MONASH University
Engineering

Assessment Overload! How much is too much at Monash Engineering?

ENG4702: Final Year Project - Final Report

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1 Executive Summary

Engineering students and staff at higher education institutions are faced with extreme workload due to assessment. This research focuses on Monash University's Faculty of Engineering, aiming to address the specific issue of assessment overload experienced by both students and staff. A multimodal analysis was conducted by assessing Monash engineering students' perception of different assessment types and their frequency involving data from 187 survey responses from Monash engineering students, 8 interviews from Monash teaching staff and assessment schedule of engineering assessments sourced through Moodle, Monash's assessment platform.

The results highlighted that students feel most overload by exams but found quizzes to be helpful in structuring their studies. Faculty members reported that a significant portion of their time is devoted to preparing and marking exams, which limits their availability for other teaching activities such as engaging with students and developing innovative teaching methods. The visualization tool developed identified peak periods where assessments are due Based on the research findings, several recommendations were proposed to alleviate assessment overload while maintaining high academic standards. These include reducing the weight of exams to 40%, continuing the implementation of low-weighted quizzes throughout the semester, and increasing the focus on group work and project-based assignments. Monash Engineering faculty is also encouraged to use the visualisation tool to reduce assessment bunching. These strategies aim to create a more balanced assessment process that enhances the learning environment and supports both students and staff.

2 Acknowledgement of Country

In the spirit of reconciliation our research team acknowledges the Traditional Custodians of country throughout Australia and their connections to land, sea, and community. We pay our respect to their Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

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3 Introduction

In recent years high workload has been one of the challenges engineering students and staff in higher education are required to face. One primary aspect is the overload of assessments which creates a negative impact on both students and staff. However, universities are also required to deliver a high-quality education and relevant assessments which are important to ensure that the degree provided at their institution is a valid and up to standards. As such, it is important for universities including Monash University who has established a reputation for its commitment to nurture world-class engineer. to provide an assessment structure that benefits the student and staff that also meet the requirements.

For students, the overload of assessment can lower the effectiveness of their learning and reduces time for social activities. A significant factor leading to overload is 'assessment bunching,' wherein numerous assessments are either closely scheduled or overlap. This stress often drives students to adopt survival strategies, resulting in surface-level engagement that ultimately diminishes learning and retention. On the other side of the spectrum, Monash's academic staff are not immune to these pressures. The high demands for administering many assessments have consequences for teaching staff. They find themselves stretched thin, juggling multiple responsibilities including the creation, grading, and feedback for a multitude of assessments. This not only affects the quality of feedback and guidance they can offer to students but ultimately affecting the quality of education and supports to students that they can provide.

By examining assessment practices through the lens of workload, this research aims to evaluate the effectiveness of different assessment types across various engineering disciplines within Monash University. The study will examine current assessment practices within Monash Engineering to understand their impact on both students' and staff's workload. Ultimately it is crucial to develop balanced assessment processes that enhance the learning environment. Through careful evaluation of the types and impacts of assessments, this study will provide actionable recommendations that can mitigate stress and improve engagement and learning outcomes. These recommendations will be crucial in fostering a sustainable academic environment where both students and staff can thrive without the detrimental effects of overload.

4 Aims and Objectives

4.1 Aims

The aim of this research is to investigate Monash engineering assessment practices from the perspective of assessment workload. The workload factors such as volume and stress from different engineering assessments will be concluded and analyse in this research by examining the detrimental effects of excessive and complex assessments on students' learning experiences and the significant challenges faced by academic staff, to finally formulate an evidence base recommendation to assist Monash Engineering academics in creating balanced assessment processes.

4.2 Objectives

- **Investigate and evaluate assessment workload of current Monash engineering student.**

  Data will be extracted from Monash's Institutional database to evaluate the nature, volume and intensity associated with student assessments of engineering units. A survey will be distributed around campus to determine specific time investment allocate to different units and assessments.

- **Investigate and evaluate assessment workload of current Monash engineering teaching staff.**

  Interview will be done on campus to gain insight from teaching staff regarding the volume, intensity, complexity, and time commitment in the creation and marking an assessment.

- **Formulate an assessment guideline to minimize the workload of Monash students and staff.**

  From the data collected from previous objectives and literature review, recommendations will be provided to guide Monash engineering academics in completing assessments in a more effective and efficient way.

4.3 Research Question

1) What type of assessments overload engineering students and staff the most?
2) How can Monash University decrease overload for engineering students and staff while maintaining high educational standards?

5 Literature Review

5.1 Defining High Quality Assessments

Qualities of what makes a good assessment in higher education is a topic that has been researched thoroughly and academics in this field have come to a consensus. There are conditions which need to be met to facilitate a learning environment for students. Hirst and Peters [1] argues three conditions are required to facilitate 'teaching' [1]. The activities (1) "must be conducted with intention of bringing about learning."; (2) "they must indicate or exhibit what is to be learnt"; and (3) "they must do this in a way which is intelligible to, and within the capacities of, the learners". The final statement is of a main focus in this context as agreed by Chambers [2]who argued that students require adequate amount of time to absorb and understand their studies [2]. When students are faced with abundant pressure from assessments students cannot be expected to perform at their highest potential.

A high-quality assessment should be valid, fair, transparent, reliable, and feasible [3]. They should satisfy most, if not all, of these aspects. A valid assessment ensures that the students are being assessed on the required learning objectives at the expected level [4]. This is crucial for ensuring the institutions are equipping students with the skills and knowledge necessary to perform with the associated accreditation. All these principles are important in creating an assessment that is effective, worthwhile, and valuable, nevertheless, Boyd and Bloxham argues that balancing all these aspects have been a hurdle for academics [5]. However, there has been limited research on Australian assessments. To combat such hurdles, there is a need for a guideline for academics which will assist them in deciding on an assessment strategy.

5.2 Workload for students

Defining and assessing the workload of students in higher education has been a challenge in this field of study [6]. Nevertheless, previous studies indicate a general consensus on what is considered as workload for students. While Marsh considered the difficulty, amount of work and hours spent beyond the class, Chambers included the additional time required to understand the concepts and complete assignments [2] [7]. The time required to complete each assignment has been one of the biggest hurdles in these studies as the completion of each assignment can vary dramatically between students as noted by Chambers. Kember also agrees that workload can be identified as the number contact hours in addition to the time required for independent studies [8].

For every unit Monash University offers, a unit handbook is released in which it outlines the outline of the unit and coursework. Additionally, it also reveals the expected workload requirement for that unit. The majority of the units has a minimum expected workload of 144 hours per semester to achieve the learning outcomes of the units. They predict a mixture of 3 to 6 hours of scheduled activities as well as additional 6 to 9 hours of independent study per week. Scheduled activities may include online engagement, attending laboratory classes or workshops. Independent may include completion of readings, assessment, and necessary preparation for the scheduled activities. The current expectation at Monash University for students undertaking a full-time course load with 4 units per semester will be a total of 36 to 60 hours a week with an average of 48 hours per week and 576 hours per semester.

Several studies have focused on relationship between high volume of workload and performance of student's academic results. According to Gibbs and Simpson, students will spend more time devoting studies at a surface level when faced with a high volume of assessments [9]. Gibbs further argues that a lot of small assignments will limit the chance of reflection and risk the chance of double assessment of learning outcomes [10]. This has also been explored by Kneale who highlighted that students are having to spend time on other commitments beyond their studies such as extracurricular activities and part time work turning them into strategic learners who will aim to complete their studies through surface level learning [11]. As prior investigations have shown, studying becomes ineffective when most of that time is spent at a surface level further highlighting the hurdles of creating assessments that satisfy different principles [9]. On the other hand, Boyd and Bloxham share a differing view that very infrequent examination means students will leave all their learning hours into the time immediately before the exam or assessment [5]. As such, academics feel the need to add multiple minor assessments throughout the module. The motivation behind this is to make sure that students are keeping up with content so that the academics can be sure of their skill and validity. These findings present a notable contrast to the studies present earlier which argues that more volume reduces academic validity.

The existing literature indicates a mix of results in finding the best approach to find a suitable volume of assessments for students. Many of the literature note the limitation of individual institutions having their own guidelines. Finally, while hurdles and barriers regarding the volume of assessment are presented in the previous literature, these papers do not present solutions. As such there is a clear need to create a system that balances motivation for students without overloading them with assessment.

5.3 How long do students spend studying?

To understand assessment overload, it will be important to understand how much students spend studying. A few strategies have been put in practice by researchers to quantify this workload. One approach by McKay simply asked students retrospectively about the workload for a course or an assignment [12]. This method depends on the perception of students and the extent in which they feel overburdened or over worked. In a retrospective approach, other components such as interest and difficulty also become factors that effects their answers making assessment of their results more complex. The Hale Report on the other hand took a different approach in asking students to keep a logbook of the time they spent studying after each session [13]. There are complications in that students may feel obligated to report a respectable number of hours to not feel embarrassed. Regardless of the chosen methodology there will be hurdles and difficulties in accurately determining the time spent by students actually studying.

Previous studies have shown methods to find the workload from university staff. Melin et al. [14] sent a questionnaire to all staff to gather information for analysis. Some issues found by the author was that not every staff member was able to complete the questionnaire even after several reminders. Four main factors were indicated on a scale from 1 to 5 very rarely to always. These key measures in this study included: (1) Complexity of work; (2) Clarity in goals and guidelines; (3) Regulation in time and space; and (4) Regulation in task performance.

5.4 Assessment overload on academics

While the volume of assessments impact students, the academics are also faced with the workload associated with assessments. Beyond having an assessment that is well crafted, there are also management aspects that add to the workload of academics. As Black and William argued, one of the most important aspects of the assessment process in raising achievement is the provision of feedback [15]. Feedback has been studied to be ineffective unless it is detailed and timely. This pressures the academics to respond to submitted assessments quickly. Staff are also required to provide valuable feedback in order to ensure that students are learning. Both these obligations add to a higher workload for the teaching staff. Furthermore, academic integrity is an increasingly pressing issue that academics are having to face. Some solutions include regularly changing assessment questions and varying contemporary case studies Boyd and Bloxham [5]. This also ensures that assessments are valid. However, this also adds to the workload of academics.

The nature of modular course structure will inevitably lead to bunching of assignment deadlines near the end of the module. There have been some attempts to reduce the impact of assessment bunching. For example, the online tool 'Map my Assessment' allows students to map out their upcoming assessments so that they can prepare ahead of time [16]. However, this type of solution places the emphasis on the student to take ownership of this issue. A different strategy has been implemented by the University of South Wales where they have increased the number of yearlong modules to reduce the number of assessments being placed at the same time. By understanding the workload expected of each assessment for educators as well, we will be better able to create a system that is practical and feasible to be implemented in a course structure.

5.5 Current strategies to combat assessment overload.

Some strategies have been developed in order to attempt to solve the issue of assessment overload. For example, self-assessments have also been noted as a way to reduce workload for academic staff while enhancing student learning [17]. This was also supported by Boud and Falchikov, who suggested that self-assessment provides an authentic opportunity for students to develop a deeper understanding of the content they are learning as they will need to evaluate it [18]. They will also have a chance to improve their analysis and critical thinking which will be important for their self-growth and developing employable skills [19]. However, this approach is limited based on the specific goal of each institution and individual modules. As such further research is needed to determine the viability of this strategy in the current Monash engineering course.

Another method is to reduce the volume of small value assessments and replace them with regular subtasks with expected finish dates leading up to a larger final assessment [5]. While this contradicts the ideas proposed by previous literature that assessments without associated marks will not be completed, Boyd and Bloxham suggests that the existence of deadlines and guidance will still encourage students to stay on track without contributing to additional work for educators [5]. This is also supported by other authors suggesting that higher academic workload can be caused by continuous assessments [20]. This is particularly suggested for first year students. For higher level students, fewer but larger assessments that require independent thinking and less tutor intervention was suggested. This will also allow the students to develop more employability skills as they approach the completion of their accreditation as well as reduce workload for both staff and students.

The main theme in these studies is for educators to look at guidelines set by their institutions as every course and accreditation is unique and has specific requirements. Boyd & Bloxham [3] further suggests that if a range such as word count or page limit is suggested for an assessment, the lower end be taken to reduce workload for the students. These previous studies were limited to general suggestions. They were unable to provide specific solutions or guidance because of the different requirements for each institution.

6 Methodology and Methods

6.1 Research design

Initial data such as assessment type, weight and frequency will be collected from Monash University for preliminary data analysis. A tool will be developed to visualise this data. Afterwards, we will begin our data collection with surveys and interviews. The collected data will be used for data analysis and the creation of assessment guidelines. This process is shown in a flow chart in Figure 1.

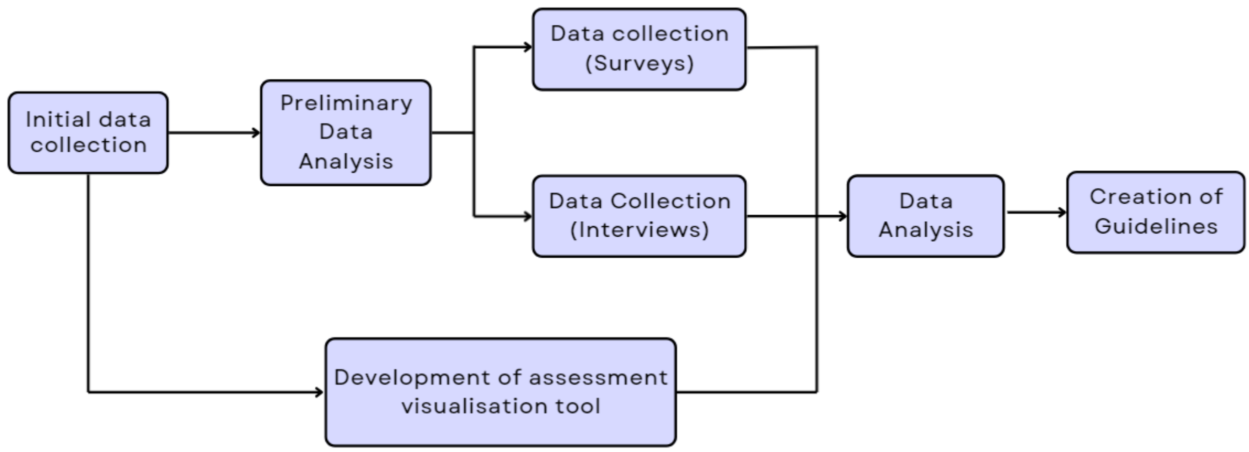


Figure 1 Project flowchart

6.2 Data Collection

Three main types of data collecting methods were chosen for this project:

6.2.1 Initial data collection

Monash Engineering unit handbooks and assessment data shared by academic staff provide information on unit code, assessment types, weights, due dates, and learning outcome for each unit. The data we collected came primarily in 3 different formatted layouts which are JSON, Excel, and CSV files.

6.2.2 Survey

Survey is proposed to be conducted using Google Forms, which will be given to Monash Engineering students for data collection purposes. Samples will be collected in various ways such as emails, help from academics, student clubs and through social media. The surveys will be completed in the second semester.

There will be two types of questions in the survey. Background questions were used to identify students' background such as gender, discipline, year level and whether they are international students or domestic students. For each assessment type, the participants will then rate, from 1 to 5, how stressful, difficult, helpful in learning and helpful for interpersonal growth that assessment type is (1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree). They will also indicate how much time they spent on each assessment. Participants will also have a chance to go into details regarding their experiences for each assessment in a short answer section.

6.2.3 Interviews

Qualitative interviews will be conducted with Monash engineering teaching staff. Initially, 48 email invitations were sent to Monash staff representing various disciplines and year levels, including Aerospace, Chemical, Civil, Electrical, Materials, and Mechanical Engineering. The distribution of invitations targeted 3 staff members each from year levels 2 and 3, and 1 staff member from year level 4 within each discipline.

The interviews focus on exploring participants perspectives on assessment workload within Monash Engineering, covering aspects such as Teaching, Administration, and Marking within their respective units. Participants are asked about their experiences with marking methods, strategies for maintaining academic integrity, and other factors that significantly contribute to their workload. Interviews are conducted using Zoom. The gathered qualitative data will undergo thematic analysis to identify common challenges, and potential areas for improvement in assessment practices within Monash Engineering.

