CS4437
Final Year Project (FYP)
2025/2026

Block 3.1 15 ECTS

Overview
The Final Year project (FYP) is a significant component of your final year and as such involves a substantial piece of individual work with multiple submissions. The FYP must be a software technology-based project. It is supervised by one or several members of staff in the CSIS department and over the wider university community.

Where possible, the FYP should be based on the project worked on as part of Residency 4. There is a synergistic benefit of tying the project to residency work. For some, however, this may not be possible due to NDAs (non-disclosure agreements).

Students are required to submit their final FYP report and related components to Brightspace. The supervisors will mark and provide feedback on submitted interim reports.

Academic Integrity and Plagiarism, use of AI

The university's regulations on academic integrity and plagiarism apply.

Students will be expected to include a declaration on academic integrity and plagiarism with both, their interim submission and final submission.

The use of generative AI for any part of the project, at any stage of the process is not permitted, apart from the following scenarios:

- The express, written, permission of the supervisor is obtained by email and a copy of the email exchange detailing the student's request and the supervisor's response is included in the report (interim and/or final). Further, the report must then include a declaration that describes in detail which AI was used, how and for which purpose.
- The use of generative AI is an integral part of the project, and is as such discussed, in full, in the report.

Research Ethics

The University mandates that where research for an FYP involves human participants students must apply for ethical approval. This is done by completing, and submitting, the appropriate application form. Which form is used depends on the nature of the research. FYP students who are using subjects over the age of 18 should only need the Science & Engineering Expedited Application form. If, for example, the subjects are younger than 18, or include people with mental disabilities, then the more complex, full application form may be needed. The student and supervisor, in consultation, should complete, and submit, whichever ethics approval form

is required. The Science & Engineering Expedited Application form and the Science & Engineering Guidelines for Research on Human Persons by Faculty or Students are available at https://www.ul.ie/scieng/scieng-research/research-ethics

It is the students' responsibility to initiate the research application process. It is the supervisor's responsibility to guide the research ethics application process. It is the student's responsibility to ensure that sufficient time is planned into the project timeline to allow for the ethics application process. Lead time is around 4-6 weeks but can take 6-8 weeks. Students should engage with this process early on, in the first semester of the FYP.

The student must make any data that requires archiving as per the ethics committee requirements available to the supervisor. The supervisor will then ensure that this data is archived or request the archiving from the FYP coordinator.

Students must choose from 1 of the following 2 options:

Type	Name	Connected to RP	Format
Option 1	Technical Benchmarking Study: Comparing Software Tools or Algorithms Under Similar Conditions	Preferably	Report format
Option 2	Research Paper Project	Not necessarily	Academic paper format

Option 1:
Technical Benchmarking Study: Comparing Software Tools or Algorithms Under Similar Conditions

Objective:
To conduct a quantitative benchmarking study that rigorously evaluates and compares two or more software tools, frameworks, or algorithms based on specific performance metrics under controlled conditions. At least one of these should be related to your residency placement.

Instructions:

1. **Choose a Topic:** Select two or more software tools, libraries, or algorithms that serve a similar function. Preferably at least one of your chosen tools or algorithms should have direct relevance to your residency, allowing you to apply your findings to real-world scenarios in your field. Examples include:
    - Sorting algorithms (e.g., QuickSort vs. MergeSort)
    - Web servers (e.g., Apache vs. Nginx)
    - Programming languages for a specific task (e.g., Python vs. Go)
    - Machine learning libraries (e.g., TensorFlow vs. PyTorch)

2. **Define Your Evaluation Criteria:** Choose 2–4 measurable metrics that will allow for a clear and objective comparison. Examples include:
    - Execution time / Runtime performance
    - Memory usage
    - CPU utilization
    - Accuracy (for Machine Learning models)
    - Scalability or throughput

3. **Set Up the Environment:**
    - Ensure all tools are tested under **similar hardware and software conditions as much as possible**. This is critical to ensure a fair comparison and isolate the performance differences to the tools themselves, rather than environmental factors.
    - Thoroughly document your testing environment, including the operating system, hardware specifications (e.g., CPU model, RAM), and specific software versions used for each tool.

4. **Run the Benchmarks:**
    - Perform multiple test runs for each scenario to reduce variability and ensure reliable results.
    - Collect and log results systematically. Consider using scripting or automation to minimize manual errors and potential bias during data collection.

5. **Analyse the Results:**
    - Present your quantitative results clearly using **tables or graphs** to visually represent the data. When presenting data, go beyond raw numbers; utilize appropriate statistical measures (e.g., averages, standard deviations) to make the data understandable.
    - Discuss the **key differences observed** between the tools/algorithms and explain their implications.

