Work package

In general, we are going to discuss how this system is going to be built, the tasks needed to be performed as well as the required resources that must be existed to build the system, for this purpose we need first to introduce the general idea of the system that must be achieved then we will discuss the methods needed perform it

The main controller that will monitor all the inputs and outputs is the Arduino board, it will sense the human weight using four load cell that will be installed under the user bed for example installing a load cell on each leg of the bed, the load cells will measure the bed weight including the weight of user, and will detect the user existence depending on the weight.

To connect the load cells to the Arduino a special amplifier is required because the output voltage of the load cells is very low.

Also, there are two IR obstacle sensors installed at the room entrance, we will use two sensors to detect the person movement direction, if sensor1 triggered first then sensor two this means the person is entering the room and if sensor two then sensor one, this means that the person is leaving the room.

Finally, the Arduino will send SMS to the responsible person telling him that the patient left the room, this will be done by adding a GSM modem to the controller

Work needed to be performed

This system includes the following main field of knowledge

- **Hardware assembling:** this part should be easy and the connection diagram between the components are available from the manufacturers
- **Arduino programming:** Arduino needed to be programmed using the Arduino IDE program running on windows, programming requires good knowledge in C programming.
- **GSM modem:** the GSM modem programming requires good knowledge and skills in communication as well as the AT command for communicating with the

modem, but fortunately there are a lot of Arduino libraries that deals with GSM modems to send and receive messages.

Needed resources:

- Laptop for programming the Arduino
- Arduino IDE for writing the code
- SIM card to be inserted in the modem to send SMS
- Voltmeter to measure the system voltage and to test the IR sensor

Steps to finish the work

steps	Deliverable
Step1	• Design the system block diagram • Check compatibility between components
Step2	• Decide the main controller board • Decide the IDE for developing the code
Step3	• Ordering the components • Research about the available GSM modems
Step4	• Assembling the weight sensor to the main controller • Develop test code to read and display weight
Step5	• Assembling IR sensors to the main board • Develop testing code for sensors
Step6	• Connect GSM modem to main board
Step7	• Configure the selected GSM to send SMS • Send data from controller to mobile phone
Step8	• Run overall test • Make desired modifications to both system and software
Step9	• Finalize the final prototype • Make final real tests and modifications
Step10	• Document the steps of work • Draw the final schematics and connections • Prepare and plan for next steps.

Required products to finish the work

To achieve the project goals, we must divide our work into small tasks and we will allocate a certain time period for each task, every task is a milestone in the project and has to be done at the dedicated time in order to open the working process of the next task, the main controller will monitor all the inputs and outputs is the Arduino board, it will sense the human weight using four load cell that will be installed under the user bed for example installing a load cell on each leg of the bed, the load cells will measure the bed weight including the weight of user, and will detect the user existence depending on the weight.

part	Acquisition Schedule: 1 st Semester	Required time (hours)	Cost
Arduino	• Ordering main controller :15$ • Power supply 5v:12$ • Wires: 10$ • Usb cable 3$	30	40$
Weight sensor	Purchase the weight sensor parts • 4 pcs 50kg Load Cells • HX711	10	12$
sensor	• Ordering IR sensors (detecting incoming or outgoing persons), this sensor should cover 1.5 meter with break beam sensing	10	32$
GSM	Ordering GSM modem	20	20$
casing	Ordering the prototyping components • Box • Base • connectors	30	50$
• TOTAL			154$