

SQL Feature Summary

Student Management System - Group 63

Stored Procedures (48 Total)

sp_RegisterStudentForCourse: Enrolls students with prerequisite validation, hold checking, and capacity management in atomic transaction

sp_GetDepartmentHierarchy: Displays department organization using recursive CTE with indentation and hierarchy paths

sp_CoursePrerequisite_Add/Remove: Manages course prerequisites with circular dependency detection

sp_Student_* (9 procedures): CRUD operations, search, GPA calculation, transcript generation for student management

sp_Course_* (9 procedures): Course catalog management, prerequisite checking, department-based filtering

sp_Enrollment_* (11 procedures): Enrollment CRUD, grade updates, failing student reports, course offering management

sp_Department_* (6 procedures): Department management with active/inactive status filtering

sp_Semester_* (6 procedures): Semester operations including current semester retrieval and recent semester queries

sp_StudentHold_* (7 procedures): Student hold management for financial, academic, disciplinary, and administrative holds

User-Defined Functions (3 Total)

fn_CalculateGPA: Scalar function computing student GPA from completed courses with grade point mapping (A=4.0 to F=0.0)

fn_CheckPrerequisitesMet: Scalar function validating if student has passed all prerequisite courses for enrollment eligibility

fn_GetStudentTranscript: Table-valued function returning complete academic transcript with courses, grades, credits, and semesters

Triggers (2 Total)

trg_After_GradeUpdate (AFTER UPDATE): Automatically logs grade changes to Audit_GradeChanges table with old/new grades and timestamp

trg_InsteadOf_DeleteStudent (INSTEAD OF DELETE): Implements soft delete by setting EnrollmentStatus to 'Inactive' instead of removing student record

Views (3 Total)

vw_CourseCatalog: Displays complete course catalog with department information for active departments only

vw_AvailableCourseOfferings: Shows course offerings with available seats (CurrentEnrollment < MaxCapacity) for registration

vw_StudentTranscript: Joins students, enrollments, offerings, courses, and semesters to generate formatted transcripts

Indexes (10 Total)

Filtered Indexes:

- **IX_Students_Active:** Filtered index on Students WHERE EnrollmentStatus = 'Active' for fast active student queries
- **IX_Enrollments_FailedCourses:** Filtered index on Enrollments WHERE Grade = 'F' for failing student reports

- **IX_StudentHolds_Student_IsActive:** Filtered composite index on (StudentID, IsActive) WHERE IsActive = 1 for hold validation

Unique Indexes:

- **UQ_Semesters_Year_Season:** Ensures unique semester combinations preventing duplicate Fall 2024 entries
- **UQ_CourseOfferings_Course_Semester:** Prevents duplicate course offerings in same semester (one CS101 per Fall 2024)
- **UQ_Enrollments_Student_Offering:** Prevents students from enrolling twice in same course offering

Standard Indexes:

- **IX_Enrollments_StudentID:** Optimizes student enrollment history queries
- **IX_Enrollments_OfferingID:** Speeds up course roster retrieval
- **IX_Courses_DepartmentID:** Accelerates department course catalog queries
- **IX_CourseOfferings_Available:** Filtered index for courses with available capacity

Table Partitioning (2 Partitioned Tables)

Enrollments Table: Partitioned by EnrollmentDate (yearly 2022-2026) on PS_EnrollmentsByDate scheme for efficient historical data queries

Audit_GradeChanges Table: Partitioned by EnrollmentDate (yearly 2022-2026) on PS_AuditByDate scheme with composite PK including partition column

Common Table Expressions (CTEs)

Recursive CTE in sp_GetDepartmentHierarchy: Traverses department tree structure with MAXRECURSION 100, building indented names and hierarchy paths for organizational visualization

Total SQL Features: 66 (Stored Procedures: 48, Functions: 3, Triggers: 2, Views: 3, Indexes: 10)