project Proposal document. (See the section on the Project Proposal for details.) Don't worry if your ideas have changed and developed since you wrote the initiation document. Delay at the Project Proposal stage reduces the time available for the actual work on the project, so it's vital that you devote enough time to your project at this point.

The draft Project Proposal must be submitted by the date shown in your schedule. Submission is through Canvas – be sure to include all the documents in your file. You can also get an originality report, to help you check that you are using information sources correctly.

The Project Proposal will then be reviewed by the supervisor and second marker, and you must arrange to meet with them as shown in your schedule. You need to take your logbook, which contains the Project Proposal review and feedback form for your supervisor and second marker to complete. If amendments are needed to the proposal, you should discuss these with your supervisor, then make the changes and give them to your supervisor and second marker within a week of the review. If the second marker requires

a second review meeting, this should take place as soon as possible. Once approved, the final versions of the Project Proposal should then be uploaded to Canvas by the due date. If your Project Proposal requires further changes, you should also update it on Canvas with the latest version containing those changes.

THE PROJECT PROPOSAL

The Project Proposal are a critical element of the project and the yardstick against which the project will be measured. Give your Project Proposal a cover page that shows:
- The course name and number (CCP3012-3026 Individual Project),
- The heading 'Project Proposal',
- Your full name, student ID and course,
- The project title,
- The names of your supervisor and second marker.
- The project type: Investigative Project or Application Project.

The Project Proposal should contain the following sections:

Project title

At this early stage, you need only provide a working title. You can decide on the exact wording for your title when you are nearer to completing your dissertation. Nevertheless, even at the start, aim to create a title that conveys the idea of your investigation/development. Normally, a title beginning "A study in . . ." is too vague; decide whether you want to compare, collate, assess. Also, do not worry if you compose a long title as you are preparing to write an academic document.

A good title should:

i. Orient your readers to the topic you will research/develop.
ii. Indicate the type of study you will conduct (Please state your specialization).

Introduction
The introduction helps put your project in conversation with other projects on similar topics. Generally, the introduction provides necessary background information to your study and provides readers with some sense of your overall research interest. A good introduction should:
- Establish the general territory (real world or research) in which the research is placed
- Describe the broad foundations of your study, including some references to existing literature and/or empirically observable situations. In other words, the introduction needs to provide sufficient background for readers to understand where your study is coming from.
- Indicate the general scope of your project, but do not go into so much detail that later sections (purpose/literature review) become irrelevant.
- Provide an overview of the sections that will appear in your proposal.
- Engage the readers.

a) Background to Project

The background and history highlights empirical foundations of research. The purpose of a background/history section is to give the reader the relevant facts about the topic and/or research site so that they understand the material or case in the proposal and how it links to the questions posed.This should describe the "context" of the proposed project and answer the question, "Why this project?", both from your own perspective as a student undertaking a final year computing project, and that of any client. It should show what makes this proposal a worthwhile computing final year project. *It must make clear both the application area or area of investigation and the computing aspects of your work.*

It will be helpful to start by briefly stating the nature of the product that you intend to produce or the research question that you intend to investigate.

After that, describe the problem domain you will be working in. This may include a practical context – for example, a client organisation and its needs. It will certainly involve introducing the field in which you will be working. For example, what previous work suggested your research question? What ideas will be important to defining and carrying out your project? For Application projects in particular, it will usually be appropriate to introduce the general features of the kind of application you are trying to build, and ideas related to the problem that you will investigate in your literature review.

You should, by now, have done a fair amount of reading about the area, to put your ideas into context, and to ensure that the project idea is valid and viable, and identified some useful literature about the problem that you are trying to solve or investigate; One reason for doing this is to show that you will be able to find the useful and interesting ideas and information that your project will need. This requires references! It is also a good chance for you to practise the academic style of writing needed for your report.

Indicate why the proposed project is of interest, both to you and more generally, and why it is useful and to whom. For example, where did the idea come from?   Was it requested by your client, or does it arise from your supervisor's research? Did some problem you encountered in real life or a paper that you read in the literature suggest a research question? Will it benefit a client – and how? What problems will you need to solve? Will you be using interesting or unfamiliar technologies? What is challenging? (Remember that the project will stretch you beyond what you have achieved in other assignments.)

A common fault with Project Proposal is for the background section to be too short and superficial. A good background is usually at least two pages in length, and a very short background suggests that you haven't explored the area in sufficient depth to know that the project is interesting and feasible. Note that you will usually have to carry out some sort of investigation to develop the background and rationale section of your Proposal; in other words, you will have started on the reading that you will continue into your analysis work.

b) Problem statement

A problem statement is usually one or two sentences to explain the problem your process improvement project will address. In general, a problem statement will outline the negative points of the current situation and explain why this matters. It also serves as a great communication tool, helping to get support from others. A problem statement is used in research work as a claim that outlines the problem addressed by a study. The statement of the problem briefly addresses the question: What is the problem that the research will address?

A research problem leads to a hypothesis (H) and/or research question (RQ)

A good research problem should have the following characteristics:

- It should address a gap in knowledge.
- It should be significant enough to contribute to the existing body of research
- It should lead to further research
- The problem should render itself to investigation through collection of data
- It should be of interest to the researcher and suit his/her skills, time, and resources
- The approach towards solving the problem should be ethical

c) **Research questions (Applicable to investigative type of report)**

A research question is the fundamental core of a research project, study, or review of literature. It focuses the study, determines the methodology, and guides all stages of inquiry, analysis, and reporting.

Questions should in some way…

- Be worth investigating
- Contribute knowledge & value to the field
- Improve educational practice
- Improve the human condition

d) **Research objectives (Applicable to investigative type of report)**

Research objectives describe what research expect to achieve by a project. It is usually expressed in lay terms and are directed as much to the client as to the researcher. Research objectives may be linked with a hypothesis or used as a statement of purpose in a study that does not have a hypothesis.

e) **Definition of key concepts**

A brief definition of the key concepts of your project.

f) **Proposed research methodology**

A research methodology involves specific techniques that are adopted in research process to collect, assemble and evaluate data. It defines those tools that are used to gather relevant information in a specific research study. Surveys, questionnaires and interviews are the common tools of research.

g) **Proposed work**
h) Provide more details of what you are proposing to do. You should emphasise the computing aspects you expect to be involved in, including those specifically relevant to your programme. You are required to provide a brief description of the work involved in carrying out the project and your approach to the development of investigation. You are also required to highlight the technical aspects as well as the general processes.
This section follows directly from the background, and should give more details of what you are proposing to do. The project must exhibit a level of difficulty appropriate to final year honours BSc work, and be of a size that can be attempted in the time available; this section should define the topic and project work in enough detail for the markers to be sure that it is suitable. The more detail and discussion you produce at this stage, the stronger the foundation for the actual project work. You should emphasise the computing aspects you expect to be involved in, including those specifically relevant to your programme. Remember that you are undertaking the project as part of

a BSc programme in a computing-related discipline, and avoid being side-tracked into areas that are not relevant to your course.)

Make sure that you include the following:

- A brief description of the work involved in carrying out the project and your approach to the development or investigation. Bring out the technical aspects as well as the general processes.
- What areas or questions will you need to investigate in order to carry out the project work? What topic(s) will your literature review cover and how does it help the project?
- Any further details of the product to be built or practical investigative work that will help to define the size and scope of the project.
- What computing technologies will be used and why? (If you will be deciding this as part of the project work, say so, and indicate the possibilities.)

This is one of the most important sections of your Proposal. After reading this part of your Proposal, the reader should know what would be involved in undertaking the project.

d) Aims of project

An overall statement of what the project is intended to accomplish. This should be expressed in terms relating to the project, not personal achievements. There will normally be only one or two aims. If you have more than three, then revise them since they will normally be inappropriate as aims.

The following are examples of project aims:

Project 1 (Application):
- "To investigate how an e-card service is made and the types of database that can be used to store images."
- "To build an e-card service to allow a user to manipulate images and create their own e-card."

Project 2 (Investigative.):
- "To compare the effects of flat and deep menu structures on users' website navigation performance."

Note the English style in which aims are expressed, and use the same style yourself.

e) Objectives

Each objective should identify an expected outcome. By the end of the project, it should be obvious to you and your supervisor whether you have accomplished an objective or not, although it may be debatable as to how well you have accomplished it. Thus each objective must be clear, measurable and concrete. (The 'SMART' acronym is helpful here.) Phrase them so that it is clear what will show that the objective has been achieved. For example, 'Create a requirements specification for…' is more exact than, 'Identify requirements for…'.

Projects for this course typically have 7-12 objectives, relating to areas such as:
- Literature review
- Establishing requirements
- Learning new/enhanced knowledge/skills,
- Creation of designs for a product
- Implementing a product
- Experimental work
- Production of items of systems/software documentation

- Testing a product
- Production of chapters of the project report
- Analysis of investigation results
- Evaluation of a product.
- Evaluation of the project process,
- Etc.

If you have more than one aim, then you should be able to associate objective(s) with each aim. To produce your project plan, you will identify the tasks needed to achieve your objectives.

f) Skills

The purpose of this section is to help you and your supervisor to assess how strong a base of learning you are building on, and whether the enhancements of your knowledge and skills that the project will require are feasible. Projects should generally be relevant to your degree programme, e.g. students taking Web Design and Development should do projects that use skills relevant to that area and build on courses from that programme.

Identify and list the skills that you will need to carry out the project work. You should explicitly identify both familiar areas of knowledge and skills and new/enhanced ones that the project will require. Against each, indicate which course that you have taken or are taking gives you those skills. If you will be acquiring skills during the course of your project, say how this will be done.

g) Sources of information / bibliography

This is simply a reference list and bibliography, presented in the usual format. Include the sources have you consulted in preparing the Project Proposal and any additional sources that you anticipate using during the work. It is not expected that you will yet have identified all the information that you will use. Ensure that you follow standard referencing guidelines.

h) Resources - statement of hardware / software required

The purpose of this section is to ensure that all the resources needed for the project are in fact available for it.

Identify and justify the software, computer hardware or any other equipment that you require for the project. You should also indicate how it will be provided, and its purpose in the project. A bulleted list that gives this information for each item is sufficient.

Consider carefully how you would cope if resources were not available; what alternative resources might be employed. This is particularly important if you intend to use your own equipment or that of an external body.

Note that you will need to demonstrate your product at the University. It is important to plan how this will be achieved. Your list of resources should include those needed for the demonstration.
Where relevant, you may use your own computer for part or all of the practical work, provided that it is suitable for the purpose, as agreed by the supervisor, and that **all** proprietary software is properly licensed for the machine on which it is running. Similarly, hardware and software provided by a client may be used, under the same conditions.

All software used in your project at any point must be used with the necessary licenses or permissions for that machine. This includes software on your own machine and software used in the

demonstration/viva. Do not make illegal copies, whatever the cost of the software in question. You may be able to find a free alternative, or to use software that is available in the School labs, or to choose a different approach. ***Software piracy is not acceptable under any circumstances.***

i) Structure and contents of project report

The report structure must correspond to the chosen type of project (Investigative Project or Application Project.) You should produce the following:

(i) Report structure.
Give a list of planned chapter titles with a brief description of each - see the sections of this handbook that discuss the report for your chosen type of project.

All the chapters should be cross-referenced to the objectives in (d).

The headings given in the marking scheme may provide an appropriate basis for the report structure.

(ii) List of appendices.
An agreed list of documents to appear in the appendices; e.g. requirements specification, design documents, source coding, test plans and results, experimental data, documents used in investigative work. It may not be necessary for full documentation for a software product to be included in the report – for example, extensive code or large files of test data may be best presented on CD. However, it should be available for assessment - see the section "The Product and Documentation." For all projects, Appendix A must be the agreed Project Proposal.

It should be possible to see a clear relationship between the report contents and the objectives.

j) Marking Scheme

This section contains three items: the type of project, the allocation of report chapters between sections of the report marking scheme, and criteria for marking the product or practical work.

You should study the marking scheme for your chosen project type before writing this section.

(i) Project Type.
State whether this is an Investigative Project or an Application Project. Your work will be marked according to your chosen marking scheme. The general framework for each marking scheme is fixed, and given elsewhere in this handbook. However, some aspects need to be specified here.

(ii) Project Report:
For the body of the report, specify which chapter(s) and/or section(s) of chapter(s) correspond to each section of the marking scheme. This can be done by listing the chapters in each of:
- Introduction
- Analysis
- Synthesis
- Evaluation, Conclusions & Recommendations.

The third element of this section will be either Product or Quality of Practical Work. This is the part of the Project Proposal that many people find the most difficult, as you are asked to agree the criteria on which your product or practical investigative work will be assessed.

You should agree these criteria with your supervisor and second marker at the Project Proposal review meeting, and you are strongly advised to review them with your supervisor early in semester 2, to ensure that they still reflect the planned direction of your project. Changes may be agreed at that point, and recorded in your log book.

(iii) Product (Application Projects only)

The product does not only consist of the final software or hardware, but also of all the associated deliverables that you use to product it, e.g. requirements specifications, design models, test plans and results, etc.

Product marks are divided between two main criteria: 'Fitness for Purpose' and 'Build Quality'. The breakdown between these is as follows:

	Fitness for Purpose	Build Quality
Application Project	40%	60%

The criteria are described fully in the product marking schemes for each type of project, which you should study carefully before writing this section of your PROPOSAL.

List **all** the deliverables (finished software/hardware, specifications, prototypes etc.) that will form part of your product.

Then list the criteria on which fitness for purpose and build quality will be assessed. Some of these are provided in the marking scheme, and you may add others. Marks for these elements may also be apportioned within the weighting for Fitness for Purpose and Build Quality. (Looking at the marking scheme will probably make this clearer!)

For an **Application Project:**
Fitness for Purpose must include the following criteria and deliverables:
    Meeting of Requirements as identified during project
    Quality of Functionality
    HCI (unless there is no user interface)
Other criteria and deliverables may also be specified.
Build Quality must include the following, which are fully defined in the marking scheme:
    Requirements specification & analysis
    Design specification
    Code quality
    Test plans and results
Other criteria and deliverables may also be specified.

