

**Programming II**

Year 1 (2019/20), Semester 2

## SCHOOL OF INFOCOMM TECHNOLOGY

Diploma in Financial Informatics

Diploma in Cybersecurity & Digital Forensics

Diploma in Information Technology

**ASSIGNMENT**

**Duration :**  2.5 weeks (20 Jan 2020 to 5 Feb 2020)

**Weightage :** 35% of total coursework

**Individual/Team :** Team (2 students)

**Format :** Programming - Basic Requirements (50%)

Advanced Requirements (20%)

Presentation (30%)

**Cut-Off Date/Time: Wednesday, 5 February 2020, 8:30 AM**

There is a total of 17 pages (including this page) in this hand-out.

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| ***WARNING***  ***If a student is found to have submitted work not done by him/her, he/she will not be awarded any marks for this assignment. Disciplinary action will also be taken.***  ***Similar action will be taken for the student who allows other student(s) to copy his/her work.*** |

**Patient Management System**

|  |
| --- |
| In this assignment, you are to apply Object Oriented Programming to develop a simple ***Patient Management System***. The assignment requirements described below are broken down into 2 stages of development, described in this document as **'*Basic Features*'** and **'*Advanced* *Features*'**. You are advised to do your programming progressively in these stages. Refer to the **'*Grading Criteria*'** to have an idea of how the different components are graded. |

# Background

Singa Hospital, the first and largest hospital on our island country state, has engaged your team to develop a computerised patient management system to streamline its process. Its management has requested for a simple prototype for the patient management system to be developed for a start.

Since its inception, the hospital has expanded to a 900-bed hospital from 100 beds in 20 years. These beds can be categorized according to their ward type i.e., Class A, Class B, and Class C. Each bed is identified by a ward number, bed number, and availability status. The daily rate for Singapore Citizens (SC), Singapore Permanent Residents (PR), and Foreigners differ according to the type of ward and the subsidize rate as shown in Table 1 below.

In addition to the basic charge, patients at Class A wards may have an accompanying person in the room that is chargeable at $100 per day. Patients at Class B wards may opt for an air-conditioned variant for an extra charge of $50 per week ie. Patient will be charged $100 if he utilizes the air condition for 8 days. Patients at Class C wards may request for a portable TV, which is chargeable at one time cost of $30.

Table 1 below shows the subsidised rate in term of the percentage of daily rate:

|  |  |  |  |
| --- | --- | --- | --- |
| **Bed Type** | **Percentage of Daily Rate** | | |
| **SC** | **PR** | **Foreigner** |
| Class A | 100% | 100% | 100% |
| Class B | 30% | 60% | 100% |
| Class C | 20% | 40% | 100% |

Table 1 – Subsidised rate in term of the percentage of daily rate

With regards to hospital payment, patients in the child and adult categories will first have their total charges deducted from their Child Development Account (CDA) (SC only) and Medisave (SC and PR only) respectively. The balance will then be paid in cash by the patient. For seniors, 50% of their charges will be further subsidized by the government, and the remaining is to be settled by the patient.

Table 2 below shows the patient categories:

|  |  |
| --- | --- |
| **Condition** | **Category** |
| Age <= 12 years old | Child |
| 12 years old < Age < 65 years old | Adult |
| Age >=65 years old | Senior |

