ENGR 1242

Engineering Fundamentals

# *Lab Reports*

*You will be graded on your ability to produce lab reports. There are many ways to write reports. For this class, you are required to adapt the following format, which contains some of the basic components of design reports. While the notebook focuses on just that week’s project,* ***the report is a cumulative effort****. At the end of the course, it will describe your entire robotic vehicle.*

***There are six lab reports due: after Projects 1, 2, 5, 7, 8 and 9. (Use these numbers for correlating reports to projects)***

**Format:**

Upper Right Corner: Name, Professor, Date of submission

Centered: ENGR 1242, Engineering Fundamentals, Project Report Number

1. Functional Objective Progress and Success

For each functional objective:

* 1. Functional objective …………………………………………………………..………..… 3 pts
  2. Constraints…………………………………………………………….………………………. 6 pts
     1. Operation
     2. Layout
     3. Components
     4. Time
  3. Test plan and results……………………………………………….…………..…………. 6 pts
     1. Setup
     2. Test
     3. Results
  4. Statement of success………………………………………………………………………. 5 pts

1. Hardware Design (new page):
   1. Hardware System Overview …………………………………………….………………. 20 pts
      1. System Block Diagram
      2. Subsystem Descriptions
      3. Signal Descriptions
   2. Circuit Diagrams (new page)………………………………………………………………20 pts
      1. Power System
      2. PIC Configuration
      3. Pin outs
      4. LED Circuits
      5. Test Pins
      6. Motor Drivers
      7. Bumper System
      8. Light Detection System
2. Software Design:
   1. Software System Overview …………………………………………….………………. 20 pts
      1. High-Level Description
      2. Pin Definitions
      3. Code Listing of definitions.h
   2. Detailed Function Descriptions ………………………………………………………… 20 pts
      1. Function Description
      2. Function Calls
      3. Flow Chart
      4. Code Listing of function

**What to Include:**

1. **Functional Objectives**:

**This part should ADD one section each report; at the end there should be SIX.**

For each function:

* 1. **Functional objective** (from notebook)
  2. **Constraints** (from notebook)
     1. Operation
     2. Layout
     3. Components
     4. Time- when was the due date to demonstrate project
  3. **Test plan and results** (from notebook)
     1. Setup: what needed to be setup to perform test (e.g. diagrams of course)
     2. Test: what was the test and how the robot needed to perform to be successful
     3. Results: when was the test plan demonstrated and how the robot performed
  4. **Statement of success**

*A brief summary statement on the success of the project. It should include the date the project was signed off, and either*

* *a statement that says, “Since the test plan showed the functional objectives were met, and since the given constraints were satisfied, the project was successful.”*

*or*

* *a statement of which parts of the functional objectives were not met (which part of the test plan failed), or which parts of the constraints were not obeyed that prevented complete success.*

Sample Outline:

Functional Objectives:

* 1. The robot should be programmable
     1. Constraint
     2. Test Plan 1 and results
     3. Statement of success
  2. The robot should communicate to the user
     1. Constraint
     2. Test Plan 2 and results
     3. Statement of success
  3. The robot should be mobile
     1. Constraint
     2. Test Plan 5 and results
     3. Statement of success
  4. The robot should be responsive to obstacles
     1. Constraint
     2. Test Plan 7 and results
     3. Statement of success
  5. The robot should be responsive to light
     1. Constraint
     2. Test Plan 8 and results
     3. Statement of success
  6. The robot should be able to complete mission
     1. Constraint
     2. Test Plan 9 and results
     3. Statement of success

1. **Hardware Design**:*(Start a new Page)*

**This section should be for the entire robot, up to this point.**

* 1. **Hardware System Overview** 
     1. **System Block Diagram**

*A block diagram is an abstraction of the interrelationship of the functional subsystems of your design[[1]](#footnote-1). It should consist of:*

* *blocks representing each subsystem given a descriptive name*
* *arrows showing*

*the direction of the flow of information*

*a short descriptive name*

*The PIC should always be included with its inputs and outputs to the system. Other “blocks” would be any input/output devices (such as sensors and LCD screens) and circuits that are described by their function.*

* + 1. **Subsystem Descriptions**

List all the subsystems

* + 1. **Signal Descriptions**

List all the signals that are in the system block diagram. Write a 1-3 sentence description of its function. Include a truth table with the inputs in the left columns and outputs in the right column.

* 1. **Circuit Diagrams**

*Any circuit from your design should be complete and in portrait orientation. As each of the following is added to your robot, you should include it in your report.*

* + 1. Power System
    2. PIC Configuration: this should be updated as pins are used

(Each pin that is used to connect to a subsystem should have a labelled arrow indicating that it is connected to one of the circuits in part iv)-viii). )

* + 1. Pinouts
* Voltage Regulator
* MOSFET
* BJT
* Nor Gate
  + 1. LED Circuits
    2. Test Pins
    3. Motor Drivers
    4. Bumper System
    5. Light Detection System

1. **Software Design:** *(Start a new Page)*

**This section should be for the entire robot, up to this point.**

* 1. **Software System Overview**:
     1. **High-Level Description**

*Give a description of the software system that explains the purpose of the software system and, at a high level, how it accomplishes this purpose. Your program has a major test suite function and this section should include that as a function.*

* + 1. **Pin Definitions**

*Add a table.*

*Column 1: Each PIC pin used*

*Column 2: the name in software that your program uses for that pin*

*Column 3: a one-line description of the pin*

* + 1. **Code Listing of definitions.h**
* *Your program should have a header file which contains all of the global variable definitions, preprocessor definitions (#define commands) and possibly the function prototypes. Include this program listing in this section.*
* *The code should be printed in COURIER NEW font, single-spaced, size 8 or 10, with a blank line before and after the listing.*
  1. **Detailed Function Descriptions:**

For each function, put in a table (see below):

* + 1. **Function Purpose:** *a 1-3 sentence description of what the function does*
    2. **Function Calls:** *a single-spaced list of functions that this function calls*
    3. **Code Listing of function**
* *The code should be printed in COURIER NEW font, single-spaced, size 8 or 10.*
  + 1. **Flow Chart: only necessary if there is a branch or loop in the function!**

|  |  |
| --- | --- |
| Name: | **main()** |
| Purpose: | Start program and decide whether to run the test suite or the operating system. |
| Calls: | definepins()  runTestSuite()  runRobotOS() |
| Code: | int main() {  /\* initialize the ability to send messages to the  \* PICKit 2 using printf.  \*/  initializeUART();  definePins();  if(testPin3 || testPin4)  runTestSuite();  else  runRobotOS();  halt();  printf("test\r\n");  return(0);  } |
| Flowchart: |  |

**Report Notes:**

* Single Space with additional space between sections
* Font size 12.

**Grading:**

* You will be graded using the point system listed above.
* To get credit for a project, you must have it signed off in your notebook. The date and time of the sign-off determines the completion date.
* Each lab day a project is overdue reduces the project score by 10%. After the third lab day a project is late, grades will be awarded at the instructor’s discretion.
* The reports are graded, given a grade based on quality, and then receive the same deduction as the project. (For example, a student completes a project two lab periods late. A score of 80 will be recorded for that project. The report is given a score of 85. The recorded score will be 85\*0.8 = 68.)
* A score between –20 and +5 may be added to your score for neatness and organization.

1. This is not a diagram of your layout!! There is little correlation between the placement of your components on the chassis with the position in the block diagram. [↑](#footnote-ref-1)