1. General Information

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| Project Title: | Path, and Motion Planning for Ground Vehicles. | | |
| Brief Project Description: | This project aims at programming of a Ground Vehicle that demonstrates the versatility of a planned trajectory, and defining its own Motion. | | |
| Prepared By: | Brian Festus, Janet Chepkirui, Brian Gacheru, Fred Munene, Timons King’au | | |
| Date: | 10th March 2022 | Version: | 1.0.1 |

1. Project Objective:

Explain the specific objectives of the project. For example: What value does this project add to the organization? How does this project align with the strategic priorities of the organization? What results are expected? What are the deliverable? What benefits will be realized? What problems will be resolved?

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| To design a ground vehicle that generates a path, creates an optimal path plan from a starting point to a defined destination and in case of unclassified scenarios, it prompts for a custom remote assistance.  Specific objectives:   * To model the ground vehicle using CAD software. * To design its electronic circuit (components and wiring). * To program and simulate the motion of the vehicle. * Testing and demonstration of the route path planning and navigation features. |

#### Assumptions

List and describe the assumptions made in the decision to charter this project. Please note that all assumptions must be validated to ensure that the project stays on schedule and on budget.

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| * All components to be used to carry out the project to completion are easily accessed within the DeKUT Mechatronic laboratory. * The program for the vehicle will be written in common programming languages like Python, C, C++, leveraging the power of simulation and computing software like MATLAB, Solidworks, Inventor Autodesk and middleware such as ROS – Robot Operating System. |

#### Project Scope

Describe the scope of the project. The project scope establishes the boundaries of the project. It identifies the limits of the project and defines the deliverable.

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| The ground vehicle should:   * Perceive its immediate environment. * Plan a path and effectively optimize its motion. * Control its maneuver and allow custom remote-assistance if the need arises. |

List any requirements that are specifically excluded from the scope.

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| * The software(s) used in programming utilizes an already existing set of libraries that contain efficient computation and interfacing algorithms. This saves on time should the program be designed from ground/scratch. |

#### Project Milestones

List the major milestones and deliverable of the project.

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| **ASSIGNMENT** | **Milestones** | **Deliverable** | **Date** |
| Team | Mechanically design and assemble the ground vehicle and all the required sensing, control and actuating components | CAD Design | May/2022 |
| Team | Design, test and simulate electronic components. | Electronic  Circuit Design | May/2022 |
| Team | Program (design decision and control algorithms), simulate and implement on the mechanical assembly. | Matlab / ROS  and a functioning Ground Vehicle assembly | September/2022 |
| Team | Compile a detailed report of the project, outlining the entire process and tools, and the team’s evaluation of newly acquired skill and knowledge. | Report | September/2022 |

1. Impact Statement

List the impact this project may have on existing systems or units.

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| **Potential Impact** | **Systems / Units Impacted** |
| Periodically engaging lecturers -our supervisors- the Mechatronic laboratories and workspace. | Other Students who intend to make use of the project space, components and lecturers. |

**Roles and Responsibilities**

Describe the roles and responsibilities of project team members followed by the names and contact information for those filling the roles. The table below gives some generic descriptions. Modify, overwrite, and add to these examples to accurately describe the roles and responsibilities for this project.

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| **Sponsor:** Provides overall direction on the project. Responsibilities include: approve the project charter and plan; secure resources for the project; confirm the project’s goals and objectives; keep abreast of major project activities; make decisions on escalated issues; and assist in the resolution of roadblocks. | |
| **Name** | **Email / Phone** |
| The Mechatronic Department |  |
| Dedan Kimathi University of Technology |  |
| **Project Manager:** Leads in the planning and development of the project; manages the project to scope. Responsibilities include: develop the project plan; identify project deliverable; identify risks and develop risk management plan; direct the project resources (team members); scope control and change management; oversee quality assurance of the project management process; maintain all documentation including the project plan; report and forecast project status; resolve conflicts within the project or between cross-functional teams; ensure that the project’s product meets the business objectives; and communicate project status to stakeholders. | |
| **Name** | **Email / Phone** |
| Dr. Kagiri | **0721643535** |
| **Team Member:** Works toward the deliverable of the project. Responsibilities include: understand the work to be completed; complete research, data gathering, analysis, and documentation as outlined in the project plan; inform the project manager of issues, scope changes, and risk and quality concerns; proactively communicate status; and manage expectations. | |
| **Name** | **Email / Phone** |
| Brian Festus Machio | Brian.festus18@students.dkut.ac.ke |
| Janet Chepkirui | Chepkirui.janet17@students.dkut.ac.ke |
| Brian Gacheru | Brian.gacheru18@students.dkut.ac.ke |
| Fred Mutegi Munene | Fred.munene18@students.dkut.ac.ke |
| Timons King’au Mathenge | Timons.mathenge18@students.dkut.ac.ke |
| **Customer:** The person or department requesting the deliverable. Responsibilities include: partner with the sponsor or project manager to create the Project Charter; partner with the project manager to manage the project including the timeline, work plan, testing, resources, training, and documentation of procedures; work with the project team to identify the technical approach to be used and the deliverable to be furnished at the completion of the project; provide a clear definition of the business objective; sign-off on project deliverable; take ownership of the developed process and software. | |
| **Name** | **Email / Phone** |
| The Mechatronics Department |  |
| **Subject Matter Expert:** Provides expertise on a specific subject. Responsibilities include: maintain up-to-date experience and knowledge on the subject matter; and provide advice on what is critical to the performance of a project task and what is nice-to-know. | |

1. Resources

Identify the initial funding, personnel, and other resources committed to this project by the project sponsor.

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| Resource | Constraints |
| Project Budget | (See budget proposal) |
| Project Team Size | 5 members, 1 supervisor |

1. Project Risks

Identify the high-level project risks and the strategies to mitigate them.

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| Risk | Mitigation Strategy |
| Limited on-board computation power | Perform computation and data processing on a remote PC and deploy instruction to the on-board controller. |
| Unavailability of hardware components | Implementing a software function to represent the missing hardware component. |

1. Success Measurements

Identify metric and target you are trying to achieve as a result of this project. For example, overall cost savings of $50K or reduce processing time by 25 percent.

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| Implementation of a Semi-autonomous ground vehicle, whose concept, in terms of design and implementation can be used in various spaces. For example, warehouse navigation applications and last-mile delivery mobile vehicles. This allows lengthier round the clock-working optimizing resources such as time and labor cost. |

1. Signatures

The signatures of the people below document approval of the formal Project Charter. The project manager is empowered by this charter to proceed with the project as outlined in the charter.

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| **Group members:** |  |  |
| **Name** | **Signature** | **Date** |
| Brian Festus Machio  E022-01-1070/2018 |  | 10th March 2022 |
| Janet Chepkirui  E022-01-1753/2017 |  | 10th March 2022 |
| Brian Gacheru  E022-01-1060/2018 |  | *10th March 2022* |
| Fred Munene Mutegi  E022-01-1054/2018 |  | 10th March 2022 |
| Timons King’au Mathenge  E022-01-1838/2018 |  | 10th March 2022 |
| **Project Sponsors:** |  |  |
| **Name** | **Signature** | **Date** |
| Mechatronic department  **Project Manager:** |  |  |
| **Name** | **Signature** | **Date** |
| Dr. Kagiri |  |  |