

READ THIS FIRST

What this file is. A study reference that shows how the twelve synopsis components listed in section V of the IGNOU MCSP-232 Project Guidelines (MCA_NEW, July 2026 and January 2027 edition) fit together for one software topic. It is a format model, built line by line on those components, so you can see the depth an evaluator expects.

What this file is not. It is not a synopsis you may submit. The guidelines say the project must be genuine and original, and that copied work is forwarded to the Exam Discipline Committee as an unfair means case (Message from the Project Coordinator, p. 3). Choose your own topic, do your own analysis, and write every line yourself.

- Text in [square brackets] is a fact only you can supply: your laboratory or client, city, figures from your own fact finding, dates, durations, versions and your guide's details.
- Do not reuse this topic. Also do not repeat the topic you did at BCA level (p. 3).
- Length: the guidelines print "14-18 pages" on p. 6 and "15-20 pages" on p. 10. Aim for 15 to 18 pages, which satisfies both lines. This sample is longer because of its notes in italics and the ignouproject.com bands; your own text, without them, should fit the range.
- Not inside this file, but required with your proposal: the signed and dated proforma (p. 5), your guide's signed and dated bio-data with a certified copy of identity proof, and, for MCA_NEW, a self-addressed stamped envelope. Post it to the Regional Director of your Regional Centre, never to SOCIS. MCAOL (Online) learners upload on the LMS and add the guide's self-attested degree certificate (MCAOL guidelines, July 2024 and January 2025).
- Diagrams here are drawn simply so the logic is visible. Draw yours properly for your own system.
- The guidelines set no font or spacing for the synopsis. This file uses 12 pt with single line spacing, the spacing they set for the final report (section VI, point 3).

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PROJECT PROPOSAL (SYNOPSIS)

MCSP-232

CALIBRATION AND PREVENTIVE MAINTENANCE TRACKER FOR [NAME OF DIAGNOSTIC LABORATORY], [CITY]

by

[Student's Full Name]

Enrolment No: []

Under the guidance of

[Project Guide's Full Name]

[Designation], [Organisation]

Submitted to the Regional Director, IGNOU Regional Centre [Name]
for approval under the Master of Computer Applications (MCA_NEW)
programme,

School of Computer and Information Sciences

[Month and Year]

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The guidelines number item (ix) twice. The second (ix) is the network architecture item; keep the order and you will cover every component.

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1. Title of the Project

Calibration and Preventive Maintenance Tracker for [Name of Diagnostic Laboratory], [City]

The title names the system, what it manages and where it will run. Keep these exact words on the proforma (box 2), on every page of the final report and on the Certificate of Originality: the guidelines require the title to stay the same throughout the project (section VI, points 5 and 10).

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2. Introduction and Objectives of the Project

2.1 Introduction

A diagnostic laboratory depends on instruments such as analysers, centrifuges, pipettes, balances, incubators and refrigerators. A result is only

as reliable as the instrument that produced it, so each instrument has to be calibrated at a fixed interval and kept in working order through preventive maintenance. ISO 15189:2022 sets requirements for laboratory equipment, its calibration and its metrological traceability, and the WHO Laboratory Quality Management System Handbook (2011) treats equipment management as one of the essentials of laboratory quality.

At [Name of Diagnostic Laboratory], calibration dates and service visits are currently recorded in [describe the present method from your own fact finding, for example a paper register or a spreadsheet]. During the study period of [dates], [number] instruments were in use across [number] sections. [State, from your interviews with the laboratory staff, the problems you actually observed, for example missed due dates or certificates that could not be traced.]

The proposed system is a web application that keeps one register of all instruments, schedules calibration and preventive maintenance, alerts the responsible staff before a due date, prevents an overdue instrument from being shown as usable, records breakdowns as tickets, and produces the reports the laboratory needs for internal review and audit.

2.2 Objectives

- To maintain a single register of every instrument with its full calibration and maintenance history.
- To schedule calibration and preventive maintenance from each instrument's interval and to alert the responsible user [N] days before the due date.
- To block an instrument from being marked usable once its calibration is overdue, until a new certificate is recorded and verified.
- To record breakdowns and service visits as tickets and track each ticket to closure.
- To keep an audit trail of every change that users cannot edit or delete.
- To generate due lists, overdue lists, instrument histories, ticket ageing and vendor reports.

Each objective states what the system will do, so each one can be traced to a functional requirement in section 5 and a test case in the final report.

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3. Project Category

RDBMS-based web application (client-server, online). The core of the system is a relational database of instruments, events and users, accessed through a browser over a local network or the internet. The guidelines list

RDBMS, OOPS, Networking, Artificial Intelligence, Expert Systems, Machine Learning, Data Science, Image Processing and Mobile Computing as example categories (section V, item iii).

Because this is an information management system, it is built in Python with Django and MySQL, not in C or C++, which section VIII, note (ii) rules out for such projects. No barred package (dBase III Plus, FoxPro, Visual FoxPro, MS-Access, or Visual Basic with MS-Access) is used (note i).

