UNIVERSITY OF CAPE TOWN

Department of Electrical Engineering

EEE4022F/S - Final Year Project

Graduate Attribute Tracking Form

Student name:	Caide Marc Spriestersbach	DP Awarded? [Y/N]	Y
Student no:	SPRCAI002	Supervisor name:	Dr. Stephen Paine
Date:	30/09/2024	Date:	01/10/2024
Student signature:		Supervisor signature:	

VERY IMPORTANT: Receiving DP for the course does NOT imply that all GA's have been met in the course. Assessment of GA's only happens in the final marking of the project report.

GA 1: Problem Solving

Student Response:

I began by understanding and researching literature on Maxwell's equations, electromagnetism, and microwave operations to understand the interactions between microwaves and catalysts. I also made sure to research all the literature on the current understanding and investigations that have been done up until this point. I identified a gap in the understanding of these interactions, which led to the development of a temperature sensing module and experimental design to analyse catalyst behaviour in microwaves. Complex mathematics describing electric and magnetic fields was applied to grasp microwave operation. This investigation contributes to the sustainable conversion of plastics into valuable products, aiding in efficiency optimisation and reducing environmental impact.

Supervisor Response:

Agree with students assessment above. The student is on track to meet GA 1.

GA 4: Investigations, Experiments, and Data Analysis

Student Response:

I designed and conducted experiments to investigate the heating behaviour of various catalysts under different microwave power levels, catalyst placements, and compositions. These variables were chosen to thoroughly understand the factors influencing catalyst heating. The experiment design was informed by recommendations from existing literature, ensuring that my methodology addressed current gaps in understanding.

Although I am still in the data collection phase, I plan to utilise MATLAB for data analysis, as it will allow me to plot, interpret trends, and draw meaningful conclusions about the catalysts' interactions with microwaves.

Supervisor Response:

Agree with students assessment above. The student has performed an extensive investigation as part of the project and is currently busy with experiments and data analysis and is on track to meet GA 4 by the end of the project.

GA 5: Use of Engineering Tools

Student Response:

To investigate the catalyst heating behaviour in microwave fields, I utilised a range of engineering tools and technologies. I used PyCharm by JetBrains to develop and implement the code for the temperature sensing module, integrating a Raspberry Pi 3B+ microcontroller, thermistors, and a thermocouple for real-time data acquisition. MATLAB will be employed for data analysis and visualisation, allowing me to identify trends and correlations effectively. Additionally, the hardware tools, including the MAX6675 thermocouple converter and MCP3008 ADC, were selected and integrated into the system to ensure accurate temperature measurements.

Supervisor Response:

Agree with students assessment above. A number of engineering tools have been used throughout the project as indicated and the student should have no problems meeting GA 5 by the end of the project.

GA 6: Professional and Technical Communication

Student Response:

Throughout the project, I have maintained regular communication with my supervisor via weekly meetings and Microsoft Teams updates, ensuring a consistent flow of information and feedback. My report is thorough, well-structured, and adheres to a professional standard, demonstrating my ability to communicate complex engineering concepts effectively in written form. Additionally, I have engaged

frequently with my supervisor and peers, explaining intricate ideas and receiving constructive feedback, which has enhanced my ability to convey complex engineering principles to diverse audiences.

Supervisor Response:
The student has been diligent in his communication and his final report should serve to meet GA 6.

GA 8: Individual Working

Student Response:
Throughout this project, I have demonstrated the ability to work independently by managing all aspects of the investigation, from designing the experimental setup and conducting tests to developing the temperature sensing module and analysing data. I have taken full responsibility for planning, executing, and troubleshooting any challenges that arose during the project, showcasing my capability to work effectively as an individual in a complex engineering environment. My independent work ethic has been further evidenced by my proactive engagement with the literature, self-directed learning, and the ability to apply theoretical knowledge to practical problems. Despite working individually, I have also ensured that I am open to guidance and feedback from my supervisor, integrating their insights to enhance the quality of my work.

Supervisor Response:
Agree with students assessment above. The student is on track to meet GA 8.

GA 9: Independent Learning Ability

Student Response:
I have demonstrated strong independent learning skills throughout this project by engaging with complex concepts, theories, and methodologies related to microwave heating and catalyst behaviour without relying solely on direct guidance. I independently researched relevant literature, identified knowledge gaps, and adapted my methodology accordingly to address these gaps. My ability to self-evaluate my understanding, seek out additional resources, and ask for help when needed has enabled me to overcome challenges and advance my project effectively. Moreover, I have shown resilience in handling the uncertainty and complexities of the experiment, continuously refining my approach based on constructive feedback from my supervisor and peers.

Supervisor Response:
The student has engaged with the material and has demonstrated independent learning ability throughout the project. Student is on track to meet GA 9.

Instructions:

Students must explain in this document what they **have already done** and what they **plan to do** to satisfy each Graduate Attribute. Descriptions of each GA is provided below. Supervisors respond to the student's plans and current progress, providing additional comments or advice as they see fit. Once the student's progress is deemed sufficient (a few weeks before submission at the due date for this form), supervisors indicate that DP can be awarded.

GA 1: Problem Solving

Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development.

- A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
- Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline, much of which is at the forefront of the discipline.

GA 4: Investigations, Experiments and Data Analysis

Demonstrate competence to conduct investigations of complex engineering problems using research methods, including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

The balance of investigation and experiment should be appropriate to the discipline. Research methodology to be applied in research or investigation where the student engages with selected knowledge in the research literature of the discipline.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon and a recommended course of action rather than specifying how an artefact could be produced.

GA 5: Use of engineering tools

Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems.

- Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- Knowledge of engineering practice (technology) in the practice areas in the engineering discipline

A range of techniques, resources and modern engineering and IT tools appropriate to the disciplinary designation of the programme.

GA 6: Professional and Technical Communication

Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large, taking into account cultural, language, and learning differences.

This course evaluates the long report component of this outcome at exit level. Material to be communicated is in an academic or simulated professional context. Audiences range from engineering peers, management and lay persons, using appropriate academic or professional discourse. Written reports (10 000 to 15 000 words plus tables, diagrams and appendices) should cover material at exit-level. Methods of providing information include the conventional methods of the discipline, for example engineering drawings, as well as subject-specific methods.

GA 8: Individual, Team and Multidisciplinary Working

Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments. This course evaluates the **individual** working component of this learning outcome at exit level.

Knowledge of professional ethics, responsibilities and norms of engineering practice.

GA 9: Independent Learning Ability

Demonstrate competence to engage in independent learning through well developed learning skills.

Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

Operate independently in complex, ill-defined contexts requiring personal responsibility and initiative, accurately self-evaluate and take responsibility for learning requirements; be aware of social and ethical implications of applying knowledge in particular contexts.

- Openness to constructive feedback, awareness of own limitations, ability to cope with the discomfort of uncertainty and having access to a range of approaches, reflective selfevaluation, curiosity and proactive engagement, resilience, confidence to ask for help and draw from a broad range of stakeholders.
- Reflection of self-learning to begin to recognise if what has been covered meets the needs of the activity or task.