ITIExaminationSystem DB Documentation

DB Creation & Tables Documentation

Note:- [IsActive] columns is a method of Soft Deletion, we don't physically delete our data, we deactivate them

Department

Columns: DeptID (PK), DeptName, IsActive

Description: Stores ITI departments.

Track

Columns: TrackID (PK), TrackName, Dept_ID (FK), TotalHours, Description, IsActive

Description: Holds training tracks under each department.

Branch

Columns: BranchID (PK), BranchName, IsActive, Manager_UID (FK)

Description: Represents ITI branches and their only one Training Manager for all branches, as shown in the requirements sheet.

Class

Columns: Branch_ID (FK), Class_Number (PK)

Description: Defines classes within each branch as a week entity to branch table.

Intake

Columns: IntakeID (PK), IntakeName, StartDate, EndDate, IsActive

Description: Stores student intakes.

Open

Columns: Track_ID (FK), Intake_ID (FK), Branch_ID (FK) (PK composite)

Description: Links tracks, intakes, and branches.

Role

Columns: RoleID (PK), RoleName

Description: We used 1 user table to define all ITI Users(Students, Instructors, Admins, and 1 Training Manager), Role Table defines the 4 available roles in ITI

User

Columns: UserID (PK), Role_ID (FK), Name, Address, Email, Password, Phone, DOB, Branch_ID (FK), Dept_ID (FK), Track_ID (FK), Intake_ID (FK), IsActive

Description: Stores all system users.

Course

Columns: CourseID (PK), CourseName, Description, MaxDegree, MinDegree

Description: Contains all courses offered in ITI.

Track_Course

Columns: Track_ID (FK), Course_ID (FK) (PK composite)

Description: Links tracks with their courses.

Exam

Columns: ExamID (PK), Course_ID (FK), Start_Time, End_Time, Date, Score, ExamType, Branch_ID (FK), Track_ID (FK), User_ID (FK)

Description: Stores exam details for courses, ExamType shows if the exam is corrective or normal, and UserID refers to the Instructor that was assigned to prepare the exam, In conclusion, It shows an exam prepared by an instructor, assigned to students in which Branch and Track.

UserTakes

Columns: User_ID (FK), Course_ID (FK) (PK composite)

Description: Enrolls Students to courses.

Teach

Columns: User_ID (FK), Course_ID (FK), Branch_ID (FK), Track_ID (FK) (PK composite)

Description: Assigns instructors to courses per branch and track.

QuestionPool

Columns: QPID (PK), Course_ID (FK), Type, Description

Description: Stores a question bank for all courses.

Answer_MCQ

Columns: QP_ID (FK), OptionID (1–4), Option, IS_Correct (PK composite)

Description: Stores multiple-choice answers for MCQ & TrueFalse questions, knowing that MCQ questions take 4 rows (1 for each possible option) while TrueFalse questions take only 2 rows (True or False).

Choose

Columns: Exam_ID (FK), QP_ID (FK), Degree (PK composite)

Description: Defines which questions and their related degrees assigned by instructor are chosen for an exam.

StudentAnswer

Columns: User_ID (FK), Exam_ID (FK), QP_ID (FK), Student_Answer, QScore (PK composite)

Description: Stores students' submitted answers and scores per question.

StudentExamResult

Columns: User_ID (FK), Exam_ID (FK), TotalScore, IsPass, CalculatedAT, (PK composite)

Description: Stores the final exam result of each student in each exam, including score, pass status, and calculation timestamp.

Answer_Text

Columns: QP_ID (FK, PK), Answer

Description: Stores correct answers for text-based questions.

Index Documentation

These indexes are created to improve query performance, enforce uniqueness, and optimize lookups for frequently accessed columns.

User Table

UX_OnlyOneManager (Unique, Filtered) → Ensures only one active manager (Role_ID = 4, IsActive = 1).

IX_RoleID → Speeds up queries filtering by role.

IX_UserName → Speeds up lookups/search by user name.

IX_UserEmail (Unique) → Ensures each user has a unique email.

IX_UserPhone (Unique) → Ensures each user has a unique phone number.

IX_UserBranch → Optimizes queries filtering by branch.

IX_UserDept → Optimizes queries filtering by department.

IX_UserTrack → Optimizes queries filtering by track.

IX_UserStatus → Speeds up filtering by active/inactive users.

Class Table

IX_Class_Branch → Optimizes lookups of classes by branch.

IX_Branch_ClassNumber → Speeds up queries filtering by branch and class number.

Intake Table

IX_IntakeName (Unique) → Ensures intake names are unique.

IX_ActiveIntakes → Speeds up queries filtering active intakes.

Open Table

IX_Open_Track → Speeds up queries filtering by track.

IX_Open_Branch → Speeds up queries filtering by branch.