In the event that you do not specify criteria, a set of default criteria and weightings is provided; however, these may be less suitable than criteria defined specifically for your project.

(iii) Quality of Practical Work (Investigative Projects only)

The Synthesis section of the marking scheme for Investigative Projects includes assessment of the practical work that you have done. In this section of the Proposal, you must specify the criteria on which your practical work will be assessed. These will vary widely between projects, and you should choose criteria appropriate to the kind of work that you are doing. Some of these criteria may relate to the quality of deliverables produced, such as an experimental setup that you have

built, a dataset that you have constructed, a questionnaire, simple prototype, etc. Others may relate to the way that you have carried out your investigation. Ensure that the deliverables and criteria chosen will demonstrate your use of practical computing skills relevant to your course. The criterion, 'Compliance with any relevant ethical and safety guidelines,' must always be included and is printed on the marking form.

Remember that your markers will need to be able to assess your work on these criteria. You should indicate what evidence will be provided; this will usually be included in your appendices, but may be elsewhere in your submission.

k) Project Plan - Schedule of activities

A detailed statement of the stages of the project is required. A Gantt chart should be used for expressing the schedule, together with supporting information. Identify the tasks needed to achieve each objective, estimate how long they will take, plan when they should be done, and include these tasks in your Gantt chart.

Your schedule must clearly indicate for each task the number of hours' work required to accomplish it and the elapsed time over which this work should be done. The schedule should be expressed in weeks. Months do not allow for sufficiently detailed planning and control. Days are too detailed; in practice you will not yet know your daily workload in the second semester, so you cannot meaningfully plan down to the day. It is sensible to consult your assignment schedule when you make your project plan, and to avoid overloading yourself at times when you have other major commitments, but remember that your project is the largest and most important course of the year!

Final Checks

When you have drafted your Project Proposal, check that there is a complete correspondence between the components of the marking scheme for your project and the tasks and objectives that you have set yourself. Your objectives and the tasks that achieve them must allow you to produce everything that the marking scheme requires, but be sure to avoid unnecessary activities. If a task doesn't contribute towards your objectives, why do it? It may be useful to produce a table that cross-references chapters with objectives and sections of the marking scheme.

PROFESSIONAL, ETHICAL AND LEGAL ISSUES IN YOUR PROJECT

Computing professionals should ensure that all their work is carried out in an ethical way. This means that everyone doing a project needs to consider whether there are any ethical considerations that need to be taken into account. The University seeks to ensure that all research, including student projects, is carried out safely and in an ethical way.

Naturally, some ethical issues are common to all projects. For example, no project may break any applicable laws; any project that uses personal data must ensure that it is properly handled; no project may use software that is not properly licensed; and so on. Other issues can be more or less relevant depending on the subject area. In computing projects, the following are commonly areas that need to be given some thought.

Consent. People who participate in your project, e.g. by being interviewed or taking part in a trial of your product, must be able to give their 'informed consent' to participate. They have certain rights, to…
- Know what the research is about
- Know what is expected of them
- Withdraw at any time
- Know how the results of their participation will be used
- Have access to their data
- Anonymity – they are not identified, and their data is not disclosed in any way that allows them to be identified. The names of participants should not appear at any point in your report. (There may be occasional exceptions to this, for example, if a participant asks to be credited by name.) There may be further requirements for confidentiality.

It is your responsibility to ensure that participants in your project are given and aware of these rights, and that they give their consent to participate. This will normally involve using consent forms and information sheets. Survey questionnaires should explain the purpose of the research and include a mechanism for recording consent. You should consult your supervisor on guidance about special situations such as telephone interviews.

If any of your participants cannot give informed consent, e.g. because they are children, then a higher level of ethical scrutiny is needed. Consent from parents should normally be sought for the involvement of anyone under 18.

Confidentiality of personal data. This covers both data held in an information system that you are studying or developing, and data about participants in your project. For example, you may have interview results that tell you about participants or give their opinions; you may have information about people who have acted as usability testers. Some categories of data, e.g. political views and health data, are regarded as particularly sensitive. All locally applicable legislation must be followed. This would include the Personal Data Protection Act. Personal data must be protected against loss or unauthorised disclosure, and kept no longer than it is needed. It is never acceptable to use identifiable real personal data for testing or demonstrating your system – there are application-related reasons for this, as well as the legal and ethical concerns. Participants in your project must not be named in your project report; this includes interview transcripts or other documents in your appendices. It also means that you must consider where data that you collect online will be stored. Many popular tools (including Survey Monkey) reside on servers outside of the country your participants reside in, which has implications for the consent that participants must give.
Data storage and retention. Identifiable personal data must be kept carefully, and in such a way that the identity of data subjects cannot be revealed. Data stored on a computer, memory stick etc. should be

password-protected. Data in paper form should be kept in a locked cabinet. It is good practice for the identity of data subjects to be held separately from their data. This can be done by using a coding system, in which each data subject is given (say) a number, and only the number is recorded with the data. A key showing which data subject has which number can be produced, but must be securely stored separately from the data.

Personal data stored on mobile devices requires special safeguards. Note that such data should not be kept on personal cloud services.

At your viva, you will hand in an 'evidence file' containing all copies of all your data, other than evidence that forms part of your project report. This may be retained by the Department. At the end of your project, all data should be destroyed unless consent has been given to use it for further research. See 'Evidence file' below. Computer files should be deleted and, where possible, disks wiped.

Commercial confidentiality. Some organisations may not wish to be identified, or may not wish the report that you produce to be publicly available, perhaps because the project deals with commercially sensitive material. Although it is normal that reports name the client organisation, both these requests can be met if required. You should let the Projects Lecturer know if the final report should not be placed on Canvas, and attach a notice to this effect to the cover of the project report.

Some projects may also involve the following:

Work with children, young people or other vulnerable groups, such as people with dementia. Projects that will involve contact with vulnerable persons must be approved by the University. However, this is not always necessary if there is appropriate supervision: you are advised to take advice from the organisation with which you are working regarding their requirements, and from the Projects Lecturer for the University's position. The highest standards of good practice and conduct are required.

Computer security, misuse and vulnerabilities. Potential for misuse of computing products or techniques is particularly a concern in projects that involve security, ethical hacking or computer forensics, but not confined to these. Any such possibility must be identified before the Project Proposal is complete, and ways of safeguarding against misuse identified.

Projects that may produce software capable of penetrating or harming systems or data, or identify vulnerabilities or exploits, are normally approved subject to a condition of 'responsible disclosure': any such vulnerabilities, techniques etc. must be communicated to the suppliers of the target products, and may not be published until the supplier has had the opportunity to respond.

Risk to the student, other participants, or to the University. There are many kinds of risk. Physical risks may be involved if, for example, the project involves working with tools to build hardware, working in one of the Faculty's electronics labs, or visiting a client in an industrial location. Other risks include the possibility of loss of personal data; risk of legal action against the University or damage to the University's reputation; etc. All kinds of risk that may arise should be considered carefully.

Organisations with particular requirements for internal approval. Because of the limited timescales for the project course, we would not normally advise students to take on projects that involve such organisations unless they are already an employee of the organisation and a sufficiently long lead time can be allowed for gaining the necessary permissions.

If your project includes any of the following, you or your supervisor should discuss the project with the Projects Lecturer as early as possible, and preferably at the Project Initiation stage, so that the necessary consultation can take place and time is not wasted.

- Work in a school
- Contact with children or young people under 18.
- Contact with vulnerable adults or anyone who may not be able to give informed consent
- Projects involving the medical profession
- Any project where there may be intellectual property or contractual issues
- Any project where non-disclosure may be required
- Any other project that raises concerns that are not satisfactorily covered by the usual procedures for consent and confidentiality.

Carrying Out Your Project

If you are involving other people, such as interviewees or usability testers, you must get their consent to participate. This is done using two documents: templates for both are on Canvas.

The **Project Information Sheet** is used to give information about a project to participants. You must create an information sheet based on the standard template, and give a copy to each participant to let them know the purpose of the project and what they are expected to do, and also how the data that they provide will be handled. (This sheet is sometimes called a 'fair processing notice'.)

The **Consent Form.** Each person who will take part in interviews, user tests, focus groups etc. must give their consent by signing one of these. Create consent forms based on the standard template and customised for each participant. The form should set out the things for which consent is given, including the way their data will be used. Consent forms must be retained in a safe place where they cannot be accessed by others, and the whole set should handed in at the end of the project as part of your evidence file. They will then be kept for a period and destroyed in accordance with the University policy on retention of data. (Participants who only fill in survey questionnaires need not use the consent form but the questionnaire itself should include information about the project and a way of recording consent.)

Submission

When you submit your project report and any product, you will include everything your markers will need to assess your work. As well as product deliverables, you will include copies of data such as interview transcripts, questionnaires and experimental results. These may be submitted as appendices to your report, on a CD bound into your report, or some combination as appropriate. Data relating to individuals should be anonymous. Please do not submit consent forms at this point.

Evidence File and Disposal of Data

After you have submitted your project, you must prepare an evidence file. This should be a binder, large wallet, or similar. The evidence file is given to your supervisor at your viva. Its purpose is simply to ensure that data is available for audit and eventual disposal: it is not an assessed deliverable. A checklist is available to help you decide what to include; a copy of the checklist should be included at the front of the file.

The evidence includes your logbook. It should also contain all copies of all data derived from or relating to individuals, other than anonymised copies that are bound into your project report, and any other data that could be considered confidential in any way. The evidence file includes the signed consent forms. Any data on CD etc. should be included in the evidence file. The contents of the evidence file will be destroyed

after the exam boards. When you receive your final results, you should also delete all soft copies of the data, using a secure deletion method.

If you have a referral or deferral, and need to use the data again, you may collect the folder from your supervisor and hand it in again when you resubmit.

WORKING ON THE PROJECT

Analysis

Once your Project Proposal has been submitted, you can work on your analysis tasks and draft the analysis chapters of your project report. The contents of the analysis are described in the sections of this handbook that describe the project report, and in the marking schemes. The analysis always includes a literature review. For projects that have a product, the analysis tasks include producing the requirements specification, which is part of the product. (Any subsequent modelling based on analysis of the requirements specification is more conveniently dealt with under Synthesis, but you can begin this as soon as the requirements specification is complete.) If you are doing an Investigative Project, a review of available research methods takes place at this point, and you decide on your overall approach to the investigation.

During this period the supervisor will review your work and provide advice on how it can be improved. You can show your chapters and other documents to him or her as you produce them.

Some students choose to draft part of their introduction chapter at this point. Whilst this can be helpful, it will still need to be reviewed before report submission to ensure that it still reflects the work done.

By the date given in the schedule, you should give your supervisor a draft of your complete analysis, along with any other deliverables (e.g. a requirements specification) and your reference list. This is **not** a formal submission to the Office: give the work directly to your supervisor. The draft should be a complete version of the chapter(s), and you should have proof-read the work and corrected any errors in spelling or grammar. Your draft should contain all the necessary citations. Your supervisor will give you feedback on the draft, and you should make any changes that are suggested. Failure to complete the draft analysis on schedule poses a serious risk to the successful completion of your project, as it is very difficult to catch up in the second semester.

All projects will need to refer to sources of information. Investigative Projects must include a substantial literature review. Application Projects will have a briefer review. You may also need to investigate solutions similar to a product that is to be built. Advice on writing a literature review is given in a project lecture and in a later section of this handbook. You should also consult the marking scheme and the sections of this handbook that deal with the project report.

You are strongly advised to keep details of all the written sources that you consult, and to keep your reference list updated as you work on your analysis. You should keep the regulations on plagiarism in mind. The lecture sessions include advice on writing the analysis, writing a literature review, choosing good sources of information, and avoiding plagiarism.

In order to help you to avoid inadvertent plagiarism, before you submit your draft analysis chapters to your supervisor, you should also submit the draft to Turnitin, the plagiarism detection service. This will give you an originality report, which you should discuss with your supervisor.

Turnitin is accessed through Canvas via a link to its website. The service compares your work with material on the Internet and issues a report showing the similarities between your work and that of other authors. You should discuss this report with your supervisor. Similarities may be quite legitimate: for example, you may have included a properly referenced quotation. However, it can also show where you need to revise your work to avoid problems with plagiarism.

As soon as your draft analysis has been submitted to your supervisor, you can move on to the next stage of the work. Your supervisor will give you feedback on the draft, and you will need to allow some time for

doing any revisions, but don't wait until this is complete before moving on. Even if there may be changes needed to your analysis, there will be tasks that you can do.

It may be that during your analysis – or even later parts of the project – you realise that changes are needed to your objectives and the work that you are planning. These may require changes in your assessment criteria. These changes should be agreed with your supervisor and recorded on the project log page of your logbook.

Practical Work

Once your analysis is complete, you will move into the main phase of your practical work, and carry out the activities that you outlined in the Project Proposal. You will also complete the project report. You are advised to study the marking scheme in detail and to ensure that all required elements are present.

While you are doing the work, you are recommended to keep a journal recording the process chronologically. Include in it all the important decisions you make and why, all the problems you encountered and how you solved them. Such a document is very useful when you come to write up your synthesis chapters and evaluation.

Good project management and time management are vital at this stage. You may wish to add detail to your project plan. If your schedule has slipped, catch up, revise your schedule, and consider how you can organise your time most efficiently. If you deal with small slippages as they occur, you can avoid large problems. It can be tempting to ignore your project plan at this stage: don't do it!

If you discover that some of your project objectives are not feasible, you should discuss this with your supervisor as soon as possible. Similarly, if you have other problems, your supervisor can only help if s/he knows about them. There is no need to hide mistakes and difficulties.

We advise everyone to review their objectives and marking criteria with supervisors early in Semester 2 as shown in the schedule, and, if the project has changed direction since the Project Proposal was written, to make any changes necessary at that point. The second marker should be informed of any changes, and you should discuss them in your evaluation of the project. The Project Proposal may be updated for inclusion in the project report. Please note that the purpose of this is to identify any genuine changes in the direction of the project and to ensure that all students have a set of marking criteria that reflect what they are aiming to do: it is not the intention that you should adjust objectives or marking criteria to reflect what you did well or badly.

