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**Pressure Detection Project**

**Mastering Embedded Systems Diploma**

[www.learn-in-depth.com](http://www.learn-in-depth.com)

First Term (Final Project 1)

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# Case Study

## Requirements

The client requires a system with the following specifications:

1. Pressure controller informing the cabin crew when pressure exceeds 20 bars.
2. The informing method is an alarm operating for 60 seconds.
3. Keep track of the measured values (optional).

## Assumptions

The following assumptions are made:

1. No setup or shut down for the microcontroller.
2. No maintenance for the microcontroller.
3. Neither the pressure sensor nor the alarm fails
4. No power cuts for the microcontroller

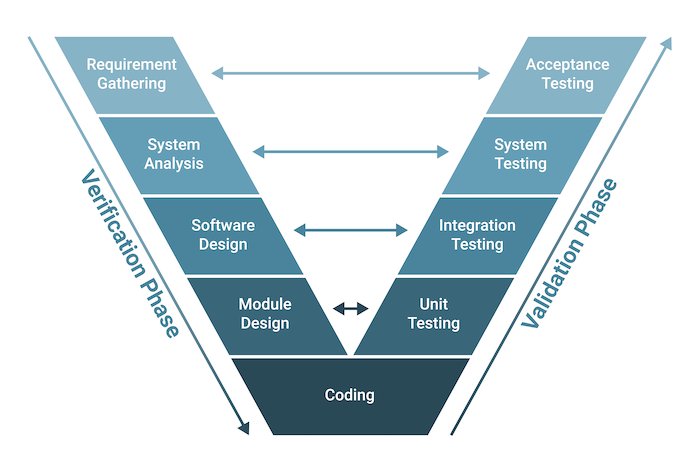
## Versioning

The possibility of storing pressure sensor readings might be included in a future version.

# Method

## Software Development Lifecycle and Software Testing Lifecycle

The (SDLC) and (STLC) will be approached based on the V-Model.



Requirements Gathering and Analysis: The first phase of the V-Model is the requirements gathering and analysis phase, where the customer’s requirements for the software are gathered and analyzed to determine the scope of the project.

Design: In the design phase, the software architecture and design are developed, including the high-level design and detailed design.

Implementation: In the implementation phase, the software is actually built based on the design.

Testing: In the testing phase, the software is tested to ensure that it meets the customer’s requirements and is of high quality.

Deployment: In the deployment phase, the software is deployed and put into use.

Maintenance: In the maintenance phase, the software is maintained to ensure that it continues to meet the customer’s needs and expectations.

The V-Model is often used in safety-critical systems, such as aerospace and defense systems, because of its emphasis on thorough testing and its ability to clearly define the steps involved in the software development process.

# System Requirements

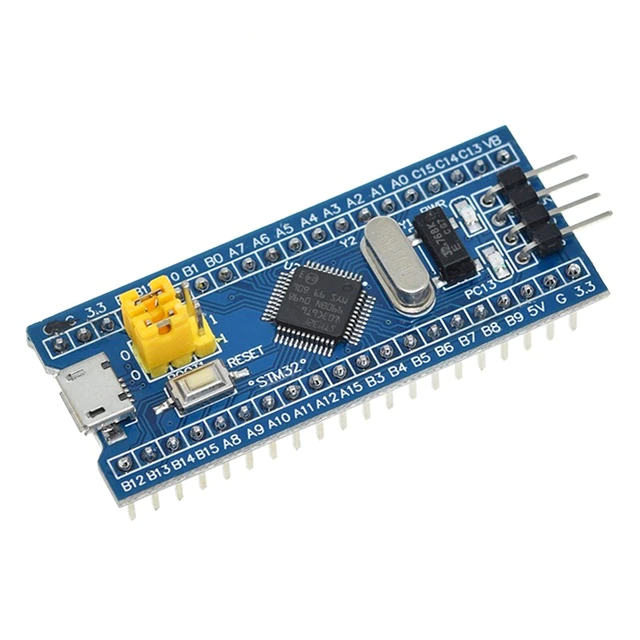
## A diagram of a computer flowchart Description automatically generatedRequirement model

# Design Space Exploration

Microcontroller: one stm32f103c8t6 SoC will be used as it meets all the needed technical requirements such as: suitable processor, acceptable flash memory size and small size as well as being cost efficient.

Overview: The STM32F103C8T6 is a medium density performance line, ARM Cortex-M3 32bit microcontroller in 48 pin LQFP package. It incorporates high performance RISC core with 72MHz operating frequency, high speed embedded memories, extensive range of enhanced I/Os and peripherals connected to two APB buses. The STM32F103C8T6 features 12bit ADC, timers, PWM timer, standard and advanced communication interfaces. A comprehensive set of power saving mode allows the design of low power applications.

