# Core questions

1. How can the garbage collection system in Venlo be improved?
   1. What is the current situation?
   2. What are the main problems of the current situation?
2. How to measure the fill-level of a container?
   1. Is extra power necessary to measure?
   2. How do existing solutions measure the fill-level of a container?
   3. What other techniques could be used?
3. How to collect data from the containers?
   1. Is extra power needed to collect and send data?
   2. What kind of data is needed?
   3. How do existing solutions collect data from the containers?
   4. What other techniques could be used?
4. How to analyze the collected data?
   1. How do existing solutions analyze the data?
   2. What other techniques could be used?
5. How to incorporate collected data into the garbage collection schedule?
   1. What does the current garbage collection scheduling process look like?
   2. How could the collected data be used to improve the scheduling process?

# Work packages

# Research phase

## Deliverables

* Budget request
* Test application
* Test plan
* Sensor research paper
* Interview questions
* Interview documentation
* Process mapping
* Criticality analysis

## Work packages

|  |  |
| --- | --- |
| ID | W1.1 |
| Related (sub)questions |  |
| Measured deliverable | Budget request |
| Availability for the assignment | 1 week |
| Approach statement | Make a budget request for the necessary equipment to perform the practical research |
| Input deliverables |  |
| Output deliverables | A budget request has been filed towards the school |

|  |  |
| --- | --- |
| ID | W1.2 |
| Related (sub)questions | 2,3 |
| Measured deliverable | Test application |
| Availability for the assignment | 2 weeks |
| Approach statement | Build an application to test and collect data from different sensors |
| Input deliverables |  |
| Output deliverables | A test application |

|  |  |
| --- | --- |
| ID | W1.3 |
| Related (sub)questions | 2,3 |
| Measured deliverable | Test plan |
| Availability for the assignment | 1 weeks |
| Approach statement | Write a test plan that describes what sensor and application properties have to be tested |
| Input deliverables |  |
| Output deliverables | A test plan, tests documentation and results |

|  |  |
| --- | --- |
| ID | W1.4 |
| Related (sub)questions | 2,3 |
| Measured deliverable | Sensor research paper |
| Availability for the assignment | 1 weeks |
| Approach statement | Process all the test results |
| Input deliverables | Test documentation |
| Output deliverables | A test application |

|  |  |
| --- | --- |
| ID | W1.5 |
| Related (sub)questions | 1, 2.1, 5.1 |
| Measured deliverable | Interview questions |
| Availability for the assignment | 2 weeks |
| Approach statement | Prepare the interview questions |
| Input deliverables |  |
| Output deliverables | Interview questions |

|  |  |
| --- | --- |
| ID | W1.6 |
| Related (sub)questions | 1, 2.1, 5.1 |
| Measured deliverable | Process mapping |
| Availability for the assignment | 2 weeks |
| Approach statement | Use interview information to document the current garbage collection process |
| Input deliverables | Interview documentation |
| Output deliverables | As-is Process map |

|  |  |
| --- | --- |
| ID | W1.7 |
| Related (sub)questions | 1, 2.1, 5.1 |
| Measured deliverable | Criticality analysis |
| Availability for the assignment | 1 week |
| Approach statement | Using the mapped processes to find possible enhancements in the garbage collection process |
| Input deliverables | As-is process map |
| Output deliverables | critical process overview |

|  |  |
| --- | --- |
| ID | W1.8 |
| Related (sub)questions | 4 |
| Measured deliverable | Result-analysis research |
| Availability for the assignment | 1 week |
| Approach statement | Find out what the best method is for analyzing collected data |
| Input deliverables | Test result |
| Output deliverables | Analysis plan |

# Design phase

## Deliverables

* Use cases
* Software requirements specification
* User interface mockups
* Class diagram
* Database design
* Sequence diagrams
* Container sketches