Software testing should be planned in advance and should follow a clear strategy. It should exercise the software at various levels, e.g. unit tests, integration tests, system tests. The purpose of testing is to detect errors: it is not a 'rubber stamp' to show that the system 'works.' The evidence that you provide should reflect this. Many students neglect the testing or evaluation aspects of the project, and lose marks as a result.

For Investigative projects, you should be sure that the results and evaluations that you produce will help you to answer your research question. Discussion of the meaning of your findings and how they relate to your topic is a vital part of your project.

If your project involves data analysis, you should not under-estimate the work needed. This may consist of summarising and statistical analysis of numeric data, drawing out the main themes from textual data such as transcripts of usability tests, or other approaches. You will need to use appropriate techniques,

then present your results in a form that a reader can easily assimilate and draw out the key points of your findings.

Completing the Project

Evaluation should be detailed and critical. You should have considered the assessment criteria for your product or practical work when you wrote the Project Proposal, but you also need to decide how you will carry out the evaluation, what information you may need to collect, and how you will go about it. You may need to investigate the best ways of evaluating a product. In some cases, this will involve user trials of software or before-after comparisons. These need to be planned well in advance. Consider the criteria against which your work will be judged and plan your evaluation in good time – which means early in the project.

Your conclusion and recommendations work will draw on your evaluation and the outcomes of the whole project. These will naturally be written towards the end of the project period.

Finally, you will write (or revise) an introduction and write an abstract. These should give an overview of the project, including the work done and (in the abstract) its conclusions, which is why they must be written (or at least finalised) at the very end of the project. You must provide all the elements listed in the marking scheme. Students often lose marks that should be easy to gain, simply by omitting parts.

It is important that these final parts of the report are written in time for you to receive feedback from your supervisor on a draft. Students often submit weak introductions, evaluations or conclusions, when advice from the supervisor would have led to a stronger submission. You are advised to give all work requiring feedback to your supervisor before the vacation, and use the remaining time for revisions, appendices, preparing the viva, etc.

Make sure that you leave ample time to create your appendices, proof-read the whole report, print and bind it, and create your CD. There is often pressure on resources in the last few days of the project period: don't be caught out!

PROJECT REPORT OVERVIEW – ALL PROJECTS

This section gives an overview of the structure of the project report and describes the components that are common to all projects. It also provides guidance on format and length. The following sections discuss aspects of the report that are specific to each type of project. These should be read in conjunction with the marking schemes.

The project supervisor and second marker will read the report independently. It must contain all the information relevant to the project since the second marker especially will be unaware of the details of the work undertaken. It is essential that it describes the work you have carried out, and that the reader can clearly identify the subject of your investigation and the nature of any product from the report.

You should not underestimate the time required for preparing the report and the product documentation. Plan the production process to ensure that you will have a means of printing the document at the right time. Beware of using unfamiliar software or hardware to word-process or typeset the document. Remember to allow enough time for binding: it is wise to find out in advance how long this will take.

General Structure of the Report
The general structure of a project report is as follows:
- Title Page
- Authorship Declaration
- Acknowledgements
- Abstract
- List of Contents
- Introduction
- Analysis
- Synthesis
- Evaluation and Conclusions
- References
- Bibliography
- Appendices
    a. Project Proposal
    b. Other appendices.

Each of the above should begin on a separate page. Your Introduction should be Chapter 1.

Title Page
This should be arranged as shown in the specimen sheet, which appears as an appendix to this handbook. The title may have been changed from the working title in the Project Proposal.

Authorship Declaration
This is a statement signed by yourself certifying that the report and the work described in it are your own and that ethical guidelines have been followed, and stating what may happen to the report. A copy appears as an appendix to this handbook: you should read it carefully, then include a signed copy in your report. You are advised to read the University's regulations concerning plagiarism and collusion. You must provide a word count: this includes only your report chapters, not the appendices, reference list or abstract.

Acknowledgements
You may wish to acknowledge help given from three different sources:
- From people outside the department, e.g. industrial companies,

- Your supervisor for general guidance,
- Special help from staff inside the department other than the supervisor.

Acknowledgements should be kept simple.

Abstract

The purpose of an abstract is to provide the reader with the essentials of your report in a very condensed form. (In a published paper, it would provide a basis for the reader to decide whether to read it or not). This means it should briefly summarise the nature of the project, its context, what work was carried out and what the major findings or conclusions were. Key technologies or approaches used will normally be mentioned. The marking schemes explain exactly what should be in your abstract. It must be no more than one side in length. It relates to completed work – it should not talk about what you are planning to do or the structure of the report. Write it last!

List of Contents

List the contents of the report by chapter and sub-section against page numbers. Include the appendices, which document the deliverables. You may additionally decide to include a list of figures by page number, a glossary and/or a table defining any special symbols used in the report.

References

It should be clear from the text which of the material presented and opinions expressed are yours and which are other people's. This includes showing clearly when you are quoting from other people's work, by means of quotation marks or indentation, and referencing all quotations or information derived from other sources. You do not need to worry about copyright in making direct quotations or copying figures provided you acknowledge the source. It is not good practice to copy sections of more than a few lines from another author, even if the source is identified. Paraphrasing helps to demonstrate your understanding better than quoting, but long paraphrased sections are to be avoided and it is not acceptable to take someone else's work and simply change a few words.

You should indicate in your work each point at which you have used one of your information sources, and provide a complete list of references after the last chapter of your report. Both of these are required: it is **not** sufficient only to provide a reference list. References should follow one of the approved referencing formats. A common style is the Harvard system, which is used in this section.

An authoritative definition of how to reference a wide variety of sources is given in 'The Library Referencing Handbook: Harvard' (Elkin, Ortega & Williams, 2015). You are strongly advised to obtain an electronic copy from the link below.

Full details are:
Elkin, E., Ortega, M. & Williams, H. (2015) *The Library Referencing Handbook: Harvard, 2nd edn.* Lincoln: University of Lincoln. Available at http://guides.library.lincoln.ac.uk/ld.php?content_id=23470161 (Accessed 19 January 2018)

Increasingly, Internet sites are a source of reference material. These must be used with care, as many web sites are of poor quality and contain unreliable information. However, many excellent academic papers are also available online. When citing a Web source, you must include the name of the author or organisation, the source date, the title of the page, the full URL and the date the site was visited. University of Lincoln's "The Library Referencing Handbook: Harvard" gives full details. If you have written about software or other media, these must also be referenced properly.

If you have made use of library software (other than standard language libraries) or other pre-existing software elements, media etc. in your product or deliverables, appropriate credit must be given for these. You should indicate in your report that they have been used, and include the references in your list. Comments in your product code should indicate any code used that you have acquired from elsewhere.

Bibliography.
The bibliography is a list of sources that were consulted during the project, but which are not directly used and therefore do not need to be cited and included in the reference list. This might include programming texts, other technical reference material that you consulted, general introductions to a topic, and other useful background material.

Appendices
The appendices contain material that is not necessary to a first reading of the report and which if included in the main text would tend to confuse the general line of argument. The appendices will also contain documentation about the product. The exact nature and extent of these documents should be clearly specified in the Project Proposal document. The appendices should not be excessively long.

You must include a copy of the Project Proposal as the first Appendix to the report.

Note on Product Documentation
For projects that have a product, documentary evidence of its quality must be included as appendices to the report. Normally, only small extracts from the product deliverables should appear in the body of the report, where they are needed to support the discussion. The report should tell the reader when they should be looking at documentation, and where to find it.

The product is represented by such items as requirement specifications, design documents, program listings, and user documentation. They should be arranged in a sensible order and clearly identified. The nature and extent of the material to be submitted will be agreed with the supervisor and identified in the Project Proposal.

Sections of code (beyond small snippets that can be incorporated and discussed in an implementation chapter) can be included in an appendix. Normally, these will be representative or key sections, perhaps those to which the report has directly referred. It is not necessary to include the complete code in the appendix unless your supervisor instructs you to do so: the place for this is on your product CD.

Other product documentation is more conveniently provided as appendices unless it is very extensive, when it may be treated in the same way as code. Data derived from people, such as questionnaires or interview transcripts from requirements gathering, should be submitted in the evidence file if it cannot be presented in anonymised form; representative anonymised samples may be given in an appendix.

All documentation appearing in the report must be presented to a good professional standard. Documentation and data provided on CD should be of appropriate engineering quality and should be legible and logically arranged, but extensive formatting for purely cosmetic purposes is not required. The supervisor will of course inspect the complete documents during the project.

Presentation
The marking scheme includes a small element for presentation. This is based on how well the report communicates to the reader, rather than superficial elements such as the use of expensive paper or decorative graphics. If your report really cannot be understood, the marks for other sections are also likely to be affected.

Length

Investigative Project: Typically 20,000 – 25,000 words; maximum is 25,000.

Application Project: Typically 10,000-15,000 words; these are expected to be shorter than reports for the other two project types. Maximum 18,000.

The above lengths exclude appendices, reference list and bibliography, title page, etc.

Remember that ***the report will be judged on quality, not quantity.*** There is no obligation to aim for the maximum length. A shorter report may gain more marks than a longer one, if it is of better quality. A report that is much too short is unlikely to attract high marks, but reports will vary widely and some very good reports are quite short. One that is at or above the maximum length may be filled with material that is irrelevant or unnecessary, or belongs in appendices. In most cases the typical length should be sufficient for you to express what needs to be discussed. A verbose or 'waffly' style may attract a lower mark for presentation. Individual report sections that contain unnecessary or inappropriate material may also receive a lower mark.

Format

The report and product documentation should be printed double-sided on A4 paper. A left margin of 1.5 inches must be left to allow for binding loss. Acceptable fonts for the main text of the document are Times New Roman 12 point or Arial 11 point, with single or 1.15 line spacing; or Calibri 12 point with single line spacing. If you have particular presentation needs, please consult your supervisor about alternatives.

Take care with spelling, grammar, layout, etc. The document should be well structured and easy to read, and include appropriate illustrations. Material that would disturb the flow of the report, such as specifications and test plans, should be included in an appendix and reference should be made to it where appropriate.

WRITING A LITERATURE REVIEW

The literature review is a very important component of the analysis. You will identify articles and books relating to your project topic, examine the relevant ideas in a critical way, relate them to the subject of your project, and of course, reference your sources. Whether you are writing the brief review on a specific topic required for a Application Project, or the more extensive review of literature in an Investigative Project, there are some things that you need to bear in mind. This section gives some indicators: further support is given in one of the project lectures.

The literature review will normally be directly related to one or more problems or decisions, or provide the underlying principles that are necessary to understanding the problem area. It may help you to refine a research question. Take care to ensure that the material presented relates to the subject of the project. Your review of the material should be related to **your specific problem**. Plain "bookwork" descriptions, where sources are simply paraphrased or information presented in an uncritical way, will attract lower marks. In the viva, you may be questioned about what you have written, and asked to show your understanding of the ideas and their n in the project.

The literature review is intended to be useful. Think carefully about what topics you will investigate, and be sure that you know what they will contribute to your project. There is no point in a literature review that just confirms that your product will be useful to someone, or simply reiterates basic material that you already know. The technical and other problems that you will have to solve are often a good focus for a review: make sure you know what they are! It is helpful to conclude a literature review by summarising what you will take forward to the rest of the project.

It is neither necessary nor desirable to include descriptions of basic material. For example, students sometimes decide to describe the principles of relational databases, common Java syntax, or the different types of UML diagrams, simply because these are going to be used. This is not a literature review: it is basic material that is not appropriate to a final year project.

The review should not simply be a collection of quotes from other authors. Nor should it simply describe each source in turn: it must be given a structure. Identify several themes and give a succinct, careful discussion of each. For each theme, you should not just summarise material; you should approach it in a critical way. This means that you should appraise the work or ideas that you have found, give your perspective on their strengths and weaknesses, and make comparisons. You may wish to form conclusions, for example, about which of a number of possible approaches is the best to use. Write as if you are addressing a computer professional, but one who is not an expert in the specific topic.

Finding literature relevant to your topic may require persistence, and you are advised to start as early as possible. You will usually refine your searches and search objectives as you become more familiar with the subject and the available material. If you need to order material through the Inter-Library Loan scheme, it may take several weeks to arrive.

Throughout your project, you should take care to use reliable sources of information, such as textbooks and papers from academic journals and good conferences. Your supervisor can advise on suitable types of source. Internet sources may also be of use, but you should carefully consider their reliability. For example, electronic versions of journals and conference proceeding, technical literature from suppliers whose software or hardware you will be using, and published papers on the websites of university departments, are usually safe sources. Articles and blogs whose authors cannot be identified as experts in the field, sales literature, and any items whose origin is uncertain, are best avoided. If you are

investigating specific products, you may need to consult suppliers' literature, but look also for independent accounts. Evaluate your information sources carefully: web sources in particular are often of poor quality and carry little weight.

Thorough referencing, as described in the 'Project Report Overview' section of this handbook, is essential. Direct quotations should also be clearly shown as quoted material. Failure to do this will be treated as plagiarism. ***Remember that you must write the review in your own words***.

See also the sections of this handbook that describe the project reports for each type of project.

THE PROJECT REPORT – INVESTIGATIVE PROJECT

You should read the following discussion in conjunction with the marking documents, which are provided at the end of this handbook. The main elements of this report are as follows:

- Abstract
- Introduction – always Chapter 1
- Analysis – usually two or more chapters
- Synthesis – one or more chapters
- Evaluation – one or two chapters
- Conclusions and Recommendations – one chapter.

Introduction

This is quite straightforward, but ensure that you have all the elements listed in the marking scheme. It is quite common for students to lose a couple of marks by missing something out. You may wish to draw on the background section written for your Project Proposal, but the introduction should not simply reproduce parts of the Project Proposal as you will develop a fuller understanding during the course of the project. The introduction is usually written at the end of the project, as it is an introduction to the report, written from the perspective of the work having been finished. Even if you begin the introduction early in the project, you will need to review it at the end.

Analysis

The analysis section may consist of several chapters. The exact number will depend upon the nature of the work you are undertaking; for example, a literature review that covered two distinct areas might form two chapters. The marking scheme indicates five areas to be covered; you should arrange the material in chapters in whatever way best presents the material, ensuring that you include everything that is required. Some projects will not require all five areas.   Typically this part of the report should provide the reader with information they will need to know in order to appreciate and understand the work you have done in the rest of the project. You should assume that your reader is computer-literate but not a specialist in your particular topic.

