

NOTE:

This is a **real-world** Functional Requirements Document (**FRD**) prepared and executed at **EngTG** by **Alan Tajbakhsh (founder)**. It translates our BRD into testable functional behavior—covering requirements, flows, data, RBAC, and compliance—and served as the basis for the timezone-aware booking, packages/wallet, and live classroom releases now in production. I’m sharing it as a reference artifact for practitioners delivering similar platform initiatives.

Functional Requirements Document (FRD)

Project: EngTG Platform – MVP (Booking, Packages/Wallet, Live Classroom, Portals)

Document ID: FRD-ENGTG-MVP • **Version:** v0.1 • **Status:** Draft

Owner: [A. Tajbakhsh] • **Date:** [04-16-2023] • **Confidentiality:** Internal

1) Document Control

1.1 Revision History

Version	Date	Author	Changes
1.0	04-16-2023	A. Tajbakhsh	Initial FRD draft aligned to BRD

1.2 Approvals

Role	Name	Title	Date	Signature
Sponsor	[]			
Product Owner	[]			
BA Lead	[]			
Tech Lead	[]			
Compliance	[]			

1.3 Linked Docs / References

- **BRD:** EngTG Platform Evolution (Timezone-aware Booking, Packages/Wallet, Live Classroom, Role-based Portals)
- **Design/Wireframes:** [Figma link]
- **Policies/Regulations:** GDPR/UK GDPR/KVKK; PCI-DSS (payments)
- **API Docs:** Stripe/Iyzico, Email/SMS provider [SendGrid/Twilio/etc.]
- **Glossary:** UAT, NPS, RBAC, PII, SLA, RPO/RTO, AC (Acceptance Criteria)

2) Purpose & Alignment

This FRD specifies **how** the EngTG MVP will functionally deliver the BRD goals via:

- **Timezone-aware scheduling & booking** with slot hold and join windows
- **Packages & wallet** with ledger, receipts/invoices, refunds
- **Production-ready live classroom** (RTC, reconnect, translator, whiteboard, materials player; transcript optional/feature-flag)
- **Role-based portals** (Student, Teacher, Admin)
- **Notifications & calendar** (email/SMS reminders, ICS)
- **Core reporting** (funnel, utilization, revenue, quality)
- **Compliance & security** (GDPR/UK GDPR/KVKK, audit logs, role-based access)

BRD business outcomes (12-month):

ID	Outcome	Target
BIZ-001	Show-up rate (attendance)	+20% from baseline
BIZ-002	Trial → Paid conversion	+15 percentage points
BIZ-003	Teacher utilization	+10% hours filled
BIZ-004	Admin minutes/booking	-50%
BIZ-005	Refund rate	-25%
BIZ-006	NPS	≥ 55

Traceability Note: All **FR-IDs** below map to one or more **BIZ-IDs** in §16.

3) Scope

3.1 In Scope (MVP / Release 1)

- **Scheduling & Availability:** TZ-aware search; **15-min slot hold**; one-off booking; **join window -5/+10 min**; student cancellations per policy.
- **Packages & Wallet:** 10/20/30/50-class packages; balance & expiry [configurable]; **ledger**; email receipts/invoices.
- **Checkout & Payments:** Stripe / lyzico card payments; **idempotency**; refunds.
- **Live Classroom:** RTC room; auto-reconnect; word-click translator; shared whiteboard; materials player; **transcript optional** (feature flag).
- **Notifications & Calendar:** Email/SMS templates; reminders; ICS invites.
- **Portals:** Student, Teacher, Admin (RBAC).
- **Reporting (v1):** funnel, utilization, revenue, quality (core KPIs).
- **Compliance & Security:** GDPR/UK GDPR/KVKK alignment; RBAC; **audit logs**.

3.2 Future Scope (Release 2/3)

Recurring booking; homework bank & submissions; vocab SRS; GPT speaking practice v1; payouts & teacher earnings; helpdesk/ticketing; advanced reporting; availability exceptions/overrides.

3.3 Out of Scope (Now)

3rd-party teacher marketplace; group classes; native mobile apps; full LMS certification beyond current EngTG certificate.

4) Stakeholders & RACI (High Level)

Activity	Responsible	Accountable	Consulted	Informed
Requirements & FRD	BA	Product Owner	Tech Lead, Compliance	Execs
Solution Design	Tech Lead	CTO	BA, QA, Vendor(s)	Execs
UAT	QA Lead	Product Owner	BA, Teachers, Students	Execs
Go-Live	DevOps Lead	CTO	BA, Support, Finance	All

5) Users, Roles & Permissions

Personas

- **Student:** books classes, manages packages/wallet, attends classroom, receives reminders.
- **Teacher:** manages availability, teaches sessions, reviews attendance & class notes.
- **Admin:** config, refunds, policy, reports, user/package management.