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4. Tools/Platform, Hardware and Software Requirement Specifications

4.1 Software

Layer	Choice	Version	Why this choice
Language	Python	[latest stable 3.x at the time of development]	listed in section VIII; strong libraries for web and reports
Framework	Django (Model-View-Template)	[current LTS release]	built-in authentication, ORM, CSRF protection and admin
Database	MySQL Community Server	[8.x release]	listed in section VIII; supports CHECK constraints, views, GRANT and REVOKE
Front end	HTML5, CSS, Bootstrap, JavaScript	[Bootstrap 5.x]	listed in section VIII; responsive screens
Reports	Django templates with PDF export library	[name and version]	printable due lists and histories
Development tools	VS Code or PyCharm, Git	[versions]	editing and version control
Server OS	Linux (for example Ubuntu Server)	[release]	deployment
Client	Any current browser	[browsers tested]	no installation on staff machines

4.2 Hardware

Item	Development machine	Server (deployment)
Processor	[]	[]
RAM	[] GB	[] GB
Storage	[] GB	[] GB, plus space for certificate files
Network	Internet for packages	LAN or hosted server with HTTPS
Other	none	[label printer, if QR labels are added later]

Write the hardware you will actually use. The evaluator checks that the specification is consistent with the software and with the number of users in section 5.

5. Problem Definition, Requirement Specifications, Literature Review, Project Planning and Scheduling

5.1 Problem definition

The laboratory has no single, reliable record that shows, at any moment, which instruments are calibrated, which are due, which are overdue and why a given instrument was out of service. [Add the specific consequences you recorded during fact finding.] The problem is to design and build a system that keeps this record, raises alerts in time and stops an overdue instrument from being treated as fit for use.

5.2 Users

Role	What the role does in the system
Lab Admin	manages users, roles, locations, instrument types and vendors
Technician	records calibrations and maintenance, raises breakdown tickets
Quality Manager	verifies calibration records, reviews overdue lists and audit reports
Section Head (read only)	views status and reports for their section

5.3 Functional requirements

ID	Requirement
FR-1	The system shall let the Lab Admin create, edit and deactivate user accounts and assign one role to each.
FR-2	The system shall register each instrument with a unique asset tag, serial number, make, model, type, location and calibration interval.
FR-3	The system shall take the calibration interval from the instrument type unless an instrument-specific interval is entered.
FR-4	The system shall record each calibration with date, result (pass, fail, adjusted), certificate number, certificate file, vendor or in-house, and the next due date.
FR-5	The system shall require a Quality Manager, who is not the person who recorded it, to verify each calibration record.
FR-6	The system shall treat an instrument as not usable when no verified passing calibration exists or the next due date has passed.
FR-7	The system shall list instruments due within [N] days and send an e-mail alert to the responsible users each day.
FR-8	The system shall let a Technician raise a preventive or breakdown ticket and track it through open, in progress and closed.
FR-9	The system shall record every insert, update and delete in an audit log that no application user can modify.
FR-10	The system shall generate the reports listed in section 9.5 on screen and as PDF.

ID	Requirement
FR-11	The system shall let users search instruments by tag, type, location and status.
FR-12	The system shall mark an instrument out of service or retired, with reason and date.

5.4 Non-functional requirements

- Security: role-based access; passwords stored only as salted hashes; every page behind login.
- Performance: search results within [] seconds for [] instruments and [] concurrent users.
- Reliability: daily database backup; certificate files backed up with the database.
- Usability: works on desktop and mobile browsers; consistent naming on every screen.
- Maintainability: modular Django apps, one per module in section 9.

In the final report, write the full SRS in a standard structure such as ISO/IEC/IEEE 29148:2018 (which replaced IEEE 830). Section VII of the guidelines checks whether the SRS follows a standard or is given in running text.

5.5 Literature review

ASTM E1578-18, the standard guide for laboratory informatics, describes instrument management functions a laboratory system should provide, including scheduling calibration and maintenance and identifying an instrument that is out of calibration so that it is not selected for use. ISO 15189:2022 and the WHO Laboratory Quality Management System Handbook set out why calibration and maintenance records must be kept and retrievable. Commercial laboratory information management systems include instrument calibration modules, but [state what you found about their cost, size or fit for a laboratory of the size you studied].

[Add three to five sources you actually read, summarise each in your own words and say what your system takes from it. Cite each one in section 13.]

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5.6 Project planning and scheduling

Activities, dependencies and durations. Fill the durations from your own plan; the evaluator checks the PERT decomposition and the validity of the Gantt chart (section VII).

ID	Activity	Depends on	o	m	p	te = (o+4m+p)/6
A	Fact finding and requirement gathering at the laboratory	none	[]	[]	[]	[]
B	SRS writing and review with guide	A	[]	[]	[]	[]
C	Analysis models: DFD, ER, use cases	B	[]	[]	[]	[]
D	Database design and normalisation	C	[]	[]	[]	[]
E	User interface design	C	[]	[]	[]	[]
F	Coding: users, register, calibration modules	D, E	[]	[]	[]	[]
G	Coding: tickets, alerts, reports, audit	F	[]	[]	[]	[]
H	Unit and integration testing	G	[]	[]	[]	[]
I	System testing with laboratory users	H	[]	[]	[]	[]
J	Documentation and report preparation	B (starts), I (ends)	[]	[]	[]	[]

o, m and p are the optimistic, most likely and pessimistic durations in weeks. Variance of each activity is $((p - o) / 6)^2$. The critical path is the longest path through the network; name it in the report and draw the PERT network from this table.