The literature review will be a very important component of the analysis. In producing it you will have to research articles and books relating to your project. A good literature review will greatly strengthen your analysis and provide a sound foundation for your later work. The length of the review should be guided by the requirements of the project, but 4000 – 6000 words is typical for Investigative projects.

Your literature review may discuss the problem that you are trying to solve or question that you are trying to answer, possible solutions, methods of investigation, etc. as appropriate to your needs.   For an investigative project, the literature will usually support the formulation of your research question, problem or hypothesis. In other words, what you learn about the subject area will inform the questions that your investigative work will try to answer. You will find out what others have done in this area, and perhaps also useful material on how you could go about investigating your question. You should use respectable academic sources, such as refereed journals or conferences, or other reliable and authoritative sources of information. Evaluate your information sources carefully. The section of this handbook on 'Writing a literature review' gives further guidance.

The literature review provides one aspect of the context for your investigation: the subject area. A good literature review will show how your project relates to this work.   However, there may also be a real-world context that is relevant, and if so, it should be discussed. For example, there may be factors relating to a client organisation that affect your research question or the way you will investigate it, or aspects of the

physical environment or the available equipment. Try to show the impact of these factors on your work. If there is nothing to write about, there's no need to invent something – but talk to your supervisor about this.

Defining the question that you are investigating is a crucial part of your analysis. You may have noticed that the marking scheme often uses the phrase, 'research question / problem / hypothesis.' This is to allow you to use appropriate terminology for your particular project and the approach you are taking. You may wish to think in terms of answering a question, investigating or solving a problem that you have discovered, or testing a hypothesis derived from your research question.

You should not only state what it is that you are investigating, but explain why you have chosen this question, drawing on the literature that you have reviewed or other factors as appropriate. For example, it might be a real world problem, and elements of the context in which the problem occurs may affect what you can achieve or what is the most important aspect of the problem.

The marking scheme asks for a 'justification of the strategy chosen or type of research to be done to investigate the question / problem / hypothesis. You will need to explain your approach at overview level, and give your reasons for choosing this approach. We are looking for a high-level discussion here. You will go into the details of exactly what you did (e.g. how you set up equipment, chose your participants, ran your tests, etc.) in the synthesis chapters. Here, you should consider the possible strategies for conducting research or investigations in your subject area. This could be quite different for projects in different subject areas, for example, forensics, networking or HCI. You may need to consider research methods – for example, are you using one of the many varieties of experimental design? Are you carrying out your study in lab conditions, or in the field? Will you be taking measurements of the performance of real equipment, or using a computer simulation? You should review the possible alternative approaches, and explain why your chosen strategy was preferable to others, or was the only possibility. Make sure that your reader will be able to understand how you expected the work to help you to answer your research question: you should be able to explain this clearly by now.

As part of your analysis, you should discuss any ethical issues or risks that you have identified. You may choose to make this a separate section, but it is possible that it may fit better as part of another section of the discussion: the context, research question or approach. The aim here is to show that you are aware of these issues and discuss their effect on your choice of question or general approach. However, the details of how you dealt with the issues are best covered in the Synthesis chapters.

Synthesis
This is a description and discussion of the work you have carried out. Synthesis attracts the largest proportion of the report marks, as this section also includes an assessment of the actual practical work you have done. You will have defined how this is to be assessed in the Project Proposal.

You should discuss the detailed design of your research or investigation. You will need to distinguish between what you planned to do and what happened when you actually carried out the work. Think about all the decisions that you had to make as you planned the work, and explain why you chose the approaches that you took and rejected others. For example, if you planned to carry out a study of how people use menu structures on web pages, you probably made decisions such as: What software will I use? How many people will be involved? How will they be chosen? What alternative tasks will I give them? On what basis will I divide the people into groups and / or assign them to different tasks? What exactly will I measure, and how, and what equipment will I need? How will I analyse the resulting data? If you are comparing the performance of networks using different configurations, how will you set them up, what tests will you carry out, how will you measure the performance, what data will you use, how will you analyse it,

etc? How will you follow any relevant ethical or safety guidelines? You should justify these decisions, showing that you considered alternative solutions carefully.

You should also discuss what actually happened. This does **not** mean that you have to repeat what you have already said about the design of your investigation, but you can comment on anything new or interesting that occurred, and perhaps add details that arose from events. It's possible that you had to adapt your approach in some way. If things when wrong, or in the event you took an approach different from the one you planned, then you can explain what happened, what you did about it, and why. (It isn't expected that everything will go according to plan: how you deal with situations that arise can be a very interesting part of your report.) If you have produced deliverables, you can present and discuss these. Anything that would impede the flow of your chapter can be provided in the appendices or, if large, on your disk.

The final part of the synthesis is the presentation of your results. You may have quantitative or qualitative data, or even both. The best way of presenting your results will be determined by the type of data and the nature of your investigation, but will usually involve summarising the data in some way. Data analysis is too large and varied a topic to discuss in detail here, and how you do it will be very dependent on the project that you are doing. You are likely to have found out about appropriate methods as part of your project. In some cases it may be appropriate to present calculations, e.g. to demonstrate how performance figures are derived. If you are doing statistical analyses, it will be helpful include levels of significance with the results where applicable. The presentation of qualitative data may involve summarising it, identifying significant factors, including representative examples, discussing interesting cases or critical incidents in depth, the use of quotations and illustrations, or identifying significant categories of content from textual data and looking at how often they occur. For example, if you had been interviewing people about their use of information, you might identify categories related to the type of information, the method of access, etc.

It may be helpful to use diagrams, charts or tables to present the work or the results. These should come with enough explanation for the reader to make sense of what you are showing.

In general, raw data in the body of your report will be limited to small elements or examples that that you are discussing. Further data can go in your appendices or (if bulky) on your CD, and you should tell the reader where to look for it. Identifiable personal data should never be included in any part of your submission. If you need to refer to individuals, you can mention 'Participant A' in your study, or in organisational settings it may be appropriate to refer to someone by their job title.

Evaluation and Conclusions
You should present two critical evaluations of your work, preferably giving each evaluation its own chapter. A further chapter gives your conclusions, with recommendations for further work.

Discussion and Evaluation of Findings
This is perhaps the most important section of your report, as this is where you discuss the meaning of your results. What answers have you found to the question that you are investigating? You should explicitly relate your findings to the problem, question or hypothesis, and discuss how far you have answered that question or solved the problem, whether your results support or refute your hypotheses, etc. You may wish to compare your findings with those of other work that you have discussed in your literature review. The marking scheme asks you do discuss your confidence in your findings and how far they can be generalised. Are there factors that affect the reliability of your results or conclusions? If this is relevant to your project, are your results statistically significant? Would you expect similar studies to achieve the same results? Would you expect that people carrying out similar work in a different organisation would come to

similar conclusions? Remember that it is often not possible to generalise from a single case, or from a small number of tests participants etc.

An Evaluation of the Project Process

This is fully described in your marking scheme. At some point in this section you should assess how far you achieved the project objectives; you may cover these wherever seems most appropriate.

You must evaluate your approach to the investigation and the work that you actually carried out. It will be helpful to look back at your research design and the justification for the decisions that you made. Consider the strengths and weaknesses of the research design, the tools and techniques that you used, the artefacts that you produced, how the work went in practice, problems that arose, etc. You may find that alternatives that you rejected now seem better: you can discuss these.

You will also evaluate more general aspects of your project. These will be common to any final year project. Here the emphasis will be on the learning process and on how well you managed your project work. What have you learned, and what would you do differently in future? Some of your objectives may be relevant here. You should reflect on your project plan, and may wish to suggest other plans that would have worked better. Don't avoid discussing any problems that arose: your reflection on them can strengthen your evaluation. You should discuss any relevant ethical or safety issues, and may also wish to comment on relevant social, legal or professional issues and your handling of them. For example, you might sum up how far you met any relevant guidelines. (Again, put these where they fit best.)

Conclusions and Recommendations

An effective set of conclusions should not introduce new material. Instead it should briefly draw out, summarize, combine and reiterate the main points that have been made in the body of the project report and present opinions based on them. The conclusions section should include a summary of what has been achieved, and of the main results of the project. To some extent this will involve summarising aspects of the evaluation.

The main conclusions will relate to the research question or problem that you tackled: what answers and solutions did you find, or what did you conclude about your hypotheses? You should also sum up what you achieved, and how far your aims and objectives were met. You may also have drawn other conclusions from the work, perhaps about the effectiveness of methods or tools used.

It is quite likely that by the end of your project you will not have achieved all that you planned at the start; and in any case, your ideas will have grown during the course of the project beyond what you could hope to do within the available time. The recommendations will focus on further work: this is where you describe your unrealised ideas. It is where you tell the reader what extra you wish you could have done or what other investigations would benefit this subject area. Try to look beyond the work that you yourself have done to the subject context. A good set of recommendations can provide the basis for a future project. You may also have more general recommendations for other people working in this field.

THE PROJECT REPORT – APPLICATION PROJECT

Structure

You should read the following discussion in conjunction with the marking documents. They are provided at the end of this handbook. For an Application Project, you will need to write

- Abstract
- Introduction – one short chapter.
- Analysis – one or more chapters covering the sections in the marking scheme
- Synthesis – one or more chapters covering the sections in the marking scheme
- Evaluation – one or two chapters.
- Conclusions and Recommendations – one chapter.

These fit within the general report structure given in the previous section. The sections of the marking scheme often provide a suitable framework for chapters and sections of an Application Project report.

It is essential to understand that it is the product deliverables, not the report, that should give the full definition of your software. You do not have to describe every aspect of your software or your supporting models. You can assume that the reader will look at your requirements specification, design models, and other deliverables. It is up to you to make sure that those deliverables communicate all that is important about your product.

Introduction

The introduction is intended to be brief: a typical length would be 1500 words or about 3 sides. It is usually written at the end of the project. You may wish to draw on the background section written for your Project Proposal, but the introduction should not simply reproduce parts of the Project Proposal as you will develop a fuller understanding during the course of the project. Even if you begin the introduction early in the project, you will need to review it at the end, as it outlines what you achieved.

It should contain the following four elements. (Text in bold type is taken from the marking scheme.)

1. **The aims and objectives of the project – stated and briefly explained.** Give the aims and objectives as stated in your Project Proposal, and explain what they mean. There is no need to state the obvious, but you will wish to give a little more detail or clarification, explain terms of interest, etc.

2. **An overview of the product that was built – its purpose, scope, main features and characteristics.** Here, you should aim to give the 'big picture' of what you have built, so concentrate on the purpose, scope and main elements of the system. Note that this is an overview: full details of your product are given by the product documentation, and selected aspects will be discussed later in the report. You should explain the purpose of the system, but there is no need to justify individual features here: that comes in your analysis.

3. **Discussion of the problem context and the reasons for undertaking the project. This should relate to the state of the art in the subject area and / or the real world context of the problem.** The purpose of this section is to answer the question 'Why this project' and to give some introductory context for the work. Discussion of the context might relate to the needs of a client organisation, and/or the subject area in which you will be working, such as a particular area of technology, or a class of problem that you are trying to solve. You may wish to include references, but avoid duplicating your literature review. There may be a real-world problem that you are trying to solve, and / or other reasons for undertaking the work. This is similar to the background section of your Project Proposal, and you may wish to draw on what you wrote then, but the introduction should not simply reproduce parts of the

Project Proposal as you will develop a fuller understanding during the course of the project. (It may be helpful to revisit the guidance given in the Project Proposal section of this handbook for ideas.)

4. **A brief summary of the approach taken and tools used.** It is sufficient to briefly summarize how you approached the problem, by describing your methods and tools: you do not need to justify them here, as this will be dealt with in the analysis You could describe the development tools and underpinning technologies that you used, the computational techniques, analysis and design techniques, etc.

The above should all be quite straightforward, but ensure that you have all the elements listed in the marking scheme. It is quite common for students to lose a couple of marks by missing something out.

Analysis

The two required parts of the Analysis, as defined in the marking scheme, are:

A brief **critical review of literature** relevant to the problem to be solved, or to an aspect of the solution. The implications for the project should be made clear.

A commentary on key points in the requirements specification, including a discussion and justification of significant decisions made and the alternatives considered, and any problems or constraints on the solution that were foreseen as a result of the requirements. The discussion should cover both functional and non-functional requirements, including a justification of the choice of methods and tools to be used and the intermediate deliverables (e.g. models) to be produced. Justification of requirements should consider the implications of relevant factors, e.g. organisational context, principles derived from the literature review. Where similar products have been considered in deciding on the features of the product to be built, they may be discussed here as part of the justification of requirements.

These should be the main chapters or sections of the analysis part of your report. (Brief chapter introductions and summaries are also useful, for all your chapters.) Note that they are of roughly equal importance: it is a common mistake to neglect one or other.

Critical Review of Literature

The Application Project marking scheme does not expect an extensive literature survey, but there should be a short focused review of ideas or existing work relevant to your topic. Any worthwhile project will have at least one aspect that is not entirely straightforward, and where some investigation is required. Such areas are likely to relate to the problem that you are solving or to possible approaches to the design or implementation. There may be a specific technical problem that you know you will have to solve. You are expected to choose a key area and critically review literature (ideas, experiments, reports of proposed designs, etc.) that discusses it. The purpose is to help you to analyse the problem or propose appropriate solutions: look for important concepts and principles, and possible techniques, structures or other ideas that you could use. You should bring out the implications of these ideas etc. for your project.

Another pitfall to avoid is attempting to write about too many areas. It is better to aim for depth in one area, or at the most, two. An opposite problem is the review where many areas are tackled but nothing of significance is said about any of them, and perhaps only one source (or no sources!) is cited for each. In this case, assuming that the project topic is suitable, the student would have been better advised to take a narrower focus.

Note that the marking scheme says that a 'critical review' is required. You should not simply be relaying information or paraphrasing the sources that you have found, but identifying principles, structuring ideas,

discussing the relevance to your project and making evaluative comments about what you have found. It is useful to end the literature review by summarising the key ideas that it has contributed to the project.