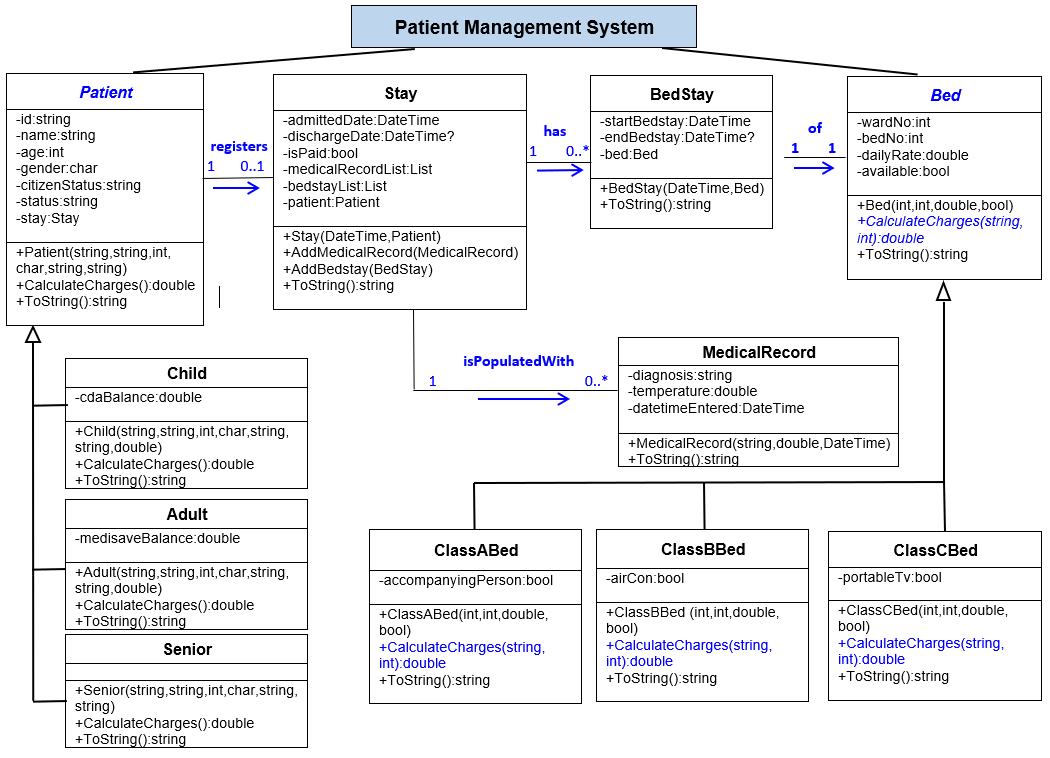
Table 2 – Patient categories

Information of the beds and the existing patients are given in the ***Beds.csv*** file and ***Patients.csv*** file respectively. Both files can be found and downloaded from MeL. Your program is required to create beds and patients (“Registered” status) from these 2 files at the start.

The class diagram for the patient management system is shown in Figure 1 on the next page.

The different “status” in the Patient class are as follows:

1. Registered (After successful registration)
2. Admitted (After patient is admitted into the hospital)
3. Discharged (After patient is discharged and paid)

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**Figure 1: Class Diagram for Patient Management System**

**Note:**

* **CalculateCharges()** in **Patient** class returns the total charges amount calculated based on bedstayList.
* **CalculateCharges()** in **Child** class returns the remaining amount to be paid after deducted the total charges amount from CDA balance (assume the full amount from CDA balance will be used).
* **CalculateCharges**() in **Adult** class returns the remaining amount to be paid after deducted the total charges amount from Medisave balance (assume the full amount from Medisave balance will be used).
* **CalculateCharges**() in **Senior** class returns 50% of the total charges amount.
* **CalculateCharges(string citizenStatus, int noOfDays)** in **ClassABed**, **ClassBBed** and **ClassCBed** returns the bed charges based on the citizen status and number of days passed in.

# Basic Features

* 1. **List all patients**

1. *display the information of all the patients*

* 1. **List all beds**

1. *display the information of all the beds*

* 1. **Register patient**

1. *prompt user to enter the following information for the patient: Name, ID number, Age, Gender, and Citizenship status*
2. *prompt user for following details based on age provided*
   1. *0 – 12 = Child Development Account (CDA) balance (SC only)*
   2. *13 - 64 = Medisave balance (SC and PR only)*
3. *create a patient object (child, adult, or senior) with the information given*
   1. *child = 0 - 12*
   2. *adult = 13 – 64*
   3. *senior = 65 and above*
4. *add the patient object (child, adult, or senior) to the patient list with the “Registered” status*
5. *Append the patient information to the* ***patients.csv*** *file*
6. *display the status of the registration (i.e. successful or not successful)*
   1. **Add new bed**
7. *prompt user to enter the following information for the bed: Ward Type, Ward No., Bed No., Daily Rate, Available*
8. *create a bed object (classABed, classBBed, or classCBed) with the information given*
9. *add the bed object (classABed, classBBed, or classCBed) to the bed list*
10. *append the bed information to the* ***beds.csv*** *file*
11. *display the status of the add (i.e. successful or not successful)*