Gantt chart (shade the weeks for each activity from your own dates):

Activity	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16
A																
B																
C																
D																
E																
F																
G																
H																
I																
J																

Weeks are counted from the date of approval. [Enter your start date.] An approved proposal is valid for two slots (section V, point 3), so the plan must finish inside that period.

5.7 Cost and effort estimate (function point analysis)

Section VII asks for cost and effort estimation "with the help of functional point analysis or other similar methods". The functions below come from the requirements in 5.3. Rate each one simple, average or complex using the IFPUG counting rules and fill the weights.

Type	Functions identified in this design	Count	Complexity and weight	Points
EI (external input)	add or edit user; register or edit instrument; record calibration; verify calibration; raise ticket; update or close ticket; add vendor	7	[]	[]
EO (external output)	due list report; overdue list; instrument history; ticket ageing; vendor report; daily alert e-mail	6	[]	[]
EQ (external inquiry)	search instruments; view certificate; view audit extract	3	[]	[]
ILF (internal logical file)	users and roles; instruments; calibration events; tickets; vendors; audit log	6	[]	[]
EIF (external interface file)	[none, or name any external file your system only reads]	[]	[]	[]
			Unadjusted FP (UFP)	[]

Standard IFPUG weights (simple, average, complex): EI 3, 4, 6; EO 4, 5, 7; EQ 3, 4, 6; ILF 7, 10, 15; EIF 5, 7, 10. Rate the 14 general system characteristics 0 to 5, add them (TDI), and compute VAF = $0.65 + 0.01 \times \text{TDI}$ and adjusted FP = UFP $\times$ VAF. Effort = adjusted FP $\times$ [your hours per function point, with its source]. Cost = effort $\times$ [hourly rate you justify]. IGNOU does not prescribe the productivity figure or the rate, so state yours and where it comes from.

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6. Scope of the Solution

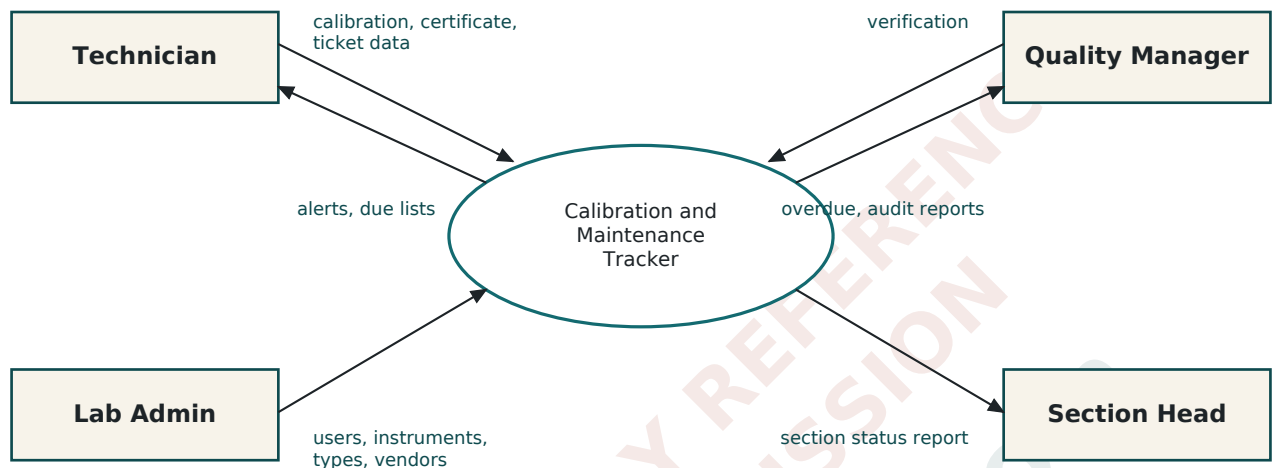
In scope: users and roles; instrument register; calibration scheduling, recording and verification; preventive and breakdown tickets; overdue lock-out; daily e-mail alerts; audit trail; the reports in section 9.5; deployment for [number] users at [laboratory].

Out of scope in this project: reading measurements directly from instruments; patient or test-result data (the system stores no patient information); billing; measurement uncertainty calculation. These appear under future scope where relevant.

Keeping patient data out of scope keeps the project inside what one student can analyse, build and test in the time available, which the evaluator checks under feasibility.

