**University of Wolverhampton**

**Faculty of Science and Engineering**

**School of Mathematics and Computer Science**

# Module Assessment

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| **Module** | 5CS019 Object Oriented Design and Programming |
| **Module Leader** | Dr John Kanyaru |
| **Semester** | 1 |
| **Year** | 2020 |
|  |  |
| **Assessment** | Main portfolio task |
| **% of module mark** | 80%. The other 20% is from workshop tasks. |
| **Due Date** | We estimate that it should be possible to complete this work by 20/12/2020. You should speak to your tutors during scheduled workshop sessions, and via MS Teams  to get feedback on your work. |
| **Hand-in – what?** | Zip or jar file containing program code for the task and other specified portfolio items. Other file formats that cannot easily be opened by your tutor will not be accepted. Program code should be Java source files only, and diagrams should be submitted as pdf documents. |
| **Hand-in- where?** | To be submitted via Canvas by 14:00 on the given date. |
| **Cheating, plagiarism, collusion** | Any evidence of these offences will not be tolerated. The work you submit must be your own work. |
| **Pass mark** | 40% is required overall to pass the module. A detailed marking guide is provided.  The final grade will not be calculated entirely mechanically. A degree of academic judgement will be used to assess how well you have met the learning outcomes overall. |
| **Method of retrieval** | Resit portfolio tasks will be in the summer resit period. These will not necessarily be the same as the original tasks, but variants of them. |
| **Collection of marked work** | Feedback returned through Canvas |

## Task Details

## A leisure facility management system

The Mangoes Leisure Facility is a School Swimming Pool, Sports Hall and Exercise Studio, which is managed as a private facility with the objective of making a profit for the School. It has started to make a steady income in the last year, since the introduction of an Exercise and Weights Studio on the Mezzanine floor between the Sports Hall and Gymnasium.

The School has priority use of all the facilities, but otherwise the Mangoes membership (and members of the public) can use them. The leisure Centre users consist of mainly local people from the surrounding area.

In the past the cost of running the Swimming Pool and staffing of the facilities has been a large drain on the School’s income. Dominic James has been the Manager for the last three years and has managed to build up Mangoes income by slowly increasing the staffing levels and facilities as the membership has increased. There are a number of differing memberships available that will allow for different member requirements. These provide the highest proportion of income for Mangoes, however there is a large cash income from the rental of facilities.

Members have to complete an application form on joining which includes their bank details. From this a membership number is allocated and a plastic membership card completed. The completed form is filed in alphabetical order in a locked filing cabinet in the Managers office.

This has caused a number of problems because:

a. when the manager is absent staff have been unable to verify customer details

i. if membership cards are lost

ii. members have wished to change their details or change their membership

iii. there have been bank queries

b. a number of forms have been mis-filed, making Mangoes look inefficient

c. increased cost due to having to compensate members (in two cases free memberships for one month)

To make a booking for a fitness class a member of Mangoes or the general public can make the booking in person at the Leisure Centre or by email or phone. The member of staff on duty looks in the Fitness Diary. The Fitness Diary has a list of all classes held on each date, the grade of the class, the time the class begins and ends and the instructor that takes it. If there is a vacancy for that class then the staff member adds the person’s name to the list. Payment has to be made before attendance at the class.

To make a booking for use of a Facility such as the Sports Hall, Gymnasium or Swimming Pool a member of Mangoes or the general public can also make the booking in person at the Leisure Centre or by email or phone. The member of staff on duty looks in the Facilities Diary. The Facilities Diary has the name of the facility and the activity that takes place on each date. If the Facility is free in the Diary then they book it. Payment has to be made within 48 hours of booking.

There are a number of issues with the booking system.

