

MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF COMPUTER ENGINEERING

CENG 491
COMPUTER ENGINEERING DESIGN I
REQUIREMENT ANALYSIS REPORT

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1.0 Introduction and Scope

In section 1.1, you can find general information about the project. The description of the project is also written in this section. At the end of this section you will have the general ideas about what our project is and what the result or product of the project will be. In section 1.2, the way to this result, that is, goals and objectives of the system are discussed.

Hardware and software requirements are the topics of section 2. In addition to this, pic programming is also mentioned. In section 2, tools are explained with details such as features, functionality.

In section 3, we mentioned about the meetings that we made with two academicians who are the teaching assistants of the Ceng 336 – Introduction to Embedded Systems Development course in our department: Alper Kılıç and Fatih Gökçe.

Section 4 is the modeling section of our report. In Functional Modeling part, Data Flow Diagrams and Data Dictionary, are given.

Finally, in section 5, we give information about the scheduling for our project. Also a Gantt Chart is provided.

Although our team consists of four members, many different people, such as some users, electronics engineers in the pic processors and emulators' area and some colleagues of us helped for finding software requirements.

In this requirement analysis, we did not use much time for cost and effort estimation. Because, time and due dates are not variables in our project. Also, hardware that will be used in our project is mostly given by our department. And we don't demand any financial help.

1.1 Short Description of the Project

Pic microcontrollers are devices widely used in Computer Engineering and Electronics Engineering. These devices have applications such as:

- Consumer segment, e.g. cameras , microwave ovens
- Telecommunications, e.g. cellular phones
- Automobiles, e.g. air bags
- Computer peripherals, e.g. printers, fax machines
- Other industrial products, e.g. automatic faucets.

Pic emulators enable us to observe the behaviors of hardware packages with pic processors without using it in the real world.

In our CENG Embedded Systems Course, we used a specialized card designed by our department. This card has two pic processors, interfaces, parallel and serial ports, smart card readers... In this course, we used an emulator named MP LAB – IDE which is one of the most popular emulators in this area.

However, MPLAB is not designed for only our card. MPLAB provides an interface for a wide range of pic processors. So, it does not provide an opportunity to see what is happening in the whole parts of our card.

In this project, we will implement a software emulator, compiler and development environment. But, this software package will emulate all functions and parts of our embedded course card. Programs written by the user can be compiled, uploaded and debugged. Also it will emulate users' programs in the virtual card.

1.2 Goals and Objectives

In our Project, we aim to provide a software(MX-4W) in which students, instructors and other users will be able to emulate their works which is produced by using CEng Embedded Course Card. Since MX-4W is developed for only this specific card, it will fulfill our needs better.

MX-4W provides an environment for;

- Compilation of the programs,
- Debugging,
- Testing,
- Simulation of the process without using the card,
- Uploading the program to the card.

2.0 Hardware- Software Requirements

- Windows 2000, XP Operating Systems
- Microsoft Visual Studio .NET
- PIC Microcontrollers

Since our project is related to pic microcontrollers, we will discuss about pics a bit. This part will help us to understand pics' world better.

What is a pic microcontroller?

Peripheral Interface Controller is a device to control an electronic system by writing programs. After finishing the codes you will load your program to the integrated circuitry.

The PIC isn't for every project. It won't replace a PC, or even a larger processor. But for many jobs it is just the right size, inexpensive, and doesn't require much in the way of support hardware.

What are some things people have done with a PIC?

- Morse code keyers
 - Robots
 - Clocks and timers
 - Phone dialers
-
- **PIC16F877**

There are many different varieties of PICs. Since PIC16F877 is used in CEng Embedded Card, we will study on this pic.



- **CEng Embedded Card**

In our Project, we are supposed to develop a software about CEng Embedded Card. Parts of the card can be seen in the picture given.

