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|  |  |  | UNIVERSITY OF CAPE TOWN  Department of Electrical Engineering  EEE4022F/S - Final Year Project  Graduate Attribute Tracking Form |
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| Student name: | Qailah Bhamjee |  | DP Awarded? [Y/N] |  |
| Student no: | BHMQAI001 |  | Supervisor name: |  |
| Date: | 2024/09/26 |  | Date: |  |
| 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 happen in the final marking of the project report.**

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| **GA 1: Problem Solving** |
| Student Response:   * Completed a break-down of the project into subsystems. * Utilised principles of mathematics and physics to analyse particle motion in the system. * Written a comprehensive literature review using relevant sources to make informed project decisions on each of the subsystems. * Applied understanding of electromagnetic field dynamics to formulate control systems for particle acceleration, and research of sensor systems to create a sensor-driven detection system. * Using available, low-cost components to create the particle accelerator model. * Using an STM microcontroller for interfacing between the control/detection systems and a PC. |
| Supervisor Response: |

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| **GA 4: Investigations, Experiments, and Data Analysis** |
| Student Response:   * Researched different sensor and control system designs. * Explored different options of microcontrollers. * Designing versions of experiments to test the magnetic fields’ impact on particle velocity within a closed track. * Designing experiments to test synchronisation and timing of the control systems for particle movement. * Evaluating data and adjusting hardware components accordingly. |
| Supervisor Response: |

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| **GA 5: Use of Engineering Tools** |
| Student Response:   * Used electromagnetism formulas to predict particle movement, adjust magnet strength and refine design parameters. * Evaluated sensor systems and magnetic components for optimising accelerator performance. * Integrating an STM-based embedded control system (written in python) for real-time particle tracking and acceleration. * Evaluating and testing different hardware components for the track and ‘particles’, in order to create an appropriate model. |
| Supervisor Response: |

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| **GA 6: Professional and Technical Communication** |
| Student Response:   * Creating documentation for the software and hardware systems of the project. * Formulating a comprehensive thesis report to present the project and its results. * Ensuring code is clearly commented. * Creating circuit diagrams, diagrams and tables to log results and illustrate particle motion. |
| Supervisor Response: |

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| **GA 8: Individual Working** |
| Student Response:   * Completed ethics clearance forms. * Independent investigation into the appropriate hardware and software components to be used in the project. * Separated out the project build into versions and conducting tests on each version, in order to make informed decisions on the final build. * Designing tests to be conducted. * Employing time management to keep track of project deliverables and the due date. |
| Supervisor Response: |

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| **GA 9: Independent Learning Ability** |
| Student Response:   * Completing, revising, and engaging with relevant literature. * Researching and learning principles of: * particle acceleration * sensor systems * control systems * hardware design * STM interfacing   for the completion of the final project. |
| Supervisor Response: |

**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 self evaluation, 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.