    - Address any **anomalies or unexpected results**, offering potential explanations.

Report Structure and Requirements:
Your report should be structured logically and at a minimum include the following elements:

- **Introduction:** Clearly state your chosen topic and explain why this specific comparison is significant and relevant, especially in the context of your residency. This section should include scholarly literature to define the areas, highlight recent peer-reviewed knowledge on the topic, and review the current discourse or thinking within the field.

- **Methodology:** Detail what you tested, how you conducted the tests (including your data model, schemas if applicable, and measurement techniques), and justify your methodological choices.

- **Quantitative Results:** Present your raw and processed data in **charts, tables, and brief descriptive text**. Ensure all figures and tables are clearly labelled and easy to understand.

- **Discussion:** Interpret your quantitative results. Explain what the data means, discuss the strengths and weaknesses of each tool/algorithm based on your findings, and address any limitations of your study. This section serves as the in-depth analysis of your findings.

- **Conclusion:** Summarise your findings and explicitly state which tool or algorithm you deem more suitable under specific conditions, based on the evidence presented in your report.

- If required use **appendices** for code.

Additional Requirements:

- **Clarity and Conciseness:** Use clear and concise language throughout the report. Ensure that each section flows logically into the next, maintaining a cohesive narrative.

- **Evidence-Based Claims:** Support all claims and interpretations with **specific data points and examples** derived directly from your benchmarking results.

- **Referencing and Citation:** Make sure your report is correctly referenced and uses appropriate citation as prescribed by the **UL Cite It Right standard**. Please refer to the official UL Cite It Right guidelines for detailed instructions on referencing.

- **Video Summary:** In addition to the written report, create a concise video summary of your key findings. This video should effectively convey the essence of your work to your class members and examiner, providing a clear overview of your methodology, results, and conclusions.

- **Word Count:** 10,000 words maximum.
    - Title page, appendices and bibliography are not included in the word count.
    - Documents that exceed the word count by 10% will be penalised.

Option 1:
Technical Benchmarking Study: Comparing Software Tools or Algorithms Under Similar Conditions

Marking Guide

Content & Understanding (30%)

- Introduction: Clear topic, relevance to residency, objective.
- Scholarly literature used is relevant and is applied well.
- Conclusion: Summary of findings, clear recommendations/conditions.
- Discussion: Interpretation of results, strengths/weaknesses, limitations.
- Overall understanding of the chosen tools/algorithms and benchmarking principles.

Methodology (25%)

- Appropriate topic/tools chosen.
- Clear and measurable evaluation criteria defined.
- Controlled and well-documented test environment.
- Sound benchmarking procedure (multiple runs, automation, precise timing).

Quantitative Results (20%)

- Accurate data collection.
- Clear and effective presentation (tables, graphs, labels).
- Appropriate use of statistical measures (averages, etc.).

Presentation & Communication (15%)

- Clarity and conciseness of language.
- Logical flow between sections.
- Claims supported by data/examples.
- Correct referencing and citation (UL Cite It Right).

Video Summary (10%)

- Effectively conveys key findings.
- Concise and clear overview.
- Appropriate for the target audience (classmates, examiner).

Residency 4: Quantitative Benchmarking Report – Grading Rubric

Category	Weight	Fail <30 (F)	Fail 30–39 (D1/D2)	40–51 (C3/C2)	52–59 (C1/B3)	60–71 (B2/B1)	72–79 (A2)	80–100 (A1)
Content & Understanding Demonstrates understanding of the topic, tools, and benchmarking. Includes introduction, discussion, and conclusion. **Review of Relevant Literature** How critical, relevant, comprehensive and current is the review? Are the sources demonstrated to be current/credible/ authoritative (or not)?	30	Unclear or incomplete. Lacks relevance, depth, or reflection. Uncritical, irrelevant and not comprehensive context and/or lit review provided; Zero or a few sources mentioned, but not reviewed. Possible plagiarism.	Basic understanding with limited relevance. Minimal insight or reflection. Minimally relevant context and/or lit review provided; A few sources offered, superficial review, poorly related to or misunderstanding of the subject.	Covers most elements but lacks depth or critical interpretation. Sufficiently relevant context and/or lit review provided. Limited understanding and analysis.	Clear understanding with some insight and reflection. Relevant context and/or lit review provided. Research uses authoritative sources; Shows some understanding and analysis.	Strong grasp of tools and purpose. Thoughtful discussion. Highly relevant context and/or lit review provided. Well researched and articulated, demonstrating understanding and some critical analysis abilities; Uses credible, current material with good critique.	Deep understanding with strong insights and reflection on limitations. Evidence of extensive research;	Exceptional insight and depth of understanding. Demonstrates critical thinking and awareness of broader context. Review is extremely insightful. Inclusion of critical comments challenging assumptions or current practice.
Methodology Selection and justification of	25	Poorly defined metrics or weak testing	Method lacks clarity or justification.	Reasonable method but lacks detail or	Appropriate methodology with some	Sound methodology with good	Well-justified, rigorous, and repeatable	Methodology is exemplary, innovative, and