6.3 Data Visualisation tool

A tool was developed using Python to visualise all the engineering assessment due date using data from Monash University. The tool will allow users to primarily create correlation visuals such as heatmaps to identify the number of assessments due at a specific day during the chosen semesters. Part-of-a-whole visuals are used to determine the percentage of different components against the whole category, for example, the percentage of assessments that have final assessments.

7 Results and Discussion

7.1 Student Surveys

The survey results which focused on students' perceptions of assessments can be seen in Appendix E: Survey Results. Table 1,Table 2,Table 3, and Table 4 summaries students' perception on different aspects of assessment from the surveys.

Table 1: Students' perception of most common assessment types - Stress

	Exams	**Individual assessments**	**Moodle quizzes**	**In semester tests**	**Group projects**	**Presentations**
Not stressful	4%	20%	51%	9%	10%	23%
Neutral	11%	32%	28%	19%	34%	24%
Stressful	85%	49%	21%	72%	56%	53%

Table 2: Students' perception of most common assessment types - Difficulty

	Exams	**Individual assessments**	**Moodle quizzes**	**In semester tests**	**Group projects**	**Presentations**
Not difficult	3%	15%	47%	6%	9%	28%

Neutral	13%	35%	36%	27%	30%	35%
Difficult	84%	50%	18%	67%	60%	37%

Table 3: Students' perception of most common assessment types - Learning

	Exams	**Individual assessments**	**Moodle quizzes**	**In semester tests**	**Group projects**	**Presentations**
Not beneficial	46%	11%	13%	17%	20%	35%
Neutral	32%	22%	28%	32%	24%	32%
Very beneficial	22%	67%	59%	51%	56%	33%

Table 4: Students' perception of most common assessment types – Personal Growth

	Exams	**Individual assessments**	**Moodle quizzes**	**In semester tests**	**Group projects**	**Presentations**
Not beneficial	48%	18%	41%	37%	12%	16%
Neutral	32%	32%	28%	37%	18%	24%
Very beneficial	20%	50%	32%	25%	70%	60%

Exams were found to be a key factor which played in students' feelings of assessment overload. Exam stress have been associated with distress and anxiety [21]. Notably, 85% of students taking the survey found exams to be either stressful or very stressful. In comparison, only 21% of students found the Moodle Quizzes to be stressful or very stressful. Similarly, 84% of the students found exams to difficult or very difficult while only 18% of the students found Moodle quizzes to be difficult or very difficult. Exams also scored poorly in terms of learning and retention. 46% of students found exams to be either unhelpful or very unhelpful for their learning. This is in accordance with previous research suggesting the lack of beneficial evidence for highly weighted final exams [22] and the encouragement of strategic learning where students are not deeply interacting with the content [23]. Furthermore, 48% students found exams to be unhelpful or very unhelpful towards their personal growth. This is reflective of lack of real-world relevancy of final exams.

Table 5 summaries the data gathered from the surveys regarding the amount of time spent on the most common types of assessments in Monash engineering. Exams were found to be the assessment type where students are spending the most time. Exam stress have been found to be positively associated with the student's perception of course load [24]. This coupled with the previous finding that students are most stressed out by exams indicates that the exams one of the key factors in student's feelings of assignment overload. The next highest assessment with the highest workload were found to be group assignments. However, group assignments on average are given several weeks to complete while exams often have just the SWOTVAC and the time until their scheduled exams which are random. As such, students are studying a lot more hours for exams within a shorter period of time.

Table 5: Summary of time spent on different assessments.

	Exam	Individual assessments	Moodle quizzes	In semester tests	Group Projects	Presentations
Average	32	16	4	11	27	9
Median	25	10	2	10	20	5
Max	150	100	50	50	100	50
Min	2	0	0	1	1	0

Figure 2 visualises the correlation between the amount of time students spend on individual assessments and how stressful and difficult the assessment appears to be. A similar trend can be seen in Figure 3 where students feel more stressed based on the weight of the assessment. Finally, Figure 4 shows the relationship between time spent and the weight of the assessments. It can be observed that there are very strong relationships between weight of an assessment, time spent and the associated stress of the assignment of students.

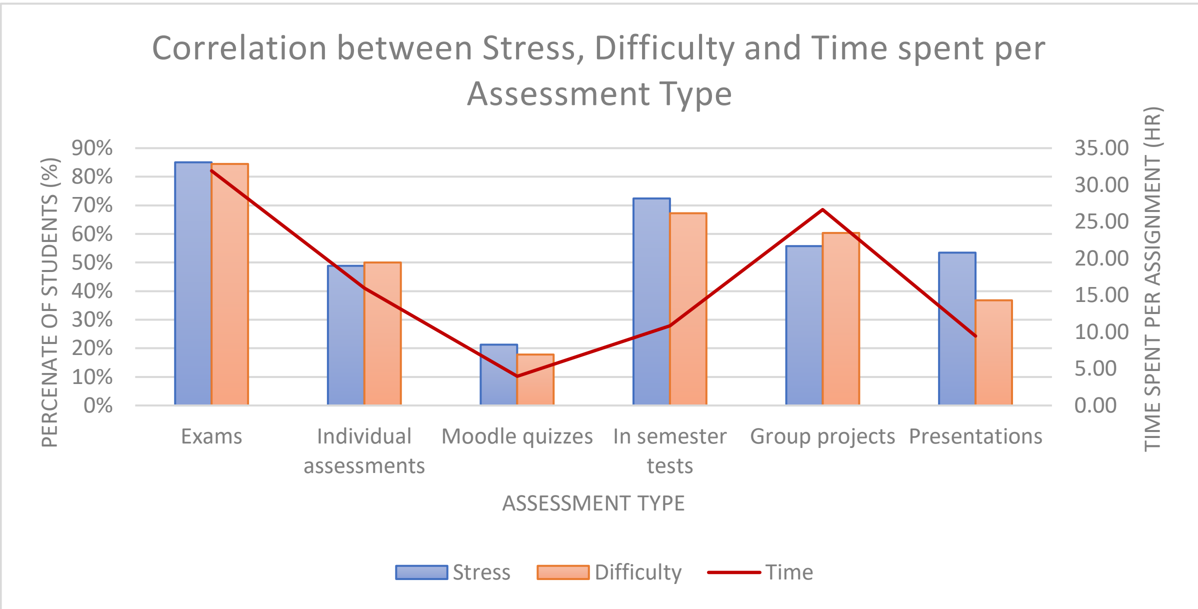


Figure 2: Correlation between Stress, Difficulty and Time spent per assessment type

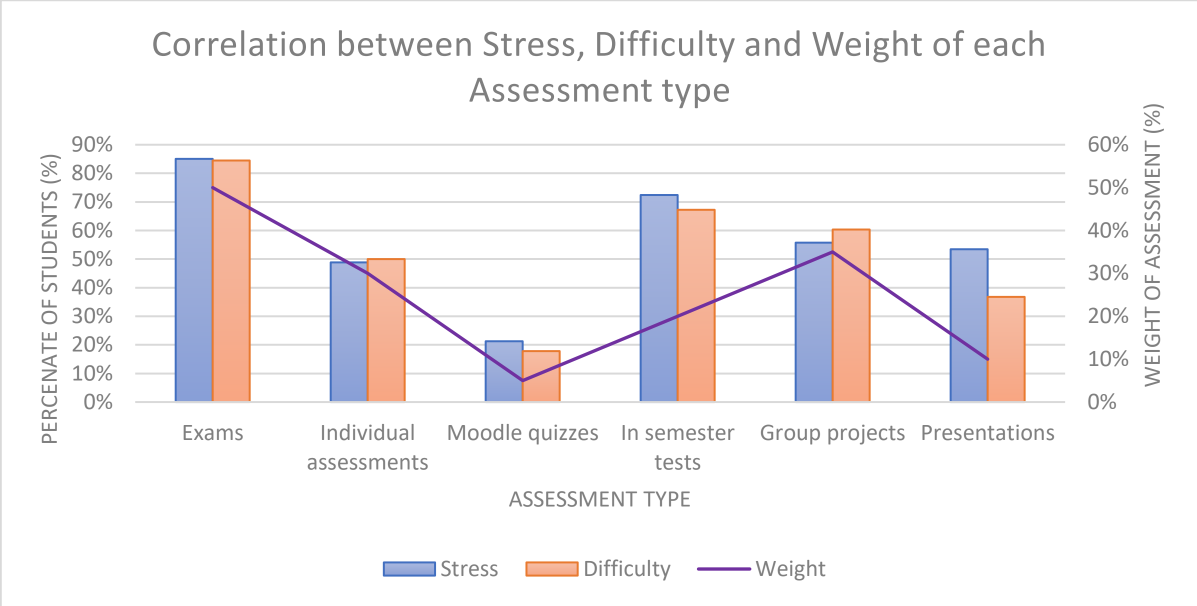


Figure 3: Correlation between Stress, Difficulty and Weight of each assessment type

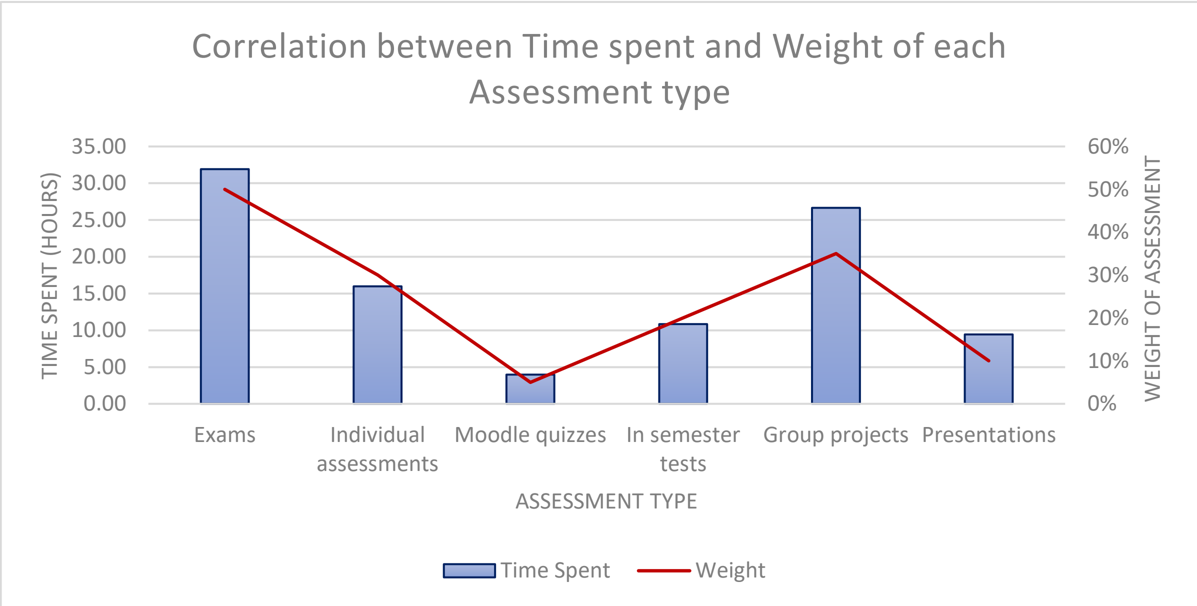


Figure 4: Correlation between time spent and weight of each assessment type

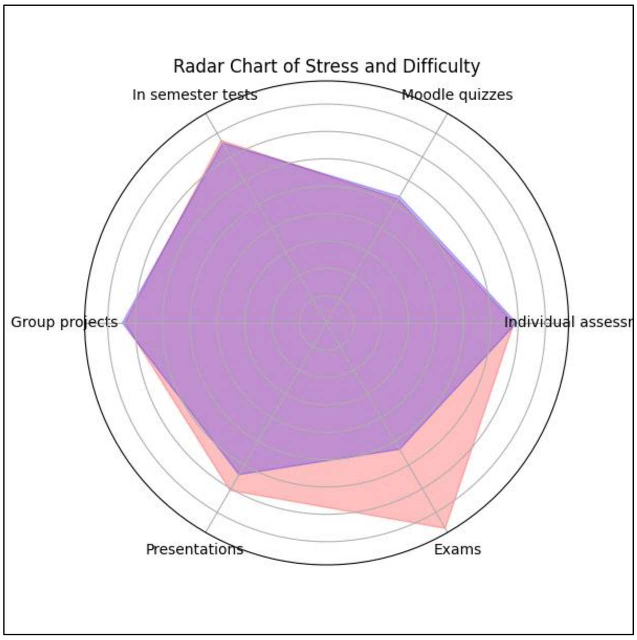


Figure 5 Radar Chart between Stress and Difficulty

As previously observed, there are very strong relationships between weight of an assessment, time spent and the associated stress of the assignment of students. It was also noted that exams are weight the highest, causes the most stress and were found to be the least helpful for students' learning and development as visualised in Figure 6. As such, one of the key suggestions to lower assessment overload and improve student's learning experience is for Monash Engineering to lower the weight of engineering exams from the most common 50% to 40%. There may be concerns that lowering the weight will reduce the ability for students to improve their grades and fail to reflect their learnings. However, the amount needed to improve a student's grade is effectively the same for exams which are weighted from 30% to 50% (Franke 2018).

Quizzes on the other hand were viewed quite favourably by students. Many students found that the quizzes created a structure and goal for them to study towards allowing to focus and retain chunks of information throughout the semester. Through low stake quizzes, students are able to test their understanding and better prepare for future assessments [23]. This finding, however, contradicts previous literature regarding continuous assessment and workload. Previous research finds that an increase in continuous assessments and workloads leads to surface level learning and retention [9]. However, our survey suggests that 87% of students feel either neutral or positively about quizzes in terms of learning and retention and 79% of students feel either neutral or positively regarding stress of quizzes. This suggests that they are not being overwhelmed in terms of quizzes and have found quizzes to be helpful. Furthermore, the ability for students to secure small number of marks towards their final grade through low stress and low difficulty assessments allow students to reduce their stress and pressure towards their final exams [23].

Another notable finding from the survey were the perception of assessments from students of different disciplines. Environmental engineering students in particular have highly positive perception of their assessments. Furthermore, they found most benefits from their assessment, they are the least stressed about their assessments and found the assessment types to be most helpful for their learning. Out of the 4 metrics and 6 assessment types (24 categories), they rated the highest positively for 15 of them highest in 62.5%. Other disciplines should look in to why the environmental engineering students rated their assessments this way. Although there may be challenges in this as each discipline have significantly different types of content and assessments which makes the comparison hard and adoption of practices difficulty.

7.2 Staff Interviews

The interviews conducted with faculty members from the Monash Engineering department reveal a significant allocation of time to the preparation and marking of exams, which constitutes a major portion of their workload, shown in Figure 6.This substantial dedication to examination tasks limits faculty engagement in other essential pedagogical duties, such as responding to student inquiries, and implementing innovative unit designs. Faculty members reported that creating a new assessment or test generally takes one day, usually scheduled in advance before the semester starts. This preparation, coupled with the significant time required for marking—which can take from 8 to 10 hours per week including providing feedback—underscores the intensive workload associated with non-quiz assessments, especially exams. On the contrary, the time spent on preparing lecture slides, addressing student queries, and ensuring academic integrity measures is notably lower. For instance, strategies employed for maintaining academic integrity, such as using plagiarism detection tools and designing unique assessments, were noted to require moderate effort. However, according to Figure 8, the majority of interviewees said that their time and effort spent on this aspect are 'low'.