* 1. **Register a hospital stay**

1. *list patients who are registered and discharged in the system but not admitted yet*
2. *prompt user to enter patient ID number*
3. *retrieve the selected patient*
4. *list all beds*
5. *prompt user to select an available bed*
6. *retrieve the selected bed*
7. *prompt user to enter the date of admission*
8. *prompt user for a response [Y/N] depending on the ward type selected*
   1. *Class A: accompanying person*
   2. *Class B: upgrade to air-con room*
   3. *Class C: rent a portable tv*
9. *create a stay object with the information given*
10. *create a bedstay object with the information given*
11. *add the bedstay object to the bedstay list of the stay*
12. *assign the stay object to the stay of the patient*
13. *update patient status to “Admitted”*
14. *display the status of the stay registration (i.e., successful or not successful)*
    1. **Retrieve patient details**
15. *list all patients in the system*
16. *prompt user to e nter patient ID number*
17. *retrieve and display the details for the patient according to the user input*
    1. *personal details (e.g., name, ID number, gender, citizenship status, status)*
    2. *stay (e.g., admission date, discharge date, payment status)*
       1. *bedstay (e.g., ward no, bed no, ward class, start of bed stay, end of bed stay)*
    3. **Add medical record entry**
18. *list all admitted patients in the system*
19. *prompt user to enter patient ID number*
20. *retrieve the selected patient*
21. *prompt user for the temperature & diagnosis of the patient*
22. *create a MedicalRecord object with the information given*
23. *add the MedicalRecord object to the records list of the stay*
24. *display the status of the medical record entry (i.e., successful or not successful)*

* 1. **View patient medical records**

1. *list all admitted patients in the system*
2. *prompt user to enter patient ID number*
3. *retrieve and display all medical records details for the patient according to the user input*
   1. **Transfer patient to another bed**
4. *list all discharged patients in the system*
5. *prompt user to enter patient ID number*
6. *retrieve the most recent stay object*
7. *list all beds*
8. *prompt user to select an available bed*
9. *retrieve the selected bed*
10. *prompt user to enter the date of transfer*
11. *update current bed availability*
12. *add date of transfer to the enddate of current bed*
13. *create a bedstay object with the information given*
14. *add the bedstay object to the bedstay list of the most recent stay*
15. *display the status of the bed transfer (i.e. successful or not successful)*
    1. **Discharge & Payment**
16. *list all admitted patients in the system*
17. *prompt user to enter patient ID number*
18. *retrieve and display the details for the patient according to the user input*
19. *prompt user to enter date of discharge*
20. *update bed availability*
21. *display the details of the bedstay/s that are unpaid*
22. *calculate and display the total unpaid hospital charges*
23. *display the balance amount payable after the following deduction/subsidy*
    1. *child (SC only): deduction from CDA*
    2. *adult (SC and PR only): deduction from Medisave*
    3. *senior: 50% subsidy*
24. *prompt user to make payment*
25. *update the CDA/Medisave balance amount for child and adult respectively*
26. *update the isPaid of the stay object/s to true*
27. *update patient status to “Discharged”*
28. *display the status of the payment process (i.e. successful or not successful)*

* **Validations** (and feedback)
* *The program should handle all invalid entries by the user*

*e.g. invalid option, invalid year, invalid month, invalid day, etc.*

* *If user made a mistake in the entry, the program should inform the user via appropriate feedback*

# Advanced Features

You are required to do all the advanced features below.