tools and metrics. Documentation and testing quality.		process. Environment not clearly controlled.	Inconsistent testing.	precision. Some inconsistencies.	justification. Mostly consistent testing.	documentation and justification.	method. Clear documentation.	robust. Fully justified and well executed.
Quantitative Results Presentation and interpretation of data. Use of statistics.	20	Data unclear, poorly presented, or lacking accuracy and insight.	Results presented but lack clarity or accuracy. Minimal analysis.	Results are present but presentation may lack clarity or completeness.	Clear presentation of results with some statistical interpretation.	Mostly accurate results with good use statistics.	Accurate and clearly presented results. Appropriate use of statistics.	Results are exceptionally well presented and interpreted. Insightful statistical analysis.
Communication & Referencing Structure, clarity, and referencing quality.	15	Unclear or poorly structured. Referencing is missing or incorrect.	Writing is inconsistent. Referencing has major errors.	Understandable but lacks clarity or structure. Referencing may have errors.	Mostly clear and logical. Referencing mostly correct.	Clear, concise, and logically structured. Referencing aligns with UL Cite It Right.	Very well written and structured. Referencing is accurate and complete.	Outstanding clarity and structure. Referencing is flawless and enhances credibility.
Video Summary Effectiveness and clarity of video summary.	10	Missing or ineffective summary.	Basic summary with limited clarity or relevance.	Summary provided but lacks detail or engagement.	Covers main points clearly. Appropriate for audience.	Effective and engaging summary. Clear and concise.	Highly effective summary with strong audience engagement.	Exceptionally clear, engaging, and insightful summary. Demonstrates deep understanding.

Option 2:
Research Paper Project

Objective:
The purpose of this thesis project is to investigate a concept or idea as a software technology-based project. Please note it is the responsibility of each student to identify the topic for their project.

Report Structure:
This research thesis project should be submitted in an academic paper format that follows IEEE Manuscript Templates for Conference Proceedings
Manuscript Templates for Conference Proceedings | IEEE

Your FYP thesis should be structured logically and at a minimum include the following elements:

Introduction that clearly has:

- identified the problem/issue/gap/opportunity the project is focusing on, addressing the need for the project considering the work of others, and detailing the expected impact of the project;
- specified the objectives/goals of the project, with a summary of the proposed approach to achieving these objectives/goals.

Background/Literature review that has:

- provided clear evidence of relevant background research that is rigorous and scholarly, that has identified key findings/lessons learnt;

Methodology that clearly has:

- shown how the student proposes to address the objectives of the project including ethical issues and practical considerations relating to the project;
- Detail the approach taken to develop a solution/capability to address the problem/issue/gap/opportunity previously identified, outlining the key steps/stages logically.

Overall paper should show the student has:

- provided evidence of work done to date;
- displayed excellent organisational and presentational skills, sections are well structured and lucidly written and properly referenced.
- Other aspects may be included at the supervisor's discretion, but these additional aspects must be agreed with the supervisor up-front.

If required use appendices for code.

Additional Requirements:

- **Clarity and Conciseness:** Use clear and concise language throughout the report. Ensure that each section flows logically into the next, maintaining a cohesive narrative.

- **Evidence-Based Claims:** Support all claims and interpretations.

- **Referencing and Citation:** Make sure your report is correctly referenced and uses appropriate citation as prescribed by the UL Cite It Right standard. Please refer to the official UL Cite It Right guidelines for detailed instructions on referencing.

- **Video Summary:** In addition to the written report, create a concise video summary of your key findings. This video should effectively convey the essence of your work to your class members and examiner, providing a clear overview of your methodology, results, and conclusions.

- **Word Count:** 10,000 words maximum.
    - The reference section is **included** in the word count.

- Documents that exceed the word count by 10% will be penalised.
- If required, use **appendices** for code.