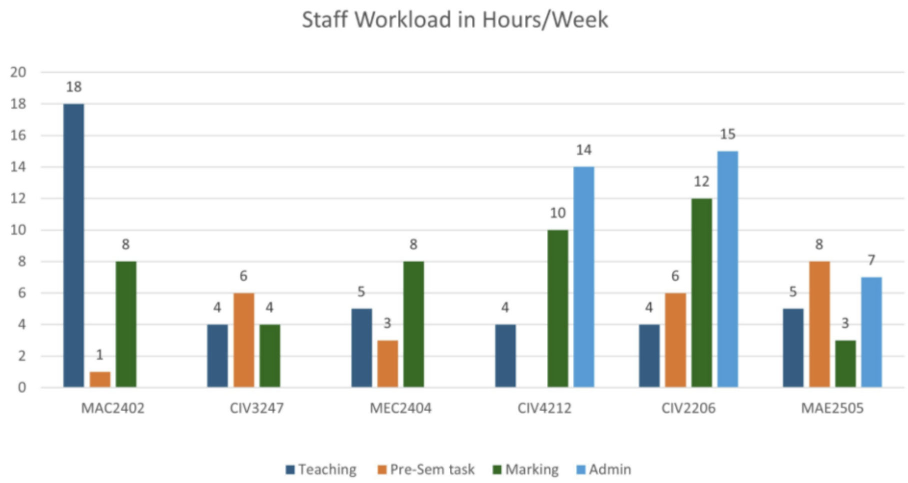


Figure 6 Staff Workload (Hours per week)

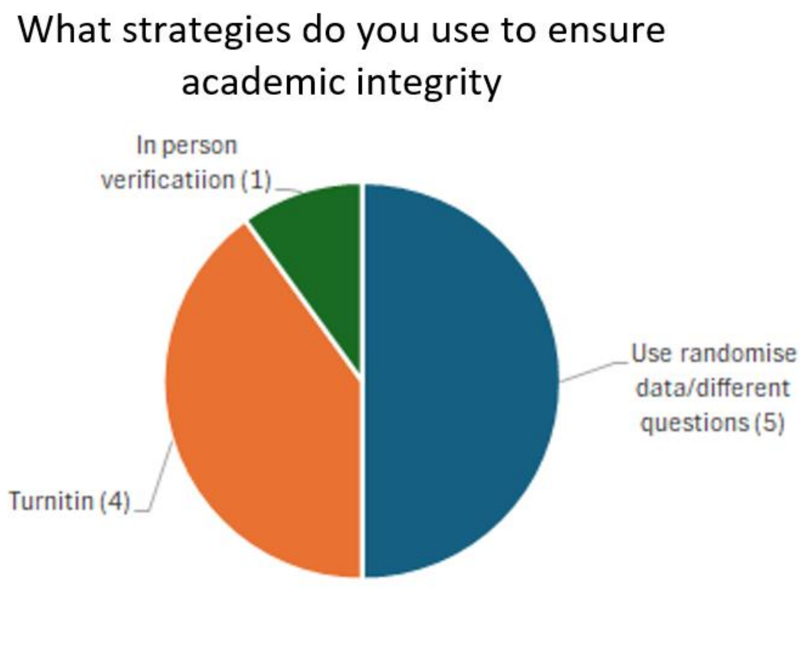


Figure 7 Strategies used by staff in ensuring academic integrity.

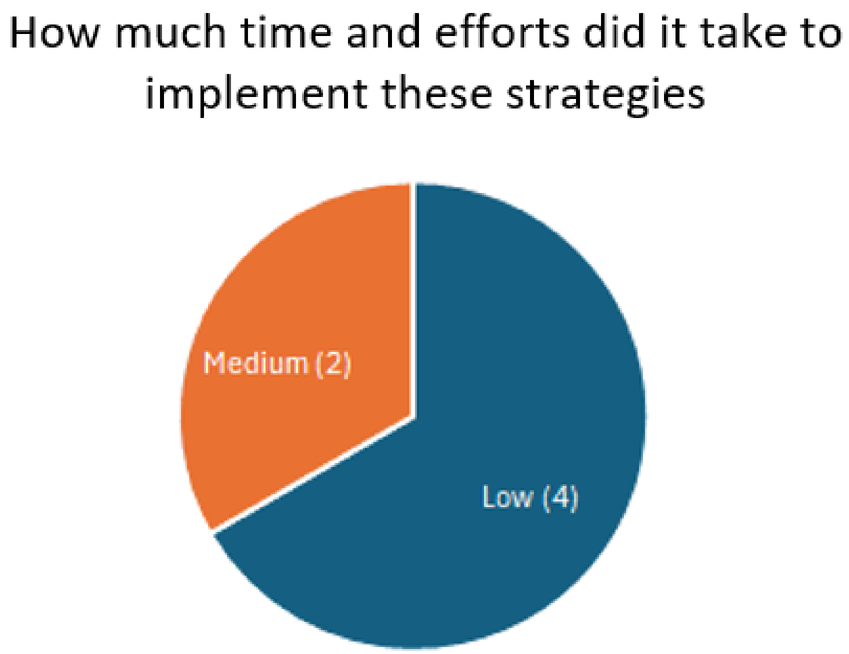


Figure 8 Time and effort for staff to implement those strategies.

The data suggests that a reallocation of efforts from excessive exam-related tasks towards these under-resourced areas could lead to improvements in educational quality and faculty satisfaction. Reducing the frequency or extent of exams could free up valuable time for faculty to engage more deeply in course design, direct student interaction, and robust academic integrity measures. Such a shift in focus would not only help in better managing faculty workload but also contribute towards a more engaging and supportive learning environment. It would allow faculty members to spend more time on activities that are crucial for student development and success, such as personalized feedback and hands-on learning experiences.

Quizzes, particularly those administered through learning management systems like Moodle, offer an efficient and integrity-enhancing alternative to traditional exams in the Monash Engineering department. They are easier to design due to automated and significantly reducing setup and marking time. By incorporating a variety of question types and regularly updating question pools, quizzes can provide diverse and challenging assessments while maintaining academic integrity through question randomization. This makes it difficult for students to copy answers, thus promoting a fair testing environment. Furthermore, immediate feedback from automated quizzes aids in learning by allowing students to quickly understand their errors and enabling instructors to address areas of common difficulty.

Overall, the interviews highlight a critical need for strategic changes in assessment policies within the Monash Engineering department to achieve a more effective and balanced educational approach. This could potentially lead to enhanced student satisfaction and academic performance, as well as improve faculty experiences and job satisfaction.

7.3 Assessment Clashes

The frequency of assessments within the Engineering faculty of Monash University has been a significant factor that contributes to the stress and overload of students. As illustrated in Figure 9 and Figure 10, both the Semesters 1 and 2 have notable concentration of assessment towards the end of the semester, particularly Week 12 Friday where the frequency of assessments peak significantly. Such clustering of assessments creates high-pressure periods for students increasing their stress levels and potentially impacting their performance and well-being. A heatmap breakdown for each individual engineering discipline can be found in Appendix F: Assessment Due date Heat Map per discipline.

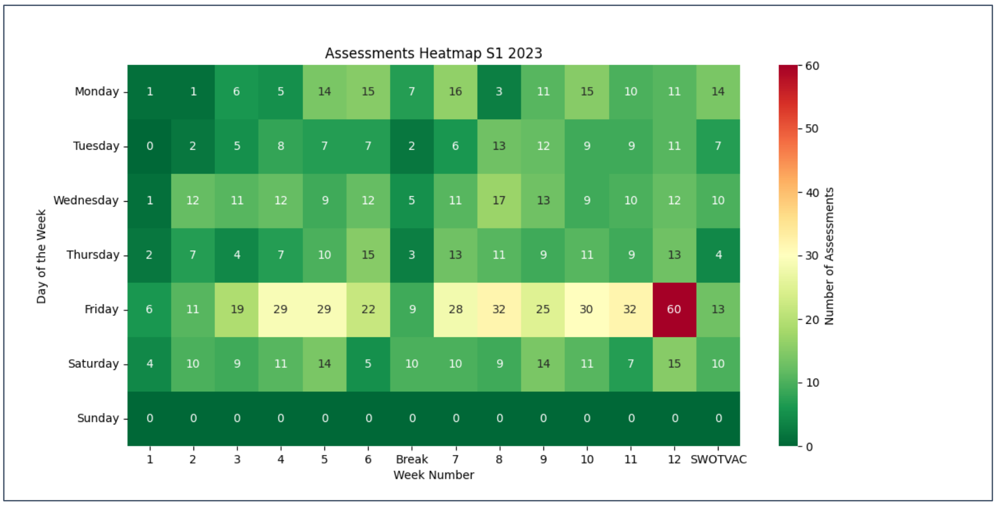


Figure 9: Assessment due dates – Semester 1, 2023

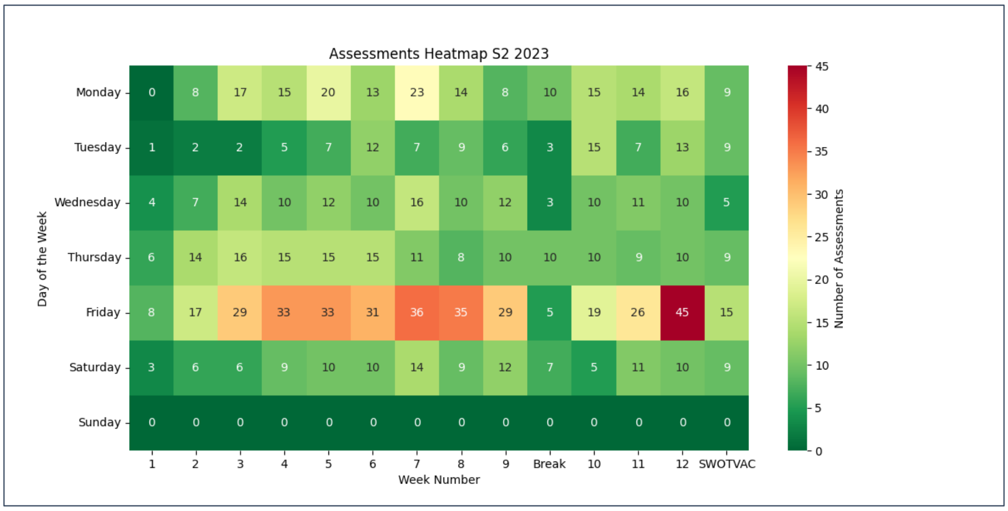


Figure 10: Assessment due dates – Semester 2, 2023

7.4 Assessment Frequency

The distribution of assessments duration, as shown in Figure 11 indicates a very significant number of assessments due within a shorter timeframe with peaks on 1-, 5-, and 7-days assessment durations.

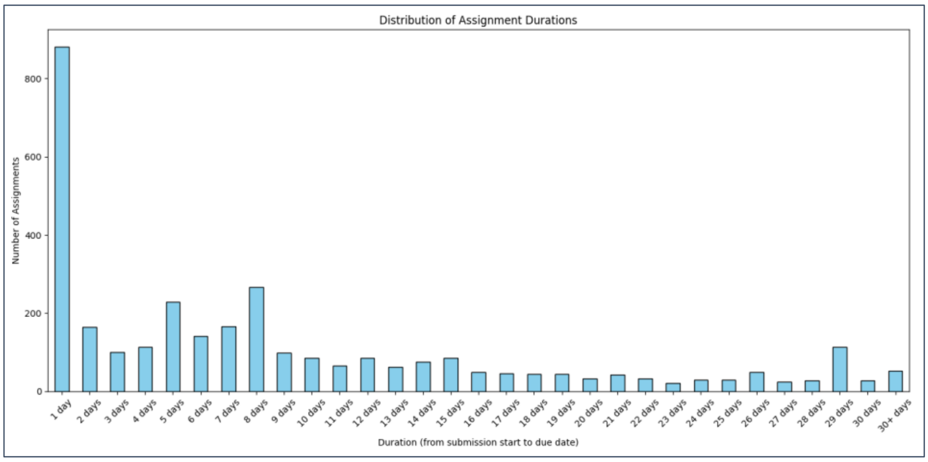


Figure 11: Distribution of assessment durations.

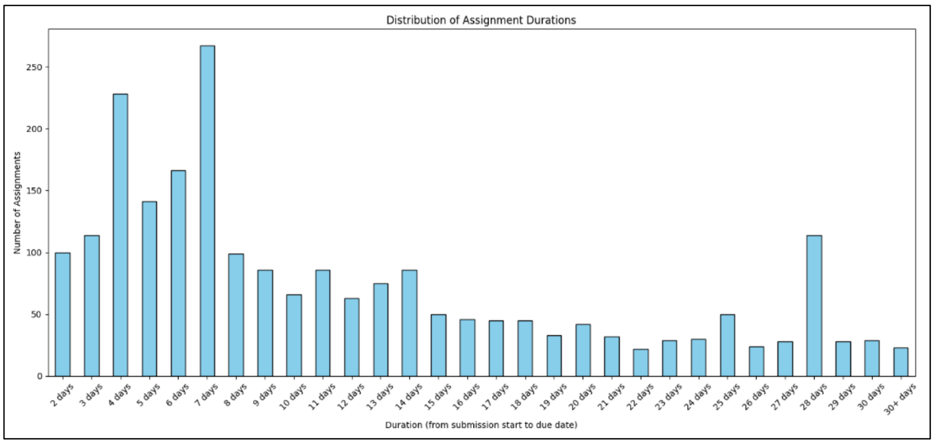


Figure 12: Distribution of assessment durations (without 1-day assessments)

While 1-day assessments are mostly attributed to quizzes/tests, it is evident from our separate graph, as shown in Figure 12, that most assessments are due within a week. This short duration gives students very little time to organise their work for the week, especially if they might have other commitments and classes to attend.

7.5 'Assessment Overload!' App

To help visualize and analyse the frequency and distribution of assessments, we Assessment Overload team has developed a python-based app which we have named "Assessment Overload". As shown in Figure 13 and Figure 14 this application allows users to generate heatmaps and analyse the assignment durations across faculties, semesters, and year levels.

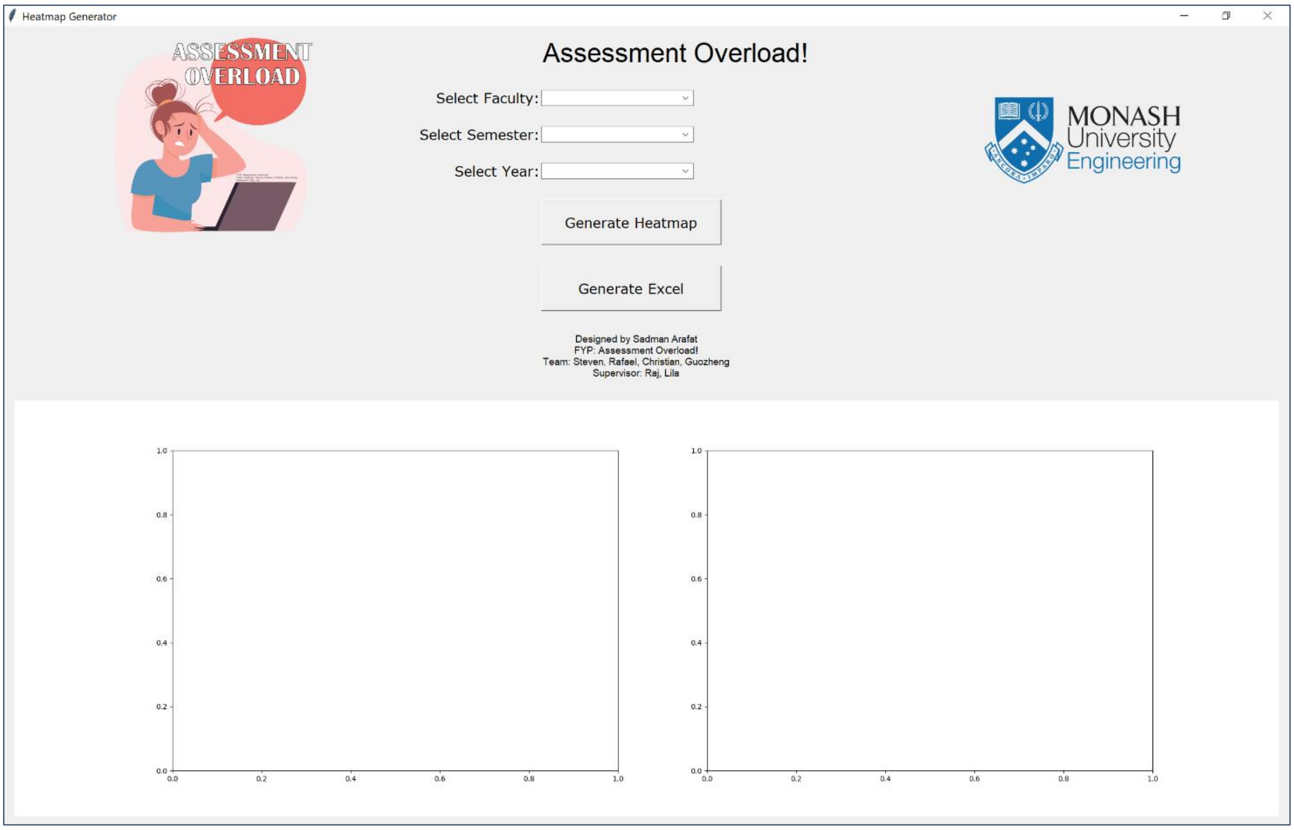


Figure 13: Assessment Overload! App

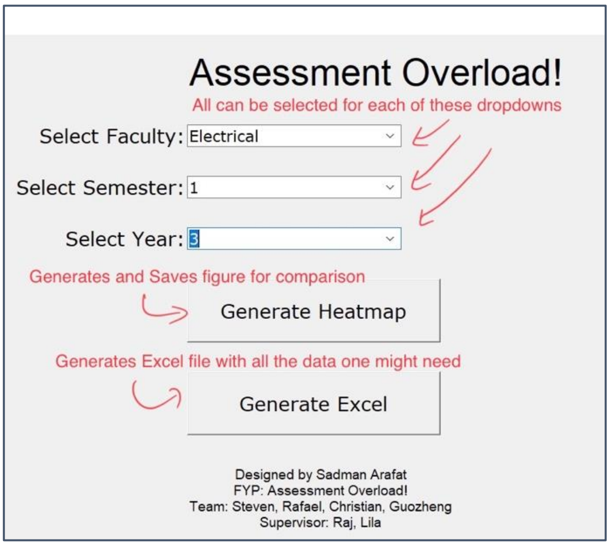


Figure 14: App Input

User can select the faculty, semester, and year levels to generate heatmaps that helps visualize the number of assessments dur on each of the days of an academic week through the selected semester. This is shown in Figure 16. This helps identify peak periods and clusters of assessments, providing insights into workload distribution which is easier for everyday educators to use.