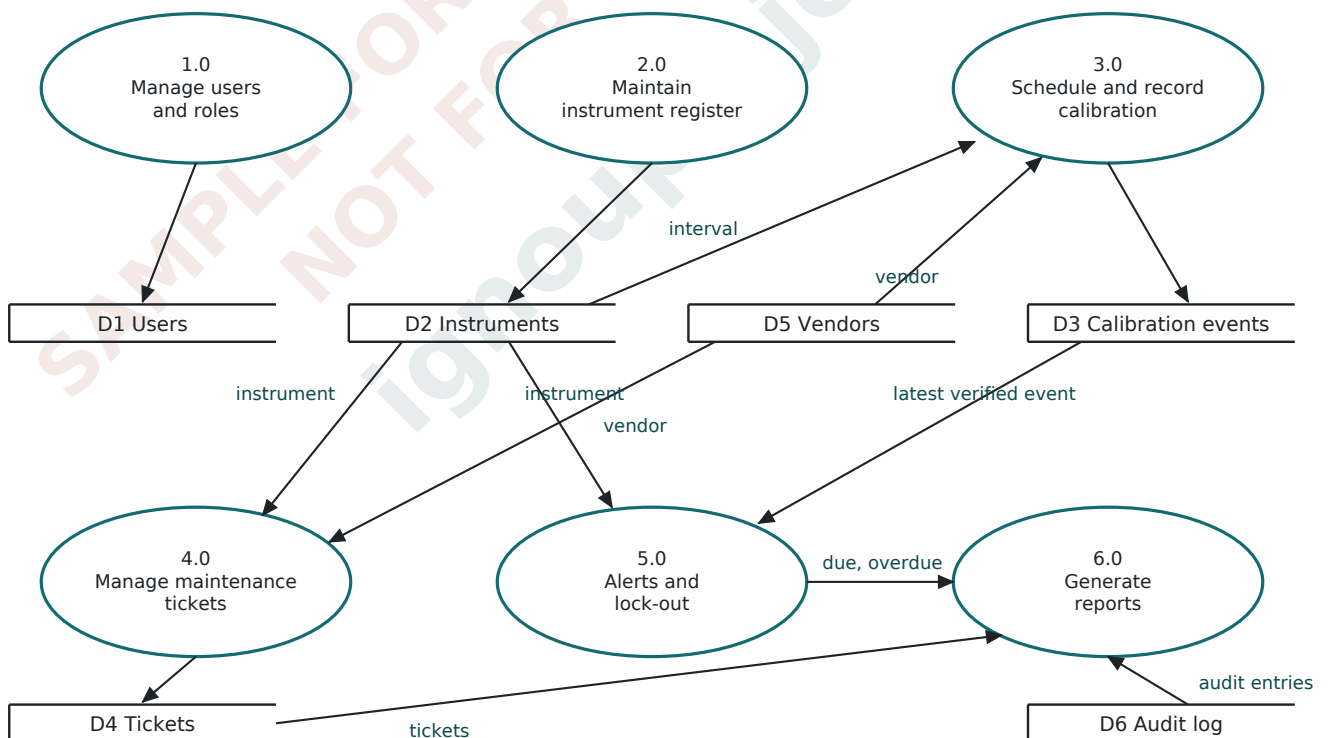
7. Analysis

7.1 Context diagram (DFD level 0)



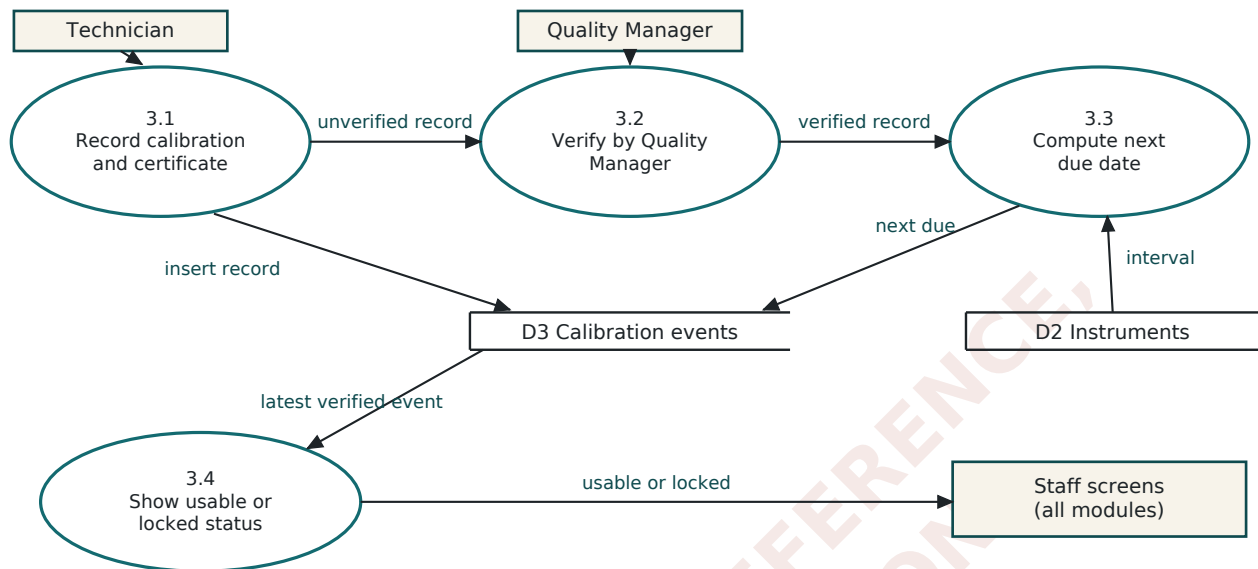
Vendors do not use the system. Certificate details received from a vendor are entered by the Technician, which is why the vendor appears as data, not as an external entity.