## Work packages

|  |  |
| --- | --- |
| ID | W2.1 |
| Related (sub)questions |  |
| Measured deliverable | Use cases |
| Availability for the assignment | 2 days |
| Approach statement | Create the use cases for the prototype |
| Input deliverables |  |
| Output deliverables | Use case document |

|  |  |
| --- | --- |
| ID | W2.2 |
| Related (sub)questions |  |
| Measured deliverable | Software requirements specification |
| Availability for the assignment | 2 days |
| Approach statement | Create the software requirements specification for the prototype |
| Input deliverables | Use case document |
| Output deliverables | Software requirements specification |

|  |  |
| --- | --- |
| ID | W2.3 |
| Related (sub)questions |  |
| Measured deliverable | User interface mockups |
| Availability for the assignment | 2 days |
| Approach statement | Create the mockups for the user interface |
| Input deliverables | Software requirements specification |
| Output deliverables | Mockups |

|  |  |
| --- | --- |
| ID | W2.4 |
| Related (sub)questions |  |
| Measured deliverable | Class diagram |
| Availability for the assignment | 2 days |
| Approach statement | Create a class diagram for the prototype |
| Input deliverables | Software requirements specification |
| Output deliverables | Class diagram |

|  |  |
| --- | --- |
| ID | W2.5 |
| Related (sub)questions |  |
| Measured deliverable | Database design |
| Availability for the assignment | 2 days |
| Approach statement | Create a database design for the database |
| Input deliverables |  |
| Output deliverables | Database design |

|  |  |
| --- | --- |
| ID | W2.6 |
| Related (sub)questions |  |
| Measured deliverable | Sequence diagrams |
| Availability for the assignment | 2 days |
| Approach statement | Create sequence diagrams for the prototype application |
| Input deliverables | Class diagram |
| Output deliverables | Sequence diagram |

|  |  |
| --- | --- |
| ID | W2.7 |
| Related (sub)questions |  |
| Measured deliverable | Container sketches |
| Availability for the assignment | 2 days |
| Approach statement | Design the sensor testing container |
| Input deliverables |  |
| Output deliverables | Test container design |

# Development phase

## Deliverables

* Front end application
* Back end application
* Embedded application (Arduino)
* Documentation
* User manual
* Prototype container(s)
* Research report

## Work packages

|  |  |
| --- | --- |
| ID | W3.1 |
| Related (sub)questions |  |
| Measured deliverable | Front end application |
| Availability for the assignment | 4 weeks |
| Approach statement | Build the final front end application   * Specified in the software requirements specification |
| Input deliverables | Software requirements specification |
| Output deliverables | Front end application |

|  |  |
| --- | --- |
| ID | W3.2 |
| Related (sub)questions |  |
| Measured deliverable | Back end application |
| Availability for the assignment | 4 weeks |
| Approach statement | Build the final back end application   * Specified in the software requirements specification |
| Input deliverables | Software requirements specification |
| Output deliverables | Back end application |

|  |  |
| --- | --- |
| ID | W3.3 |
| Related (sub)questions |  |
| Measured deliverable | embedded application |
| Availability for the assignment | 4 weeks |
| Approach statement | Build the final embedded application   * Specified in the software requirements specification |
| Input deliverables | Software requirements specification |
| Output deliverables | embedded application |

|  |  |
| --- | --- |
| ID | W3.4 |
| Related (sub)questions |  |
| Measured deliverable | Documentation |
| Availability for the assignment | 4 weeks |
| Approach statement | Write the documentation for all the applications that are being developed. Will be done concurrently during development |
| Input deliverables |  |
| Output deliverables | Documentation |

|  |  |
| --- | --- |
| ID | W3.5 |
| Related (sub)questions |  |
| Measured deliverable | User manual |
| Availability for the assignment | 1 week |
| Approach statement | Write a user manual about each part of the application. This manual describes the installing, deployment, operation and maintenance of the prototype |
| Input deliverables | Front end, back end and embedded application |
| Output deliverables | User manual |

|  |  |
| --- | --- |
| ID | W3.6 |
| Related (sub)questions |  |
| Measured deliverable | Prototype container(s) |
| Availability for the assignment | 1 week |
| Approach statement | Build the container(s) that will be used with the prototype application |
| Input deliverables | Container design |
| Output deliverables | Prototype container(s) |

|  |  |
| --- | --- |
| ID | W3.7 |
| Related (sub)questions |  |
| Measured deliverable | Research report |
| Availability for the assignment | 6 weeks |
| Approach statement | Write the report which describes the complete research process and its results |
| Input deliverables | All previous deliverables |
| Output deliverables | Research report |