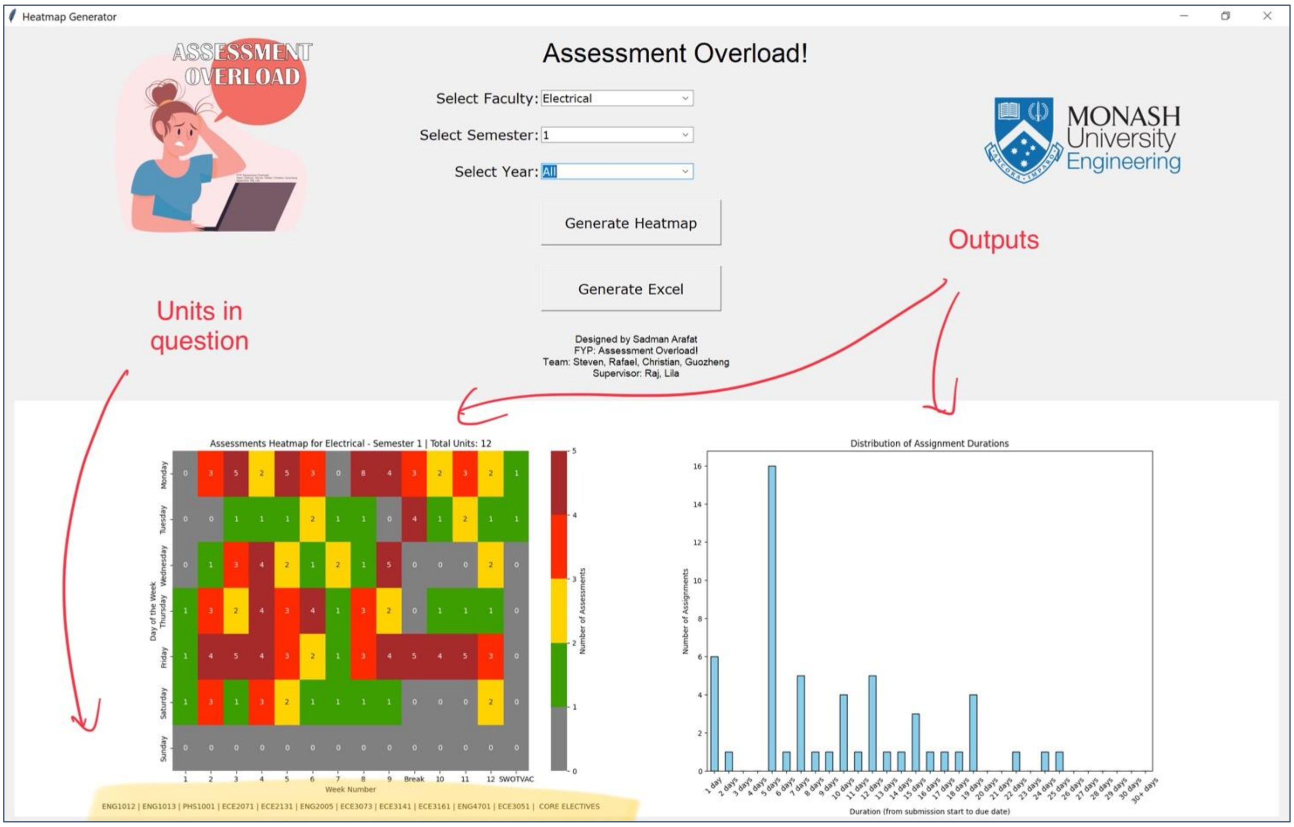
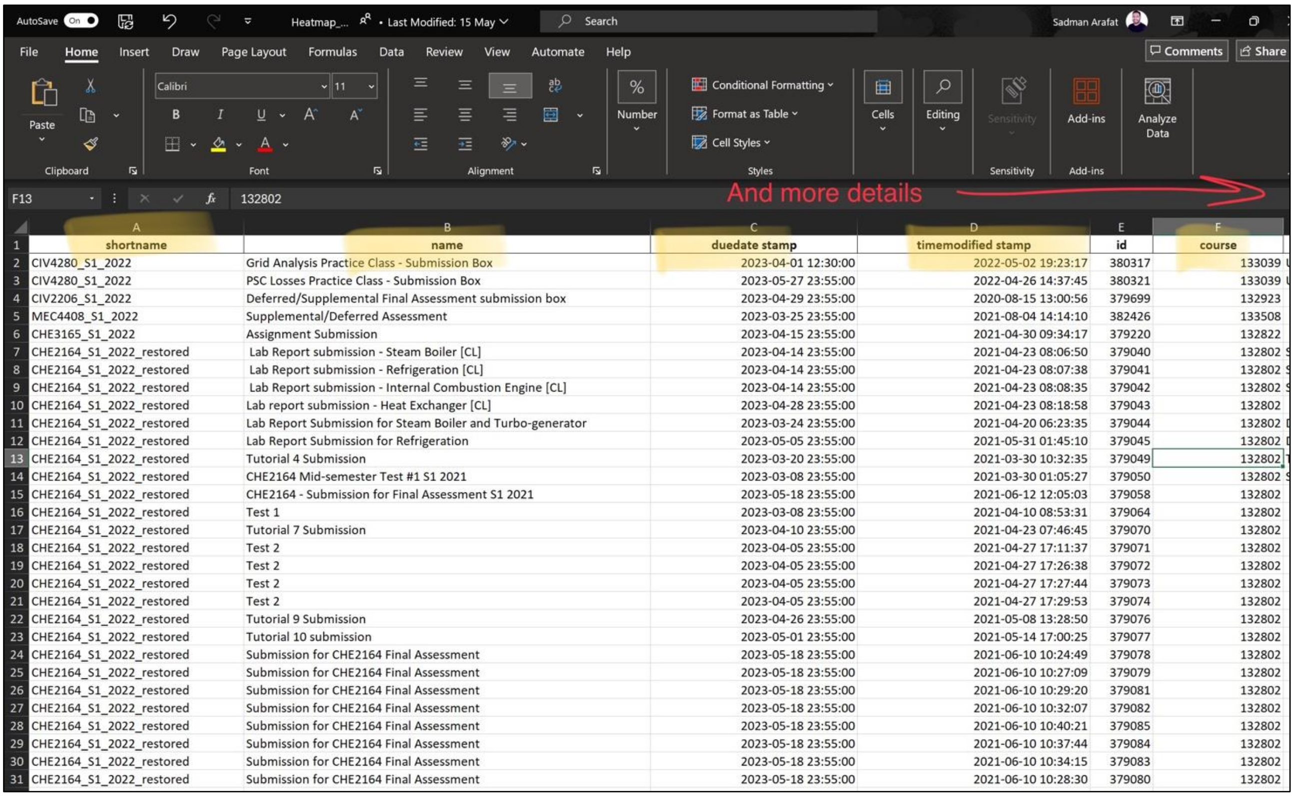


Figure 15: App Outputs

From Figure 15, we can see that this app includes a feature to analyse the duration of the assessments showing the distribution of each of these assessments based on the time between when they are assigned and their due date. This will help to identify peak periods and clusters of assessments providing in depth insights of workload distribution.

The user interface is also designed to be intuitive, with dropdown menus for selecting faculties, semester, and year. Buttons are provided to generate heatmaps and export the data to Excel for further analysis. This app also includes visual elements such as logos and a clear layout to enhance the user experience.

The generate figure outputs includes the heatmaps and assignment duration distributions are displayed within the app, and it automatically saves these visualisations for reports, presentations and to further compare multiple plots.



	shortname	name	duedate stamp	timemodified stamp	id	course
2	CIV4280_S1_2022	Grid Analysis Practice Class - Submission Box	2023-04-01 12:30:00	2022-05-02 19:23:17	380317	133039
3	CIV4280_S1_2022	PSC Losses Practice Class - Submission Box	2023-05-27 23:55:00	2022-04-26 14:37:45	380321	133039
4	CIV2206_S1_2022	Deferred/Supplemental Final Assessment submission box	2023-04-29 23:55:00	2020-08-15 13:00:56	379699	132923
5	MEC4408_S1_2022	Supplemental/Deferred Assessment	2023-03-25 23:55:00	2021-08-04 14:14:10	382426	133508
6	CHE3165_S1_2022	Assignment Submission	2023-04-15 23:55:00	2021-04-30 09:34:17	379220	132822
7	CHE2164_S1_2022_restored	Lab Report submission - Steam Boiler [CL]	2023-04-14 23:55:00	2021-04-23 08:06:50	379040	132802
8	CHE2164_S1_2022_restored	Lab Report submission - Refrigeration [CL]	2023-04-14 23:55:00	2021-04-23 08:07:38	379041	132802
9	CHE2164_S1_2022_restored	Lab Report submission - Internal Combustion Engine [CL]	2023-04-14 23:55:00	2021-04-23 08:08:35	379042	132802
10	CHE2164_S1_2022_restored	Lab report submission - Heat Exchanger [CL]	2023-04-28 23:55:00	2021-04-23 08:18:58	379043	132802
11	CHE2164_S1_2022_restored	Lab Report Submission for Steam Boiler and Turbo-generator	2023-03-24 23:55:00	2021-04-20 06:23:35	379044	132802
12	CHE2164_S1_2022_restored	Lab Report Submission for Refrigeration	2023-05-05 23:55:00	2021-05-31 01:45:10	379045	132802
13	CHE2164_S1_2022_restored	Tutorial 4 Submission	2023-03-20 23:55:00	2021-03-30 10:32:35	379049	132802
14	CHE2164_S1_2022_restored	CHE2164 Mid-semester Test #1 S1 2021	2023-03-08 23:55:00	2021-03-30 01:05:27	379050	132802
15	CHE2164_S1_2022_restored	CHE2164 - Submission for Final Assessment S1 2021	2023-05-18 23:55:00	2021-06-12 12:05:03	379058	132802
16	CHE2164_S1_2022_restored	Test 1	2023-03-08 23:55:00	2021-04-10 08:53:31	379064	132802
17	CHE2164_S1_2022_restored	Tutorial 7 Submission	2023-04-10 23:55:00	2021-04-23 07:46:45	379070	132802
18	CHE2164_S1_2022_restored	Test 2	2023-04-05 23:55:00	2021-04-27 17:11:37	379071	132802
19	CHE2164_S1_2022_restored	Test 2	2023-04-05 23:55:00	2021-04-27 17:26:38	379072	132802
20	CHE2164_S1_2022_restored	Test 2	2023-04-05 23:55:00	2021-04-27 17:27:44	379073	132802
21	CHE2164_S1_2022_restored	Test 2	2023-04-05 23:55:00	2021-04-27 17:29:53	379074	132802
22	CHE2164_S1_2022_restored	Tutorial 9 Submission	2023-04-26 23:55:00	2021-05-08 13:28:50	379076	132802
23	CHE2164_S1_2022_restored	Tutorial 10 submission	2023-05-01 23:55:00	2021-05-14 17:00:25	379077	132802
24	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:24:49	379078	132802
25	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:27:09	379079	132802
26	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:29:20	379081	132802
27	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:32:07	379082	132802
28	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:40:21	379085	132802
29	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:37:44	379084	132802
30	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:34:15	379083	132802
31	CHE2164_S1_2022_restored	Submission for CHE2164 Final Assessment	2023-05-18 23:55:00	2021-06-10 10:28:30	379080	132802

Figure 16: Excel Output

An Excel export feature, as shown in Figure 16, allows users to download the underlying data for further analysis or record keeping. By using this app, educator, examiners, and other stakeholders can gain a clearer understanding of assessment patters and make informed decisions to improve the distribution of assessments, ultimately aiming to reduce student stress an enhance the learning experience.

7.6 Assumptions

It should be noted that some assumptions were made during the analysis of the acquired data. It is possible that students who took the survey misunderstood the questions regarding the amount of time they spent on the assignments. Some students answered with days instead of hours specified in the questions. While it is possible that they only study the specificized amount it is certainly an outlier compared to the average. As such, these data points were removed to ensure that they are not interfering with the majority of the data set. Another complication with assessing the workload of students was that difference in the number of quizzes each unit required with some units not having any quizzes as all. As such the results reported should be used to gain a general understanding of student workload rather than an exact measurement. Finally, there was an imbalance in the number of students from each discipline undertaking the survey. Some disciplines had significantly more participants than others. Therefore, the weight of each response is much stronger for those disciplines, such as resource and material engineering.

7.7 Assessment Guidelines

In summary, the following guidelines have been created to assist Monash Engineering students and staff to reduce the feelings of assessment overload.

7.7.1 Reduce weight of exams to 40%

Exams are the prime cause of assessment overload for students. Yet, the exams are weighted the highest. This will ensure that students are able to reduce their stress and overload while maintaining rigorousness.

7.7.2 Continuation/ implementation of low weighted quizzes throughout the semester

For Monash engineering students the weekly quizzes were not contributors for assessment overload. Quizzes are preferred by both students and staff as they require lower preparation and commitment.

7.7.3 Higher focus on group work and project-based assignments.

Open ended projects and group works reflects the real-world engineering environment the most accurately. Monash University is encouraged to create assessments that will prepare students the best post studies.

7.7.4 Monash to use the developed tool.

The developed assessment clash visualization tool should be used by Monash engineering faculty to identify periods of high assessment load. Calanders within each discipline and semester could be used between each unit coordinator to communicate when they plan to create a due date.

7.8 Limitations and future work

Interviews allowed the collection of qualitative data from unit coordinators. The setting in which interviews are conducted can significantly affect the responses given by participants [25]. In this research, interviews are arranged to be conducted in early semester, where staff workload in teaching, marking, and providing feedback is not significant. Therefore, when answering about workload in these aspects, the interviewees may not reflect on what is happening, but rather an impression of previous years. Only a small part of staff from part of all Engineering disciplines were interviewed. More interviews across all departments will provide a more accurate result.

Surveys were chosen as a time effective and efficient method of gathering data, however some engineering disciplines were more responsive and helpful than others. As such, the data gathered could be skewed towards one or more specific engineering discipline. Similarly, there were limited unit coordinators who were available to complete the interview resulting in missing insights from some engineering disciplines.

Several opportunities were identified for future research following this research. Environmental engineering students have significantly more positive perception of their assessments. Future research could investigate the reasoning for this and how other engineering disciplines could adapt. Future works could also assess factors external to university courseload such as part time work and extracurricular commitments to understand how feelings of assessment overload is attributed. Interviewing unit coordinators from every engineering discipline would provide a wholistic understanding of overload for engineering staff at Monash University.