7.2 DFD level 1



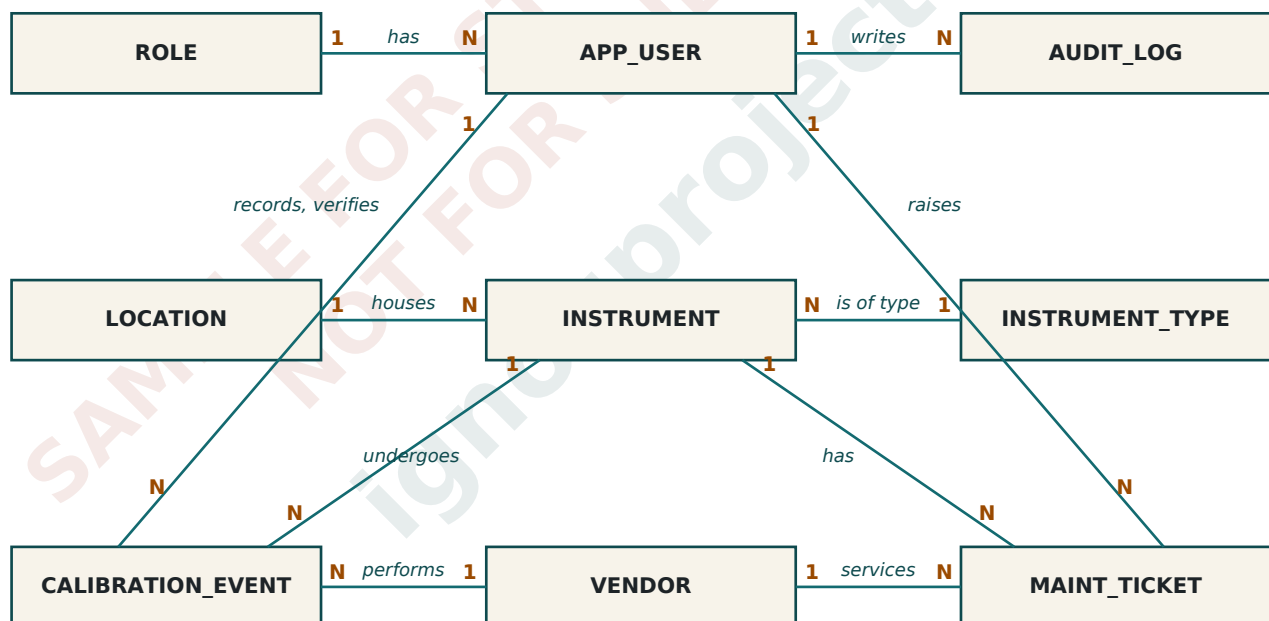
Every process also writes an entry to D6 Audit log, and 6.0 also reads D2, D3 and D5. Those lines are left out so the diagram stays readable; list them in the data dictionary of your report. External entities from the context diagram connect to the processes they use.

7.3 DFD level 2 for process 3.0 (schedule and record calibration)



Rule inside 3.2: the verifier must be a different user from the one who recorded the calibration.
 Rule inside 3.3: next due date = calibration date + the instrument's interval, or its type's default interval when no instrument interval is set.

7.4 Entity relationship diagram



Cardinality: one role has many users; one user writes many audit entries, records or verifies many calibration events and raises many tickets; one location houses many instruments; many instruments are of one type; one instrument undergoes many calibration events and has many tickets; one vendor performs many calibration events and services many tickets (in-house events and tickets have no vendor). Attributes are listed with each table in section 8.

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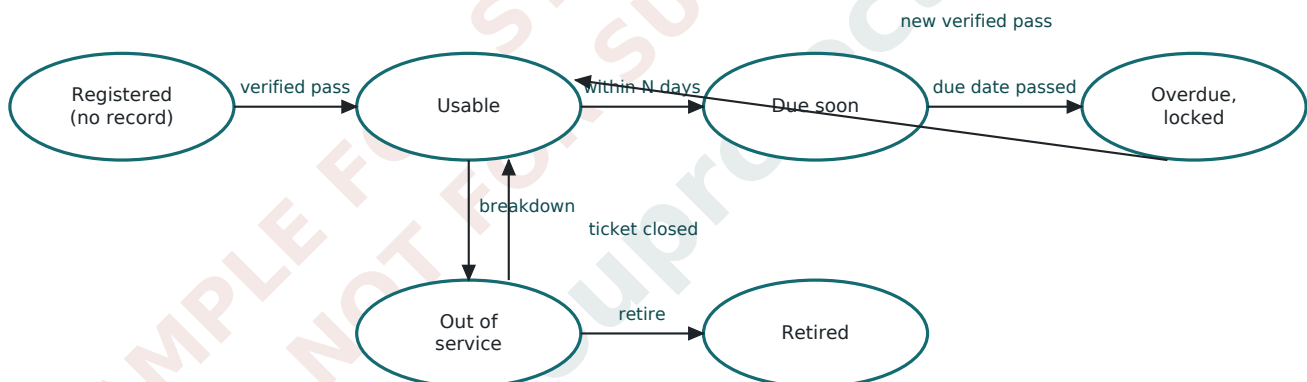
7.5 Use cases