* 1. **Display currencies exchange rate (using Web API)**
* *Search for an available Web API provider*
* *Retrieve and display the exchange rate from Web API list* 
  1. **Display the PM 2.5 information (using Web API)**
* *Search for an available Web API provider*
* *Retrieve and display the PM2.5 in the different region in Singapore with the time-stamped from Web API list*

***IMPORTANT INSTRUCTIONS:***

* *Student 1 is required to implement 2.1, 2.3, 2.5, 2.6, 2.9, 3.1*
* *Student 2 is required to implement 2.2, 2.4, 2.7, 2.8, 2.10, 3.2*
* *The team has to divide the work when implementing the classes.*
* *Individual student without a team is required to implement Student 1 portion only. He/She has to implement all classes except MedicalRecord class.*
* *Please note that you should implement the advanced features only AFTER all the basic features have been fully implemented and working.*
* *NO MARKS will be awarded for the advanced features if the basic features have NOT been fully implemented and working.*

## Screen Shots

Some sample screen shots are provided to guide you in your assignment. You are free to design your own interface.

**Main screen:**

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| MENU  =====  1. View all patients  2. View all beds  3. Register patient  4. Add new bed  5. Register a hospital stay  6. Retrieve patient details  7. Add medical record entry  8. View medical records  9. Transfer patient to another bed  10. Discharge and payment  11. Display currencies exchange rate  12. Display PM 2.5 information  0. Exit  Enter your option : \_\_ |

**Option 1 : View all patients**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter your option : **1**  Option 1. View All Patients   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | ID No. | Age | Gender | Citizenship | Status | | Adrian | S1234567A | 10 | M | SC | Registered | | David | G1234567A | 12 | M | PR | Registered | | Gabriel | F1234567A | 8 | M | Foreigner | Registered | | Benjamin | S2345678A | 35 | M | SC | Registered | | Edda | G2345678A | 38 | F | PR | Registered | | Hannah | F2345678A | 33 | F | Foreigner | Registered | | Christina | S3456789A | 70 | F | SC | Registered | | Febe | G3456789A | 72 | F | PR | Registered | | Ian | F3456789A | 66 | M | Foreigner | Registered | |

**Option 2 : View all beds**

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| --- |
| Enter your option : **2**  Option 2. View All Beds  No Type Ward No Bed No Daily Rate Available  1 A 51 1 450 True  2 A 51 2 450 True  3 A 52 1 450 True  4 A 52 2 450 True  5 B 41 1 268 True  6 B 41 2 268 True  7 B 41 3 268 True  8 C 31 1 205 True  9 C 31 2 205 True  10 C 31 3 205 True |

**Option 3 : Register patient**

|  |
| --- |
| Enter your option : **3**  Option 3. Register Patient  Enter Name: **James**  Enter Identification Number: **S8999223A**  Enter Age: **28**  Enter Gender [M/F]: **M**  Enter Citizenship Status [SC/PR/Foreigner]: **SC**  Enter Medisave Balance: **200**  James is registered successfully. |

**Option 4 : Add new bed**

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| Enter your option : **4**  Option 4. Add new bed  Enter Ward Type [A/B/C]: **A**  Enter Ward No.: **53**  Enter Bed No.: **1**  Enter Daily Rate: $**450**  Enter Available [Y/N]: **Y**  Bed added successfully. |

**Option 5: Register a hospital stay**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter your option : **5**  Option 5. Register a hospital stay   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | ID No. | Age | Gender | Citizenship | Status | | Adrian | S1234567A | 10 | M | SC | Registered | | David | G1234567A | 12 | M | PR | Registered | | Gabriel | F1234567A | 8 | M | Foreigner | Registered | | Benjamin | S2345678A | 35 | M | SC | Registered | | Edda | G2345678A | 38 | F | PR | Registered | | Hannah | F2345678A | 33 | F | Foreigner | Registered | | Christina | S3456789A | 70 | F | SC | Registered | | Febe | G3456789A | 72 | F | PR | Registered | | Ian | F3456789A | 66 | M | Foreigner | Registered |   Enter patient ID number: **S1234567A**  No Type Ward No Bed No Daily Rate Available  1 A 51 1 450 True  2 A 51 2 450 True  3 A 52 1 450 True  4 A 52 2 450 True  5 B 41 1 268 True  6 B 41 2 268 True  7 B 41 3 268 True  8 C 31 1 205 True  9 C 31 2 205 True  10 C 31 3 205 True    Select bed to stay : **1**  Enter date of admission (DD/MM/YYYY) : **05/01/2020**  Any accompanying guest? (Additional $100 per day) [Y/N] : **Y**  Stay registration successful! |