8 Conclusion

This study on Monash University's Faculty of Engineering has provided crucial insights into causes of assessment overload for both students and staff. The key findings highlight that exams are the primary source of stress and perceived as the least beneficial for learning and personal growth, yet they require the most time and effort. In contrast, quizzes are more positively viewed, offering structured and less stressful learning opportunities. Students were found to favour assessment which are relevant and reflective of their engineering discipline such as design-based group projects. The data collected from student surveys and staff interviews revealed that 'assessment bunching' significantly contributes to student stress and superficial learning engagement. Faculty members also face substantial workloads due to the extensive preparation and marking required for exams, which affects their ability to deliver support to students, limits time for other vital educational activities.

Based on the research findings, recommendations were made to Monash University's Faculty of Engineering, these recommendations aim to create a more balanced and effective assessment strategy that supports both students and staff, fostering a more engaging and supportive learning environment. The evidence-based guidelines and visualization tool developed through this research provide a solid foundation for Monash University to enhance its engineering programs, ensuring that both students and staff can thrive in a balanced and supportive academic setting.

9 Reflection on Project Management

9.1 Project Scope

9.1.1 In-Scope:

- Investigating assessment types, practices and factors that increases assessment overloads.
  - Conducting a comprehensive Literature review on assessment practices in engineering education
  - Identifying common assessment types and their frequency (e.g. quiz, mid test, finals, group projects, lab reports)
  - Analysing the scheduling and distribution of these assessment to pinpoint periods of high density assessment.
  - Surveying and interviewing students and staff to gather qualitative data on perceived assessment overload and its impact.
- Focused on the engineering department at Monash University
  - Collaborating with faculty members to access necessary insights.
- The study will concentrate on full-time students undertaking a full load of 4 units each semester.
  - Stratifying the sample by year of study to capture differences across academic levels.
- Creation of the assessment due date visualisation tool

9.1.2 Out-of-Scope:

- Overloading and underloading students.
- Excluding the evaluation of how feedback is given and its effectiveness in improving student performance.
- Plagiarism and authenticity of assessment types
- This research does not aim to be a longitudinal study.

9.1.3 Constraints:

- Monash Engineering course structure and content might undergo changes, which can pose challenges in obtaining consistent data.
- The course map and associated assessment structures might differ year-on-year, potentially impacting the consistency of data.
- The insights will heavily rely on the candidness and accuracy of the responses from surveys and interviews.

9.2 Project Plan & Timeline

Figure 17 demonstrates the original project timeline.

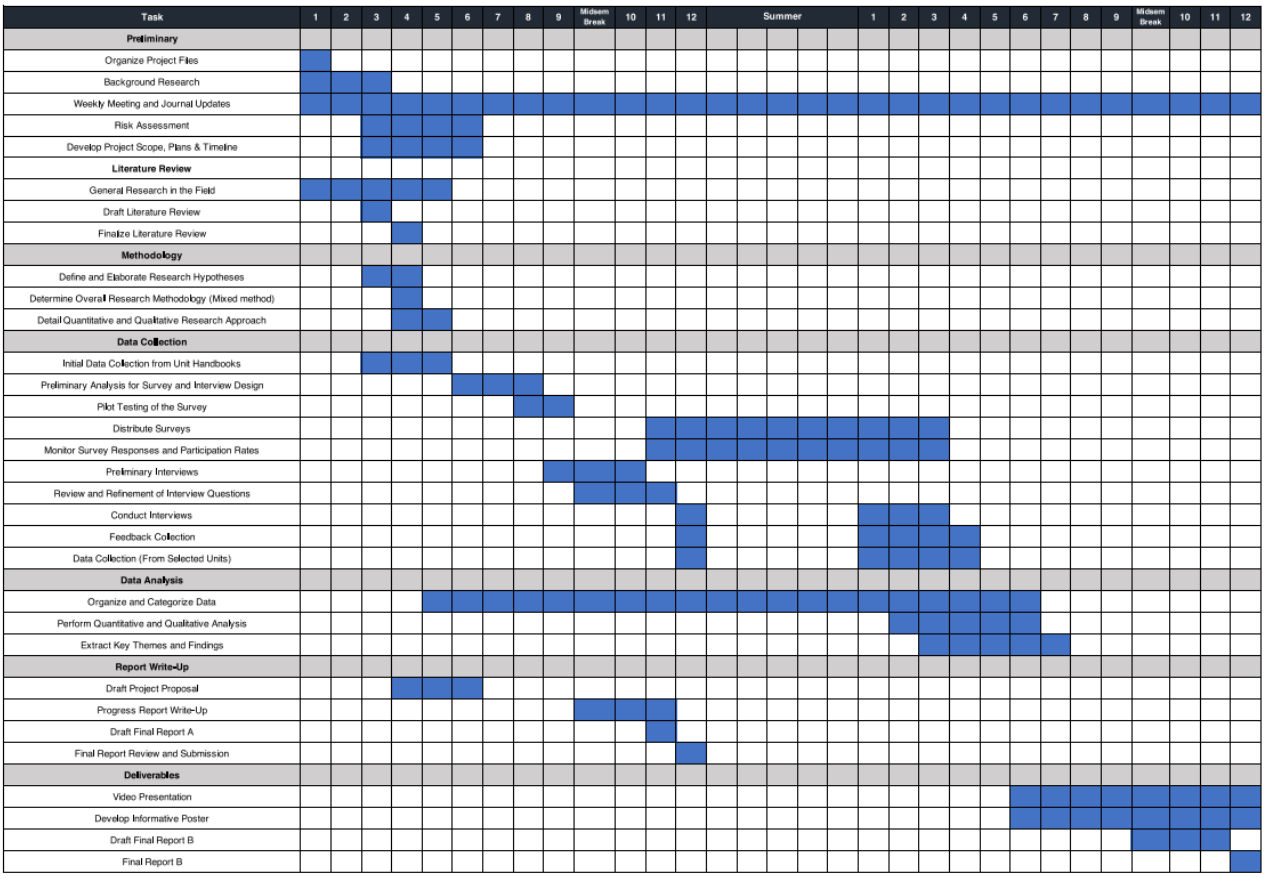


Figure 17: Project Timeline

9.3 Reflection on Project

9.3.1 Team performance and project successes

The team successfully worked together to complete the project aims and objectives. Each team member contributed towards the completion of the research project.

- Evidence based guidelines were developed tailored to Monash University
- Assessment due date visualisation created tool, available to be used by Monash University for design of future engineering courses.

9.3.2 Improvement strategies for future projects

- Surveys should be designed with little room for participants misreading the question.
- A bigger advertisement pushes would be encouraged to gather more survey and interview participants.

9.3.3 Timeline assessment

- The team stuck rigorously to the planned timeline.
- The ethics approval process took longer than expected. However, it did not delay other planned activities.

9.3.4 Scope changes

The scope was very similar to the scope detailed in the progress report. The creation of the data visualisation tool became a much bigger focus requiring a lot more resources. The tool is now being used by Monash for the design of future courses. This was not in the previous scope. The team planned to have a secondary round of interviews for further questioning and clarification. This idea was eliminated due to time constraints.

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11 Appendices

11.1 Appendix A: Project Risk Assessment

52397	RISK DESCRIPTION	STATUS	TREND	CURRENT	RESIDUAL
	ECSE_ENG4701_CL_2023_S2_RafaelLiem_AssesmentOverloadHowMuchIsToMuchAtMonashEngineering	Under Approval		Medium	Low

RISK TYPE
1. Activity or Task Based Risk Assessment

RISK OWNER	RISK IDENTIFIED ON	LAST REVIEWED ON	NEXT SCHEDULED REVIEW
RAFAEL MATTHEW LIEM	31/08/2023	17/10/2023	17/10/2026

RISK FACTOR(S)	EXISTING CONTROL(S)	CURRENT	PROPOSED CONTROL(S)	TREATMENT OWNER	DUE DATE	RESIDUAL
when conducting interview in person, the site may have uneven or slippery flooring, poor lightning and obstacles in the walking path resulting in slip, trips or misstpes.	Control: Caution signage is placed in risk area. Control Effectiveness: ______________ Control: Prior to Conducting interview or surveys, members of the group should inspect any hazard around the area Control Effectiveness:	Low				Low
Electrical shock, small explosion or burn from malfunction gadgets such as laptops and Computers.	Control: Ensure all tools and gadgets are in optimal conditions to be used Control Effectiveness: ______________ Control: check for damaged cables and gadgets Control Effectiveness:	Low	Power points are RCD protected.	RAFAEL MATTHEW LIEM	02/10/2023	Low
While doing research and interviews, sudden gestures while standing up or sitting accidentally strike someone nearby	Control: Ensure that interview and research setting allow space to minimize risk of accidental contact. Control Effectiveness:	Low				Low
Sitting in awkward positions for long durations during interview that may last for extended periods for both interviewers and interviewees developing musculoskeletal stress.	Control: plan short breaks during lengthy interviews. Control Effectiveness: ______________ Control: Use Comfortable chairs that encourage healthy postures. Control Effectiveness: ______________ Control: Plan a stretching exercise for long interviews Control Effectiveness:	Low				Low
Pacticipants might have to discuss or recall stressful expirience related to assesment, such as poor performance leading to stress	Control: Stop or pause the interview if any of the participants feel stress or any other disturbing feelings. Control Effectiveness: ______________ Control: Briefly discuss with participants about the questions before hand Control Effectiveness:	Medium				Low

11.2 Appendix B: Risk Management Plan

Table 6: Risk Level Matrix

Likelihood or Consequence	Insignificant	Minor	Moderate	Major	Catasthrophic
Rare	L	L	L	L	M
Unlikely	L	L	M	M	S
Possible	L	M	M	S	H
Likely	L	M	S	H	E
Almost Certain	M	S	H	E	E

L=Low Risk, M=Medium Risk, S=Substantial Risk, H=High Risk, E=Extreme Risk

Table 7: Risk matrix description

Descriptor	Description
Almost Certain	Is expected to occur in most circumstances
Likely	Will probably occurs in most circumstances
Possible	Might occur at some time
Unlikely	Could occur at some time
Rare	May occur only in exceptional circumstances
Insignificant	Low financial loss, no disruption to capability, no impact on community standing.
Minor	Medium financial loss, minor disruption to capability, minor impact on community standing.
Moderate	High financial loss, some ongoing disruption to capability, modest impact on community standing.
Major	Major financial loss, ongoing disruption to capability, major impact of community standing.
Catastrophic	Mission critical financial loss, permanent disruption to capability, and ruinous impact on community standing.

Table 3. Risk Categories

Project	Liability	Environmental	Occupational health and safety
• Data inaccuracies that could lead to incorrect conclusions or misinterpretation. • Critical software tools needed for data collection or analysis failing or	• Participants may experience mild anxiety or stress when answering questions related to assessments, such as failure or poor	• Fuel consumption for transportation to research and interview site contributing to air pollution.	• when conducting interview in person, the site may have uneven or slippery flooring, poor lightning and obstacles in the walking path resulting

producing errors. • Gadget used to do research and analyzing data fails leading to data loss • Fail to complete data collection could lead to invalid analysis and delay of the project. • Poorly design survey question or interview protocols may lead to ambiguous or misleading responses • Delay in the creation of interview and survey questions.	performance topics during an interview • If the research is conducted improperly or published without thorough verification, it could discredit the researchers and the institution.		in slip, trips or missteps. • Electrical shock, small explosion or burn from malfunction gadgets such as laptops and Computers. • While doing research and interviews, sudden gestures while standing up or sitting accidentally strike someone nearby • Sitting in awkward positions for long durations during interview that may last for extended periods for both interviewers and interviewees developing musculoskeletal stress.

Table 8: Risk assessment for non-OHS risk

Hazard	**Risk**	**Likelihood**	**Consequence**	**Risk level**	**Mitigation**	**Residual Risk**
When doing Research for literature review and when collecting data from handbooks	Data inaccuracies that could lead to incorrect conclusions or misinterpretation.	**Unlikely**	**Moderate**	**M**	- Use trusted and verified data sources - schedule regular data audits	Even after applying mitigations measures, the risk is reduced not eliminated there is still risk of data inaccuracy.

After doing the Interview and survey, the data collected is analyze using a software	Critical software tools needed for data collection or analysis failing or producing errors.	**Unlikely**	**Moderate**	**M**	**-** Keep all software up to date ensure protected against bugs or virus. - prepare a backup software	Software could still fail due to unforeseen bugs, external cyber-attack, and hardware issues.
When doing research, making interviews and surveys using laptops, computers, iPad.	Gadget used to do research and analyzing data fails leading to data loss	**Possible**	**Major**	**S**	-Have a data backup into a cloud storage or external hard drive -regular checking to ensure all gadgets are working in optimal conditions	Gadget may still fail due to manufacture defects, backups can minimalize data loss, but still need time to recover and create delays in the project.
Not enough participants in the interview and surveys. or not enough data research	Failure to complete data collection could lead to invalid analysis and delay of the project.	**Unlikely**	**Moderate**	**M**	-have a buffer time in the project schedule to accommodate unexpected delays	- impact lowered but still significant.
When creating survey and interview questions	Poorly design survey question or interview protocols may lead to ambiguous or misleading responses	**Unlikely**	**Minor**	**L**	**-** consult to mentors about the questions before handling the surveys and interviews - do small sampling test and feedback to improve the questions	Despite clear questions, misinterpretation may still happen
When doing interview and surveys.	Participants may experience mild anxiety or stress when answering questions related to assessments, such as failure or poor performance topics during an interview.	**Unlikely**	**Moderate**	**M**	**-** clearly inform the participants in advance so they know what to expect. **-**create a calm and comfortable setting **-**Allow participant to skip a potential	Despite the support and debriefing, participants may still experience stress or anxiety during or after the interview and surveys.

					stressful question	
When doing or publishing the research project.	If the research is conducted improperly or published without thorough verification, it could discredit the researchers and the institution.	**Unlikely**	**Catastrophic**	**S**	**-** do an internal review with peers and mentor for the research design and ensure it meets ethical and scientific standard	despite all the precautions to lower the risk, misconduct and publication errors may still happen.
Using transportation to go to research or interview site.	Fuel consumption for transportation to research and interview sites contributing to air pollution.	**Possible**	**Moderate**	**M**	**-**use public transport instead of personal vehicle -use virtual interview and surveys to reduce physical travel	air pollution is reduced but still produced by fuel consumption for transportation.
When creating survey and interview questions	Delay in the creation of Interview and Survey questions.	**Possible**	**Minor**	**M**	Divide the responsibility to multiple members to speed up the process	Team members could still have emergency that could result in delay despite task delegation

11.3 Appendix C: Sustainability Plan

Constructed by the United Nations, the Sustainable Development Goals (SDGs) were created to address the current social, environmental, and economic challenges. By using these goals as a guideline, the UN looks to protect the planet and improve the standard of living for everyone in the world. Therefore, it is important that all upcoming research projects consider the impact of their research through the lenses of these goals to minimize negative impacts and provide value. For this project, the third goal, 'Good health and wellbeing,' is the goal which the project most closely aligns itself with.

The major stakeholders of this project will be academics and students at Monash University. Using our results as a basis, academics and students from other universities may also benefit because of this project. The aim of the third SDG goal is to "ensure healthy lives and promote well-being for all at all ages." Main focuses for the UN through this goal include reduction of maternal mortality rates and treatment of epidemics of AIDS. Moreover, this goal also aims to improve the general health and wellbeing of everyone on the planet including our stakeholders. The key product created from this project will be a guide for academics to determine whether the amount of assessment in their course is overloading the students and the teaching staff. Our project will aim to improve the work life balance of our stakeholders by providing a tool that can be utilised to improve their working conditions in a sustainable way by removing excessive assessments.

By achieving our aim, the results of the project will allow the students and academics to have a better work-life balance, be less stressed and improve general wellbeing. With less time working on unnecessary assessments, our stakeholders will have more time to attend to their busy lives and other commitments. With more opportunities to reduce stress by spending time with friends, family, and leisure activities, the project will have a positive impact by improving mental health and well-being Monash University. As a result, we hope that academics can better balance their workload and other commitments leading to improvement in all aspects of their lives including the quality of teaching provided. Similarly, we hope that better management of the assessment workload will allow students to focus their time on important aspects of their lives including spending time with friends and family. Ultimately, our project will lead students and staff to have more time to improve better mental, physical, and social well-being directly in line with the UN's third SDGs.