Actor	Use cases
Lab Admin	log in; manage users; manage locations, types and vendors; register instrument; retire instrument
Technician	log in; record calibration; upload certificate; raise ticket; update ticket; search instruments
Quality Manager	log in; verify calibration; view overdue list; view audit extract; print reports
Section Head	log in; view section status; print section report
System (scheduled job)	compute due list daily; send alert e-mails

7.6 Activity diagram: recording a calibration



7.7 State diagram: instrument status as the system sees it



"Due soon" and "Overdue, locked" are derived from the latest verified calibration and today's date; they are not stored (see section 8.3). "Out of service" and "Retired" are set by a user and stored.

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8. Complete Database and Tables

Database name: caltrack. Engine: InnoDB (for foreign keys and transactions). Every table has a surrogate primary key; natural identifiers carry UNIQUE constraints.

8.1 role

Column	Type	Key or constraint	Meaning
role_id	INT	PK, AUTO_INCREMENT	role identifier
role_name	VARCHAR(30)	NOT NULL, UNIQUE	Lab Admin, Technician, Quality Manager, Section Head

app_user

Column	Type	Key or constraint	Meaning
user_id	INT	PK, AUTO_INCREMENT	user identifier
username	VARCHAR(40)	NOT NULL, UNIQUE	login name
full_name	VARCHAR(80)	NOT NULL	display name
email	VARCHAR(120)	NOT NULL, UNIQUE	alert address
role_id	INT	FK to role(role_id), NOT NULL	one role per user
password_hash	VARCHAR(128)	NOT NULL	salted hash, never plain text
is_active	BOOLEAN	NOT NULL, DEFAULT TRUE	deactivated, not deleted

location

Column	Type	Key or constraint	Meaning
location_id	INT	PK	section or room
location_name	VARCHAR(60)	NOT NULL, UNIQUE	for example Haematology

instrument_type

Column	Type	Key or constraint	Meaning
type_id	INT	PK	type identifier
type_name	VARCHAR(60)	NOT NULL, UNIQUE	for example micropipette
default_cal_days	INT	NOT NULL, CHECK (default_cal_days > 0)	default calibration interval
default_pm_days	INT	NULL, CHECK (default_pm_days > 0)	default preventive maintenance interval

vendor

Column	Type	Key or constraint	Meaning
vendor_id	INT	PK	service provider
vendor_name	VARCHAR(100)	NOT NULL	name
contact_email	VARCHAR(120)	NULL	contact
phone	VARCHAR(15)	NULL	contact
accreditation_ref	VARCHAR(60)	NULL	vendor's accreditation reference, if any

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instrument

Column	Type	Key or constraint	Meaning
instrument_id	INT	PK	instrument identifier
asset_tag	VARCHAR(30)	NOT NULL, UNIQUE	laboratory asset number
serial_no	VARCHAR(60)	NOT NULL	manufacturer serial
make	VARCHAR(60)	NOT NULL	manufacturer
model	VARCHAR(60)	NOT NULL	model
type_id	INT	FK to instrument_type, NOT NULL	type
location_id	INT	FK to location, NOT NULL	where it is kept
cal_interval_days	INT	NULL, CHECK (> 0)	overrides the type default when set
manual_status	ENUM	(IN_SERVICE, OUT_OF_SERVICE, RETIRED), DEFAULT IN_SERVICE	only states a user sets
status_reason	VARCHAR(200)	NULL	why out of service or retired

calibration_event

Column	Type	Key or constraint	Meaning
cal_id	INT	PK	event identifier
instrument_id	INT	FK to instrument, NOT NULL	which instrument
vendor_id	INT	FK to vendor, NULL	NULL means in-house
performed_on	DATE	NOT NULL	calibration date
result	ENUM	(PASS, FAIL, ADJUSTED), NOT NULL	outcome
certificate_no	VARCHAR(60)	NOT NULL	certificate reference
certificate_file	VARCHAR(255)	NOT NULL	path outside web root
next_due	DATE	NOT NULL, CHECK (next_due > performed_on)	computed at entry
recorded_by	INT	FK to app_user, NOT NULL	Technician
verified_by	INT	FK to app_user, NULL; CHECK (verified_by <> recorded_by)	Quality Manager
verified_on	DATETIME	NULL	time of verification

maint_ticket

Column	Type	Key or constraint	Meaning
ticket_id	INT	PK	ticket identifier
instrument_id	INT	FK to instrument, NOT NULL	which instrument
ticket_type	ENUM	(PREVENTIVE, BREAKDOWN), NOT NULL	kind
raised_by	INT	FK to app_user, NOT NULL	who raised it
raised_on	DATETIME	NOT NULL	when
vendor_id	INT	FK to vendor, NULL	if serviced by a vendor
ticket_status	ENUM	(OPEN, IN_PROGRESS, CLOSED), DEFAULT OPEN	progress
closed_on	DATETIME	NULL, CHECK (closed_on >= raised_on)	closure time
remarks	TEXT	NULL	work done

audit_log

Column	Type	Key or constraint	Meaning
log_id	BIGINT	PK	entry identifier
user_id	INT	FK to app_user, NOT NULL	who changed it
table_name	VARCHAR(40)	NOT NULL	which table
record_id	INT	NOT NULL	which row
action	ENUM	(INSERT, UPDATE, DELETE), NOT NULL	what was done
changed_at	DATETIME	NOT NULL, DEFAULT CURRENT_TIMESTAMP	when
old_value	JSON	NULL	before
new_value	JSON	NULL	after