RBAC Matrix (excerpt)

Capability	Student	Teacher	Admin
Search availability, book	✓	✗	✓
Manage packages/wallet	✓	✗	✓
Manage availability	✗	✓	✓
Enter classroom	✓	✓	✗
Refund / revert ledger	✗	✗	✓
Reporting dashboards	✗	View (own)	✓ (all)
User/Role management	✗	✗	✓
Audit log access	✗	✗	✓

6) Key Business Rules

ID	Rule
RULE-001	All displayed times are local to the viewer's timezone ; all persisted times in DB are UTC (IANA zones; DST-aware).
RULE-002	Slot hold = 15 min. Held slots are invisible to others; auto-release on timeout or failed payment.
RULE-003	Join window = -5/+10 min relative to scheduled start; outside this, join is blocked unless Admin override.
RULE-004	Student cancellation policy: [TBD – e.g., free $\geq$ 12h, charge $<$ 12h]. System must enforce and log reason.
RULE-005	Packages: 10/20/30/50 classes; expiry [configurable, e.g., 180 days from purchase/activation].
RULE-006	Wallet ledger is append-only with reversible entries via Admin refund/reversal records.
RULE-007	Payments are idempotent ; retries use the same Idempotency-Key to avoid double-charge.
RULE-008	Transcript is off by default ; can be enabled via feature flag per class/tenant.
RULE-009	Audit every state change in bookings, packages, ledger, and refunds (who, when, what).

7) Functional Requirements (by area)

7.1 Scheduling & Booking

- **FR-101 – Search Availability (TZ-Aware)**

Description: Students can search teacher slots by date/time; results converted from teacher timezone to viewer timezone.

Acceptance Criteria (Gherkin):

- **Given** a student with timezone “Europe/Istanbul” **When** they search for slots on [2025-11-10] **Then** the system shows available slots converted to Europe/Istanbul time.
- **Given** a teacher in “America/New_York” **When** DST changes **Then** slot conversions remain correct without overlaps/gaps.

- **FR-102 – Slot Hold (15 min)**

Description: On selecting a slot, system creates a **Held** record for 15 minutes.

AC:

- **Given** a slot selected **When** the student proceeds to checkout **Then** the slot is hidden from others for 15 minutes.
- **Given** payment fails or time elapses **When** 15 minutes pass **Then** the slot returns to **Open**.

- **FR-103 – One-off Booking & Double-Booking Prevention**

Description: Confirm booking post-payment, ensure teacher not double-booked.

AC:

- **Given** an unpaid hold **When** payment succeeds **Then** booking status becomes **Confirmed** and conflicts are re-checked atomically.
- **Given** a conflicting booking **When** a second payment attempt occurs **Then** system blocks with error “Slot unavailable; refund initiated if charged.”

- **FR-104 – Join Window (-5/+10)**

AC:

- **Given** class at 10:00 **When** student clicks **Join** at 09:56 **Then** access is allowed.
- **Given** class at 10:00 **When** join at 10:11 **Then** access is blocked unless Admin override flag is true.

- **FR-105 – Cancellations (per policy)**

AC:

- **Given** cancellation $\geq$ policy threshold **When** student cancels **Then** wallet is restored per rules and teacher is notified.
- **Given** late cancellation **When** student cancels **Then** wallet deduction remains (no refund) and reason is logged.

7.2 Packages, Wallet & Ledger

- **FR-201 – Purchase Packages (10/20/30/50)**

AC:

- **Given** product selection **When** payment succeeds **Then** wallet balance increases by package units; expiry set [config].
- Email **invoice/receipt** is sent with fiscal info.

- **FR-202 – Wallet Deduction on Booking**

AC:

- **Given** wallet $\geq$ 1 class **When** booking confirms **Then** deduct 1 class and create **LedgerEntry [DEBIT]**.

- **Given** booking canceled within free window **When** policy applies **Then** create **LedgerEntry [CREDIT]**.
- **FR-203 – Refunds**
AC:
 - **Given** Admin approves refund **When** processed **Then** payment gateway refund is executed and **LedgerEntry [REFUND]** recorded with audit trail.
- **FR-204 – Ledger & Statements**
AC:
 - Students can view a chronological ledger (debit/credit/refund) with amounts, reasons, and references; CSV export for Admin.

7.3 Checkout & Payments

- **FR-301 – Stripe/lyzico Integration**
AC:
 - **Given** checkout **When** creating a charge **Then** send **Idempotency-Key**; store gateway refs.
 - **Given** webhook event **When** received **Then** update payment state idempotently; do not duplicate ledger.
- **FR-302 – Error & Retry Handling**
AC:
 - Network timeouts are retried with exponential backoff; duplicate charges prevented via idempotency.