Furthermore, there will be more time to develop their employability skills beyond university such as extracurricular activities or volunteering. Students are also often required to take up part-time work to support themselves. Managing assessment over will also have a positive impact on the quality of education for students. As Boyd and Bloxham find, students are more likely to participate in shallow surface-level learning if they feel they are overloaded with assessment. By reducing the workload and removing unnecessary assessments, we hope to allow students to have more time to effectively engage with the learning material rather than be distracted by the stresses of trying to simply get a good grade. As a result, Monash University will produce a cohort of engaged and well-educated students to become high quality engineers into the workforce.

Finally, there was also an environmental focus during our research project. Our project is heavily focused on data collection and analysis. We are not contributing to the making of physical products but rather a guideline. As such our environmental considerations focused on the execution of the project. The project requires volunteers and participants to gather enough data from the Monash staff and students to complete our analysis so have aimed to advertise and spread news about this project in a way that minimizes negative environmental and social impacts. We have opted for a predominantly digital advertising campaign. In utilizing the strength of social media and official Monash announcement channels to raise awareness we improve upon the traditional method of printing out papers, posters, and flyers reducing paper usage.

11.4 Appendix D: Generative AI Statement

We acknowledge the use of ChatGPT (https://chat.openai.com) to brainstorm research ideas and refine the academic language of our report. The example of prompt that might be used is "help me find synonyms of (Word)" and "How to describe this (word) in a more academic way." Then the result is integrated into the report.

Instead of going through numerous of websites, the AI was also used to fasten some process of searching through libraries, the prompt could be "what function to use to plot charts in phyton?" or "What function to use to import Json/ excel file in phyton". The use of AI in this research was in accordance with ethical guidelines.

11.5 Appendix E: Survey Results – Specification Breakdown

Table 9: Engineering disciplines' perception of most common assessment types - Stress

Row Labels	Average of Exams	Average of Individual assessments	Average of Moodle quizzes	Average of In semester tests	Average of Group projects	Average of Presentations
Aerospace	**4.25**	**3.75**	**2.50**	**3.75**	**3.67**	**3.58**
1	4.00	3.50	3.00	3.50	4.00	4.00
2	3.75	3.25	2.25	3.00	3.25	3.25
3	5.00	4.00	2.33	4.67	4.67	4.33
5	4.50	4.00	2.50	5.00	3.00	3.50
6+	4.00	5.00	3.00	2.00	3.00	2.00

Biomedical	**4.50**	**3.50**	**3.00**	**4.00**	**4.25**	**3.50**
1	4.00	3.00	2.00	3.00	4.00	4.00
2	4.50	4.00	2.50	4.50	4.00	3.50
4	5.00	3.00	5.00	4.00	5.00	3.00
Chemical	**4.08**	**3.54**	**2.38**	**3.92**	**3.46**	**3.54**
1	4.00	3.00	1.50	3.50	3.00	3.50
2	3.67	3.50	2.33	3.67	3.17	3.67
4	4.33	4.33	2.67	5.00	4.33	3.67
5	5.00	3.00	3.00	3.50	3.50	3.00
Civil	**4.36**	**3.29**	**2.40**	**3.91**	**3.84**	**3.38**
1	4.50	3.00	2.50	4.00	5.00	4.50
2	4.00	3.50	2.88	4.13	3.88	4.00
3	4.20	3.50	2.10	3.80	3.90	3.20
4	4.11	2.78	2.11	3.56	3.33	2.78
5	4.88	3.00	2.38	4.00	3.50	3.25
6+	4.63	3.75	2.63	4.13	4.38	3.50
Electrical	**4.20**	**3.25**	**2.95**	**3.80**	**3.25**	**3.15**
1	4.50	3.00	3.50	3.00	2.50	2.00
2	3.80	3.40	2.80	3.60	3.00	3.00
3	3.75	3.50	3.00	3.50	3.75	4.00
4	4.00	3.25	3.00	4.75	3.50	3.50
5	5.00	3.00	2.00	3.00	4.00	1.00
6+	5.00	3.00	3.00	4.00	3.00	3.25
Environmental	**4.17**	**3.50**	**2.67**	**4.00**	**3.50**	**3.83**
1	4.00	5.00	5.00	5.00	3.00	4.00
2	5.00	3.00	2.00	2.00	3.00	2.00
3	4.50	3.00	2.00	5.00	4.50	4.00
4	4.00	2.00	2.00	3.00	3.00	4.00
5	3.00	5.00	3.00	4.00	3.00	5.00
First year	**4.47**	**3.74**	**2.95**	**3.89**	**3.63**	**3.47**
1	4.47	3.74	2.95	3.89	3.63	3.47
Materials	**5.00**	**4.00**	**2.50**	**4.50**	**4.50**	**3.50**
2	5.00	4.00	2.50	4.50	4.50	3.50
Mechanical	**4.07**	**3.53**	**2.67**	**3.80**	**3.87**	**3.53**
1	4.33	3.67	2.33	3.67	3.17	3.17
2	4.50	4.00	2.50	4.00	4.50	4.50
3	4.00	3.67	3.33	4.00	4.33	3.67
4	2.00	3.50	3.00	3.50	4.00	3.00
5	5.00	2.00	2.00	4.00	4.00	4.00
6+	5.00	3.00	3.00	4.00	5.00	4.00
Resource	**5.00**	**3.00**	**4.00**	**5.00**	**5.00**	**5.00**
6+	5.00	3.00	4.00	5.00	5.00	5.00
Robotics	**4.29**	**3.25**	**2.33**	**3.88**	**3.92**	**3.54**
1	4.67	4.00	2.33	3.67	4.00	3.67
2	4.11	3.00	2.22	3.67	4.33	3.33
4	4.33	3.17	2.50	4.00	3.50	3.50
5	4.50	3.50	2.75	4.25	4.25	4.00
6+	4.00	3.00	1.50	4.00	2.50	3.50
Software	**4.58**	**3.50**	**3.00**	**4.00**	**3.42**	**4.00**

1	4.20	3.60	2.00	3.60	3.00	4.00
3	5.00	3.20	3.60	4.00	3.60	4.00
4	5.00	3.00	4.00	5.00	3.00	3.00
5	4.00	5.00	4.00	5.00	5.00	5.00
Mechatronics	**4.00**	**4.00**	**2.00**	**4.00**	**3.00**	**3.00**
2	4.00	4.00	2.00	4.00	3.00	3.00
Grand Total	**4.31**	**3.44**	**2.61**	**3.90**	**3.70**	**3.49**

Table 10: Engineering disciplines' perception of most common assessment types – Difficulty

Row Labels	Average of Exams2	Average of Individual assessments2	Average of Moodle quizzes2	Average of In semester tests2	Average of Group projects2	Average of Presentations2
Aerospace	**4.33**	**3.67**	**2.83**	**3.83**	**3.67**	**3.42**
1	4.00	4.00	3.50	4.00	4.50	4.00
2	4.00	3.75	3.00	3.50	3.25	3.25
3	5.00	3.00	2.00	3.67	4.33	3.67
5	4.50	3.50	2.50	5.00	3.00	3.00
6+	4.00	5.00	4.00	3.00	3.00	3.00
Biomedical	**4.75**	**3.75**	**2.50**	**4.50**	**3.75**	**3.25**
1	4.00	4.00	3.00	4.00	5.00	4.00
2	5.00	4.00	2.50	5.00	3.50	3.50
4	5.00	3.00	2.00	4.00	3.00	2.00
Chemical	**4.00**	**3.54**	**2.62**	**3.77**	**3.77**	**3.46**
1	4.00	3.00	2.50	3.50	3.50	3.00
2	3.50	3.83	2.67	3.17	3.33	3.50
4	4.33	3.67	2.33	5.00	4.67	4.00
5	5.00	3.00	3.00	4.00	4.00	3.00
Civil	**4.56**	**3.53**	**2.49**	**3.82**	**3.82**	**3.00**
1	5.00	5.00	2.00	4.50	5.00	3.50
2	3.88	3.38	2.75	3.75	3.88	3.50
3	4.60	3.60	2.50	3.80	3.40	2.80
4	4.56	3.11	2.22	3.44	3.22	2.78
5	4.75	3.50	2.50	4.00	4.13	2.88
6+	4.88	3.75	2.63	4.00	4.38	3.00
Electrical	**4.25**	**3.50**	**2.90**	**3.80**	**3.30**	**2.90**
1	4.50	4.00	3.50	4.00	4.00	3.00
2	3.80	3.40	2.40	3.80	3.00	2.80
3	3.75	3.75	3.50	3.25	3.75	3.50
4	4.50	3.50	3.00	4.75	3.75	3.00
5	5.00	4.00	3.00	2.00	2.00	1.00
6+	4.75	3.00	2.50	3.75	2.75	2.75
Environmental	**4.33**	**3.17**	**2.50**	**3.67**	**3.67**	**3.00**
1	4.00	5.00	5.00	4.00	3.00	4.00
2	4.00	2.00	2.00	3.00	3.00	2.00
3	5.00	3.00	2.00	4.50	4.50	3.50
4	4.00	3.00	2.00	3.00	3.00	3.00
5	4.00	3.00	2.00	3.00	4.00	2.00
First year	**4.32**	**3.58**	**2.58**	**3.79**	**4.05**	**2.79**

1	4.32	3.58	2.58	3.79	4.05	2.79
Materials	**5.00**	**3.50**	**2.00**	**4.00**	**3.50**	**3.50**
2	5.00	3.50	2.00	4.00	3.50	3.50
Mechanical	**4.27**	**3.40**	**2.80**	**4.07**	**3.33**	**3.27**
1	4.00	3.50	2.67	4.00	3.33	2.83
2	4.00	3.00	2.50	4.00	3.00	3.50
3	5.00	4.00	3.67	4.67	3.33	4.33
4	3.50	2.50	2.50	3.50	3.50	3.50
5	5.00	3.00	3.00	4.00	3.00	2.00
6+	5.00	4.00	2.00	4.00	4.00	3.00
Mechatronics	**4.00**	**2.00**	**2.00**	**3.00**	**3.00**	**3.00**
2	4.00	2.00	2.00	3.00	3.00	3.00
Resource	**5.00**	**3.00**	**3.00**	**5.00**	**5.00**	**4.00**
6+	5.00	3.00	3.00	5.00	5.00	4.00
Robotics	**4.33**	**3.25**	**2.50**	**3.67**	**4.00**	**3.29**
1	4.67	4.00	2.67	4.00	4.00	3.33
2	3.78	3.00	2.44	3.44	4.44	3.00
4	4.67	3.00	2.50	3.67	3.83	3.67
5	4.50	3.25	2.75	4.00	4.00	3.00
6+	5.00	4.00	2.00	3.50	2.50	4.00
Software	**4.17**	**3.33**	**3.00**	**3.75**	**3.75**	**3.58**
1	4.00	2.60	2.80	3.40	3.80	3.20
3	4.60	3.60	3.00	3.80	3.80	4.00
4	5.00	4.00	4.00	5.00	4.00	4.00
5	2.00	5.00	3.00	4.00	3.00	3.00
Grand Total	**4.36**	**3.46**	**2.64**	**3.82**	**3.74**	**3.15**

Table 11: Engineering disciplines' perception of most common assessment types – Learning

Row Labels	Average of Exams3	Average of Individual assessments3	Average of Moodle quizzes3	Average of In semester tests3	Average of Group projects3	Average of Presentations3
Aerospace	**2.42**	**2.92**	**3.33**	**2.58**	**3.33**	**2.75**
1	3.00	3.00	5.00	3.00	3.00	3.50
2	2.25	2.75	3.50	2.50	4.00	3.25
3	2.67	2.33	2.67	2.67	3.33	2.00
5	2.00	3.50	3.00	1.50	2.50	2.00
6+	2.00	4.00	2.00	4.00	3.00	3.00
Biomedical	**2.25**	**3.75**	**3.25**	**3.25**	**3.50**	**3.50**
1	2.00	3.00	1.00	3.00	4.00	3.00
2	3.00	4.00	4.00	3.00	3.50	3.50
4	1.00	4.00	4.00	4.00	3.00	4.00
Chemical	**2.85**	**3.85**	**3.54**	**3.46**	**3.15**	**3.00**
1	3.00	3.50	3.00	3.50	4.00	3.00
2	2.67	3.83	4.00	3.33	2.50	2.33
4	3.00	4.00	3.33	3.33	3.33	4.00
5	3.00	4.00	3.00	4.00	4.00	3.50
Civil	**2.56**	**3.76**	**3.56**	**3.44**	**3.42**	**2.89**
1	2.50	4.00	3.00	3.50	2.50	3.00

2	3.50	4.00	3.88	3.88	3.50	3.13
3	2.50	4.00	3.40	3.30	3.60	2.60
4	2.78	3.22	3.44	3.56	3.33	2.89
5	2.13	4.00	3.38	3.50	3.63	3.13
6+	1.88	3.50	3.88	3.00	3.25	2.75
Electrical	**2.95**	**4.00**	**3.95**	**3.65**	**3.65**	**3.35**
1	4.00	4.00	3.00	4.00	2.50	3.00
2	3.00	3.20	4.00	3.60	3.60	3.80
3	3.00	4.25	4.00	3.50	3.25	2.50
4	2.75	4.25	4.75	3.75	4.25	3.75
5	2.00	5.00	3.00	4.00	5.00	5.00
6+	2.75	4.25	3.75	3.50	3.75	3.00
Environmental	**3.00**	**3.33**	**3.33**	**3.00**	**3.17**	**2.33**
1	4.00	3.00	1.00	3.00	3.00	3.00
2	4.00	5.00	5.00	3.00	3.00	2.00
3	2.50	2.00	4.50	3.00	2.50	2.00
4	3.00	4.00	4.00	4.00	4.00	2.00
5	2.00	4.00	1.00	2.00	4.00	3.00
First year	**2.79**	**3.47**	**4.05**	**3.58**	**3.63**	**3.11**
1	2.79	3.47	4.05	3.58	3.63	3.11
Materials	**2.00**	**4.00**	**2.50**	**3.00**	**3.50**	**4.50**
2	2.00	4.00	2.50	3.00	3.50	4.50
Mechanical	**3.07**	**3.93**	**3.67**	**3.67**	**3.53**	**2.87**
1	3.50	4.17	4.00	4.00	3.83	2.83
2	3.50	5.00	4.50	5.00	2.50	1.50
3	2.00	3.00	3.33	2.33	3.67	2.67
4	3.00	3.50	2.50	3.50	2.50	3.50
5	3.00	4.00	4.00	3.00	4.00	4.00
6+	3.00	4.00	3.00	4.00	5.00	4.00
Resource	**2.00**	**4.00**	**4.00**	**2.00**	**4.00**	**5.00**
6+	2.00	4.00	4.00	2.00	4.00	5.00
Robotics	**2.75**	**4.08**	**3.92**	**3.71**	**3.46**	**2.83**
1	3.00	4.33	4.67	3.67	4.00	4.67
2	3.44	3.56	3.56	3.89	2.89	2.22
4	2.17	4.33	4.33	3.67	3.67	3.50
5	2.25	4.25	3.50	3.75	3.25	2.00
6+	2.00	5.00	4.00	3.00	5.00	2.50
Software	**1.92**	**3.67**	**2.92**	**2.58**	**3.50**	**2.58**
1	2.40	4.00	4.00	3.60	3.20	2.40
3	1.80	3.40	2.60	2.20	4.00	2.40
4	1.00	5.00	1.00	1.00	5.00	3.00
5	1.00	2.00	1.00	1.00	1.00	4.00
Mechatronics	**2.00**	**3.00**	**4.00**	**4.00**	**3.00**	**3.00**
2	2.00	3.00	4.00	4.00	3.00	3.00
Grand Total	**2.66**	**3.74**	**3.63**	**3.39**	**3.46**	**2.96**

Table 12: Engineering disciplines' perception of most common assessment types - Growth