8.2 Integrity rules

- Entity integrity: every primary key NOT NULL and unique; asset_tag, username, email, role_name, type_name and location_name are alternate keys.
- Referential integrity: ON DELETE RESTRICT for instrument, vendor and user references, so history is never orphaned; users and instruments are deactivated or retired, not deleted.
- Value constraints: intervals greater than zero; next_due after performed_on; closed_on not before raised_on; verifier different from recorder.
- CHECK constraints are enforced by MySQL from release 8.0.16. Confirm the release you install.

8.3 Normalisation

All tables are in third normal form: every non-key column depends on the key, the whole key and nothing but the key. The due date and usable status of an instrument are derivable from its latest verified calibration, so they are not stored in instrument. They are produced by a view, which keeps the design in 3NF as section VII requires:

```
CREATE VIEW v_instrument_due AS
SELECT i.instrument_id, i.asset_tag, MAX(c.next_due) AS next_due
FROM instrument i LEFT JOIN calibration_event c
  ON c.instrument_id = i.instrument_id
  AND c.verified_by IS NOT NULL AND c.result IN ('PASS', 'ADJUSTED')
WHERE i.manual_status = 'IN_SERVICE'
GROUP BY i.instrument_id, i.asset_tag;
```

[In the final report, show the un-normalised form you started from and each step to 3NF.]

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9. Complete Structure

9.1 Modules

No.	Module	Description	Main screens
M1	Accounts and roles	login, logout, password change, user and role management, session timeout	login; user list; user form
M2	Masters	locations, instrument types with default intervals, vendors	three list and form pairs
M3	Instrument register	register, edit, search, mark out of service or retired, history view	register; search; instrument detail
M4	Calibration	record event, upload certificate, verify, compute next due	record form; verification queue
M5	Maintenance tickets	raise, assign vendor, update, close, ageing	ticket list; ticket form
M6	Alerts and lock-out	daily due list, e-mails, usable flag for every screen	dashboard; overdue list
M7	Reports	reports in 9.5, on screen and PDF	report menu
M8	Audit	write log on every change; read-only extract for Quality Manager	audit extract

Eight modules across four roles give an estimate of the effort involved, as item (ix) asks. [Adjust after your own analysis.]

9.2 Data structures

- Relational tables in section 8, accessed through Django ORM models (one model class per table).
- In the daily alert job: a dictionary keyed by user e-mail, each value a list of (asset tag, due date) tuples, so each user gets one combined e-mail.

- Report pages: query sets ordered by due date, paginated [] rows per page.

9.3 Process logic of key modules

M6, usable check (called by every screen that shows an instrument):

```
FUNCTION is_usable(instrument)
  IF instrument.manual_status IS NOT IN_SERVICE THEN RETURN FALSE
  last := latest calibration_event of instrument
  WHERE verified_by IS NOT NULL AND result IN (PASS, ADJUSTED)
  IF last IS NONE THEN RETURN FALSE
  RETURN today <= last.next_due
END FUNCTION
```

M4, next due date at entry:

```
interval := instrument.cal_interval_days IF SET ELSE
instrument.type.default_cal_days
next_due := performed_on + interval days
IF result = FAIL THEN next_due is not used for usability (instrument stays not
usable)
```

M6, daily alert job (scheduled at [time]):

```
FOR EACH instrument IN v_instrument_due WHERE next_due - today BETWEEN 0 AND [N]
  ADD (asset_tag, next_due) TO list of every Technician and the Quality Manager
FOR EACH user, list IN alerts: SEND one e-mail; WRITE audit_log entry
```

9.4 Implementation methodology

Incremental model with three increments, each analysed, built and tested before the next: (1) M1, M2, M3; (2) M4, M6, M8; (3) M5, M7. Each increment ends with a review by the guide and a demonstration to [laboratory contact]. Django migrations keep the database in step with the models; unit tests use Django's test framework; Git keeps the history.

