

**Learn IN Depth**  
Be Professional In Embedded System



# Project **2** Learn in Depth

## STUDENT MANAGEMENT SYSTEM

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## Project Scope / Problem Statement:

For this project, a student information management system software has to be implemented using queue method.

The following operations have to be included in the system:

1. Store the first name of the student
2. Store the last name of the student
3. Store the unique roll number of the student
4. Store the GPA of every student
5. Store the courses registered by the student

## Methodology / Approach:

The main idea is to develop different functions for each operation. All functions together will form the entire software. As mentioned earlier, **the mechanism of queue data structure (as a dynamic linked list)** is the underlying methodology behind the entire software.

The entire SW is built up based on the following files:

- Student\_Mangement.c
- Student\_Mangement.h
- main.c
- Platform\_Types.h
- Student\_Mangement.txt

## Functions Description:

**Main.c** is including the main infinite loop with all options to be selected by the user of the software. As well as, **Queue\_LinkedList.h** is included which provides all functions needed for the software.

```
vuint8_t on = 1;

int main()
{
    FIFO_buff_t students;
    char temp_text[40];
    if(FIFO_init(&students, buffer, width) == FIFO_no_error)
        DPRINT("FIFO Init.....Done\n");

    DPRINT("\n\tWelcome to the Student Management System\n")

    while(on)
    {
        DPRINT("\n =====");
        DPRINT("\n\t Choose one of the following Options: \n");
        DPRINT("\n 1 : Add The Student Details Manually");
        DPRINT("\n 2 : Add The Student Details for a text file");
        DPRINT("\n 3 : Find The Student Details by Roll Number");
        DPRINT("\n 4 : Find The Student Details by First Name");
        DPRINT("\n 5 : Find The Student Details by Course ID");
        DPRINT("\n 6 : Find Total Number of Students");
        DPRINT("\n 7 : Delete The Student Details by Role Number");
        DPRINT("\n 8 : Update The Student Details by Role Number");
        DPRINT("\n 9 : Show All Information");
        DPRINT("\n 10: Exit");
        DPRINT("\n Enter Option Number: ");

        gets(temp_text);
        DPRINT("\n =====");

        switch(atoi(temp_text))
        {
            case 1:
                add_student_manually(&students);
                break;
            case 2:
                add_student_file(&students);
                break;
            case 3:
                find_roll_number(&students);
                break;
            case 4:
                find_first_name(&students);
                break;
            case 5:
                find_c(&students);
                break;
            case 6:
                total_students(&students);
                break;
            case 7:
                delete_student(&students);
                break;
            case 8:
                update_student(&students);
                break;
            case 9:
                show_students(&students);
                break;
            case 10:
                DPRINT("\nProgram Log Out....Done\n")
                on = 0;
                break;
            default:
                DPRINT("\n Wrong Option")
                break;
        }
    }
}
```