Row Labels	Average of Exams4	Average of Individual assessments4	Average of Moodle quizzes4	Average of In semester tests4	Average of Group projects4	Average of Presentations4
Aerospace	**2.58**	**3.17**	**2.92**	**2.58**	**4.00**	**3.50**
1	3.00	3.00	4.50	3.00	3.00	3.00
2	2.50	3.25	2.75	2.75	4.00	3.75
3	3.00	2.67	3.00	3.00	3.67	2.00
5	1.50	3.50	2.50	1.50	5.00	5.00
6+	3.00	4.00	1.00	2.00	5.00	5.00
Biomedical	**2.25**	**4.00**	**3.25**	**3.25**	**4.25**	**4.00**
1	3.00	4.00	2.00	4.00	4.00	4.00
2	2.50	4.00	3.50	2.50	4.00	4.00
4	1.00	4.00	4.00	4.00	5.00	4.00
Chemical	**2.85**	**3.23**	**2.85**	**2.77**	**3.62**	**3.54**
1	3.00	3.00	3.00	3.50	3.50	3.50
2	2.67	3.00	3.50	2.83	3.33	3.00
4	3.33	3.67	2.00	2.00	4.00	4.00
5	2.50	3.50	2.00	3.00	4.00	4.50
Civil	**2.51**	**3.38**	**2.67**	**2.84**	**3.64**	**3.62**
1	3.00	3.00	3.00	3.00	3.00	3.00
2	3.63	3.63	2.63	3.38	3.50	3.38
3	2.60	3.60	2.90	2.80	3.70	3.40
4	2.67	3.22	2.56	3.00	3.89	3.67
5	1.88	3.38	2.50	2.63	3.38	3.63
6+	1.63	3.13	2.63	2.38	3.88	4.25
Electrical	**2.65**	**3.60**	**3.20**	**2.85**	**4.25**	**3.95**
1	3.00	3.50	3.00	3.00	4.00	3.50
2	2.60	2.80	3.00	2.40	4.40	4.20
3	3.25	4.00	3.75	3.50	4.00	3.75
4	2.25	3.50	3.75	2.75	4.25	3.50
5	4.00	5.00	2.00	3.00	5.00	5.00
6+	2.00	4.00	2.75	2.75	4.25	4.25
Environmental	**2.50**	**2.83**	**2.00**	**2.83**	**4.17**	**4.00**
1	3.00	2.00	1.00	3.00	3.00	3.00
2	3.00	4.00	4.00	3.00	5.00	5.00
3	2.50	3.00	1.00	3.00	4.00	4.00
4	3.00	4.00	4.00	4.00	4.00	3.00
5	1.00	1.00	1.00	1.00	5.00	5.00
First year	**2.63**	**3.26**	**2.89**	**2.68**	**3.95**	**3.21**
1	2.63	3.26	2.89	2.68	3.95	3.21
Materials	**2.00**	**3.50**	**2.00**	**3.00**	**4.50**	**5.00**
2	2.00	3.50	2.00	3.00	4.50	5.00
Mechanical	**2.80**	**3.67**	**3.33**	**3.67**	**3.60**	**3.60**
1	2.83	4.00	3.33	4.00	3.67	3.67
2	3.00	4.50	4.50	4.50	3.00	2.50
3	2.00	3.33	2.67	2.33	4.00	3.33
4	3.00	2.50	3.00	3.50	3.00	3.50
5	4.00	3.00	2.00	4.00	4.00	5.00

6+	3.00	4.00	5.00	4.00	4.00	5.00
Resource	**2.00**	**4.00**	**4.00**	**2.00**	**4.00**	**5.00**
6+	2.00	4.00	4.00	2.00	4.00	5.00
Robotics	**2.58**	**3.63**	**2.96**	**2.75**	**3.79**	**3.67**
1	3.67	3.67	3.33	3.33	4.33	4.33
2	3.00	3.56	2.22	2.67	3.44	3.78
4	2.00	3.83	4.33	3.00	3.67	3.33
5	2.25	3.25	2.50	2.50	3.75	3.50
6+	1.50	4.00	2.50	2.00	5.00	3.50
Software	**1.83**	**3.33**	**2.58**	**2.08**	**3.58**	**3.17**
1	2.20	2.80	2.80	2.40	3.60	2.80
3	1.80	3.60	2.40	2.20	3.80	3.20
4	1.00	5.00	1.00	1.00	5.00	4.00
5	1.00	3.00	4.00	1.00	1.00	4.00
Mechatronics	**2.00**	**4.00**	**4.00**	**4.00**	**3.00**	**3.00**
2	2.00	4.00	4.00	4.00	3.00	3.00
Grand Total	**2.54**	**3.43**	**2.87**	**2.82**	**3.82**	**3.61**

11.6 Appendix F: Assessment Due date Heat Map per discipline

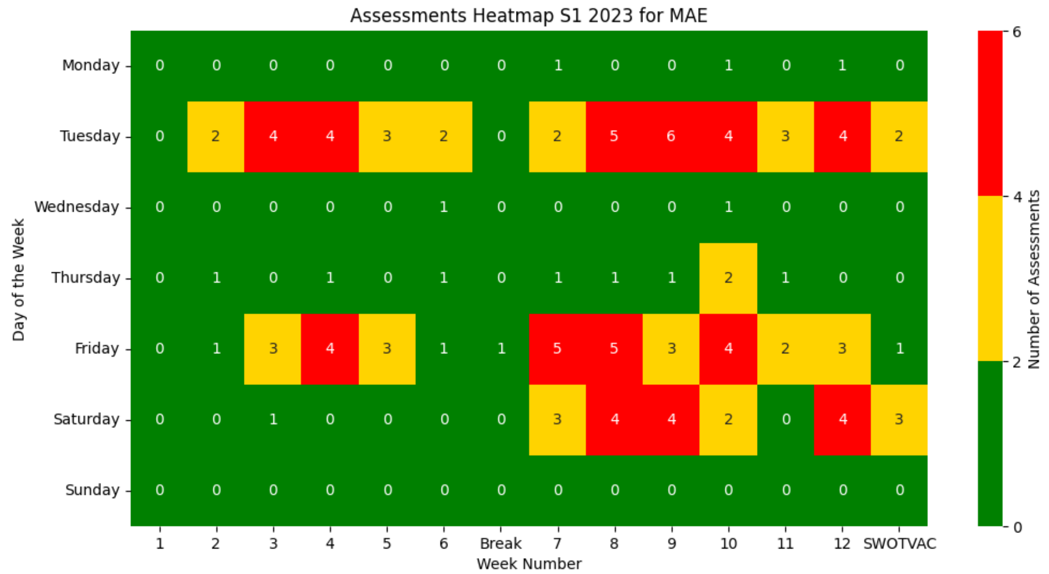

Figure 18: Assessment Due Date Heat Map: Semester 1 2023 – Mechanical and Aerospace Engineering

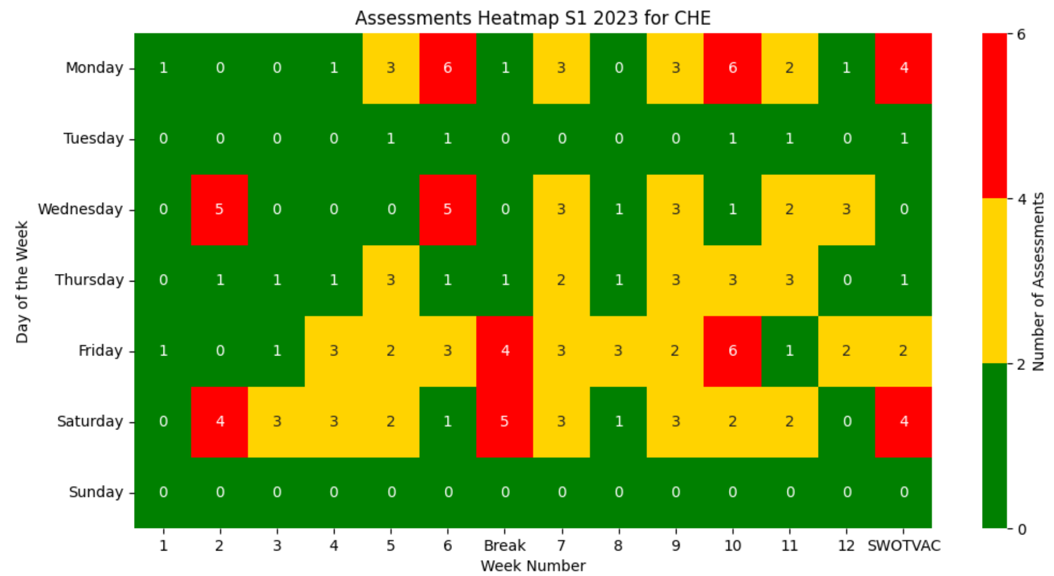

Figure 19: Assessment Due Date Heat Map: Semester 1 2023 – Chemical Engineering

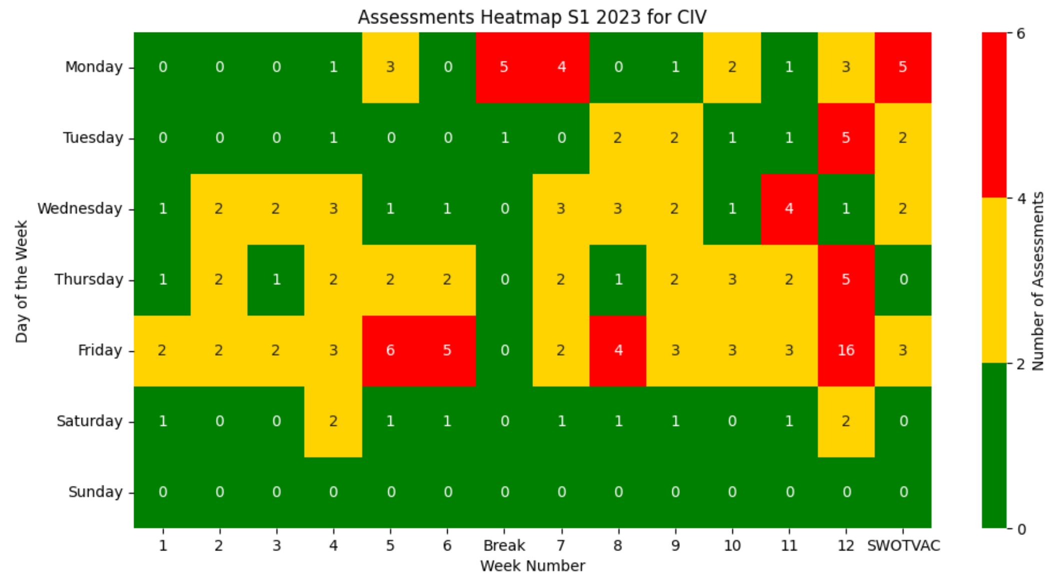

Figure 20: Assessment Due Date Heat Map: Semester 1 2023 – Civil Engineering

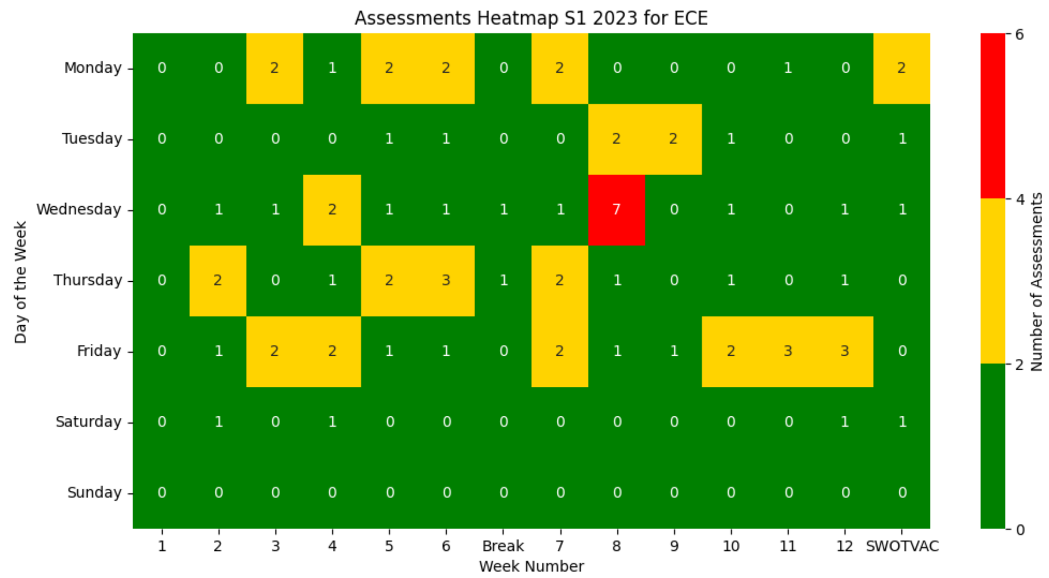

Figure 21: Assessment Due Date Heat Map: Semester 1 2023 – Electrical Engineering