The commonest problems with literature reviews in Application projects are:

- Lack of a critical approach. See above, and the section on 'Writing a Literature Review'.
- Lack of depth. The review may cover many topics in a very superficial way.
- The review makes no contribution to how you will do the project. You should be able to explain why you will review this area, before you start. If there are no such useful areas, choose a different project!
- The review simply demonstrates that the product will be useful or helps to decide what it will be. (Reviews which present statistics of mobile phone / OS usage are frequently in this category.) That is appropriate background for your Project Proposal or Introduction, but the literature review should take you further than this.
- The review achieves good depth, but is much longer than expected. Perhaps it has several areas to cover, or there is simply too much to cover in the expected length.   If it seems that this may be the case with your review, being more selective about its scope may be an answer, but you should also discuss with your supervisor as soon as possible whether your project topic is better suited to an Investigative Project, which offers more scope and reward for this aspect of the work.

Note that most of these problems can be avoided at the Project Proposal stage, as long as you started reading about your topic in good time.

The project lecture on this topic will provide further guidance. See also the section of this handbook on writing a literature review.

A Commentary on Key Points in the Requirements Specification

The first thing to say here is that you are not expected to paraphrase (or copy!) the whole requirements specification. That will be in an appendix, and (as with all your deliverables) you should refer your reader to it at all appropriate points. That means referring to specific requirements that you are discussing. If you are wise, your requirements specification will have a numbering scheme that you can use!

You should include a brief account of your approach to eliciting or deciding on the requirements: this is part of your justification as it can show that your requirements are soundly based. In this part of the project, you are likely to be using the techniques of requirements elicitation and modelling. You may have carried out some modelling of your problem domain or of current systems as an aid to establishing your requiremts, or even built small prototypes; it is appropriate to comment on significant findings that affect the requirements; and to include any artefacts produced and the outputs of your investigations in the product documentation. See the section on the Product for further suggestions. Interview transcripts, observation results etc. should be included in your evidence file.

Assuming that your specification is sufficiently detailed, it is unlikely that you will need to comment on every requirement that it contains. Instead, you should discuss and justify the most important and interesting aspects. You will want to select those requirements that were difficult to establish or where significant decisions had to be made, those that are particularly significant for the operation of the system, those that may cause problems later in development, those that were influenced by ideas from your literature review, and others of particular interest. You will need to show how the findings from your literature review and other factors influenced the decisions you made. When considering decisions that you have made, remember to discuss the options that you did not choose as well as those that you did! Point out any parts of the specification that are missing or incomplete, or where decisions had to be left until later in the project.

For some projects, it is useful to examine products similar to the one you will be building, and use what you learn to help in specifying the requirements for your own software product. Depending on the topic of your project, these may be commercial products or found in the research literature. Studying similar products to the ones you are developing can help you to identify possible features and methods of solving problems in the application area, or even approaches to solving design and implementation problems. It may be helpful and appropriate to compare the features of these products, and present the results of these comparisons, e.g. in a benchmarking document. This can be one of your product artefacts, but you should discuss your findings as part of the justification for your requirements. (Note that this kind of comparison belongs here rather than in your literature review.) Naturally, full references should be given for all the products that you discuss: The Library Referencing Handbook: Harvard' (Elkin, Ortega & Williams, 2015) tells you how to give references for software.

It is expected that your requirements specification will cover both functional and non-functional requirements. Non-functional requirements include usability requirements, requirements relating to the operational environment, development tools and methods to be used, and various software quality factors: you are advised to remind yourself of the possible areas, and to discuss non-functional requirements as well as product functionality.

You must justify the methods and tools that you will be using. If you need to carry out a comparison of tools, you should discuss the alternatives here, and justify your choice. This can be based on any relevant factors, but you should demonstrate that the chosen development tools and methods are appropriate for solving the problem and meeting the requirements, and explain why you chose the particular application deliverables that you are going to produce.

Remember to concentrate on the decision or justification, and avoid unnecessary descriptive material. If you need to present an extensive comparison to justify your choice, consider putting a comparison document in an appendix and treating it as a deliverable. You can then concentrate on discussing the decisive features as part of your justification.

For some projects, there will not be any realistic alternatives to the tools and techniques that you are using. This is not a problem, as long as you can show that they will do the job. We do **not** expect comparisons of tools or techniques unless there is a genuine choice to be made, and you will need to avoid long descriptions of tools and methods. There is no need to consider tools that there is no possibility of you using, and it is fine to choose a language because you know it or because your client uses it, as long as you can demonstrate that it is suitable for the job. It is better to indicate a few key features of (for example) a development language that make it particularly suitable for your project than to provide an extensive description without your own analysis. Similarly, common sense can be applied to the justification of your development methods. For example, if you are developing a Java application, the fact that it is an object-oriented language is sufficient reason to use object-oriented modelling techniques, and UML is both familiar and a standard notation. However, you might wish to explain, for example, how your chosen analysis and design approach supports a non-OO development, or why you chose a particular plan for iterative development.

Synthesis
This is a **commentary on the product deliverables** that you will produce once the requirements specification is complete, and is intended to be read in conjunction with those deliverables. This means that you do not need to describe every aspect of your product or your development work, because the deliverables should do much of this for you. Descriptions of your models and other deliverables can be kept at the level of brief overviews, only giving the key points that a reader will need to understand the work that you have done and pointing out aspects that are important to understanding the solution. The

emphasis should be on discussing important features, decisions made, problems encountered and the solutions considered and chosen, interesting techniques applied, and so on. If you have done something difficult, clever, or novel, point it out to the reader! These comments should be related to the deliverables; in other words, your markers will want to look at each part of your product and see what you have said about it. It should be very clear which models, code or other artefacts you are writing about at any point. Deliverables should be provided as appendices to the report or, if too bulky, on the CD.

It is not possible to say here exactly what artefacts these comments should cover for any individual project, as the deliverables will be those that you defined in your Project Proposal.

However, the marking scheme expects that they will fall into these areas:

- **Analysis models (e.g. class diagram), including any significant features arising from the requirements.** These are models that you produce by analysing your requirements: for example, you might derive class diagrams and communication diagrams from your use cases and then go on to produce a merged analysis class diagram. (Use case models and other models that contributed to the requirements specification are more helpfully discussed under Analysis, as they are part of the specification or contributed to justifying requirements.)

- **The design specifications, including database design and HCI design where appropriate.** A wide variety of deliverables and topics is possible here. Design may be specified and discussed at both the architectural and detailed levels. You should discuss interesting or important design decisions. These might relate to the high-level structure of the application, significant classes, the use of particular design patterns, issues in database design, navigation structures; how aspects of the interface design were influenced by usability principles or the results of usability assessment, etc.

- **The product code, or equivalent.** This refers to your software artefacts, however they are constructed. They might include code in programming and scripting languages, a database or the SQL to create it, HTML and CSS, or whatever else you have produced. It is helpful to tell the reader (briefly) what code you have built and whether any proposed features were not developed. Apart from that, you should concentrate on discussion and justification of implementation decisions, and on other aspects of the implemented software that were important, interesting, challenging, or problematic. It is appropriate to comment on standards that you followed. Interesting points may include ways in which the design decisions affected the implementation and any aspects of the design that could not be implemented or had to be changed. You may have had to face unforeseen problems. Explain how you overcame them. Don't feel obliged to discuss minor details in order to pad out the report. It is important to point out outstanding problems and any features that are missing or not working. You can discuss the problems that you encountered and how you solved them, but you need not mention minor programming errors that you corrected, unless they had a significant effect on the product or your progress.

  A common question relates to the inclusion of code in the report. You should only give small and important snippets of code here, and then only if you are discussing them. Everything else should be in an appendix or on your CD. It is quite acceptable to refer the reader to code in an appendix. Remember that code files on CD are harder to navigate than documents in an appendix, and clearly tell your reader where they should be looking.

- **The test plans and test results, including the testing strategy, techniques used and conclusions drawn from the testing.** Good testing follows a test strategy and detailed test plans. Your test plans should communicate your approach to testing, such as the types of test to be carried out and the techniques used to identify test cases. In the synthesis section of your report, you can summarise the

testing that you carried out, and discuss the reasons for your choice of testing approach and the rationale for selection of test cases (e.g. boundary value analysis, path coverage criteria), but there is no need to describe every possible variety of software test before saying what you chose.

- If your testing was thorough, there will be a lot of test cases and test results, and you are not expected to discuss every test that you ran. The test results themselves will be given in an appendix, but your synthesis will give a summary of the results and discuss any important findings. Your conclusions might also refer to the kinds of fault that have been eliminated and those that might remain. You should make clear what has been completed and whether any planned tests were not carried out.

- **If applicable to the project, the approach taken to any user testing or usability evaluation, artefacts used, and the results obtained.** Usability evaluation and user testing are not possible or appropriate for all projects, but where they have been done, you will provide evidence of the way that they were conducted, such as task instructions and artefacts used for data gathering, and you will need to discuss your approach in the report. Comments on the results of testing can usefully summarise the results and point out any problems identified or interesting or surprising findings.

It is not expected that you will present new theoretical material or discussion of literature in the synthesis, but you may wish to discuss how principles and techniques were applied or influenced your decisions. In particular, it will be useful to consider how the ideas that you derived from your literature survey were used. You can assume that your readers are computer literate individuals who will appreciate the problems that you have tackled.

Evaluation and Conclusions

You should present two critical evaluations of your work and a conclusion with accompanying recommendations, preferably giving each evaluation its own chapter. The marking scheme provides good guidance as to content; further advice is given here.

An Evaluation of Your Product

Approach this from a technical point of view. Attempt to identify the strengths and weaknesses of your product in meeting its requirements, and review the possible alternative technical approaches to its design and implementation. Beware of the 'anecdotal' evaluation - you are expected to take a critical view and justify your argument. You should try to give evidence to support your evaluation: this could include the result of testing or user trials, feedback from clients, etc. You can include successes and failures of the development such as unresolved design problems. Do not be afraid to discuss weaknesses; your evaluation will be assessed by its validity, regardless of the quality of the product. You should identify which are the important features of the design. You may point out significant design or implementation techniques and a discussion of mistakes made in the design, and the problems that they caused. If, exceptionally, the objectives of your project have been changed (by agreement with your supervisor) since the Project Proposal were agreed, you should discuss the reasons for the change.

An Evaluation of the Project Process

This section is the same for all kinds of project, and is fully described in your marking scheme. The emphasis should be on the learning process and how well you managed your project work. What have you learned, and what would you do differently in future? Achievement of relevant objectives should be assessed, so look at the objectives in your Project Proposal and see which ones are relevant here and which are part of the product evaluation. You can reflect on your project plan and suggest other plans that might have worked better.

You may also be able to discuss legal, social, ethical or professional issues that have arisen and comment on your handling of them. If any of these seem more relevant to the product evaluation, it is fine to put them there.

Conclusion and Recommendations

You should present your main conclusions from the work, including how far your project's aims and objectives were met. You may also have conclusions drawn from your experience, e.g. about the suitability of an approach that you tried. The conclusion may to some extent summarise the evaluation, but don't introduce new material here. Recommendations could include further work that is needed on the project, recommendations for how similar problems should be solved, and any areas that require further investigation or research.

Note that the suggested length for the evaluation is 2500-4000 words. The evaluation is an important part of your report, and you should give it adequate time and thought.

MARKING SCHEMES

The following pages give the criteria used by the supervisor and second marker when marking your work. There is a marking scheme for each project type. You are advised to study them so you understand what is expected of you.

When all the projects have been marked, the Project Marks and Feedback form will be used to give you your results and feedback.

These are followed by samples of the Project Initiation Document, title page and the declaration of authorship page for your report. Soft copies can be downloaded from Canvas.

CCP3012-3026 Individual Project
Marking Scheme (For Investigative Project / Application Project)
Project Proposal Review (100 Marks, Weighted @ 20%)

Student ID: *Student Name:*

1st Marker / 2nd Marker:

LEARNING OUTCOME	MARKING CRITERIA	SCALE					Task Marks (Max. 100)	Task Weighted Marks
		Fail (0-49)	3rd Class (50-59)	2nd Lower Class (60-69)	2nd Upper Class (70-79)	1st Class (80-100)		
Part A: Problem Statement								
CLO1: Construct a problem statement working from unstructured ideas	**1. Background to Project & Proposed Work**	*Discussion was very poorly written and inadequate.*	*Discussion showed adequate understanding of issues and technology involved.*	*Discussion showed good understanding of issues and technology involved.*	*Discussion showed very good understanding of issues and technology involved.*	*Discussion showed excellent understanding of issues and technology involved.*		/30
	2. Aims and Objective of the Project	*The aims and objective of the project were very poorly described.*	*The aims and objective of the project were adequately described.*	*The aims and objective of the project were fairly well described.*	*The aims and objective of the project were clear and succinctly described.*	*The aims and objective of the project were very clear and succinctly described.*		/30
						Subtotal (60%)		/60
Part B: Project Planning								
CLO2: Plan the conduct of an investigative project	**3. Technical Skills and the Hardware/ Software Resources**	*Skills and resources required were mostly not identified.*	*Skills and resources required were fairly adequate, clear and realistic.*	*Skills and resources required were good, clear and realistic.*	*Skills and resources required were very good, clear and realistic.*	*Skills and resources required were excellent, clear and realistic.*		/10
	4. Sources of Information/ Bibliography	*Depth and breadth of sources provided was very poor.*	*Depth and breadth of sources provided was adequate.*	*Depth and breadth of sources provided was good.*	*Depth and breadth of sources provided was very good.*	*Depth and breadth of sources provided was excellent.*		/10
	5. Proposed Structure of the Report	*Structure not cross-referenced with the objectives.*	*Structure adequately cross-referenced with the objectives.*	*Structure well cross-referenced with the objectives.*	*Structure very well cross-referenced with the objectives.*	*Structure thoroughly well cross-referenced with the objectives.*		/10
	6. The Project Plan	*Not realistic and in line with real-world expectations.*	*Somewhat realistic and in line with real-world expectations.*	*Fairly realistic and in line with real-world expectations.*	*Mostly realistic and in line with real-world expectations.*	*Realistic and in line with real-world expectations.*		/10
						Subtotal (40%)		/40
						Total (100%)		/100

Marking Scheme: Investigative Project (Weighted @ 80%)
Overview

Report & Practical Work 90%

Abstract & Introduction	5%	
Analysis		20%
Synthesis: discussion of methods & results		20%
Synthesis: quality of practical work		30%
Evaluation & Conclusions		20%
Presentation		5%

Viva 10%

Abstract and Introduction

Abstract: a precise and concise summary of the project - the essence of the work. It represents the report in a highly condensed form, including the context of the work, aims and research question, methods, results and conclusions. (Typically 250-400 words.)