Option 2:
Research Paper Project

Marking Guide

Introduction: Project Framing / Formulation of Research Question / Research Statement.	10
Contextualisation / Review of Relevant Literature	20
Methodology	10
Primary Research and/or deliverable	25
Analysis	10
Summary, conclusions and recommendations	10
Research Paper Quality & Video	15

Introduction (10%)

- Problem/Issue/Opportunity Identification
  - Clear identification of the problem, its significance, and context within existing work.
- Objectives and Approach
  - Well-defined project objectives with a clear plan for achieving them.
- Expected Impact
  - A detailed discussion of the expected impact of the project.

Background/Literature Review (20%)

- Background Research
  - Thorough and scholarly review of relevant literature with clear connections to the project
- Problem Analysis
  - In-depth analysis of the problem area, linking findings to the project's goals.

Methodology (10%)

- Addressing Objectives & Ethical Considerations
  - Clear explanation of how the project will meet its objectives, including ethical concerns.
- Development Approach & Key Steps
  - Logical, detailed approach with clear steps for addressing the identified problem.
- Practical Considerations
  - Discussion of feasibility, time, and resource considerations for the project.

Primary Research and/or Deliverable (25%)

- Innovative primary research or deliverable produced and documented.

Analysis (10%)

- Insightful and appropriate analysis of the data.
- Clear and effective presentation (tables, graphs, labels).

Summary, Conclusions and Recommendations (10%)

- Summarise your conclusions and recommendations explicitly.
- If required use appendices for code.
- If required have a future work section

Overall Report Presentation (15%)

- Work Done to Date
    - Evidence of progress and substantial work completed.
- Organisation & Presentation
    - Well-structured and clearly written, with good formatting and readability.
- References & Citations
    - Accurate and consistent references with proper citation formatting.

Video Summary

- Effectively conveys key findings.
- Concise and clear overview.
- Appropriate for the target audience (classmates, examiner).

Residency 4: Research Paper Project - Grading Rubric

Final Year Project: Final Submission Marking Form

Student Name:	**Student ID**:

		TYPICAL FEATURES OF WORK AT THIS LEVEL						
Category	**Weight**	**Fail < 30 (F)**	**Fail 30-39 (D1/D2)**	**40-51 (C3/C2)**	**52-59 (C1/B3)**	**60-71 (B2/B1)**	**72-79 (A2)**	**80-100 (A1)**
Project Framing / Formulation of Research Question / Research Statement. Outline of project's aims and objectives To what extent is the problem/topic and investigation well framed in the report? How challenging or ambitious is the problem to be addressed?	**10**	No framing or very generalised with vague aims or objectives.	Project framing outlined but insufficiently clear aims and objectives.	Project framing, aims and objectives apparent, but shows limited understanding and analysis.	Project framing, aims and objectives well-articulated; Some analysis; Key aspects of the context are covered.	Project aims and objectives well framed and viewed in wider context; Shows good understanding and analysis.	The problem is clearly shown to be challenging; Student demonstrates confidence in criticising assumptions or current practice.	Analysis is particularly insightful.

		TYPICAL FEATURES OF WORK AT THIS LEVEL						
Category	**Weight**	**Fail < 30 (F)**	**Fail 30-39 (D1/D2)**	**40-51 (C3/C2)**	**52-59 (C1/B3)**	**60-71 (B2/B1)**	**72-79 (A2)**	**80-100 (A1)**
Contextualisation / Review of Relevant Literature How critical, relevant, comprehensive and current is the review? Are the sources demonstrated to be current/credible/ authoritative (or not)? Is the work correctly referenced with a bibliography in Harvard/UL Cite it Right style?	**20**	Uncritical, irrelevant and not comprehensive context and/or lit review provided; Zero or a few sources mentioned, but not reviewed. Possible plagiarism.	Minimally relevant context and/or lit review provided; A few sources offered, superficial review, poorly related to or misunderstanding of the subject.	Sufficiently relevant context and/or lit review provided. Limited understanding and analysis. Referencing adequate but with some errors/omissions.	Relevant context and/or lit review provided. Research uses authoritative sources; Shows some understanding and analysis. Referencing good with perhaps a few errors/omissions.	Highly relevant context and/or lit review provided. Well researched and articulated, demonstrating understanding and some critical analysis abilities; Uses credible, current material with good critique. Very good referencing with perhaps a few minor errors.	Evidence of extensive research; Excellent referencing free of errors.	Review is extremely insightful. Inclusion of critical comments challenging assumptions or current practice.