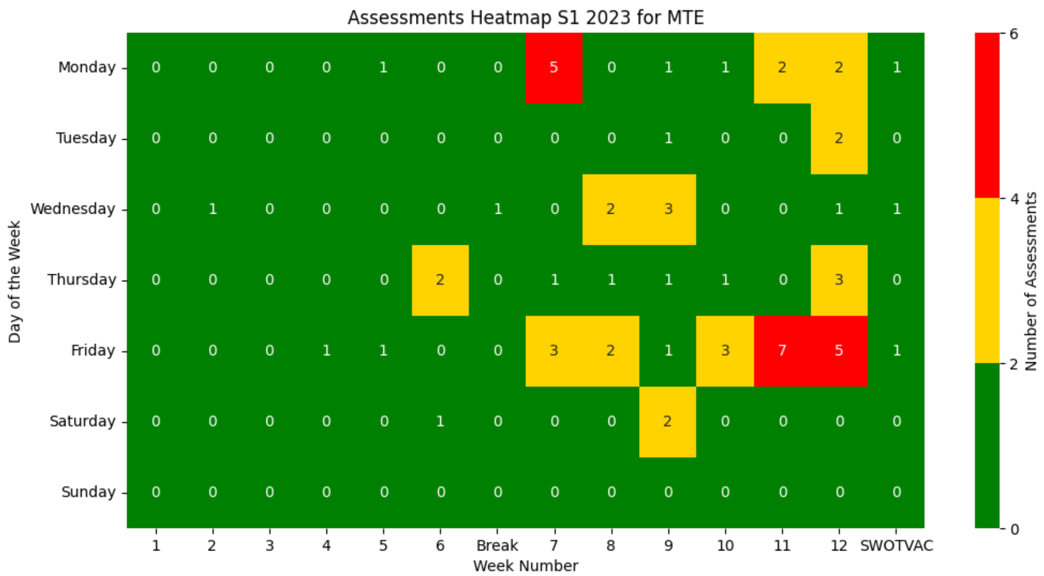

Figure 22: Assessment Due Date Heat Map: Semester 1 2023 – Material Engineering

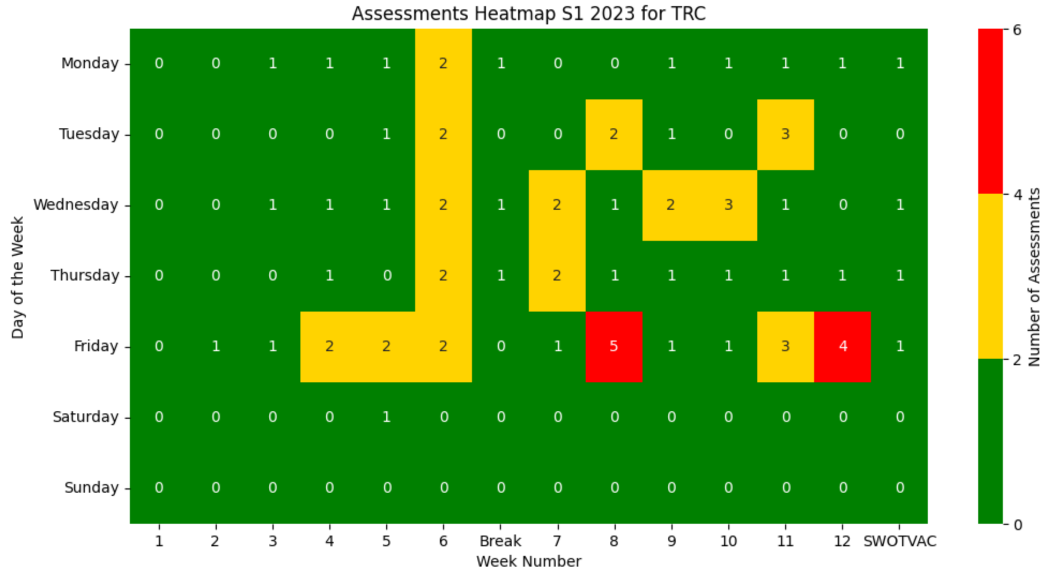

Figure 23: Assessment Due Date Heat Map: Semester 1 2023 – Robotics Engineering

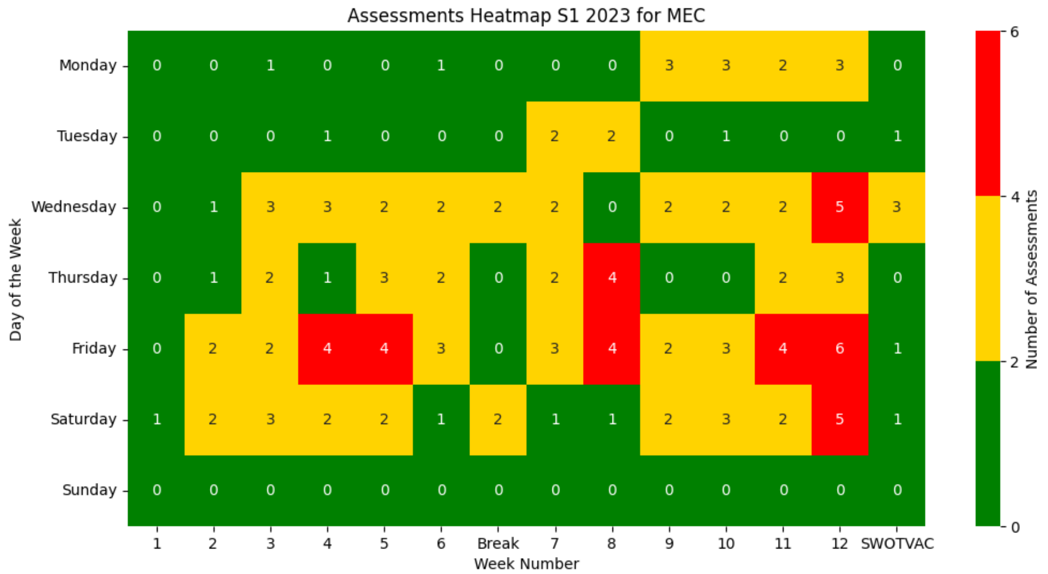

Figure 24: Assessment Due Date Heat Map: Semester 1 2023 – Mechanical Engineering

11.7 Appendix G: Python Code

```python
# Designed by Sadman Arafat
# FYP: Assessment Overload!
# Team: Steven, Rafael, Christian, Guozheng, Sadman
# Supervisor: Raj, Lila

import pandas as pd
import datetime
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
pd.options.mode.chained_assignment = None
import tkinter as tk
from tkinter import ttk
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from matplotlib.backends.backend_tkagg import FigureCanvasTkAgg
import matplotlib.colors as mcolors

# BACK END

def analyze_assignment_durations(sem, unit_codes, excel,ax2):
    if sem == 2:
        academic_weeks_start = ["24072023", "31072023", "07082023", "14082023", "21082023", "28082023", "04092023", "11092023", "18092023", "25092023", "02102023", "09102023", "16102023", "23102023"]
        academic_weeks_end = ["30072023", "06082023", "13082023", "20082023", "27082023", "03092023", "10092023", "17092023", "24092023", "01102023", "08102023", "15102023", "22102023", "29102023"]
        week_number = ["1", "2", "3", "4", "5", "6","Break", "7", "8", "9",  "10", "11", "12", "SWOTVAC"]
    elif sem == 1:
        academic_weeks_start = ["27022023","06032023","13032023","20032023","27032023","03042023","10042023","17042023","24042023","01052023","08052023","15052023","22052023","29052023"]
        academic_weeks_end =   ["05032023","12032023","19032023","26032023","02042023","09042023","16042023","23042023","30042023","07052023","14052023","21052023","28052023","04062023"]
        week_number = ["1", "2", "3", "4", "5", "6", "7", "8", "9","Break", "10", "11", "12", "SWOTVAC"]

    start_date = academic_weeks_start[0]
    end_date = academic_weeks_end[13]
    start_date = pd.to_datetime(start_date, format="%d%m%Y")
    end_date = pd.to_datetime(end_date, format="%d%m%Y")
    df = excel
    df['duedate'] = pd.to_datetime(df['duedate'], unit='s')
    df['allowsubmissionsfromdate'] = pd.to_datetime(df['allowsubmissionsfromdate'], unit='s')

    df = df[(df['duedate'] >= start_date) & (df['duedate'] <= end_date)]
    df['cleaned_shortname'] = df['shortname'].str[:7].str.upper()

    unit_codes = [code[:7].upper() for code in unit_codes]

    df = df[df['cleaned_shortname'].isin(unit_codes)]
    saved_data=df

    if df.empty:
        print("No data available for the given date range and unit codes.")
    else:
        df['duration'] = (df['duedate'] - df['allowsubmissionsfromdate']).dt.days

        df = df[df['duration'] <= 31]

        bins = [i-0.5 for i in range(31)] + [float('inf')]
        labels = [f"{i} day" if i == 1 else f"{i} days" for i in range(1, 31)] + ['30+ days']

        df['duration_category'] = pd.cut(df['duration'], bins=bins, labels=labels, right=True)

        duration_counts = df['duration_category'].value_counts().reindex(labels)

        return duration_counts, saved_data, labels
```

```python
def generate_heatmap(data_assessment, data_quiz, unit_code,sem):

    if sem == 2:
        academic_weeks_start = ["24072023", "31072023", "07082023", "14082023", "21082023", "28082023", "04092023", "11092023", "18092023", "25092023", "02102023", "09102023", "16102023", "23102023"]
        academic_weeks_end = ["30072023", "06082023", "13082023", "20082023", "27082023", "03092023", "10092023", "17092023", "24092023", "01102023", "08102023", "15102023", "22102023", "29102023"]
        week_number = ["1", "2", "3", "4", "5", "6","Break", "7", "8", "9",  "10", "11", "12", "SWOTVAC"]
    elif sem == 1:
        academic_weeks_start = ["27022023","06032023","13032023","20032023","27032023","03042023","10042023","17042023","24042023","01052023","08052023","15052023","22052023","29052023"]
        academic_weeks_end =   ["05032023","12032023","19032023","26032023","02042023","09042023","16042023","23042023","30042023","07052023","14052023","21052023","28052023","04062023"]
        week_number = ["1", "2", "3", "4", "5", "6", "7", "8", "9","Break", "10", "11", "12", "SWOTVAC"]

    exclude_keywords = ["final", "supplementary", "deferred", "Malaysia", "Examination", "DEFF", "CPD", "Sup/Def", "Exam", "Def/Supp", "Non-graded","End-of-Semester","Practice"]

    unit_code = unit_code.upper()

    data_assessment = data_assessment[data_assessment['shortname'].str.upper().str.contains(unit_code)]

    data_quiz = data_quiz[data_quiz['Unit'].str.upper().str.contains(unit_code)]

    data_assessment['duedate stamp'] = pd.to_datetime(data_assessment['duedate stamp'])
    data_assessment['name'] = data_assessment['name']
    data_assessment['type'] = 'assessment'

    data_quiz['duedate stamp'] = pd.to_datetime(data_quiz['Due Date'])
    data_quiz['name'] = data_quiz['Quiz Name']
    data_quiz['type'] = 'quiz'

    data_combined = pd.concat([data_assessment, data_quiz], ignore_index=True)

    academic_weeks = [(datetime.datetime.strptime(start, '%d%m%Y'), datetime.datetime.strptime(end, '%d%m%Y')) for start, end in zip(academic_weeks_start, academic_weeks_end)]

    heatmap_data = pd.DataFrame(0, columns=week_number, index=["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday", "Sunday"])

    for i, (start_date, end_date) in enumerate(academic_weeks):
        days_count = {"Monday": 0, "Tuesday": 0, "Wednesday": 0, "Thursday": 0, "Friday": 0, "Saturday": 0, "Sunday": 0}

        for N in range(len(data_combined)):
            name = str(data_combined.at[N, 'name'])
            if not any(keyword.lower() in name.lower() for keyword in exclude_keywords):
                due_date = data_combined.at[N, 'duedate stamp']
                if start_date <= due_date <= end_date:
                    day_of_week = due_date.strftime('%A')
                    days_count[day_of_week] += 1
                    heatmap_data.at[day_of_week, week_number[i]] += 1
                    if due_date.strftime('%A') == 'Sunday':
                        print(f"Assessment due on day check: {name}, Due Date: {due_date.strftime('%d-%m-%Y')}")

    return heatmap_data

def heatmap_plotter(heatmap_data, sem, header, units, canvas, ax1, fig):
    fig.clf()
    ax1 = fig.add_subplot(121)

    colors = ["gray","green", "yellow", "orange", "red","brown"]
    boundaries = [0, 1, 2, 3,4,5]
    cmap = mcolors.LinearSegmentedColormap.from_list("", list(zip(np.linspace(0, 1, len(boundaries)), colors)))

    sns.heatmap(heatmap_data, ax=ax1, cmap=cmap, annot=True, fmt="d", cbar_kws={"label": "Number of Assessments"},
                norm=mcolors.BoundaryNorm(boundaries, cmap.N, clip=True))
    ax1.set_title(f"Assessments Heatmap for {header} - Semester {sem} | Total Units: {len(units)}")
    ax1.set_xlabel("Week Number")
    ax1.set_ylabel("Day of the Week")
    text_to_display = " | ".join(units)

    ax1.text(0.5, -0.1, text_to_display, ha='center', va='top', transform=ax1.transAxes)
    canvas.draw()
```

```
def duration_plotter(duration_counts, labels):

    ax2 = fig.add_subplot(122)

    ax2.clear()
    duration_counts.plot(kind='bar', ax=ax2, color='skyblue', edgecolor='black')
    ax2.set_xlabel('Duration (from submission start to due date)')
    ax2.set_ylabel('Number of Assignments')
    ax2.set_title('Distribution of Assignment Durations')
    ax2.set_xticks(range(len(labels)))
    ax2.set_xticklabels(labels, rotation=45)
    canvas.draw()



def loop_heatmap(data_assessment,data_quiz,unit_codes,sem):
    heatmap_data = generate_heatmap(data_assessment, data_quiz, unit_codes[0],sem)
    for unit_code in unit_codes[1:]:
        heatmap_data += generate_heatmap(data_assessment, data_quiz, unit_code,sem)
    return heatmap_data

def get_course_codes(faculty, year, sem, df):
    filtered_df = df

    if faculty != 'All':
        filtered_df = filtered_df[filtered_df['Faculty Name'] == faculty]

    if year != 0:
        filtered_df = filtered_df[filtered_df['Year level'] == year]

    if sem != 0:
        filtered_df = filtered_df[filtered_df['Semester'] == sem]

    unit_codes = filtered_df['unit codes'].to_numpy()
    print(unit_codes)
    return unit_codes

def on_generate():
    faculty = faculty_var.get()

    sem = sem_var.get()
    if sem == 'All':
        sem = 0
    else: sem = int(sem)

    year = year_var.get()
    if year == 'All':
        year = 0
    else: year = int(year)

    unit_codes = get_course_codes(faculty, year, sem, coursemap)


    ax1.clear()
    ax2.clear()

    if unit_codes.size > 0:
        heatmap_data = loop_heatmap(data_assessment, data_quiz, unit_codes, sem)
        heatmap_plotter(heatmap_data, sem, faculty, unit_codes.tolist(), canvas, ax1, fig)

        duration_counts, saved_data, labels = analyze_assignment_durations(sem, unit_codes, data_assessment, ax2)
        duration_plotter(duration_counts, labels)
    else:
        print("No course codes found for the selected options.")

    plt.savefig('Output\Figure.jpg', format='jpg')
```

```python
def on_generate_excel():
    faculty = faculty_var.get()

    sem = sem_var.get()
    if sem == 'All':
        sem = 0
    else: sem = int(sem)

    year = year_var.get()
    if year == 'All':
        year = 0
    else: year = int(year)

    unit_codes = get_course_codes(faculty, year, sem, coursemap)
    duration_counts, saved_data, labels = analyze_assignment_durations(sem, unit_codes, data_assessment, ax2)
    duf = pd.DataFrame(saved_data)
    duf.to_excel('Output\Heatmap_Data.xlsx', index=False)


# LOAD DATA FILES
data_assessment = pd.read_excel('Data\Moodle_Report.xlsx')
data_quiz = pd.read_excel('Data\quiz_report.xlsx')
coursemap = pd.read_excel('Data\CourseCodes.xlsx')
image_path2 = 'Data\MonashLogo.png'
image_path1 = 'Data\FYPLogo.png'
```

```python
#FRONT END
root = tk.Tk()
root.title("Heatmap Generator")
root.geometry("1600x1200")

image1 = tk.PhotoImage(file=image_path1)
image2 = tk.PhotoImage(file=image_path2)

image_label = tk.Label(root, image=image1)
image_label.image1 = image1
image_label.grid(row=0, column=0, rowspan=20, padx=200, pady=20, sticky='nw')

image_label = tk.Label(root, image=image2)
image_label.image2 = image2
image_label.grid(row=0, column=2, rowspan=20, padx=200, pady=20, sticky='ne')

large_font = ('Verdana', 20)
medium_font = ('Verdana', 16)

fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(20, 8))
canvas = FigureCanvasTkAgg(fig, master=root)
canvas_widget = canvas.get_tk_widget()
canvas_widget.grid(row=10, column=0, columnspan=3, padx=20, pady=20, sticky='nsew')

title_label = tk.Label(root, text="Assessment Overload!", font=('Helvetica', 38))
title_label.grid(row=0, column=2, pady=20, sticky='w')

faculty_label = tk.Label(root, text="Select Faculty:", font=large_font)
faculty_label.grid(row=1, column=1, sticky='e')
faculty_var = tk.StringVar()
faculty_choices = ['All', 'Aerospace', 'Electrical', 'Biomedical', 'Environmental', 'Software', 'Mechatronics (AI)', 'Chemical', 'Materials', 'Software (Industry)', 'Mechatronics (Automation)', 'Civil', 'Mechanical']
faculty_dropdown = ttk.Combobox(root, textvariable=faculty_var, values=faculty_choices, font=medium_font, height=10)
faculty_dropdown.grid(row=1, column=2, pady=20, sticky='w')

sem_label = tk.Label(root, text="Select Semester:", font=large_font)
sem_label.grid(row=2, column=1, sticky='e')
sem_var = tk.StringVar()
sem_dropdown = ttk.Combobox(root, textvariable=sem_var, values=[1, 2], font=medium_font, height=10)
sem_dropdown.grid(row=2, column=2, pady=20, sticky='w')

year_label = tk.Label(root, text="Select Year:", font=large_font)
year_label.grid(row=3, column=1, sticky='e')
year_var = tk.StringVar()
year_dropdown = ttk.Combobox(root, textvariable=year_var, values=['All', 1, 2, 3, 4], font=medium_font, height=10)
year_dropdown.grid(row=3, column=2, pady=20, sticky='w')

generate_button = tk.Button(root, text="Generate Heatmap", command=lambda: on_generate(), font=large_font, height=2, width=20)
generate_button.grid(row=4, column=2, pady=20, sticky='nw')

generate_excel_button = tk.Button(root, text="Generate Excel", command=lambda: on_generate_excel(), font=large_font, height=2, width=20)
generate_excel_button.grid(row=5, column=2, pady=20, sticky='nw')

bottom_text = "Designed by Sadman Arafat\nFYP: Assessment Overload!\nTeam: Steven, Rafael, Christian, Guozheng\nSupervisor: Raj, Lila"
footer_label = tk.Label(root, text=bottom_text, font=('Helvetica', 14))
footer_label.grid(row=6, column=2, pady=20, sticky='nw')

root.grid_rowconfigure(10, weight=1)
root.grid_columnconfigure(2, weight=1)

root.mainloop()
```