In the “Student\_Mangement.h” the queue structure is defined along with the declarations of the functions needed to handle the queue mechanism and also the user functions:

```

11  #include "Platform_Types.h"
12  #include "stdio.h"
13  #include "stdlib.h"
14  #include <string.h>
15
16  #define DPRINT(...) {fflush(stdin);\
17                      fflush(stdout);\
18                      printf(__VA_ARGS__);\
19                      fflush(stdin);\
20                      fflush(stdout);}
21
22  //USER Configuration
23  //select the element type (uint8, uint16, uint32, ...)
24  #define element_type Sinfo_t
25
26  //create buffer
27  #define width 55
28
29  typedef struct Sinfo {
30      char fname[50];
31      char lname[50];
32      int roll;
33      float gpa;
34      int cid[5];
35  } Sinfo_t;
36
37  element_type buffer[width];
38
39  typedef struct {
40      uint32 count;
41      uint32 length;
42      element_type* base;
43      element_type* head;
44      element_type* tail;
45  } FIFO_buff_t;
46
47  typedef enum {
48      FIFO_no_error,
49      FIFO_full,
50      FIFO_empty,
51      FIFO_NULL
52  } FIFO_status;
53
54  //FIFO APIs
55  FIFO_status FIFO_init();
56  FIFO_status FIFO_enqueue(FIFO_buff_t* fifo_buf, element_type item);
57  FIFO_status FIFO_dequeue(FIFO_buff_t* fifo_buf, element_type* item);
58  FIFO_status FIFO_is_full(FIFO_buff_t* fifo_buf);
59  void FIFO_print(FIFO_buff_t* fifo_buf);
60
61  //Main Function
62  void add_student_file(FIFO_buff_t* fifo_buf);
63  void add_student_manually(FIFO_buff_t* fifo_buf);
64  void find_roll_number(FIFO_buff_t* fifo_buf);
65  void find_first_name(FIFO_buff_t* fifo_buf);
66  void find_c(FIFO_buff_t* fifo_buf);
67  void total_students(FIFO_buff_t* fifo_buf);
68  void delete_student(FIFO_buff_t* fifo_buf);
69  void update_student(FIFO_buff_t* fifo_buf);
70  void show_students(FIFO_buff_t* fifo_buf);
71
72  //Extra
73  char check_id(FIFO_buff_t* fifo_buf, int id);
74  void Buffer_info(FIFO_buff_t* fifo_buf);
75
76  #endif /* STUDENT_MANAGEMENT_H_ */
77

```

In the “Platform\_Types.h” data types are defined with names that is simplified and indicate the number bits they occupy in the memory.

```
#include <stdbool.h>
#include <stdint.h>

#define CPU_TYPE          CPU_TYPE_32
#define CPU_BIT_ORDER     MSB_FIRST
#define CPU_BYTE_ORDER    HIGH_BYTE_FIRST

#ifndef FALSE
#define FALSE              (boolean)false
#endif

#ifndef TRUE
#define TRUE               (boolean>true
#endif

typedef _Bool              boolean;
typedef int8_t             sint8;
typedef uint8_t            uint8;
typedef char               char_t;
typedef int16_t            sint16;
typedef uint16_t           uint16;
typedef int32_t            sint32;
typedef uint32_t           uint32;
typedef int64_t            sint64;
typedef uint64_t           uint64;

typedef volatile int8_t    vint8_t;
typedef volatile uint8_t   vuint8_t;

typedef volatile int16_t   vint16_t;
typedef volatile uint16_t  vuint16_t;

typedef volatile int32_t   vint32_t;
typedef volatile uint32_t  vuint32_t;

typedef volatile int64_t   vint64_t;
typedef volatile uint64_t  vuint64_t;

typedef volatile char      vchar_t;
```

In the "Student\_Mangement.txt" is previously stored Students data with 2 students having duplicate Roll Numbers on purpose to test system protection against duplicate Roll Numbers.

```
1 Marco Magdy 3.5 1 2 3 4 5
1 Pavly Salah 3 80 12 37 29 63
3 Bolis Karam 3.5 45 21 55 18 46
4 Kerolos Gamal 3.5 45 21 55 18 46
```

## Software Testing Results:

**Note:** Students' Data, used in testing, are from Student\_Mangement.txt, **EXCEPT** for Add Student Manually test.

### 1. Add Students from File:

```
Welcome to the Student Management System

=====
Choose one of the following Options:

1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 1

=====
=====Add Student Details=====

Enter The Roll Number: 1
Enter The Student's First Name: Mina
Enter The Student's Last Name: Fathy
Enter the GPA: 3.76
Enter the Course ID of Courses
Course 1 ID: 1
Course 2 ID: 2
Course 3 ID: 3
Course 4 ID: 4
Course 5 ID: 5

Details Added Successfully....

=====
[INFO] The Total number of students: 1
[INFO] You can add up to: 54
=====
```

## 2. Find the student by roll number:

### - Student is Found in System:

-----  
Choose one of the following Options:

```
1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 3
```

=====
Enter The Roll Number of Student: 1

=====Student Details=====

```
The First name : Marco
The Second name: Magdy
The GPA: 3.50
The Course ID: 1
The Course ID: 2
The Course ID: 3
The Course ID: 4
The Course ID: 5
=====
```