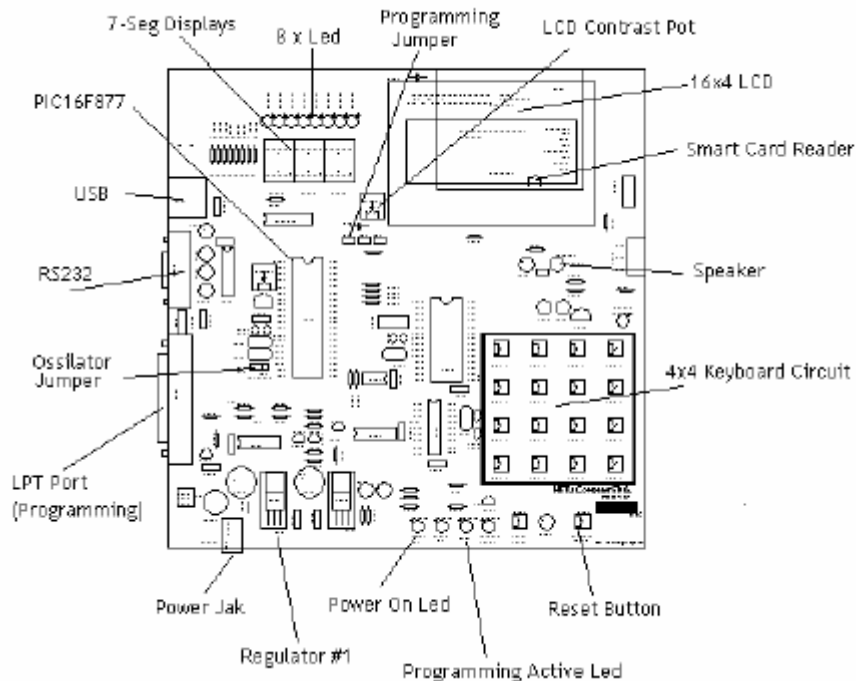


Figure : General Layout of Ceng Embedded card

3.0 Meetings

To understand the problem better, we organized two meetings(one online, one face-to-face) with experts.

3.1 Meeting with Alper KILIC

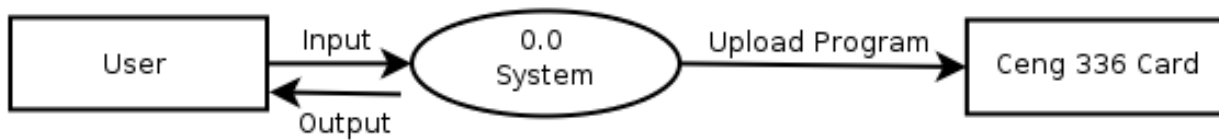
We had a meeting with Alper Kilic in his room about our project. We asked him about the problems of current systems and asked some questions to understand the project better. We also decided to set more meetings, especially in the spring semester.

3.2 Mailing to Fatih GOKCE

We also sent an e-mail to Fatih Gokce and asked him his ideas. He replied our e-mail and celebrated to us for choosing such a good topic. He mentioned about some problems of current softwares.