**Option 6: Retrieve patient details**

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| Enter your option : **6**  Option 6. Retrieve Patient Details  Name ID No. Age Gender Citizenship Status  Adrian S1234567A 10 M SC Admitted  David G1234567A 12 M PR Registered  Gabriel F1234567A 8 M Foreigner Registered  Benjamin S2345678A 35 M SC Registered  Edda G2345678A 38 F PR Registered  Hannah F2345678A 33 F Foreigner Registered  Christina S3456789A 70 F SC Registered  Febe G3456789A 72 F PR Registered  Ian F3456789A 66 M Foreigner Registered  Enter patient ID number: **S1234567A**  Name of patient: Adrian  ID number: S1234567A  Citizenship status: SC  Gender: M  Status: Admitted  Admission date: 05/01/2020  Discharge date:  Payment status: Unpaid  ======  Ward number: 51  Bed number: 1  Ward class: A  Start of bed stay: 05/01/2020  End of bed stay: |

**Option 7: Add medical record entry**

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| Enter your option : **7**  Option 7. Add Medical Record Entry  Name ID No. Age Gender Citizenship Status  Adrian S1234567A 10 M SC Admitted  Enter patient ID number: **S1234567A**  Patient temperature: **36.9**  Please enter patient observation: **The patient feels well.**  Medical record entry for Adrian successful! |

**Option 8: View medical records**

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| --- |
| Enter your option : **8**  Option 8. View medical records  Name ID No. Age Gender Citizenship Status  Adrian S1234567A 10 M SC Admitted  David G1234567A 12 M PR Registered  Gabriel F1234567A 8 M Foreigner Registered  Benjamin S2345678A 35 M SC Registered  Edda G2345678A 38 F PR Registered  Hannah F2345678A 33 F Foreigner Registered  Christina S3456789A 70 F SC Registered  Febe G3456789A 72 F PR Registered  Ian F3456789A 66 M Foreigner Registered  Enter patient ID number: **S1234567A**  Name of patient: Adrian  ID number: S1234567A  Citizenship status: SC  Gender: M  Status: Admitted  ======Stay======  Admission date: 05/01/2020  Discharge date:  ======Record # 1 ======  Date/Time: 2020-01-05 15:17:27.218027  Temperature: 36.9 deg. cel.  Diagnosis: The patient feels well |

**Option 9: Transfer patient to another bed**

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| Enter your option : **10**  Option 10. Transfer Patient to Another Bed  Name ID No. Age Gender Citizenship Status  Adrian S1234567A 10 M SC Admitted  Enter patient ID number: **S1234567A**  No Type Ward No Bed No Daily Rate Available  1 A 51 1 450 False  2 A 51 2 450 True  3 A 52 1 450 True  4 A 52 2 450 True  5 B 41 1 268 True  6 B 41 2 268 True  7 B 41 3 268 True  8 C 31 1 205 True  9 C 31 2 205 True  10 C 31 3 205 True  Select bed to transfer to: **8**  Date of transfer (DD/MM/YYYY): **06/01/2020**  Any portable TV required (Additional $30 one time cost)? [Y/N] : **Y**  Adrian will be transferred to Ward 31 Bed 1 on 06/01/2020. |