IX_Open_Intake → Speeds up queries filtering by intake.

Course Table

IX_CourseName (Unique) → Ensures unique course names.

Exam Table

IX_ExamCourse → Optimizes queries filtering exams by course.

IX_ExamDate → Speeds up lookups of exams by date.

IX_ExamType → Speeds up filtering by exam type.

IX_Exam_UID → Optimizes lookups by exam creator (User_ID).

IX_Exam_BranchID → Speeds up queries filtering exams by branch.

Track_Course Table

IX_TC → Optimizes queries filtering by track.

IX_TC_Course → Optimizes queries filtering by course.

UserTakes Table

IX_UserTakes_User → Speeds up queries filtering by user.

IX_UserTakes_Course → Speeds up queries filtering by course.

Teach Table

IX_Teach_User → Optimizes queries filtering by user (instructor).

IX_Teach_Course → Optimizes queries filtering by course.

IX_Teach_Branch → Speeds up queries filtering by branch.

IX_Teach_Track → Speeds up queries filtering by track.

QuestionPool Table

IX_QP_Course → Optimizes queries filtering questions by course.

IX_QP_Type → Optimizes queries filtering by question type.

IX_QP_Course_Type → Combined index for course + type filters.

Answer_MCQ Table

IX_AnsMCQ_QP → Optimizes queries filtering answers by question pool.

IX_IsCorrect → Speeds up queries filtering correct/incorrect answers.

Choose Table

IX_Choose_Exam → Speeds up queries filtering by exam.

IX_Choose_QP → Optimizes lookups by question pool.

StudentAnswer Table

IX_StudentAnswer_User → Speeds up queries filtering by student.

IX_StudentAnswer_Exam → Optimizes queries filtering by exam.

IX_StudentAnswer_QP → Optimizes queries filtering by question pool.

Triggers Documentation

User & Role Triggers

NonInstructorasManager → Prevents students/admins from being set as branch managers.

trg_AuditUserChanges → Logs changes to users (role, dept, track, email).

trg_Branch_ManagerRoleOnly → Ensures `Branch.Manager_UID` points only to users with the Manager role.

DeletePrevention → Blocks user deletion if linked to courses/exams.

Exam Management Triggers

trg_Exam_NoOverlap → Prevents two exams of the same course/branch from overlapping.

trg_Exam_LockAfterStart → No updates/deletes allowed after an exam starts.

trg_Choose_TotalDegreeWithinMax → Ensures total question degrees in exam ≤ course MaxDegree.

trg_Choose_LockAfterExamStart → Prevents editing chosen questions after exam starts.

trg_ExamAttemptLog → Logs every exam submission attempt.

Student Answer Validation Triggers

trg_StudentAnswer_WithinExamWindow → Answers only allowed during the exam window.

trg_AnswerText_OnlyForText → Text answers valid only for text-type questions.

trg_AnswerMCQ_OnlyForMCQorTF → MCQ/TF options only valid for those question types.

trg_AnswerMCQ_ValidateTF → Enforces TF answers as:
```
OptionID=1 → True.
OptionID=2 → False.
```

Stored Procedures Documentation

User Management SPs

AddStudent → Adds a new student with Track_ID, Branch_ID, and default (Latest) Intake_ID.

AddInstructor → Adds a new instructor with Dept_ID and Branch_ID.

AddAdmin → Adds a new admin to a branch.

Change_TM_From_Instructors → Promotes an existing instructor to Training Manager (deactivates the old one).

Change_TM_New → Creates a new Training Manager user and updates all branches with this manager.

RemoveUser → Deactivates a user (IsActive=0). Prevents removing the active Training Manager and asks user to use one of the TM SPs.

StudentToInstructor → Converts an existing student into an instructor (copies details, assigns Dept_ID, deactivates student record (Soft Deletion)).

Department Management SPs

AddDept → Creates a new department.

RemoveDept → Deactivates a department; shows instructors & tracks that need reassignment.

Track Management SPs

AddTrack → Adds a new track with name, dept, total hours, description.

RemoveTrack → Deactivates a track & shows last students in that track if an intake is still active at the point of deactivating the track.

Branch Management

Open_New_Branch → Adds a new branch with current active Training Manager as manager.

RemoveBranch → Deactivates a branch (only if no active intake running); and deletes its classes.

Intake Management

NewIntake → Creates a new intake (validates start/end date).

StopIntake → Stops an intake & deactivates all its Students, after checking CurrentDate > EndDate for that intake.

NewOpenning → Opens a track in a branch for a given intake.

Course Management

AddCourse → Creates a new course.

AddTrackCourse → Links a course to a track.

RemoveTrackCourse → Removes a course from a track & shows remaining ones.

AddUserTakes → Enrolls a student in a course.

RemoveUserTakes → Unenrolls a student from a course & shows remaining ones.