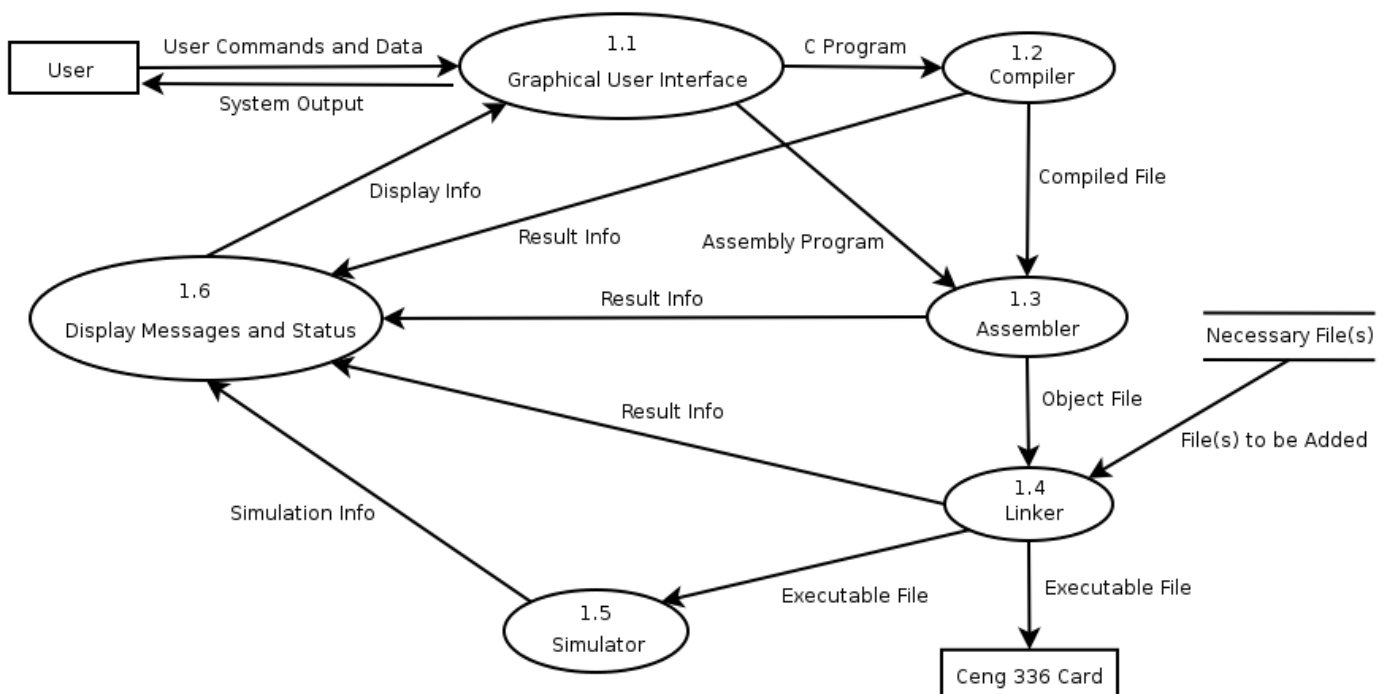
4.0 Functional Modeling

4.1 Data Flow Diagram Level 0



LEVEL 0 DFD

4.2 Data Flow Diagram Level 1



LEVEL 1 DFD

4.3 Data Dictionary

Name:	User Commands and Data
Aliases:	None
Product of:	User
Where used:	Graphical User Interface (Process 1.1)
Description:	User controls by mouse clicks, keyboard keys, or writing text through editor.

Name:	System Output
Aliases:	None
Product of:	Graphical User Interface (Process 1.1)
Where used:	User
Description:	User sees the present situation of the program through a user interface.

Name:	C Program
Aliases:	None
Product of:	Graphical User Interface (Process 1.1)
Where used:	Compiler (Process 1.2)
Description:	A program written in C language through the text editor in the program.

Name:	Compiled File
Aliases:	None
Product of:	Compiler (Process 1.2)
Where used:	Assembler (Process 1.3)
Description:	Assembly code of the program which is converted by the compiler.

Name:	Assembly Program
Aliases:	None
Product of:	Graphical User Interface (Process 1.1)
Where used:	Assembler (Process 1.3)
Description:	A program written in assembly language through the text editor in the program.

Name:	Object file
Aliases:	None
Product of:	Assembler (Process 1.3)
Where used:	Linker (Process 1.4)
Description:	Object code of the program which is converted by the assembler.

Name:	Display Info
Aliases:	None
Product of:	Display Messages and Status (Process 1.6)
Where used:	Graphical User Interface (Process 1.1)
Description:	Command line outputs or information about the state of the card (e.g. value of the registers, memory etc.)