1. The staff often cannot find the Diaries and thus keep people waiting

2. Sometimes they cannot read the writing in the books, causing double booking

3. Keeping track of payment is difficult

Dominic James is also having a number of staffing issues to resolve, particularly with the lifeguards in the Swimming Pool. Whenever the pool is open there has to be a life guard on duty at all times. Most of the lifeguards are part time and/or temporary and have to be trained before they can take up their duties. The week's duties are written using a white board of the sessions and the staff that will be covering them. There are 18 lifeguards on the list who have preferences for different sessions, these are listed in a notebook so that Dominic James can ensure the right people are allocated the right times. If he cannot find a lifeguard he has to do the duty himself. It is his experience that staff remove their names from the duty board without consulting him, that names get erased in error or that they do not find their names for that week. It has meant that most weeks he is doing a lot of hours of lifeguard duties and on one occasion he had to close the pool.

There also has to be someone on duty to check membership cards on entry to the facility and Dominic James has a number of part time reception staff who fulfil the role along with general administration duties and dealing with enquiries. A number are also trained in First Aid because there has to be a qualified First Aid person on duty in the centre at all times.

**Extracts from the Business Files:**

**Wages:**

Lifeguards - £4.25 per hour

Receptionist/Clerk - £5.00 per hour

**Extracts from the brochure:-**

Opening times  
  
**Sports Hall and Mezzanine Exercise Studio**

Weekdays **-** 6.00am - 11.00pm  
Weekends - 7.00am - 7.00pm  
Bank Holidays **-** 10.00am - 11.00pm  
  
**Swimming Pool**

Monday to Friday 6am - 10am, 2pm - 11.00pm (6.00pm - 7.00pm Adults Only)  
Saturday **-** 7.00am - 7.00pm (6.00pm - 7.00pm Adults Only)  
Sunday - 8.00am - 7.00pm (6.00pm - 7.00pm Adults Only)  
  
Fees and charges  
**Membership**

Full - unlimited use of exercise and swim facilities -£40 per month

Family - unlimited use of all facilities for up to 4 family members - £75 per month

Exercise - unlimited use of Mezzanine Studio - £25 per month

Swim - unlimited use of pool facilities - £20 per month

Casual - £10 per month and individual charges on top

**Swimming**

Adults - £2.00  
Children - £1.25 (children under 10 must be accompanied by an adult)  
Children under 4 - No Charge  
Senior Citizens (aged 60 and over) - £1.25  
Unemployed - £1.25  
Student - £1.25  
Disabled People - £1.25  
Private Hire for Pool Parties etc. **-** £26.50 + lifeguards @£7 per hour each  
  
**Sports Hall - Half Hall**  
Block booking (Adults) - £18.40 per hour  
Block booking (Concessions) - £10.50 per hour  
Casual booking (Adults) - £21.00 per hour  
Casual booking (Concessions) - £12.25 per hour  
  
**Sports Hall - Badminton per court, per hour**  
Adults - £4.75  
Juniors - £2.65  
  
**Sports Hall - Tennis per court, per hour**  
Adults - £5.25  
Juniors - £2.70  
  
**Sports Hall - Table Tennis per table, per hour**  
Adults - £4.25  
Juniors - £2.50

**Your task**

You have studied key concepts pertaining to object orientation. For instance, the class concept, association among classes, containment (aggregation and composition), inheritance and polymorphism, the use of abstract classes and interfaces. Also, you have gained skills in unit testing using Junit framework. Java also has a wealth of inbuilt classes such as those for exception handling, constructing GUIs, and storing collections of data.

You are to apply these concepts in implementing a solution to the problem described in this scenario. In particular, Mangoes **have requested that your consultancy provide them with the detailed designs (UML class diagram) and prototype (Java implementation) for:**

* Membership registration
* Booking of classes (e.g., fitness class)
* Booking a facility (e.g., sports hall)
* Viewing facility bookings and class schedules
* Altering bookings
* Altering or removing members
* Determining how much money was made from facility bookings in a week

The system should use the above as foundational features, and include data storage, an interactive GUI, and a feature for the manager check staff schedules especially for the swimming pool and the reception area.

Remember to include any assumptions which you have to make where case study information is missing or ambiguous. The assumptions should be written as Javadocs in your code.