7.4 Live Classroom

- **FR-401 – RTC Session (Reconnect)**
AC:
 - **Given** a network drop **When** connection restores **Then** the client auto-reconnects within [N] seconds without losing the room.
- **FR-402 – Word-Click Translator**
AC:
 - Selecting a word shows translation overlay; no PII is logged beyond anonymized analytics.
- **FR-403 – Shared Whiteboard & Materials Player**
AC:
 - Teacher can upload/display docs/media; students view in real time; access tied to the live session.
- **FR-404 – Transcript (Feature Flag)**
AC:
 - When transcript flag is **ON** **Then** transcription is available per class; consent and storage retention rules apply.

7.5 Portals (Student / Teacher / Admin)

- **FR-501 – Student Portal:** dashboard (next classes, wallet, packages), booking flow, receipts, notifications.

- **FR-502 – Teacher Portal:** availability management, upcoming classes, attendance marking, notes.
- **FR-503 – Admin Portal:** user management, bookings oversight, refunds, policy configuration, dashboards, audit logs.

7.6 Notifications & Calendar

- **FR-601 – Email/SMS Reminders**
AC:
 - T-24h and T-1h reminders (configurable) with join link; failure fallback to alternate channel.
- **FR-602 – ICS Invites**
AC:
 - Calendar invites include correct timezone (IANA), updates on reschedule/cancel, and meeting URL.

7.7 Reporting (v1)

- **FR-701 – Funnel Dashboard:** demo booked %, attended %, demo→purchase %, time-to-first-class.
- **FR-702 – Utilization:** teacher hours available vs booked; peak/off-peak.
- **FR-703 – Revenue:** gross revenue, refunds %, chargebacks, outstanding balances.
- **FR-704 – Quality:** NPS, homework submission %, class rating, AI practice usage (where available).
AC: Each KPI includes definition, filter by timeframe, and export.

7.8 Compliance & Security

- **FR-801 – RBAC & Least Privilege; FR-802 – Audit Logging** (who/when/what before→after);
FR-803 – PII & Consent (GDPR/KVKK); **FR-804 – Data Subject Requests** (export/delete);
FR-805 – Payments PCI Scope isolation (no card data stored).

8) Data Model & Dictionary (excerpt)

Core Entities

Entity	Key Fields (Type)	Notes
User	user_id (UUID), email, phone, first_name, last_name, timezone (IANA), locale	Roles via UserRole
Role	role_id, name {Student, Teacher, Admin}	
UserRole	user_id, role_id	Many-to-many
TeacherProfile	teacher_id, bio, skills, hourly_capacity	
AvailabilitySlot	slot_id, teacher_id, start_utc (ts), end_utc (ts), status {Open,Held,Booked}	Stored in UTC
Booking	booking_id, student_id, teacher_id, start_utc, end_utc, status {Held,Confirmed,Canceled,Completed}, reason_code	
Package	package_id, user_id, type {10,20,30,50}, purchase_at, expiry_at, status	
Wallet	wallet_id, user_id, balance_units	Derived from ledger
LedgerEntry	ledger_id, wallet_id, type {DEBIT,CREDIT,REFUND,ADJUST}, amount_units, ref_type {Booking,Payment,Admin}, ref_id	Append-only
Payment	payment_id, user_id, gateway {Stripe,Iyzico},	

	amount, currency, status, idempotency_key, gateway ref. created at	
Refund	refund_id, payment_id, amount, reason, status, created_at	
Notification	notif_id, user_id, channel {Email,SMS}, template_id, send_at, status	
AuditLog	audit_id, actor_user_id, entity_type, entity_id, action, before_json, after_json, at	

Data Lifecycle: create → update → archive → delete; retention for transcripts [TBD]; logs retained [e.g., 12–24 months] per compliance.

9) Integrations & Interfaces

9.1 Inventory

ID	System	Direction	Purpose	Protocol	Auth	SLA
INT-STR	Stripe	Out/In	Charges, refunds, webhooks	REST + Webhooks	API key	99.9%
INT-IYZ	Iyzico	Out/In	Charges, refunds, webhooks	REST + Webhooks	API key	99.9%
INT-MAIL	Email provider	Out	Transaction al emails	REST/SMTP	API key	99.9%
INT-SMS	SMS provider	Out	Reminders	REST	API key	99.0%
INT-RTC	RTC provider	Out	Classroom rooms	REST	API key	99.9%

9.2 API Contracts (summary)

- **Payments:** create charge (idempotent), refund; webhook handlers must be idempotent.
- **Notifications:** templated send; rate limits; retries with DLQ.
- **RTC:** create/join room, token issuance, expiration.