Question Management

AddQuestionUnified → Adds a question (MCQ, TrueFalse, Text) with validation + answers.

RemoveQuestionUnified → Deletes a question and its related answers.

Exam Management

AssignInstructorCourse → Assigns instructor to a course in a branch & track.

CreateExam → Creates an exam (validates time + instructor assignment).

AddQuestionToExam → Manually links a question and its assigned degree to an exam.

PopulateExamChooseAuto → Auto-selects random questions for an exam, distributes questions' scores fairly.

StudentAnswer → Records a student's answer, checks correctness (MCQ/TF), assigns score to a single question.

Views Documentation

Exam Management Views

exam_schedule_view → Shows exam schedule with course, branch, track, and instructor details.

exam_results_summary_view → Summarizes exam results with total students, pass/fail counts, and pass percentage.

instructor_exam_view → Lists exams created by instructors with student counts and average score.

Course & Question Views

course_list_view → Displays all courses with description, min/max degree, and associated track.

instructor_courses_view → Shows courses assigned to each instructor by branch and track.

question_pool_view → Lists all questions linked to their respective courses.

Student Views

student_info_view → Retrieves student details including branch, department, track, and intake.

student_transcript_view → Displays student transcript with courses, exams, scores, and pass/fail status.

student_exam_detail_view → Provides detailed breakdown of student answers, question scores, and results.

User Permissions

Student Role (app_student)

- course_list_view → View list of available courses.
- exam_schedule_view → See exam timetable.
- exam_results_summary_view → Check exam results summary.
- student_transcript_view → Access personal transcript (scores & pass/fail).
- student_exam_detail_view → Review exam answers and scores.
- StudentAnswer_PROCEDURE → Submit answers during an exam.

Instructor Role (app_instructor)

- course_list_view → Browse course catalog.
- exam_schedule_view → View scheduled exams.
- exam_results_summary_view → Review exam performance.
- instructor_courses_view → List courses taught by instructor.
- instructor_exam_view → Show instructor's exams with stats.
- question_pool_view → Access and manage question bank.
- CreateExam → Create new exam for assigned course.
- AddQuestionToExam → Attach question to an exam.
- AddQuestionUnified → Add new question to pool.
- RemoveQuestionUnified → Remove a question from pool.
- AddUserTakes → Enroll a student in a course.
- RemoveUserTakes → Unenroll a student from a course.
- populateexamchooseauto → Auto-generate exam questions.

Admin Role (app_admin)

- course_list_view → View all courses.
- exam_schedule_view → Access all exam schedules.
- exam_results_summary_view → Review exam summaries.
- student_transcript_view → See student transcripts.
- student_exam_detail_view → Inspect exam details.
- instructor_courses_view → Check instructor course assignments.
- instructor_exam_view → Review instructor exam stats.
- question_pool_view → Access course question banks.
- student_info_view → Get student profiles.
- AddStudent → Register a new student.
- AddInstructor → Register a new instructor.
- AddAdmin → Create new admin account.
- RemoveUser → Deactivate a user.
- StudentToInstructor → Convert a student into an instructor.
- Change_TM_From_Instructors → Promote instructor to Training Manager.
- Change_TM_New → Create a new Training Manager.
- AddUserTakes → Enroll student in course.
- RemoveUserTakes → Unenroll student.
- AddCourse → Create a new course.
- AssignInstructorCourse → Assign instructor to course.
- ProcessFinishedExamsAndArchive → Archive completed exams.

Training Manager Role (app_tm)

- course_list_view → View course catalog.
- exam_schedule_view → Full exam schedule access.
- exam_results_summary_view → Review result statistics.
- student_transcript_view → Access student transcripts.
- student_exam_detail_view → Inspect exam details.
- instructor_courses_view → List instructor course assignments.
- instructor_exam_view → Review instructor exam summaries.
- question_pool_view → Manage question pool.
- student_info_view → Access student profiles.
- AddUserTakes → Enroll student in course.
- RemoveUserTakes → Unenroll student.
- AddCourse → Create course.
- AddTrackCourse → Link track to course.
- RemoveTrackCourse → Unlink track from course.
- AssignInstructorCourse → Assign instructor to course.
- AddDept → Add new department.
- RemoveDept → Deactivate department.
- AddTrack → Create new track.
- RemoveTrack → Deactivate track.
- Open_New_Branch → Create new branch.
- RemoveBranch → Remove branch (no active intake).
- NewIntake → Create new intake.
- StopIntake → Stop running intake.
- NewOpenning → Open track in branch/intake.
- RemoveUser → Deactivate user.
- StudentToInstructor → Convert student to instructor.
- populateexamchooseauto → Auto-generate exam questions.
- ProcessFinishedExamsAndArchive → Archive completed exams.