		TYPICAL FEATURES OF WORK AT THIS LEVEL						
Category	**Weight**	**Fail < 30 (F)**	**Fail 30-39 (D1/D2)**	**40-51 (C3/C2)**	**52-59 (C1/B3)**	**60-71 (B2/B1)**	**72-79 (A2)**	**80-100 (A1)**
Methodology Is the methodology used appropriate, justified and well applied? Were appropriate methodological tools / techniques/ technologies deployed or considered for deployment? Were they justified?	**10**	Little/no evidence of choice or use of method	Poor choice of methodology, or little/ no evidence to support the methods used.	Methodology described; Some evidence to support methods used.	Appropriate methodology used; Some justification for use.	Credible justification for use.	Methodology well described, well applied and well justified	Investigation and application of well beyond usual undergraduate level.
Primary Research <u>and/or</u> deliverable How well designed and conducted was any primary research? How well evaluated and interpreted were the results? How well was the deliverable designed and executed?	**25**	Need for research is apparent, but none has been carried out. The deliverable is not robust and poorly designed.	Research is often poorly carried out, using a seriously flawed method, or little to no reliable data is obtained. Deliverable is not robust and shows little evidence of good design.	Some evidence of primary research but little use made of data. Deliverable shows some evidence of good design and is robust.	Thoroughly carried out, but with a limited scope, with some data obtained. Deliverable is robust and fairly, well designed.	The research was well-designed, conducted and evaluated. Puts work in a wider context. Deliverable is very robust and well-designed.	Accurate, relevant results; Reflection and cogent evaluation of research. Deliverable is very well designed and exhibits exceptional robustness.	Innovative research and/or method, justified and used in report. Deliverable is exceptionally designed and exhibits exceptional robustness.

		TYPICAL FEATURES OF WORK AT THIS LEVEL						
Category	**Weight**	**Fail < 30 (F)**	**Fail 30-39 (D1/D2)**	**40-51 (C3/C2)**	**52-59 (C1/B3)**	**60-71 (B2/B1)**	**72-79 (A2)**	**80-100 (A1)**
Analysis To what extent does the report present analysis rather than description?	**10**	Content is neither comprehensive, appropriate nor focused.	Some descriptive content but no analysis.	Content is largely descriptive with little analysis.	Shows understanding and analysis of the key aspects of the topic.	Good application of analytical methods while demonstrating critical thinking.	Excellent application of analytical methods. Challenges assumptions in the research and/or contemporary practice.	Particularly insightful analysis that demonstrates awareness of the limits of the current project.
Summary, conclusions and recommendations To what extent are the conclusions / recommendations appropriate, original and supported by the report? How well are the outcomes of the project summarised? Are the conclusions based on analysis and understanding rather than being trite?	**10**	No serious attempt made to address these aspects.	Attempts to address these aspects but is substantially incomplete and deficient	Some summary or statement of conclusions, but the conclusions are trite or somewhat irrelevant to the problem addressed	Outcomes summarised; Conclusions mostly valid and related at least partially to the objectives; Some recommendations made.	Conclusions all valid and relate well to all the objectives; Recommendations are valid with some justification.	Conclusions are appropriate and fully supported by the report. Recommendations are fully justified. Current work is placed in the context of prior work.	Insightful conclusions that are aware of the limitations of the project itself. Demonstrates self-critical faculty with strong awareness of context.

		TYPICAL FEATURES OF WORK AT THIS LEVEL						
Category	**Weight**	**Fail < 30 (F)**	**Fail 30-39 (D1/D2)**	**40-51 (C3/C2)**	**52-59 (C1/B3)**	**60-71 (B2/B1)**	**72-79 (A2)**	**80-100 (A1)**
Report Quality How comprehensive, appropriate and focused is the research paper? How well presented is the report in terms of quality of prose style; page layout; appropriate division into sections and sub-sections; use of graphics and tables; punctuation, spelling, grammar and syntax; ease of reading for the academic audience. **Video Quality**	**15**	Acutely deficient in all aspects.	Serious problems with a number of aspects of language use are often found in work in this range.	An attempt to follow directions regarding organisation, structure, use and flow of language, grammar, spelling, format, diagrams, tables etc.	Satisfactory presentation with respect to presentation, organisation, language, grammar, spelling, format, presentation, diagrams, tables etc	Very good in terms of organisation, structure, use and flow of language, grammar, spelling, format, presentation, diagrams, tables etc	Excellent in terms of organisation, structure, use and flow of language, grammar, spelling, format, presentation, diagrams, tables etc	Outstanding quality in terms of organisation, structure, use and flow of language, grammar, spelling, format, presentation, diagrams, tables etc

Further considerations to justify the grade given (optional):

Feedback comments for student:

CSIS marks to grades reference:

Mark	Grade
0	NG
0.01	F
30	D2
35	D1
40	C3
48	C2
52	C1
56	B3
60	B2
64	B1
72	A2
80	A1

This information may be subject to change.