### - Student is not in System:

Choose one of the following Options:

```
1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 3
```

=====
Enter The Roll Number of Student: 10

=====Student not in System=====

=====



### 3. Find the student by the first name:

#### - Student is Found in System

=====

Choose one of the following Options:

```
1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 4
```

=====

Enter The First name of Student: bolis

=====Student Details=====

```
The Roll Number: 3
The First name : Bolis
The Second name: Karam
The GPA: 3.50
The Course ID: 45
The Course ID: 21
The Course ID: 55
The Course ID: 18
The Course ID: 46
```

=====

#### - Student is not in System

=====

Choose one of the following Options:

```
1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 4
```

=====

Enter The First name of Student: mina

=====Student not in System=====

=====

#### 4. Find all students with the same course ID:

```
=====
      Choose one of the following Options:

1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 5

=====
Enter The Course ID: 18

=====Student Details=====

      Student NO.1

The Roll Number: 3
The First name : Bolis
The Second name: Karam
The GPA: 3.50

      Student NO.2

The Roll Number: 4
The First name : Kerolos
The Second name: Gamal
The GPA: 3.50
```

#### 5. Calculate the total number of students:

```
=====
      Choose one of the following Options:

1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 6

=====
=====
[INFO] The Total number of students: 3
[INFO] You can add up to: 52
=====
```

6. Remove single student by his roll number & display all students:

-----  
Choose one of the following Options:

```
1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 7
```

```
=====
Enter The Roll Number of Student: 1
```

```
[INFO] The Roll Number 1 is Removed Successfully
=====
```

```
9 : Show All Information
10: Exit
Enter Option Number: 9
```

```
=====
=====Student Details=====
```

Student NO.1

```
The Roll Number: 3
The First name : Bolis
The Second name: Karam
The GPA: 3.50
Course 1 ID: 45
Course 2 ID: 21
Course 3 ID: 55
Course 4 ID: 18
Course 5 ID: 46
```

Student NO.2

```
The Roll Number: 4
The First name : Kerolos
The Second name: Gamal
The GPA: 3.50
Course 1 ID: 45
Course 2 ID: 21
Course 3 ID: 55
Course 4 ID: 18
Course 5 ID: 46
=====
```

## 7. Update single student and display the all students:

```
=====
Choose one of the following Options:

1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 8

=====
Enter The Roll Number of Student: 1

Choose one of the following to Change:

1: First Name
2: Last Name
3: Roll Number
4: GPA
5: Courses
Enter Option Number: 2

Enter New Last Name: Fathy

[INFO] UPDATED SUCCESSFULLY....
=====
Enter Option Number: 9

=====
=====Student Details=====

Student NO.1

The Roll Number: 3
The First name : Bolis
The Second name: Karam
The GPA: 3.50
Course 1 ID: 45
Course 2 ID: 21
Course 3 ID: 55
Course 4 ID: 18
Course 5 ID: 46

Student NO.2

The Roll Number: 4
The First name : Kerolos
The Second name: Gamal
The GPA: 3.50
Course 1 ID: 45
Course 2 ID: 21
Course 3 ID: 55
Course 4 ID: 18
Course 5 ID: 46

Student NO.3

The Roll Number: 1
The First name : Marco
The Second name: Fathy
The GPA: 3.50
Course 1 ID: 1
Course 2 ID: 2
Course 3 ID: 3
Course 4 ID: 4
Course 5 ID: 5
```

Exit the Program:

```
=====
      Choose one of the following Options:

1 : Add The Student Details Manually
2 : Add The Student Details for a text file
3 : Find The Student Details by Roll Number
4 : Find The Student Details by First Name
5 : Find The Student Details by Course ID
6 : Find Total Number of Students
7 : Delete The Student Details by Role Number
8 : Update The Student Details by Role Number
9 : Show All Information
10: Exit
Enter Option Number: 10
[
=====
Program Log Out....Done
```