

TITLE: PROJECT STAGE 3

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DESIGN OF EXTENDED FEATURES: REASONABLE SYSTEM DESIGNS

This stage focuses on extending the current Public Library DBMS to include automation features that make daily library operations more efficient. Both features aim to improve how overdue items and member accounts are handled while maintaining data integrity and reducing manual work for staff.

Feature 1 – Overdue Alert

Purpose:

The goal of this feature is to automatically alert staff each day about materials that are overdue. This helps ensure timely follow-ups with members who have not returned their borrowed items.

Idea:

Every morning the system should list all loans that are overdue (not returned and due date is before today) so staff can act.

How overdue items are identified:

A material is overdue when the **return_date** is NULL and the **due_date** has passed the current date ($\text{due_date} < \text{CURRENT_DATE}$). This condition can be checked daily using a query or automated process.

When the alert runs:

The alert should be generated **once every day**, preferably in the morning at 9am. This can be done using a scheduler such as pg_cron, pgAgent, or an external system task that calls a simple SQL script.

Database updates or additions:

- A new **view** called v_overdue_open will display all overdue materials in real time.
- Optionally, an **overdue_alert_log** table can record daily snapshots of overdue items for reporting or auditing.

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```

WHERE b.return_date IS NULL
AND b.due_date < CURRENT_DATE;

CREATE OR REPLACE VIEW v_overdue_open AS
SELECT b.borrow_id, m.name AS member_name, mat.title AS m
      b.borrow_date, b.due_date, CURRENT_DATE - b.due_da
FROM borrow b
JOIN member m ON b.member_id = m.member_id
JOIN material mat ON b.material_id = mat.material_id
WHERE b.return_date IS NULL
AND b.due_date < CURRENT_DATE;

```

Data Output Messages Notifications

CREATE VIEW

Query returned successfully in 94 msec.

This view gives staff an up-to-date list of overdue books they can check anytime.

Query Query History Scratch Pad

```

1 SELECT * FROM public.v_overdue_open
2

```

Data Output Messages Notifications

Showing rows: 1 to 22 Page No: 1 of 1

	borrow_id Integer	member_name character varying (150)	material_title character varying (200)	borrow_date date	due_date date	days_over integer
1	31	Isla Thomas	Ulysses	2022-12-28	2023-01-18	
2	32	Alice Johnson	The Great Gatsby	2023-01-23	2023-02-13	
3	34	Kate Anderson	Lolita	2023-03-01	2023-03-22	
4	35	Luke Jackson	Brave New World	2023-03-10	2023-03-31	
5	36	Mia White	The Sound and the Fury	2023-03-15	2023-04-05	
6	37	Quinn Hall	Catch-22	2023-03-25	2023-04-15	

Total rows: 22 Query complete 00:00:00.225 CRLF Ln 1, Col 1

Feature 2 – Membership Deactivation and Reactivation

Purpose:

This feature automatically manages member status based on their overdue history. Members who repeatedly fail to return books are deactivated, and their accounts are reactivated once the overdue issues are resolved.

Defining an overdue occurrence:

One borrowing record that becomes overdue (`due_date < today` and `return_date IS NULL`). Each borrow counts as one occurrence, regardless of how long it remains overdue.

How the system reacts:

- A member's account becomes **deactivated** when they reach **three or more** overdue occurrences.
- Once they **return** the materials or **pay** the overdue fees, their account is automatically set back to **active**.

Database changes:

1. Add a **status** column to the **Member** table:

```
ALTER TABLE member
ADD COLUMN status TEXT NOT NULL DEFAULT 'active'
CHECK (status IN ('active', 'deactivated'));
```

2. We can also add an **overdue_occurrence** table to record overdue events and a table to track fee payments.

Automation - Using Triggers & Procedures:

- A daily procedure counts how many active overdue records each member has and automatically sets **status = 'deactivated'** if the count ≥ 3 .
- A trigger on the **payment** table updates member status back to 'active' when the overdue fees are cleared.

Summary

Both features make the library database smarter and more efficient. The Overdue Alert ensures staff always know which materials are late, while the Membership Deactivation/ Reactivation feature enforces fair borrowing rules automatically. Together, they improve reliability, save staff time, and strengthen data consistency across the system.

References

[1] R. Elmasri and S. B. Navathe, Fundamentals of Database Systems, 7th ed., Pearson, 2016. [2] C. Coronel and S. Morris, Database Systems: Design, Implementation and Management, 13th ed., Cengage Learning, 2019.