10) Non-Functional Requirements (NFRs)

Area	Requirement
Performance	P95 booking search API $\leq$ 500 ms (cached), classroom join token $\leq$ 400 ms
Availability	99.9% monthly for booking & classroom join
Scalability	Support 500 concurrent sessions ; scale to 5k DAU
Security	OAuth2/JWT, RBAC; OWASP ASVS L2; TLS 1.2+; encryption at rest
Privacy/Compliance	GDPR/UK GDPR/KVKK: consent, minimization, DSRs (export/delete $\leq$ 30 days)
Reliability/DR	Backups daily; RPO $\leq$ 15 min, RTO $\leq$ 2 h
Observability	Structured logs, metrics, traces; dashboards & alerts for errors, latency, queue depth
Localization/Time	IANA timezones; DST-safe conversions; user locale formats
Maintainability	CI/CD, unit/integration tests; code coverage $\geq$ 70%
Supportability	Runbooks for payments, booking, and classroom incidents

11) UX & Content (Pointers)

- **As-Is / To-Be flows:** booking, payment, wallet, refund, join, cancel.
- **Screens:** Student (Home, Book, Wallet, Receipts), Teacher (Availability, Classes), Admin (Users, Bookings, Ledger, Reports).
- **States:** empty/loading/error/success.
- **Accessibility:** WCAG 2.1 AA; keyboard navigation, contrast.

12) Analytics & Events

KPIs mapped to events:

- **Funnel:** demo_booked, demo_attended, demo_purchased, first_class_time
- **Attendance:** class_started, class_no_show, class_canceled (reason)
- **Utilization:** slot_opened, slot_booked, slot_canceled
- **Finance:** payment_succeeded, payment_refunded, chargeback_received
- **Quality:** nps_submitted, rating_submitted, ai_practice_used

Event spec (example):

class_booked { booking_id, student_id, teacher_id, start_utc, source, package_type }

13) UAT Plan & Sign-Off (MVP)

Entry Criteria: Stable build; seeded test users/teachers; payment sandbox keys; notifications enabled in test.

Scenarios (sample):

- **UAT-01:** TZ-aware search across IST ↔ NYC with DST change.
- **UAT-02:** Slot hold, payment success, booking confirm; no double-booking.
- **UAT-03:** Late cancellation applies policy and ledger behavior.
- **UAT-04:** Classroom reconnect after network drop; translator and whiteboard work.
- **UAT-05:** Email/SMS reminders & ICS show correct local time.
- **UAT-06:** Refund flow updates payment and ledger; audit log present.
- **UAT-07:** Dashboards show KPIs with correct filters.

Exit Criteria: All **Must-have FRs pass**, critical defects = 0, compliance checks passed, PO sign-off.

Sign-Off

Role	Name	Date	Signature
Product Owner			
QA Lead			
Compliance			

14) Risks & Mitigations

ID	Risk	Impact	Likelihood	Mitigation
R-01	DST/timezone conversion errors	High	Med	Use IANA tzdb; test around DST boundaries; store UTC
R-02	Payment webhook duplication	Med	Med	Idempotent handlers; dedupe by event ID
R-03	Double-booking under concurrency	High	Low	DB transactional lock on teacher/time range
R-04	SMS deliverability	Med	Med	Fallback to email; provider status checks
R-05	Transcript privacy	Med	Low	Feature flag; explicit consent; retention config

15) Open Issues

ID	Issue	Owner	Due	Status
OI-01	Finalize cancellation policy thresholds	PO	[]	Open
OI-02	Package expiry default (days)	PO	[]	Open
OI-03	ICS organizer domain & branding	Marketing	[]	Open

16) Traceability Matrix (BRD ↔ FRD)

BRD Outcome (BIZ-ID)	FR-IDs
BIZ-001 Attendance +20%	FR-101/102/104/601/602/401
BIZ-002 Trial→Paid +15pp	FR-101/201/301/701
BIZ-003 Utilization +10%	FR-101/102/702
BIZ-004 Admin minutes -50%	FR-201/202/203/503/704
BIZ-005 Refund rate -25%	FR-203/204/703
BIZ-006 NPS ≥55	FR-401/404/704 + notifications/UX accessibility

17) Appendices

- **A. Email/SMS Templates:** booking confirm, reminders, cancel/reschedule, receipt, refund.
- **B. Error Codes & Messages:** booking_conflict, payment_failed, window_closed, policy_blocked.
- **C. Config Flags:** transcript_enabled, reminder_offsets, cancellation_policy, package_expiry_days.
- **D. Operational Runbooks:** payment webhooks, slot reconciliation, refund exception handling.