**Features:**

Operating voltage range from 2V to 3.6V

64Kbytes of flash memory

20Kbytes of SRAM

CRC calculation unit, 96bit unique ID

Two 12bit, 1μs A/D converter (up to 10 channels)

7 channel DMA controller, 3 general purpose timer and 1 advanced control timer

37 fast I/O ports

Serial wire debug (SWD) and JTAG interfaces

Two SPI, two I2C, three USART, one USB and one CAN interfaces

Ambient operating temperature range from -40°C to 85°C

# System Analysis

## Use Case Diagram

A diagram of pressure value

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## Activity Diagram

A diagram of a system

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## Sequence Diagram

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# System Design

## Block Diagrams

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## State Machine Diagrams

### Pressure Sensor

A screenshot of a computer program

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### Main Controller A diagram of a data flow Description automatically generated

### Alarm Monitor

A diagram of a system

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### Alarm

A diagram of a diagram

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## C Codes

### Pressure Sensor

.c file

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.h file

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### Main Controller

.c file

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.h file

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### Alarm Monitor

.c file

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.h file

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### Alarm

.c file

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.h file

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### Main

.c file

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## Code Building Tools

### Startup code

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### Linker Script

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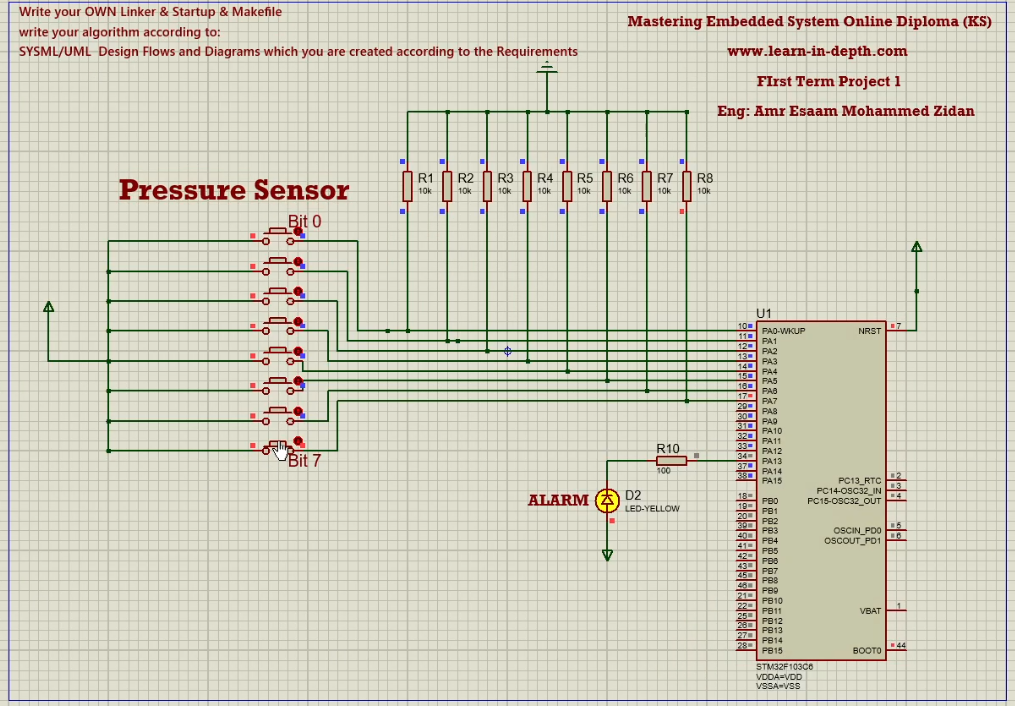
### Makefile

A computer screen shot

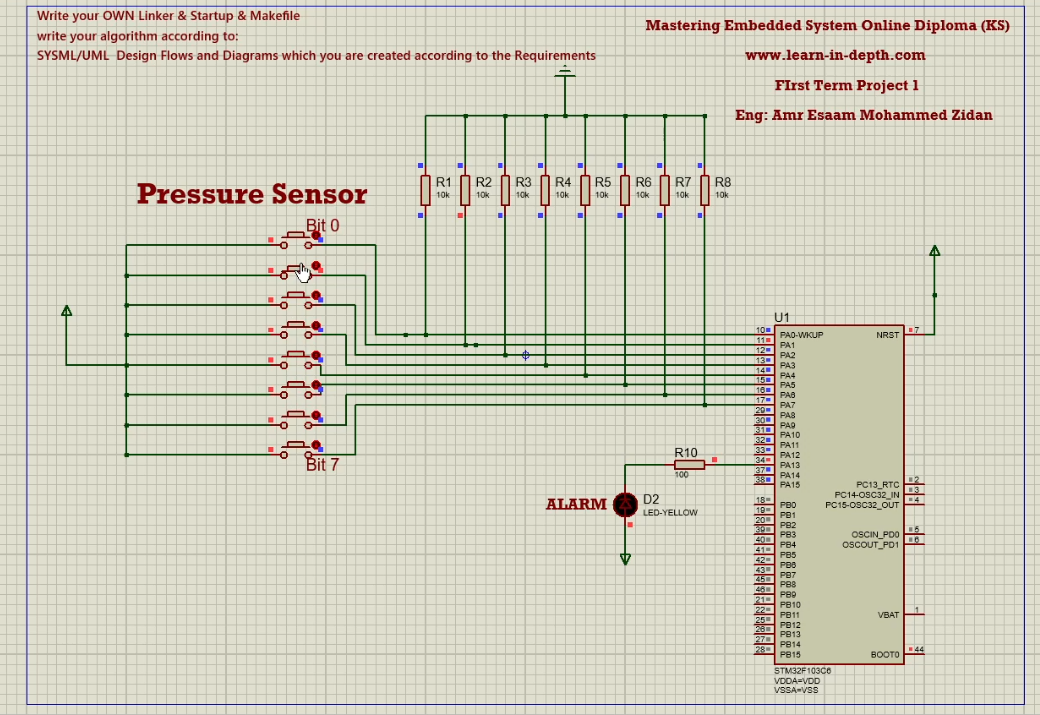
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## Simulation

### Pressure equals or larger than threshold



### Pressure less than threshold



## Software Analysis

### A screen shot of a computer Description automatically generated.map file

### Symbol Table

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### Section Table

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