Name:	Result Info
Aliases:	None
Product of:	Compiler(Process 1.2) , Assembler (Process 1.3), Linker (Process 1.4)
Where used:	Display Messages and Status (Process 1.6)
Description:	Command line outputs of the compiler, assembler or linker.

Name:	Simulation Info
Aliases:	None
Product of:	Simulator (Process 1.5)
Where used:	Display Messages and Status (Process 1.6)
Description:	Information about the simulated parts of the card.

Name:	Executable File
Aliases:	None
Product of:	Linker (Process 1.4)
Where used:	Simulator (Process 1.5), Ceng 336 Card
Description:	Binary file that can be executed on Ceng 336 Card or simulated by the program.

Name:	File(s) to be added
Aliases:	None
Product of:	Necessary File(s)
Where used:	Linker (Process 1.4)
Description:	Necessary library files to be able to execute the program for the type of PIC processor that is used in Ceng 336 Card

5.0 Time and Schedule

5.1 Project Schedule

Approximately shows our program.

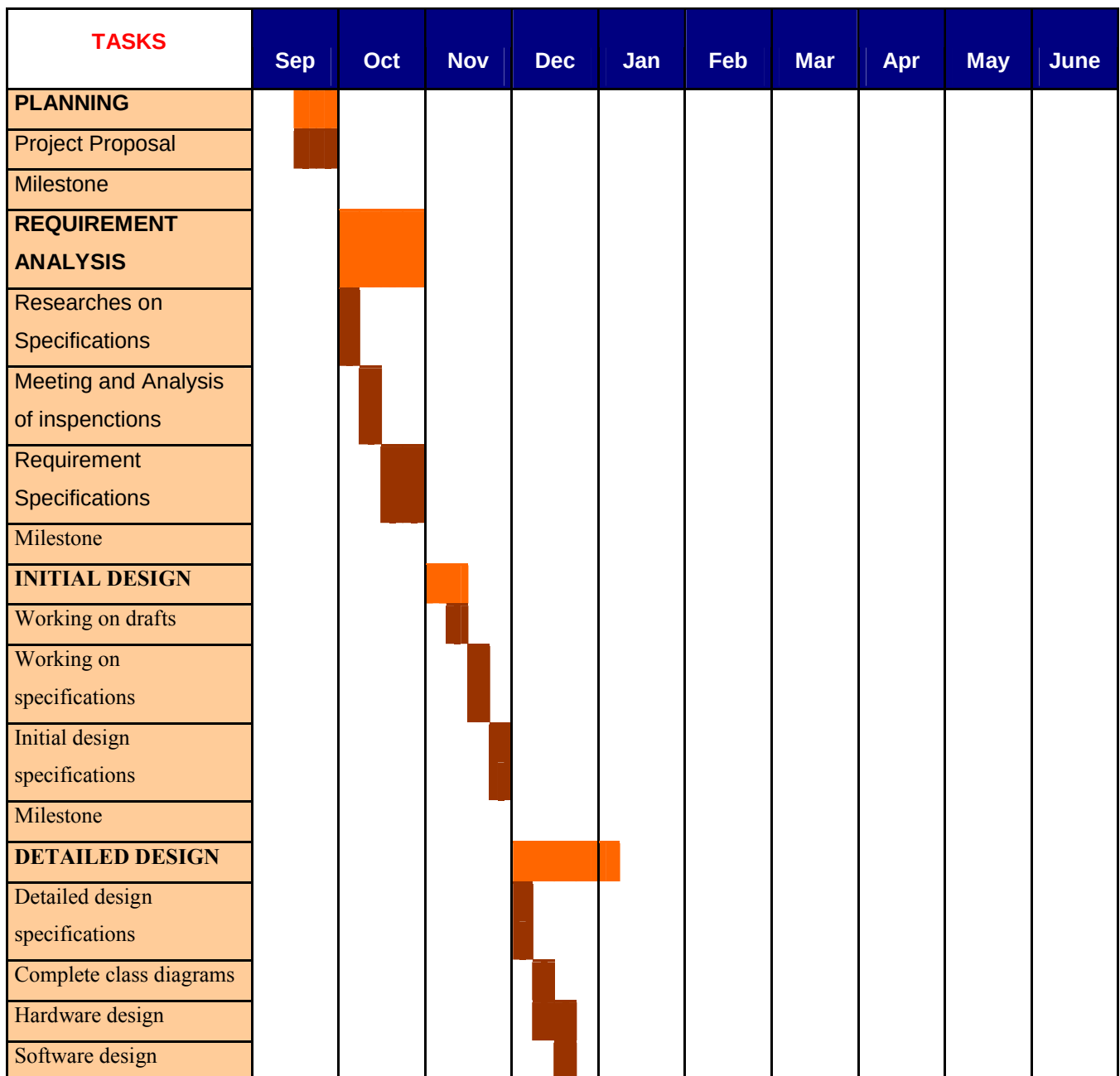
TASKS	Time	START	FINISH
PLANNING	2 weeks	3. week of September	1. week of October
Project Proposal	2 weeks	3. week of September	1. week of October
Milestone		-	
REQUIREMENT ANALYSIS	4 weeks	1. week of October	1. week of November
Researches on Specifications	1 week	1. week of October	2. week of October
Meeting and Analysis of inspenctions	1 week	2. week of October	3. week of October
Requirement Specifications	2 weeks	3. week of October	1. week of November
Milestone		-	
INITIAL DESIGN	2 weeks	1. week of November	3. week of November
Working on drafts	1 week	2. week of November	3. week of November
Working on specifications	1 week	3. week of November	4. week of November
Initial design specifications	1 week	4. week of November	1. week of December
Milestone		-	
DETAILED DESIGN	5 weeks	1. week of December	2. week of January
Detailed design specifications	1 week	1. week of December	2. week of December
Complete class diagrams	1 week	2. week of December	3. week of December

