

# 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)*