**Marks will be weighted as follows:**

* Design
* UML class diagram – with relevant details about each class 10%
* Code
* functionality 30%
* layout and style 20%
* Use of OO concepts 15%
* Junit tests 15%
* GUI 10%

Find below a detailed marking guide:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Core functionality, Unit tests, code layout** | **Data Storage & collections** | **Exception Handling** | **Use of OOP concepts & UML Design** | **Graphical User Interface** |
| 90 – 100% | A robust implementation of member registration, amendment, facility bookings including searches, viewing of class lists and facility bookings; production of weekly reports on revenue.  Comprehensive unit tests. Code style is clear and internal comments used in suitable places.  Criteria for 80-89% is met. | Data is well persisted between program invocations; Separation of application data pertaining to members, facilities and bookings and reports. | Besides checked exceptions, there are other exceptions handled to ensure correct data inputs, and to obviate unreasonable membership numbers or double-booking of facilities.  Criteria for 80-89% is met. | The UML design diagram is comprehensive & detailed; OOP concepts such as inheritance, encapsulation, polymorphism are used; also constructs such as abstract classes and interfaces are exploited | The GUI is interactive and useful in creating members, bookings, viewing class lists, editing members, altering bookings, and generating reports.  Evident use of a number of layout managers.  Criteria for 80-89% is met. |
| 80-89% | Code is laid out well, and internal comments are succinct; Core functionality meets the requirements of the scenario and weekly reports can be generated. For example, Staff rota can be created and a simulation of their wages done. Also, calculation of revenue and producing of weekly reports.  Unit tests also do provide good account of a working implementation. | Criteria for 70-79% is met. | Comprehensive exception handling. Different types of exceptions considered in different code regions.  Criteria for 70-79% is met. | Standard OOP concepts used well and class diagram is comprehensive. Minimal use of advanced concepts such as abstract classes and interfaces. | GUI provides access to various application functions, is interactive and handles user input well. Ability to store and retrieve data and generate reports. Various events handles (e.g., click event, itemselection event) |
| 70-79% | Application provides core functions, and code is well written in a clear style with use of internal comments as appropriate.  Unit tests are also clear. | Members data, facilities data, bookings, and payments can be persisted. Suitable collections used to store data in memory.  Criteria for 60-69% is met | Criteria for 60-69% is met. | Clear use of OOP concepts and a good match between implementation and design diagram. | Criteria for 60-69% is met |
| 60-69% | Criteria for 50-59% is met. | Criteria for 50-59% is met. | Checked exceptions are handled; reasonable work in handling other possible exceptions within constructors or appropriate methods where these might occur | Criteria 50-59% is met | Besides handling application functions, the GUI also provides intuitive messages and tooltips to the user. |
| 50-59% | Criteria for 40-49% is met. Some issues such as double-booking of classes by same member, or inability to amend facility booking or view their status. | Data persists between program invocations, ability to add or amend records; choice of at least 2 appropriate collections and their use. | Criteria for 40-49% is met | UML design diagram captures the problem well, associations among classes are reasonable; Minimal use of OOP concepts but the diagram and code do match | Criteria for 40-49% is met. |
| 40-49% | Basic features are available, such as member registration and booking of classes, creating of staff rota. These are evidenced with unit tests | Criteria for 26-39% is met.  Use of IO classes to store data, and minimal variety of collections used. | Besides checked exceptions, there are some additional ones to handle incorrect data inputs in at least 2 places | Criteria for 26-39% is met | Criteria for 26-39% is met. GUI is able to provide some features e.g., membership registration, class bookings, and facility viewing and booking. |
| 26-39% | Some classes identified and implemented. No meaningful associations to produce; unable to perform actions such as member registration, booking of facilities | Persistence of data is partial, unable to store data about memberships, facilities, bookings, fitness class lists. | Criteria for 0-25% is met | Criteria for 0-25% are met.  UML design diagram partly matches implementation; | Criteria for 0-25% is met.  Some event handling is done. |
| 0-25% | Minimal work is done, code has compilation errors | No persistence of data, or storage is partial and does not capture a complete use case for the application | No exception handling, except for checked exceptions | UML class diagram and implementation do not match; also, inadequate for the scenario | No GUI, or it is non-responsive |