**PHASE 3**

**TITLE : ACADEMIC RECORDS MANAGEMENT SYSTEM-Peakocks\_wed**

**LOGICAL DATA MODEL DOCUMENTATION**

1. INTRODUCTION This logical data model represents the complete database structure for the Academic Records Management System, designed to address the challenges of managing academic records efficiently in educational institutions.
2. MODEL OVERVIEW The model consists of seven interconnected entities that form a comprehensive system for managing academic records:

* Four core entities (Students, Courses, Instructors, Terms)
* Three junction entities (Enrollments, Course\_Instructors, Grades)

1. ENTITY DESCRIPTIONS AND CONSTRAINTS

**A. Primary Entities**

**STUDENTS**

* Primary Purpose: Maintains comprehensive student records
* Primary Key: student\_id (auto-incrementing integer)
* Key Attributes:
  + first\_name, last\_name (NOT NULL): Legal identification
  + email (UNIQUE, NOT NULL): Official communication channel
  + major: Current field of study
  + admission\_date (NOT NULL): Official entry date
* Business Rules:
  + Each student must have a unique email address

**COURSES**

* Primary Purpose: Catalogs all available academic courses
* Primary Key: course\_id (auto-incrementing integer)
* Key Attributes:
  + course\_code (UNIQUE, NOT NULL): Official course identifier
  + title (NOT NULL): Course name
  + credit\_hours (NOT NULL): Academic credits
  + department (NOT NULL): Responsible department
  + prerequisite\_id (FK): Self-referential link to prerequisites
* Business Rules:
  + Course codes must follow institutional format

**INSTRUCTORS**

* Primary Purpose: Records faculty and teaching staff information
* Primary Key: instructor\_id (auto-incrementing integer)
* Key Attributes:
  + first\_name, last\_name (NOT NULL): Legal identification
  + email (UNIQUE, NOT NULL): Official contact
  + department (NOT NULL): Academic department
* Business Rules:
  + Each instructor must have unique institutional email

TERMS

* Primary Purpose: Defines academic periods
* Primary Key: term\_id (auto-incrementing integer)
* Key Attributes:
  + term\_name (NOT NULL): Academic period identifier
  + start\_date, end\_date (NOT NULL): Term duration
  + academic\_year (NOT NULL): Year classification
* Business Rules:
  + End date must be after start date

**ENROLLMENTS**

* Primary Purpose: Manages student course registrations
* Primary Key: enrollment\_id (auto-incrementing integer)
* Foreign Keys:
  + student\_id (References STUDENTS)
  + course\_id (References COURSES)
  + term\_id (References TERMS)
* Key Attributes:
  + enrollment\_date (NOT NULL): Registration date
  + status (NOT NULL): Current enrollment status
* Business Rules:
  + No duplicate enrollments for same student/course/term
  + Status must be one of predefined values
  + Enrollment date must be within term dates

**COURSE\_INSTRUCTORS**

* Primary Purpose: Associates instructors with courses per term
* Primary Key: course\_instructor\_id (auto-incrementing integer)
* Foreign Keys:
  + course\_id (References COURSES)
  + instructor\_id (References INSTRUCTORS)
  + term\_id (References TERMS)
* Business Rules:
  + No duplicate assignments for same course/instructor/term
  + Assignment dates must align with term dates

**GRADES**

* Primary Purpose: Records academic performance
* Primary Key: grade\_id (auto-incrementing integer)
* Foreign Keys:
  + enrollment\_id (References ENROLLMENTS)
  + graded\_by (References INSTRUCTORS)
* Key Attributes:
  + numeric\_grade: Numerical score
  + letter\_grade (NOT NULL): Letter grade equivalent
* Business Rules:
  + One grade record per enrollment

1. **RELATIONSHIP CONSTRAINTS**

A. Referential Integrity

* All foreign keys must reference existing primary keys
* Cascading updates for key modifications

B. Business Rules

* Term-based constraints ensure proper scheduling
* Prerequisite checking for course enrollment
* Grade entry validation against grading scale
* Enrollment status transitions

1. DATA INTEGRITY FEATURES

A. System-wide Controls

* Automatic timestamp tracking
* User action auditing

B. Security Measures

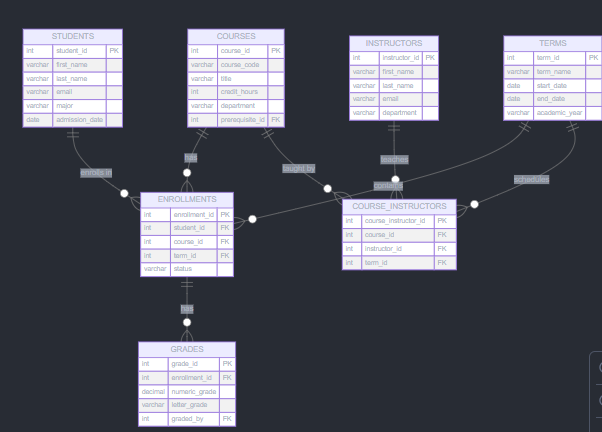
* Role-based access control
* Data encryption for sensitive information

1. **SCALABILITY CONSIDERATIONS**

* Optimized for high transaction volume
* Supports multiple academic terms

1. **PERFORMANCE OPTIMIZATION**

* Indexed key fields
* Optimized query paths

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