Introduction: includes:

- **The background to the project. This states and *briefly* introduces the subject/application area, and explains the purpose of the work or reasons for undertaking it.**
- The aims and objectives of the project, explaining their meaning and purpose as necessary.
- **A definition of the research question, hypothesis, or precise subject of the investigation,**
- A brief summary of the work undertaken, including the methods used, the scope of the work and any planned limitations.

DESCRIPTION OF QUALITY	MARK RANGE
The abstract and introduction are wholly inadequate or several of the elements are missing or the subject of the research or investigation is not made clear.	**0 - 1**
On balance, an acceptable Abstract and Introduction. The Introduction at least identifies the research question, hypothesis or subject of the investigation, and is adequate in a majority of the areas listed. Some elements are missing or flawed.	**2**
An adequate Abstract and Introduction, with clear explanations and lacking no major elements. Helpfully introduces the background to the work. There may be some inadequacies of style and/or structure, or minor omissions or errors.	**3**
A clear, accurate and concise Abstract and Introduction. The Introduction covers all the required aspects as listed above, including clear definition of the research question, hypothesis or subject of the investigation and well-chosen background material, with no significant omissions or weaknesses. May have some outstanding aspects but is not wholly outstanding.	**4**
An outstanding Abstract and Introduction which read well, cover all required areas, exhibit no factual errors, give sound justification for choosing this topic as a computing project, and convey an excellent understanding of the work to be done.	**5**

Analysis

The analysis should demonstrate a good understanding of the principles of the subject area, and justify the question to be investigated and the general approach to be taken, showing that alternatives have been considered. It consists of the following:

- A critical review of relevant literature to support formulation of the research question / problem / hypothesis and the approach.
- If applicable, discussion and analysis of the problem context, e.g. organisational context.
- The research question / problem / hypothesis should be explained and justified, drawing on the literature review and other background as applicable.
- A justification of the strategy or type of research chosen to investigate the question / problem / hypothesis. The student should review at overview level the alternative research or investigation strategies that could be suitable and their possible application to the project, and justify the choice of approach. *(This discussion is at the level of broad strategy, for example, why the student chose to retrieve a certain type of forensic data using a particular type of forensic investigation, or why a field experiment was chosen to test a particular interface feature. Detailed plans are discussed under Synthesis.)*
- Identification of any ethical issues or risks to the student or other participants

DESCRIPTION OF QUALITY	MARK RANGE
Very poor. The question to be investigated is not clear. Little or no discussion of alternative approaches to the problem, techniques, tools or the principles relating to the problem area.	**0 – 3** (< 20%)
A discussion which is inadequate in many respects but at least identifies a question to be investigated and presents most of the areas listed above.	**4-7** (<40%)
An adequate discussion of the problem area that at least reviews relevant literature, identifies an appropriate research question / problem / hypothesis and provides some justification for its choice on the basis of literature or context. The required areas are on balance adequate with only minor omissions.	**8-11** (<60%)
The analysis successfully identifies the underlying principles behind the problem area and presents an appropriate research question / problem / hypothesis, with a good justification for its choice. The literature review demonstrates good choice of material and a critical approach; it conveys a good understanding of the ideas discussed and their implications for the project. The chosen strategy has a sound justification. The required areas are on balance good: they are at least adequate in ALL respects and may be outstanding in some respect, but are not wholly outstanding.	**12-13** (<70%)
The analysis successfully identifies the underlying principles behind the problem area and presents an appropriate research question / problem / hypothesis, with a thorough justification for its choice. The literature review consistently demonstrates good choice of material and a critical approach; it thoroughly explores the ideas discussed and their implications for the project, clearly showing the student's own conclusions about the issues raised. The chosen strategy is justified and alternatives considered. Consideration of relevant ethical factors and any risks is thorough and appropriate. The required areas are on balance excellent, with only minor weaknesses, and may be outstanding in some respect, but are not wholly outstanding.	**14-15** (<80%)
An outstanding analysis which communicates an excellent understanding of the underlying principles behind the problem area, and clearly identifies the research question / problem / hypothesis to be investigated and the approach taken, giving full and valid justification of these with reference to the underlying principles and alternative approaches available, and to any other relevant contextual factors. The literature review takes a consistently critical approach and shows particular insight or originality in its handling of the ideas discussed. The chosen strategy is justified and alternatives considered; there may be elements of originality in the approach. Consideration of relevant ethical factors and any risks is thorough and conveys a sound understanding of the issues.	**16-20** (80%+)

Synthesis: Discussion

Marks are given in this section for the quality of discussion and justification of the research design and the work done, and for the presentation of results. The practical work itself is not assessed here.

The synthesis section of the report should include:

- A detailed presentation and justification of the research / investigation design, including the precise approach to be taken, techniques and tools to be used, selection of participants (if applicable), methods of data collection, methods of data analysis, how ethical or safety guidelines are followed, or any other aspects as relevant to this project. Alternatives considered and rejected should be discussed.

- An account and discussion of the work done: what actually happened; discussion of any deliverables produced; discussion and justification of decisions made, with alternatives considered. This should cover both the investigative work and the treatment of the results, and should discuss any problems or differences from the planned approach. This may be combined with or follow from the discussion of the research design, as appropriate. (*Evidence of deliverables may be provided here or in an appendix and will be included in the assessment of the practical work.)*

- Initial presentation of results achieved, including any analysis needed of raw data to produce a meaningful result. *(Discussion of the results in relation to the research question is a section of the evaluation.)*

DESCRIPTION OF QUALITY	MARK RANGE
The discussion of the investigative work and its results is wholly inadequate, or most of the areas required above are missing.	**0 – 3** (< 20%)
The discussion of the investigative work and its results is in some respects adequate but fails to address key issues or important aspects of the work or fails to present the results in an appropriate manner.	**4-7** (<40%)
An adequate discussion and justification of the investigative work and presentation of its results, including all three areas listed above. Either the work exhibits no major flaws but is not on balance good, or some weaknesses are balanced by good work in other areas.	**8-11** (<60%)
The discussion and justification of the investigative work and presentation of results are on balance good; they must be adequate or good in ALL respects and may be excellent in some respects.	**12-13** (<70%)
The discussion and justification of the investigative work and presentation of results are on balance excellent, with no inadequate areas and no more than few and minor weaknesses. Provides thorough justification for decisions made in the design and conduct of the work and clearly and succinctly presents results using appropriate techniques. May be outstanding in some respect but not wholly outstanding.	**14-15** (<80%)
An outstanding discussion of the problem solution which thoroughly justifies all aspects of the approach used, shows insight in its critical discussion of the work done and consideration of alternative approaches, clearly demonstrates how data was analysed and presents useful results with insight and clarity.	**16-20** (80%+)

Synthesis: Practical work

Marks are given here for the quality of the practical computing investigative work carried out by the student, including any deliverables produced. Appropriate evidence of the work done must be provided in the report or appendices, at the viva, or in other ways as defined in the Project Proposal.

The quality of the work is assessed on criteria applicable to the specific project, as defined in the Project Proposal. Examples could relate to the quality of any deliverables such as tools built, survey instruments designed*, equipment configurations set up; conduct of sessions with participants; use of tools and techniques, etc. Observance of relevant ethical and safety guidelines must be included.

The specified deliverables and other evidence must demonstrate the effective use of practical computing skills relevant to the student's programme; these are broadly defined and include e.g. carrying out usability evaluation, use of appropriate tools. If insufficient evidence is provided, the student cannot score highly on this criterion.

Markers may wish to review this section after the viva. The agreed assessment criteria for the quality of work done should be listed on the marking form.

Agreed assessment criteria for quality of practical work include:
- Compliance with any relevant ethical and safety guidelines
- Quality criteria related to deliverables (as defined in the Proposal)
- Other quality criteria (as defined in the Proposal)

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*The practical work must not consist entirely of survey research.

DESCRIPTION OF QUALITY	MARK RANGE
Practical work was not carried out, or the scope was very limited and quality poor in respect of the agreed criteria. Little or no evidence of the effective use of practical computing skills has been provided.	**0 – 5** (< 20%)
Practical work is limited in scope and/or quality poor in respect of the agreed criteria; on balance the work is unacceptable or provides insufficient evidence of the effective use of practical computing skills.	**6 – 11** (<40%)
The practical work is of sufficient scope and its quality is adequate or good in respect of the agreed criteria. Sufficient and appropriate evidence of the effective use of practical computing skills has been provided.	**12 – 17** (<60%)
The practical work is on balance very good in respect of the agreed criteria; some weaknesses may be balanced by excellent work elsewhere, but the work is not excellent overall. Sufficient and appropriate evidence of the effective use of practical computing skills has been provided.	**18 – 20** (<70%)
The practical work is on balance excellent in respect of the agreed criteria, with no serious weaknesses; it, and includes some outstanding elements, but is not wholly outstanding. Sufficient and appropriate evidence of the effective use of practical computing skills has been provided.	**21 – 23** (<80%)
Practical work is well conceived and outstanding in respect of the agreed quality criteria. Sufficient and appropriate evidence of the effective use of practical computing skills has been provided.	**24 - 30** (80%+)

Evaluation and Conclusions

The evaluation should take a critical approach and arguments should be justified.

Comprises 3 sections:

Discussion and evaluation of findings

- Presents analysis and interpretation of the results in relation to the research question / problem under investigation. It should be clear what answers have been provided to research questions, whether any hypotheses have been supported or refuted, whether proposed solutions are viable, etc. as appropriate to the topic. If relevant, the results are evaluated in the light of other findings, e.g. from the literature, and alternative interpretations considered. Should discuss the level of confidence in the student's findings, and how far the results can be generalised.

Evaluation of the Project Process

- Evaluation of the research method & experimental work done includes the design of the research / investigation, choice of tools and techniques used, execution of the practical work, and any deliverables produced. A discussion of alternative approaches that are considered, with hindsight, to be preferable may be given if appropriate. Achievement of relevant objectives should be assessed.
- Project management aspects should be considered. Actual progress made during the project should be related to the Project Plan expressed in the Project Proposal. Should emphasise the learning process: what skills were gained or lessons learned from the experience, and how it might be done better a second time round. Identifies performance problems such as missed milestones and the factors that caused them. A discussion of alternative project plans, given the benefit of hindsight, may be presented if appropriate. Should discuss any relevant ethical or safety issues; may also discuss other relevant legal, social or professional issues. Achievement of relevant objectives should be assessed.

Conclusions & Recommendations:

- Conclusions should cover the full project, and may to some extent summarise the evaluation: they should include conclusions regarding the question, problem or hypothesis under investigation; a review of how far the project's aims and objectives were met, and any other conclusions about the work.
- Recommendations and suggestions for further work should indicate a wider perspective than that of the project.

Evaluation and Conclusions

DESCRIPTION OF QUALITY	MARK RANGE
Little or no discussion of the results or evaluation of the work done and the student's performance. Conclusions and recommendations are missing or inadequate.	**0 – 3** (< 20%)
Some attempt at an evaluation and conclusion, but the work is weak in at least two sections. The discussion of the results and evaluation of the practical work, choice of methods and tools and personal progress and performance are present but the extent or quality is inadequate; and/or the conclusion has significant omissions in the comparison between the main aims or purposes of the project and the results obtained or work done, or no valid conclusions regarding the subject of the investigation are presented, or the recommendations for further work are missing or ill-considered. On balance, the section is not acceptable.	**4-7** (<40%)
The evaluation and conclusions are on balance acceptable, but the work is weak in at least one section: either the analysis of findings is unclear or poorly argued, or fails to take significant issues into account; or some significant issues are omitted from the evaluation of work done; or the conclusions are incomplete and/or the recommendations for further work are limited and do not show the necessary broader perspective. Not outstanding in any respect.	**8-11** (<60%)
A sound evaluation of the results and the project process that covers a good range of issues with no weak sections. Appropriate analysis of findings leads to valid conclusions about the question under investigation. The report's conclusions give valid comparison between the aims and purpose of the project and the results obtained or work done. Recommendations for further work are well-considered and may show a broader perspective than that of the project. No section has serious weaknesses, and there may be excellent or outstanding features. On balance the work is good but not wholly excellent.	**12-13** (<70%)
An excellent evaluation of the results and the project process that covers a good range of issues with no more than minor omissions in any section. Sound and well-argued analysis of findings leads to well-supported conclusions about the question under investigation. The report's conclusions give a valid and complete comparison between the aims and objectives of the project and the results obtained or work done. Recommendations for further work are well-considered and show a broader perspective than that of the project. May have outstanding features, but not wholly outstanding.	**14-15** (<80%)
An outstanding evaluation of the work undertaken: incisive, self-critical, and complete in all respects as described above. Discussion and evaluation of the findings is well-argued and insightful, giving valid conclusions and showing a good understanding of how these findings relate to other work. The conclusion gives a valid and complete comparison between the aims and objectives of the project and the results obtained or work done. Recommendations for further work take a broader perspective than the project and may show particular insight or originality.	**16-20** (80%+)

Presentation

The presentation mark is aimed at assessing how effective the report is as a means of communication. The following aspects are to be considered in assessing this:

Correct spelling, punctuation and grammar.

The manner of writing.

The choice of words, conciseness, clarity of expression, avoidance of slang, correct use of technical terms.

The presentation of arguments.

The ability to present a clear, cogent logical argument or rationale. The use of appendices where relevant.

General layout.

Use of paragraphs, headings, underlining, numbering, pagination, display of diagrams, computer print-out, etc.

References.

Correct citing of referenced materials; use of references within the text.