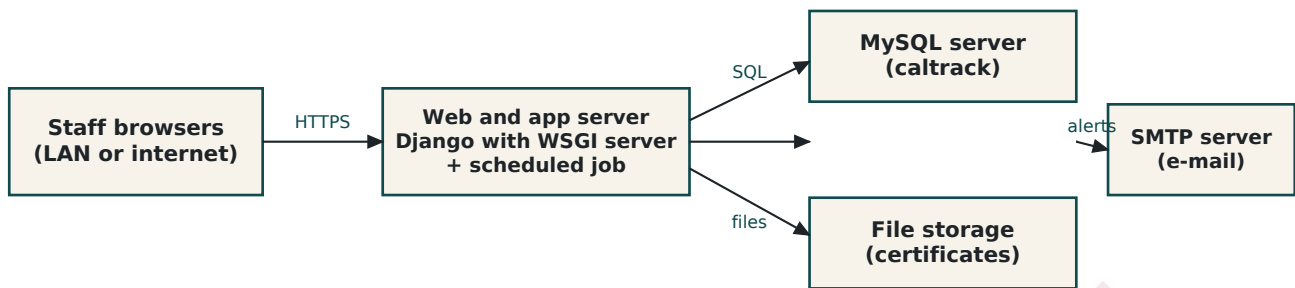
9.5 Reports likely to be generated

No.	Report	Who uses it
R1	Instruments due in the next [N] days, by location	Technicians, Section Heads
R2	Overdue and locked instruments	Quality Manager
R3	Calibration history of one instrument, with certificate numbers	Quality Manager, auditors
R4	Open tickets with ageing in days	Lab Admin
R5	Calibrations by vendor for a period	Lab Admin
R6	Audit extract for a period, by user or table	Quality Manager

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10. Overall Network Architecture



Three tiers: presentation in the browser, application logic on the Django server, data in MySQL and the certificate store. The database and file store are not reachable from outside the server. [Describe the actual deployment: in-house server or hosting, and who administers it.]

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11. Implementation of Security Mechanisms at Various Levels

Level	Mechanism
Application	Django authentication; passwords stored as salted hashes (Django default PBKDF2); role-based permissions per view; session timeout of [] minutes; CSRF protection on every form; server-side validation of every input.
Database	separate MySQL accounts with least privilege; the application account cannot UPDATE or DELETE audit_log; the reporting account can only SELECT from views; no remote root login.
Data	audit trail of every change; certificate files stored outside the web root and served only after a permission check; daily backup of database and files.
Transport and network	HTTPS for all pages; database port closed to the outside; firewall on the server.

Database privileges (section VII asks for GRANT and REVOKE and views):

```

CREATE USER 'app_rw'@'localhost' IDENTIFIED BY '[strong password]';
GRANT SELECT, INSERT, UPDATE ON caltrack.instrument TO 'app_rw'@'localhost';
GRANT SELECT, INSERT, UPDATE ON caltrack.calibration_event TO 'app_rw'@'localhost';
GRANT SELECT, INSERT ON caltrack.audit_log TO 'app_rw'@'localhost';
CREATE USER 'report_ro'@'localhost' IDENTIFIED BY '[strong password]';
GRANT SELECT ON caltrack.v_instrument_due TO 'report_ro'@'localhost';
REVOKE INSERT ON caltrack.audit_log FROM 'report_ro'@'localhost';
  
```

The last REVOKE is shown only to illustrate the command; report_ro never had that privilege. In your report, list the full GRANT script for every table.

12. Future Scope and Further Enhancement

- QR code labels on instruments so staff can open the record from a phone.
- SMS or messaging-app alerts in addition to e-mail.
- Integration with the laboratory information system so an overdue instrument cannot be selected for a test run.
- Temperature logging for refrigerators and incubators through sensors.
- Measurement uncertainty records attached to each calibration.
- Multi-branch support for laboratory chains.

13. Bibliography

APA style shown. Cite only what you read; add the sources from your literature review.

- ASTM International. (2018). ASTM E1578-18: Standard guide for laboratory informatics. West Conshohocken, PA: ASTM International.
- Albrecht, A. J., & Gaffney, J. E. (1983). Software function, source lines of code, and development effort prediction: A software science validation. *IEEE Transactions on Software Engineering*, SE-9(6), 639-648.
- Django Software Foundation. (n.d.). Django documentation. Retrieved [date], from <https://docs.djangoproject.com/>
- Elmasri, R., & Navathe, S. B. (2016). *Fundamentals of database systems* (7th ed.). Pearson.
- Indira Gandhi National Open University, School of Computer and Information Sciences. (2026). Project guidelines for Master of Computer Applications (MCA_NEW), MCSP-232, July 2026 and January 2027. New Delhi: IGNOU.
- International Function Point Users Group. (2010). *Function point counting practices manual* (Release 4.3.1). IFPUG.
- International Organization for Standardization. (2022). *ISO 15189:2022 Medical laboratories: Requirements for quality and competence*. Geneva: ISO.
- ISO/IEC/IEEE. (2018). *ISO/IEC/IEEE 29148:2018 Systems and software engineering: Life cycle processes: Requirements engineering*. Geneva: ISO.
- Oracle Corporation. (n.d.). *MySQL 8.0 reference manual*. Retrieved [date], from <https://dev.mysql.com/doc/refman/8.0/en/>
- Pressman, R. S., & Maxim, B. R. (2020). *Software engineering: A practitioner's approach* (9th ed.). McGraw-Hill Education.

World Health Organization. (2011). Laboratory quality management system: Handbook. Geneva: WHO.

[Add the sources from your own literature review.]

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