# Lab Exercise 9_Abstraction

UMP library wishes to update its computer system which based on UML diagram in Figure 1. The duration of books borrow are based on the borrower status - Staff, Postgrad or Undergrad Student, refer to Table 1 for the **maximum day allow** for each borrower. If they return their books later than maximum day allow, the **overdue** is recorded. And a fine is charge based on how many days is overdue. The fine rate is shown in Table 2. The formula for **calculating total fine** is given in a Figure 2. Table 3 shows how input and output expected for this system. Based on the system requirement set by UMP library, write a Java program to solve above problem by applying inheritance and polymorphism concept. *Person* and *Student class* must be declared as **Abstract Class** (refer to Figure 1).

**Table 1 – Maximum Days vs. Status**

| Status | Maximum Borrowed Days |
|---|---|
| Staff | 30 |
| Postgrad Student | 20 |
| Undergrad Student | 10 |

**Table 2 – Fine Rates**

| Days Overdue | Fine (RM) |
|---|---|
| 1 – 5 | 0.20 |
| 6 – 8 | 0.30 |
| 8 and above | 0.40 |

Total Fine = (Number of books) * (Overdue) * (Fine rates)

**Figure 2 – Total Fine Calculation Formula**

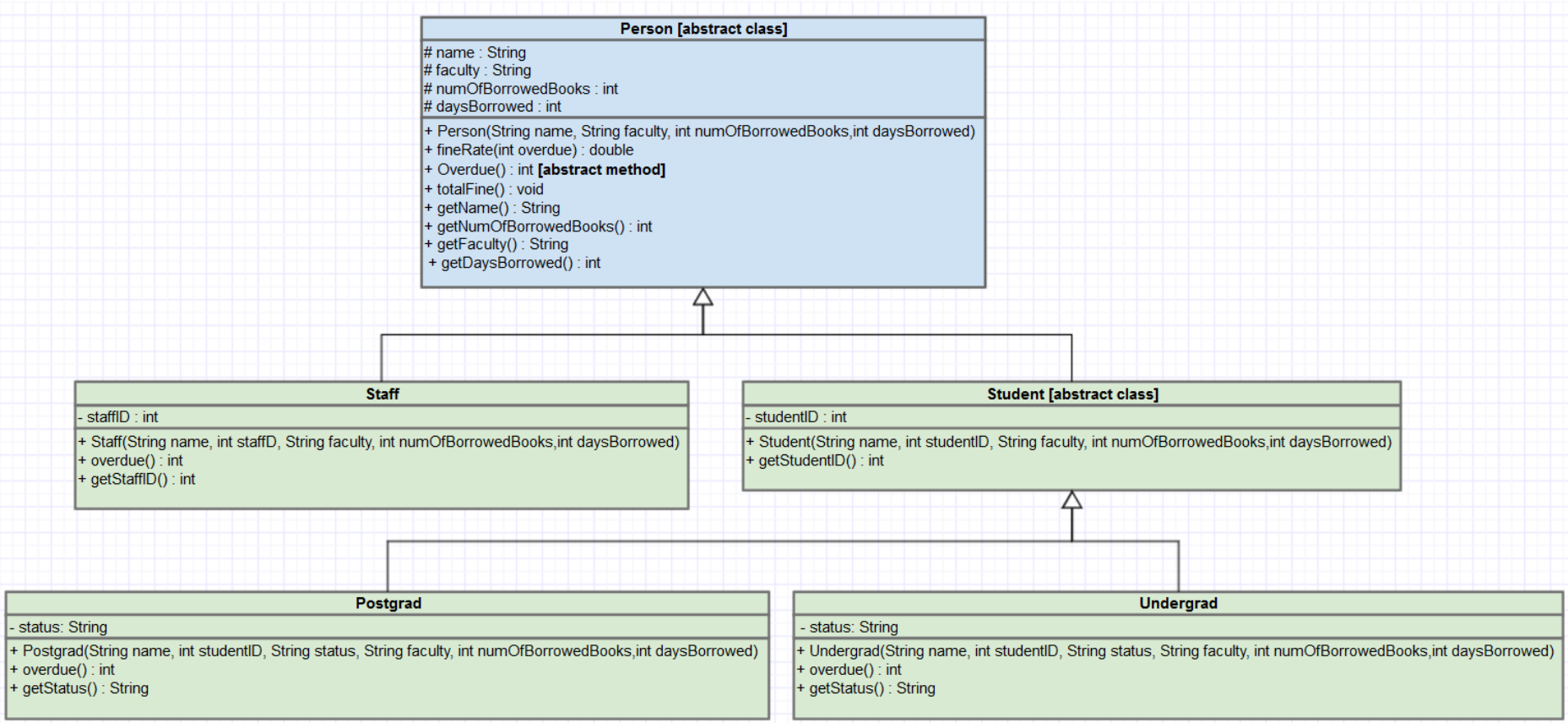


**Figure 1: UML Diagram for UMP Library System.**

**Table 3: Example of the Input and Output for the System**

| Input | Output |
|---|---|
| **Example 1 - Staff**<br>Name: Dr. Aariz Hassan<br>Staff ID: 811<br>Faculty: FSKKP<br>Num. of Books Borrow: 3<br>Days Borrowed: 25 | Name: Dr. Aariz Hassan<br>Overdue: 0<br>Fine: Rm 0.00 |
| **Example 2 - Staff**<br>Name: Dr. Aqeel Hussain<br>Staff ID: 1313<br>Faculty: FKP<br>Num. of Books Borrow: 5<br>Days Borrowed: 37 | Name: Dr. Aqeel Hussain<br>Overdue: 7<br>Fine: Rm 10.50 |
| **Example 3 - Postgrad Student**<br>Name: Lee Chong Wei<br>Student ID: 114<br>Status: Postgrad<br>Faculty: FKE<br>Num. of Books Borrow: 2<br>Days Borrowed: 29 | Name: Lee Chong Wei<br>Status: Postgrad<br>Overdue: 9<br>Fine: Rm 7.20 |
| **Example 4 - Undergrad Student**<br>Name: Roger Federer<br>Student ID: 119<br>Status: Undergrad<br>Faculty: FIST<br>Num. of Books Borrow: 1<br>Days Borrowed: 12 | Name: Roger Federer<br>Status: Undergrad<br>Overdue: 2<br>Fine: Rm 0.40 |

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