**Option 10: Discharge and payment**

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| Enter your option : **10**  Option 10. Discharge and payment  Name ID No. Age Gender Citizenship Status  Adrian S1234567A 10 M SC Admitted  Enter patient ID number to discharge: **S1234567A**  Date of discharge (DD/MM/YYYY): **07/01/2020**  Name of patient: Adrian  ID number: S1234567A  Citizenship status: SC  Gender: M  Status: Admitted  ======Stay======  Admission date: 05/01/2020  Discharge date: 07/01/2020  Payment status: Unpaid  ======Bed # 1 ======  Ward number: 51  Bed number: 1  Ward class: A  Start of bed stay: 05/01/2020  End of bed stay: 06/01/2020  Accompanying person: True  Number of days stayed: 1  ======Bed # 2 ======  Ward number: 31  Bed number: 1  Ward class: C  Start of bed stay: 06/01/2020  End of bed stay: 07/01/2020  Portable TV: True  Number of days stayed: 1  ==========  Total charges pending: $ 621  CDA balance: $ 50  To deduct from CDA: $ 50  Sub-total: $ 571  [Press any key to proceed with payment]  Commencing payment...  $ 50 has been deducted from CDA  New CDA balance: $ 0  Sub-total: $ 571 has been paid by cash  Payment successful! |

## ACTIVITY PLAN

###### Suggestions for Getting Started

1. **Analysis**

1. Understand the program specification and the requirements before attempting the assignment.

*e.g. the relationships between the classes*

*the use of the attributes in each class*

1. **Program Design**

2. Work out the User Interface required for user input and suitable output.

1. Work out the main logic of the program using Object-Oriented programming techniques;

*i.e. use inheritance and association of the classes properly.*

1. You are required to use suitable classes appropriately for this assignment.

*Marks will be deducted for inefficient use of the classes or improper use of classes*

**c) Implementation & Testing**

1. Determine the order in which the classes are to be implemented (certain classes need to be implemented before other classes can be implemented).
2. Implement the classes **ONE** at a time.
3. You should implement methods to create the patient and bed objects for the patient and bed lists respectively from the respective csv files in the main program. The csv files can be downloaded from Mel.
4. Test your program logic to make sure that it works as expected.

*You must prepare test data to see that your program works correctly. All data entry should be validated and illegal data entry should be highlighted to the user so that the user can enter correct data.*

## DELIVERABLES

* Each member must do 5 basic features and 1 advanced feature.
* Name your BitBucket repository “PRG2\_TXX\_TeamY” where “TXX” is your tutorial group, and “TeamY” is your team number, e.g. PRG2\_T01\_Team1.
* In each of your .cs file, you MUST include a blocked comment at the top stating your student number(s), name(s) and group as shown below:

//============================================================

// Student Number : **S12345678, S87654321**

// Student Name : **John Tan, Johnny Yeo**

// Module Group : **T01** //============================================================

* Ensure all classes (source files) that you have written for the whole assignment are pushed to your BitBucket repository by 5 February 2020, 8.30 am.
* In addition, submit the whole project folder, including all the classes (source files) that you have written, to your PRG2 Assignment network folder before the deadline.
* Demonstrate your application to your tutor during your PRG2 classes right after the submission deadline of 5 February 2020.

**7. GRADING CRITERIA**

This assignment constitutes 35% of this module. Performance Criteria for grading the assignment is as described below. Marks awarded will be based on **program code** as well as student’s degree of understanding of work done as assessed during the **presentation**.

**Grading criteria for the program is given below.**

***A Grade***

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| * Program implements the *Basic Features* successfully * Program implements all the basic *input validations* successfully * Program implements the one *Advanced Features* successfully * Program demonstrates good design with the correct use of methods * Program provides strong evidence of good programming practice * Program has been tested adequately * Demonstrates good use of Git (Such as meaningful commit messages, regular commits and push) |

***B Grade***

|  |
| --- |
| * Program implements the *Basic Features* successfully * Program implements some basic *input validations* successfully * Program attempts to use methods * Program provides sufficient evidence of good programming practice * Program has been tested adequately * Adequate use of Git |

***C Grade***

|  |
| --- |
| * Program implements the *Basic Features* successfully * Program provides some evidence of good programming practice * Program has been tested adequately * Demonstrates some evidence of usage of Git |

***D Grade***

|  |
| --- |
| * Program implements the *Basic Features* successfully * Program has been tested adequately * Score at least a ‘D’ in the walkthrough |

*NOTE*

* *Evidence of good programming practice include the use of meaningful variable names, proper indentation of code, appropriate and useful comments, adoption of standard naming conventions etc.*
* *Basic Input validation refers to the checking of the inputs entered by the user.*

*e.g. invalid option, invalid date*