Hardware design	2 week	2. week of December	4. week of December
Software design	1 week	3. week of December	4. week of December
User interface desing	2 week	3. week of December	1. week of January
Library design	2 week	3. week of December	1. week of January
Tests	1 week	1. week of January	2. week of January
Design specifications	1 week	1. week of January	2. week of January
Milestone	-		
IMPLEMENTATION	19 week	2. week of January	1. week of June
Working on pre implementations	3 week	2. week of January	1. week of February
Working on card	4 week	1. week of February	1. week of March
Review	1 week	1. week of March	2. week of March
Implementation details	8 week	1. week of March	1. week of May
Software implementation on card	1 week	1. week of March	2. week of March
Library implementation	3 week	2. week of March	1. week of April
Code implementation for smart card readers	1 week	1. week of April	2. week of April
Code implementation for ports	2 week	2. week of April	4. week of April
Code implementation for other parts of the card	1 week	4. week of April	1. week of May
Performance working	1 week	1. week of May	2. week of May
Tests and feedbacks	2 week	2. week of May	4. week of May
Final implementations	1 week	4. week of May	1. week of June
Documentation	11 week	2. week of March	1. week of June

Milestone		-	
USER EVALUATION	1 week	1. week of June	2. week of June
Feedback	1 week	1. week of June	2. week of June
Milestone		-	

5.2 Gantt Chart

This is the gantt chart of our schedule.



User interface desing									
Library design									
Tests									
Design specifications									
Milestone									
IMPLEMENTATION									
Working on pre implementations									
Working on card									
Review									
Implementation details									
<i>Software implementation on card</i>									
<i>Library implementation</i>									
<i>Code implementation for smart card readers</i>									
<i>Code implementation for ports</i>									
<i>Code implementation for other parts of the card</i>									
<i>Performance working</i>									
Tests and feedbacks									
Final implementations									
Documentation									
Milestone									
USER EVAULATION									
Feedback									
Milestone									