There will *not* be a mark per criterion, but rather the criteria will be used for guidance in assessment. Note that one criterion alone - e.g. badly spelt, poorly punctuated and ungrammatical English - can wreck a report in terms of its ability to communicate, which is what is being assessed.

Length. The presentation mark is capped at 3 for reports which exceed the maximum length of 25,000 words, or do not include an accurate word count. (Note that individual report sections that contain unnecessary or irrelevant material may also be penalised.)

DESCRIPTION OF QUALITY	MARK RANGE
The whole report, a significant part or several parts is/are very difficult to understand, or the report as a whole requires considerable effort from the reader to follow.	0-1
The report communicates to a satisfactory degree throughout, without too much effort required by the reader, despite a number of weaknesses on the above criteria.	2
The report in general communicates well and has few and only minor weaknesses on the above criteria.	3
A very good level of communication to the reader is achieved throughout the report. The report is within the maximum allowed length and a word count is provided.	4
The report is excellent on all the above criteria and communicates exceptionally well to the reader. The report is within the maximum allowed length and a word count is provided.	5

Viva

The viva mark assesses the student's presentation of their work, not the quality of that work. This means that a good presentation receives a good viva mark even if the work itself is poor, and a poor presentation will receive a poor viva mark even if the project work is excellent. (Students who have not achieved their objectives should present as much of the work as they have done.) Two aspects of the viva are marked:

Presentation / demonstration of the work relates to the student's initial demonstration and /or presentation. This part of the viva will normally last no longer than 20 minutes. The viva may focus on a demonstration of deliverables or practical work, a formal presentation of the project work, or a combination. The following criteria are used:

- Good planning and preparation
- Appropriate and relevant choice of content
- Clear oral presentation: audibility, fluency etc.
- Clearly demonstrates the deliverables or techniques used in practical work, and / or conveys the purpose, method and results of the investigative work, as appropriate to this presentation.
- Appropriate structure of presentation and allocation of time
- Demonstrates good understanding of the work done.
- Where used, visual aids are clear and visually pleasing.

Mark Range	Presentation
0-1	Presentation / demonstration is deficient in most of the listed criteria and / or does not adequately communicate understanding of the key elements of the work.
2	On balance, the presentation is barely adequate but at least communicates a useful level of understanding of the work done.
3	A good presentation, conveying a clear understanding of the work done; may show substantial weakness in no more than two of the listed criteria.
4	An excellent presentation which meets all the listed criteria with only very few and minor weaknesses.
5	An exceptionally clear, well-structured and engaging presentation of the work done, meeting all listed criteria to a very high level .

Handling of questions and discussion of the work relates to the student's answers to questions, responses to comments, etc. Students must be able to explain the work done, including practical tasks and the construction of relevant deliverables. Marking will take into account both the content and the clarity of answers.

Mark Range	Handling
0-1	Most questions received weak answers or no answer, and / or student showed little familiarity with relevant techniques or deliverables.
2	Answers to questions and explanations of deliverables were on balance acceptable. Some poor answers or difficulty explaining deliverables / practical work.
3	Answers to questions were on balance good. Student showed familiarity with relevant deliverables / practical work and was able to explain them clearly.
4	All answers to questions and explanations of deliverables / practical work were well-focused and good or excellent in content and clarity, showing an excellent understanding of the work and its context.
5	Answers to questions and explanations of relevant deliverables and practical work were exceptionally clear, thorough, succinct and relevant, and demonstrated an outstanding understanding of the work done and the subject context.

Marking Scheme: Application Project (Weighted @ 80%)
Overview

    Report: 40%

Abstract & Introduction	5%
Analysis	30%
Synthesis	30%
Evaluation & Conclusions	30%
Presentation	5%

    Product 50%

Fitness for Purpose	40%
Build Quality	60%

    Viva 10%

Abstract and Introduction

    Abstract: a precise and concise summary of the project - the essence of the work. It represents the report in a highly condensed form, including the aims of the work, methods, results and conclusions. (Typically 250-400 words.)

    Introduction. (Typically about 1500 words.) It includes:

- The aims and objectives of the project – stated and briefly explained.
- An overview of the product that was built – its purpose, scope, main features and characteristics.
- Discussion of the problem context and the reasons for undertaking the project. This should relate to the state of the art in the subject area and/or the real world context of the problem, and show why this is a worthwhile computing project.
- A **brief** summary of the approach taken and tools used.

DESCRIPTION OF QUALITY	MARK RANGE
The abstract and introduction are wholly inadequate or several of the elements are missing.	0 - 1
A barely acceptable Abstract and/or Introduction - adequate in some respects but with major deficiencies. Most of the elements listed above are present but some are missing or flawed.	2
An adequate Abstract and Introduction but not in any way outstanding. May show some inadequacies of style and/or structure, or minor omissions. The introduction lacks none of the elements listed above; alternatively, one missing element may be balanced by excellence in other respects.	3
A clear, accurate and concise Abstract and Introduction that cover all required aspects as listed above. May have some outstanding aspects but is not wholly outstanding.	4
An outstanding Abstract and Introduction which read well, cover all required areas, exhibit no factual errors, give sound justification for choosing this topic as a computing project, and convey an excellent understanding of the work to be done.	5

Analysis

(Typically ~4000-5000 words):

The Analysis has two parts, which are of roughly equal importance:

A brief **critical review of literature** relevant to the problem to be solved, or to an aspect of the solution. This will normally address underlying principles of the problem area and/or possible approaches to solving the problem, and should involve critical discussion of the ideas explored; it is not purely a fact-finding exercise. The literature review should make a clear contribution to the execution of the project, and the implications for the project should be made clear.

A commentary on key points in the requirements specification, including a discussion and justification of significant decisions made and the alternatives considered, and any problems or constraints on the solution that were expected to result from the requirements. The discussion should cover both functional and non-functional requirements, including a justification of the choice of methods and tools to be used and the intermediate deliverables (e.g. models) to be produced. Justification of requirements should consider the implications of relevant factors, e.g. organisational context, principles derived from the literature review. This section should briefly indicate the approach taken to requirements elicitation. Where similar products have been considered in deciding on the features of the product to be built, they may be discussed here as part of the justification of requirements.

Marks in this section are given for discussion of the areas described above. The actual specification of requirements should be provided in an appendix, along with any related deliverables, and should clearly communicate the requirements for the software to be built. It is marked as part of the product; further credit for it is not available here.

DESCRIPTION OF QUALITY	MARK RANGE
Very poor. Little or no useful discussion of relevant literature or commentary on the requirements. The discussion of requirements may simply restate the requirements specification.	**0 – 5** (< 20%)
Some useful analysis; however, the quality and extent is on balance inadequate. The analysis is weak in at least one area: the literature review is very limited, predominantly not related to computing literature, or of little relevance to carrying out the project, or simply restates basic material; and / or the discussion of requirements adds little to the requirements listed in the specification.	**6 – 11** (<40%)
An adequate review of relevant literature and discussion of key points relating to the requirements as described above, including the choice of methods, tools and deliverables. The literature review identifies and discusses relevant ideas and their implications for the project. Some aspects of the analysis may be too descriptive or may not display a sufficiently critical approach, or justification of some requirements or of method / tools may be present but weak; these weaknesses may be balanced by good work elsewhere. On balance the work is adequate but in no respect outstanding.	**12 – 17** (<60%)
The literature review demonstrates a critical approach and the sources are mostly well-chosen. It conveys a good understanding of the ideas discussed and their implications for the project. The commentary on the requirements specification explores and justifies a range of significant functional and non-functional requirements and their implications, including possible approaches to the solution of the problem and available tools / techniques. There may be some minor weaknesses or omissions. On balance the work is good; it may have some excellent or outstanding features, but is not wholly excellent.	**18 – 20** (<70%)
The literature review consistently demonstrates good choice of material and a critical approach, conveys a good understanding of the ideas discussed and thoroughly explores their implications for the project. The commentary on the requirements specification explores and justifies a range of significant functional and non-functional requirements and their implications, including comparison of possible approaches to the solution of the problem and thorough assessment of possible tools / techniques. Any weaknesses or omissions are very minor. May have outstanding features; on balance excellent but not wholly outstanding.	**21 – 23** (<80%)
An outstanding analysis. In addition to meeting the criteria for the 21 - 23 range, the critical review of literature clearly and concisely demonstrates a deep understanding of the ideas discussed and their implications for the project, and displays insight or originality in their treatment, and the discussion and justification of requirements shows outstanding insight into the issues involved and alternatives available.	**24- 30** (80%+)

Synthesis

(Typically 2500 – 4000 words.)

A commentary on the product deliverables produced in the analysis, design, construction and testing of the product. The focus should be on discussion and justification of important features and techniques, decisions made (including alternatives considered), problems encountered and their solutions. Students should be selective and not attempt to discuss every detail. Descriptive material should be kept to the minimum needed to enable the reader to understand the deliverables and discussion.

Key points of the following, in whatever form the relevant deliverables take, should be covered:

- Analysis models (e.g. class diagram), including any significant features arising from the requirements.
- The design specifications, including database design and HCI design where appropriate
- The product code, or equivalent
- The test plans and test results, including the testing strategy, techniques used and conclusions drawn from the testing.
- If applicable to the project, the approach taken to any user testing or usability evaluation, artefacts used, and the results obtained.

Note: the product deliverables (designs, test plans, etc.) are marked as part of the product; no credit for them is available here. Deliverables should provide a comprehensive representation of the product.

All product deliverables should be presented in appendices and/or the accompanying CD; only small representative extracts should be included in the body of the report.

DESCRIPTION OF QUALITY	MARK RANGE
An inadequate commentary on the product deliverables with little or no discussion of the deliverables listed above; adds little understanding of the solution of the problem beyond that given by deliverables.	**0 – 5** (< 20%)
A commentary on the product deliverables which is in some respects adequate but fails to address key issues, important decisions or problems, or important aspects of the process or deliverables. The work may contain excessive and unnecessary descriptive material, or fail to address actual deliverables, or the aspects discussed may be badly chosen.	**6 – 11** (<40%)
A commentary on the product deliverables that is on balance adequate: either it exhibits no major flaws and provides discussion and justification relating to all relevant product areas as listed above, but is not excellent in any respect; or some weaknesses or omissions are balanced by good or excellent work in other areas – but must discuss and justify aspects of deliverables related to at least design, implementation and testing.	**12 – 17** (<60%)
A commentary on the product deliverables which is on balance good: the work is at least adequate in ALL respects and may be excellent or outstanding in some respects. The comments cover deliverables from all relevant aspects of the development process as listed above. The aspects discussed are significant and the discussion has depth; sound justification is given for decisions made. Minor weaknesses may be balanced by excellent features; on balance, the work is good but not wholly excellent.	**18 – 20** (<70%)
A commentary on the product deliverables which is which is on balance excellent, and may have some outstanding features, but is not wholly outstanding; any weaknesses must be few and minor. The comments cover deliverables from all relevant aspects of the development process as listed above. The aspects discussed are significant and the discussion has depth; sound justification is given for decisions made.	**20 – 23** (<80%)
The commentary on the product deliverables gives an outstanding discussion of a range of well-chosen aspects of the work, covering all required areas as listed above. The discussion of development decisions demonstrates an excellent understanding of the issues and techniques involved throughout the development, and critically considers a range of novel or creative solutions.	**24 - 30** (80%+)

Evaluation and Conclusions

The evaluation should take a critical approach and arguments should be justified. (Typically 2500-4000 words.) It comprises 3 sections:

Product evaluation. An evaluation of the product, focusing on its build quality and fitness for purpose. This should include, and may be structured around, an assessment of the extent to which the product meets its requirements and other criteria set out in the Project Proposal. Results of any user or client evaluation should be taken into account.

Process evaluation. An assessment of the project process and the student's own performance, including project management aspects, use and suitability of methods and tools, and an appraisal of the student's learning and development during the project.

Conclusions and Recommendations. An appraisal of the extent to which the project's aims and objectives have been met, and other conclusions drawn from the work as a whole. What the student has achieved and not achieved should be made clear. (This section may to some extent summarise parts of the evaluation.) Recommendations for further work should ideally relate both to the product and to the wider field, e.g. suggestions for good practice in developing this type of system.

DESCRIPTION OF QUALITY	MARK RANGE
Little or no evaluation is offered of the product or the student's performance. Conclusions and recommendations are missing or inadequate.	**0 – 5** (< 20%)
Some attempt at an evaluation and conclusion, but the work is weak in at least two sections. Evaluation of the product, the project process and the student's personal performance and learning are present, but the extent or quality is inadequate and one or more of the major elements listed above may have been omitted; and/or the conclusion does not assess whether the aims of the project have been achieved, or the recommendations for further work are missing or ill-considered. On balance, the standard of work is not acceptable.	**6 – 11** (<40%)
The evaluation and conclusions are on balance acceptable, but the work is weak in at least one section: some significant issues may be omitted from the product or process evaluation, or the discussion may lack depth; conclusions may be incomplete, or the recommendations for further work are limited and do not show the necessary broader perspective. Not outstanding in any respect.	**12 – 17** (<60%)
A sound evaluation of the product and the project process that covers a good range of issues. The product is evaluated against its requirements and a range of other issues or criteria are considered. The conclusion compares the aims and objectives of the project and the results obtained or work done. Recommendations for further work are appropriate and may show a broader perspective than that of the project. No section has serious weaknesses, and there may be excellent or outstanding features. On balance the work is good but not wholly excellent.	**18 – 20** (<70%)
An excellent evaluation of the product and the project process that covers a good range of issues with no more than minor omissions in any section. The product is fully evaluated against its requirements and a range of other issues or criteria are considered. The conclusion gives a complete comparison between the aims and objectives of the project and the results obtained or work done. Recommendations for further work are well-considered and show a broader perspective than that of the project. May have outstanding features; on balance excellent but not wholly outstanding.	**20 – 23** (<80%)
An outstanding evaluation of the work undertaken, incisive, self-critical, evidence-based and complete in all respects. The conclusion gives a complete comparison between the aims and objectives of the project and the results obtained or work done. Recommendations for further work take a broader perspective than that of the project and show particular insight or originality.	**24 - 30** (80%+)

Presentation

The presentation mark is aimed at assessing how effective the report is as a means of communication. The following aspects are to be considered in assessing this:

Correct spelling, punctuation and grammar.

The manner of writing.

The choice of words, conciseness, clarity of expression, avoidance of slang, correct use of technical terms.

The presentation of arguments.

The ability to present a clear, cogent logical argument or rationale. The use of appendices where relevant.

General layout.

Use of paragraphs, headings, underlining, numbering, pagination, display of diagrams, computer print-out, etc.

References.

Correct citing of referenced materials; use of references within the text.

There will *not* be a mark per criterion, but rather the criteria will be used for guidance in assessment. Note that one criterion alone - e.g. badly spelt, poorly punctuated and ungrammatical English - can wreck a report in terms of its ability to communicate, which is what is being assessed.

Length. Reports will typically be 10,000 – 15,000 words in length, and should not exceed 18,000 words. The presentation mark is capped at 3 for reports which exceed the maximum length, or do not include an accurate word count. (Note that individual report sections that contain unnecessary or irrelevant material may also be penalised.)

DESCRIPTION OF QUALITY	MARK RANGE
The whole report, a significant part or several parts is/are very difficult to understand, or the report as a whole requires considerable effort from the reader to follow.	0-1
The report communicates to a satisfactory degree throughout, without too much effort required by the reader, despite a number of weaknesses on the above criteria.	2
The report in general communicates well and has few and only minor weaknesses on the above criteria.	3
A very good level of communication to the reader is achieved throughout the report. The report is within the maximum allowed length and a word count is provided.	4
The report is excellent on all the above criteria and communicates exceptionally well to the reader. The report is within the maximum allowed length and a word count is provided.	5

Product

The product is marked under two main headings: Fitness for Purpose (40%) and Build Quality (60%). Within each of these, specific deliverables to be assessed should have been defined in the Project Proposal; additional criteria may also have been defined. Weightings may also have been assigned to subdivide the mark for each section. The product marking scheme defined in the Project Proposal should be followed unless there has been an agreed change during the project. If no criteria have been agreed, the default criteria and mark ranges provided overleaf should be used.

How these marks are awarded will necessarily be to some extent product-specific, but should cover the quality of the models, code and other evidence provided with the report and the functionality, usability and other relevant aspects of quality of the work as demonstrated at the Viva. Markers will assess requirements, analysis, design and testing documentation, as well as the finished software.

Fitness for Purpose may be defined as, "Has the student built the right kind of product?"

Build Quality may be defined as, "Has the student built the product in the right kind of way?" The product should demonstrate the effective and accurate use of appropriate techniques for requirements specification, analysis, design, implementation and testing, including effective use of relevant languages and tools. This will be evidenced by models, specifications etc. appropriate to the method followed. The following (or agreed equivalents) are **required** for all products:

- **Requirements specification & analysis.** E.g. a requirements list, use case diagrams and descriptions. Both functional and non-functional requirements should be considered where appropriate. Evidence of analysis could consist of, for example, UML class and communication diagrams or other analysis diagrams.
- **Design specification.** E.g. UML class diagrams, sequence diagrams etc., database schemas or other deliverables demonstrating architecture and detailed design. The design should meet the requirements. Evidence should be provided of an HCI design process, except in the few cases where this is not applicable.
- **Code.** Software should be built to a good standard in terms of structure, style and the absence of errors. Markers should consider evidence from the viva and the code or other evidence provided. Code should be well laid out and commented, and should make use of appropriate techniques.
- **Test plans and results.** The test data and results provided should show that a serious attempt at testing has been made, that testing was thorough and appropriate techniques were used. The test cases should be sufficient and well chosen, in order to detect faults.
- **Other.** Other elements to be included should be specified in the Proposal, e.g. database, prototypes etc.

However, deliverables should be appropriate to the development method used. In some cases, prototypes may form part of the evidence of engineering quality in the analysis and design sections. Where approaches such as agile development are used, appropriate deliverables should demonstrate the engineering quality in each element of performance.

Product marking criteria & deliverables

FITNESS FOR PURPOSE (40%)	Mark Range (to total 40%)
Meeting of Requirements as identified during project. Quality of functionality. HCI (if relevant). Other criteria & deliverables (specify) :- **Default criteria and mark ranges**	To be agreed
Meeting of Requirements as identified during project.	0 – 15
Quality of functionality.	0 – 15
HCI.	0 – 10
BUILD QUALITY (60%)	**Mark Range (to total 60%)**
Requirements specification and analysis Design specification Code quality Test plans and results Other criteria & deliverables (specify) :- **Default criteria and mark ranges**	To be agreed
Requirements specification and analysis	0 – 15
Design specification	0 – 15
Code quality	0 – 15
Test plans and results	0 – 15

The default mark ranges are to be used where no other criteria and mark ranges have been agreed. Students and supervisors are encouraged to agree a marking scheme appropriate to the specific project.

Demonstration / Viva

The viva mark assesses the student's presentation of their work, not the quality of that work. This means that a good presentation receives a good viva mark even if the work itself is poor, and a poor presentation will receive a poor viva mark even if the project work is excellent. (Students who have not achieved their objectives should present as much of the work as they have done.) Two aspects of the viva are marked:

Presentation / demonstration of the work relates to the student's initial presentation / demonstration of their product. This will typically last no more than 20 minutes. The following criteria are used:

- Good planning and preparation
- Appropriate and relevant choice of content
- Clear oral presentation: audibility, fluency etc.
- Clearly demonstrates the features of the product.
- Appropriate structure of presentation and allocation of time
- Demonstrates good understanding of the work done.
- Where used, visual aids are clear and visually pleasing.

Mark Range	Presentation
0-1	Presentation / demonstration is deficient in most of the listed criteria and / or does not adequately communicate understanding of the key elements of the work.
2	On balance, the presentation is barely adequate but at least communicates a useful level of understanding of the work done.
3	A good presentation, conveying a clear understanding of the work done; may show substantial weakness in no more than two of the listed criteria.
4	An excellent presentation which meets all the listed criteria with only very few and minor weaknesses.
5	An exceptionally clear, well-structured and engaging presentation of the work done, meeting all listed criteria to a very high level .

Handling of questions and discussion of the work relates to the student's answers to questions, reactions to comments on the product, etc. Students must be able to explain the work done, including product code. Where the tools used to build the product do not involve traditional code, the equivalent deliverables should be discussed. Marking will take into account both the content and the clarity of answers.

Mark Range	Handling
0-1	Most questions received weak answers or no answer, and / or student showed little familiarity with code or other major deliverables.
2	Answers to questions and explanations of deliverables were on balance acceptable. Some poor answers or difficulty explaining code or other deliverables.
3	Answers to questions were on balance good. Student showed familiarity with code and other and gave clear explanations
4	All answers to questions and explanations of code and other deliverables were well-focused and good or excellent in content and clarity, showing an excellent understanding of the work and its context.
5	Answers to questions and explanations of code and other deliverables were exceptionally clear, thorough, succinct and relevant, and demonstrated an outstanding understanding of the work done and the subject context.

EXAMPLE – DECLARATION OF AUTHORSHIP

DECLARATIONS

I declare the following:

(1) that the material contained in this dissertation is the end result of my own work and that due acknowledgement has been given in the bibliography and references to **ALL** sources be they printed, electronic or personal.

(2) the Word Count of this Dissertation is ....

(3) that unless this dissertation has been confirmed as confidential, I agree to an entire electronic copy or sections of the dissertation to being placed on the eLearning Portal (Canvas), if deemed appropriate, to allow future students the opportunity to see examples of past dissertations. I understand that if displayed on eLearning Portal it would be made available for no longer than five years and that students would be able to print off copies or download.

(4) I agree to my dissertation being submitted to a plagiarism detection service, where it will be stored in a database and compared against work submitted from this or any other School or from other institutions using the service.

In the event of the service detecting a high degree of similarity between content within the service this will be reported back to my supervisor and second marker, who may decide to undertake further investigation that may ultimately lead to disciplinary actions, should instances of plagiarism be detected.

SIGNED:

Please remember to sign this declaration and include it before submitting your dissertation for binding.

EXAMPLE – TITLE PAGE

**A Report submitted in partial fulfilment
of the regulations governing the award of
the Degree of
BSc (Honours) *<Programme Name>*
at KDU Penang University College**

<u>**Project Report**</u>

<Put Your Title Here>

<Your Name>

<Year>

Application Project *

*or Investigative Project, as appropriate.

EXAMPLE – PROJECT INITIATION DOCUMENT

PROJECT INITIATION DOCUMENT

Student Name	**Family Name**	**Forenames**	**Usually known as**

Project Supervisor :

Aim of project :

Rationale for project :

The main challenge is :

Type of product to be produced or investigative work to be undertaken:

Resources required :

Any external body involved ? If so, who ?

Signatures :

Student :   **Supervisor :**

EXAMPLE – RESEARCH ETHICS REGISTRATION AND APPROVAL FORM

Ethical category:	
Red	▢
Blue	▢
Green	▢

Section One: Registration *[To be completed by student]*

Title of research project/dissertation	

Researcher's name	

Programme of study	

Academic Year	

Module code	

Supervisor's name	

Second marker's name	

Start Date of Project	

Brief outline of research topic:

Short description of proposed research methods including identification of participants:

Ethical considerations in the research project	YES	NO
1. Does your research involve an external organisation or partner?	☐	☐
2. Does your research involve human participants?	☐	☐
3. If yes to Q.2, will you inform the participants about the research?	☐	☐
4. Will you obtain their consent using the standard consent form?	☐	☐
5. Is any deception involved?	☐	☐
6. Do any participants constitute a 'vulnerable group'?	☐	☐
7. Will the research involve the following information?		
Commercially sensitive	☐	☐
Personally sensitive	☐	☐
Politically sensitive	☐	☐
Legally sensitive	☐	☐
8. Is the research likely to have any significant environmental impacts?	☐	☐
9. Are there likely to be any risks for the participants in your research?	☐	☐
10. Are there likely to be any risks for you in conducting the research?	☐	☐
11. If yes [to 5, 6, 7, 8, 9 or 10 above] have you identified steps to address the issues and mitigate any risks to participants, yourself or the environment?	☐	☐

Statement to explain how any issues identified above will be addressed and what steps will be taken to mitigate such risks or adverse impacts

Ethical category of research project *[Please tick as appropriate]*

Red	☐	vulnerable participants; human tissue; sensitive data; risks to participants & researchers etc.
Blue	☐	human participants requiring informed consent; commercially sensitive information etc.
Green	☐	no participants involved; secondary data only; no sensitive data

I have read the University College Ethics Policy and Procedures and confirm that the answers I have given above are correct. Where issues arise under items 5, 6, 7, 8, 9 or 10 [above] I have described in writing how I intend to approach these issues in the research. **Researcher's signature: _____** **Date: _____**

Section Two: Approval

Supervisor/Module Tutor's name confirming ethical risk status	

Ethical approval *[Please tick as appropriate]*

Green - Ethical approval is given without conditions.	☐
Blue – Ethical approval is given with the following conditions: • Information to be provided to all participants. • Participant consent to be obtained in accordance with the University College procedures. • Data to be stored and destroyed securely in accordance with University College guidelines. • Adherence to Data Protection Act. • Anonymity to be offered to participants. • Commercial confidentiality to be provided to organisations(s). • Software vulnerabilities, exploits, hazardous software etc. not to be published without prior 'responsible disclosure' to the affected supplier. • Other (please state):	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Red - Project is referred to Research Committee for approval.	☐

Name & role of reviewer 1: _____

Signature: _____

Date: _____

Name & role of reviewer 2: _____

Signature: _____

Date: _____

Outcome of Review:

EXAMPLE – RESEARCH PARTICIPANT CONSENT FORM

Research Participant Consent Form Template

Name of participant	
Organisation	
Researcher's name	
Title of research project/dissertation	
Programme of study	
Supervisor's name	

Brief description of nature of research and involvement of participant:

Standard statement of participant[*] consent (please tick as appropriate)

I confirm that:

I have been briefed about this research project and its purpose and agree to participate*
☐

I have discussed any requirement for anonymity or confidentiality with the researcher[**]   ☐

I agree to being audio recorded/filmed/photographed ***
☐

[*] *Participants under the age of 18 normally require parental consent to be involved in research.*
*** *Delete as appropriate*

**Specific requirements for anonymity, confidentiality, data storage, retention and destruction

---

Signed   ....   **Date** ....

Standard statement by researcher

I have provided information about the research to the research participant and believe that he/she understands what is involved.

Researcher's signature   ……………………………………….

Date   ……………………………………….

EXAMPLE – RESEARCH PARTICIPANT INFORMATION SHEET TEMPLATE

Research Participant Information Sheet Template

Name of participant	
Organisation	
Researcher's name	
Title of research project/dissertation	
Programme of study	
Supervisor's name	

Project overview:
Project aims:
Information required and outline of any potential risks involved:
How the information will be stored and published (if applicable):
Any other information deemed relevant to the project:

EXAMPLE – FILE OF EVIDENCE CHECKLIST TEMPLATE

FILE OF EVIDENCE CHECKLIST <NAME OF PROGRAMME>

Student Number	
Course Code	

Please tick the list below to indicate the contents of your evidence file; note that this will vary depending on your topic and methodology – you are not expected to tick all items listed. You should include all copies of both paper and electronic data.

	Included?	
Evidence	**YES**	**NO**
Records of meetings with supervisor	☐	☐
List of participants/respondents	☐	☐
All signed participant consent sheets	☐	☐
Information/briefing sheets for participants	☐	☐
Dates and locations of interviews / data collection activities	☐	☐
All completed (original) questionnaires	☐	☐
All notes from Interviews, researcher diary, lab note book etc.	☐	☐
Electronic data	☐	☐
Data collection / observation /experimentation records	☐	☐
Notes on /early drafts of mathematical calculations	☐	☐
Notes on /early drafts of drawings and sketches	☐	☐
Copies of source materials (when not available through the library/Web, such as internal company reports)	☐	☐
Notes made on /about private source materials	☐	☐
Others: (please list, continue on a separate sheet if necessary)	☐	☐

In submitting this evidence file, I understand the data will be destroyed, in accordance with University Procedure, after the Examination Board (unless previously agreed with supervisor)