GraduRank Enterprise

Mission Statement:

To provide prospective students with rankings and details of various UMD Smith programs for enabling them to make informed decisions about their preferred graduate program.

Mission Objectives:

- Identify the top programs with consistently excellent overall rankings across the years based on different websites like US News.
- Analyze which program(s) students can get into based on their GRE/TOEFL/IELTS score.
- Guide students about the faculty and their areas of research, in case they wish to pursue research professionally.
- Provide aspiring graduate students with targeted ranking information based on factors such as employability, diversity, research, etc.
- Educate students about the availability of the subjects of interest according to semester, faculty, number of credits, etc.
- Familiarize students with opportunities for internships and/or industry practicum projects for each program.

Business Description:

- Each graduate program is identified by a unique program ID and is described by name of the program, duration, intake (which can be Fall, Spring or both Fall and Spring), credits and details of the program advisor.
- The acceptance score is not independent of the graduate program. Therefore, the acceptance score requirement for each entrance exam is identified by a combination of the type of score and the program ID.
- Each program will require at least one type of competitive score and the cutoff score for exams can vary from program to program.
- Each graduate program offers multiple courses and the credits of the course vary according to the program it is offered in.
- Courses are differentiated based on their course IDs and described further based on the course name, type of course and which semester it is offered in. Each course is offered at least once either as a core or an elective.
- Every course has an associated faculty member and the course could either be taught online or offline.
- Faculty members can teach multiple courses and each course can have multiple faculty members.
- Faculty members are described by their name (recorded as first and last name), their research areas (which can be none or multiple areas simultaneously), years of experience and their contact details.
- Graduate programs have multiple ranking factors on various levels (such as State, National, Overall), which are identified with the help of a rank ID. The factors can be

diversity, employability, research, learning experience or overall and the source of this information over multiple years can be accessed.

- The database should contain only Smith Grad Program rankings.There may not be ranking data available for new programs.

Entities, Attributes and Primary Key:

1. GradProgram (**prgId**, prgName, prgDuration, prgIntake, totalCredits, feePerCredits, industryPracticum, prgAdvisorName, prgAdvisorContact, prgType)
2. Course (**courseId**, courseName, semester, courseType)
3. Faculty (**facId**, facName (-facFirstName, -facLastName), facResearchArea, facExpYrs, facContact)
4. Ranking (**rankId**, rankWebName, rankYear, rankLevel, rankOverall, rankDiversity, rankEmployability, rankResearch, rankLearningExp)
5. AcceptanceScore (**scoreType,** cutOffScore)

Relationships, Attributes, Degrees, Participating Entities and Constraints:

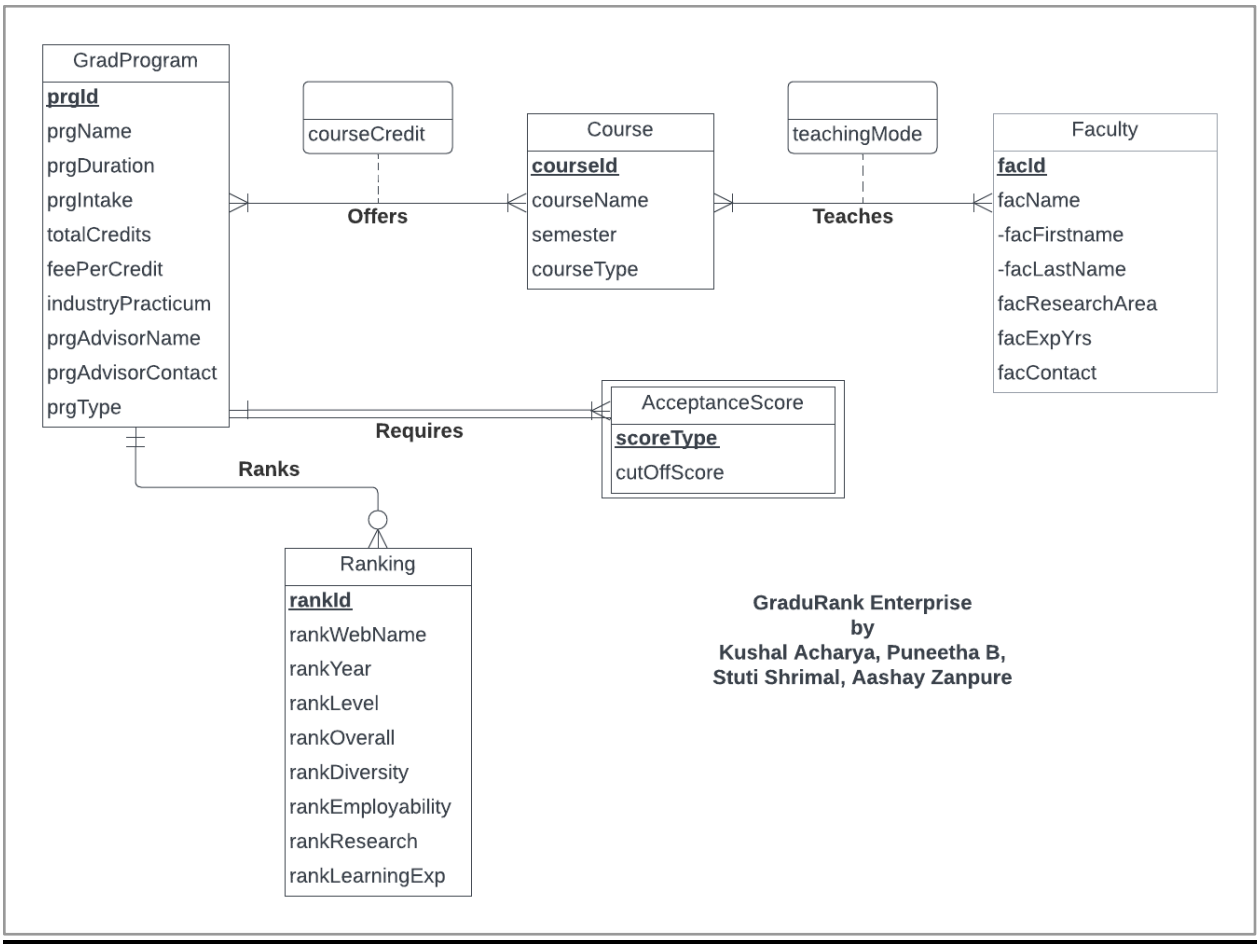
Offers (courseCredit) : binary relationship
- 1 GradProgram to 1 or more Course
- 1 Course to 1 or more GradProgram

Requires (cutOffScore) : binary relationship
- 1 GradProgram to 1 or more AcceptanceScore
- 1 AcceptanceScore to 1 GradProgram

Teaches (teachingMode) : binary relationship
- 1 Course to 1 or more Faculty
- 1 Faculty to 1 or more Course

Ranks : binary relationship
- 1 GradProgram to 1 or more Ranking
- 1 Ranking to 1 GradProgram

ER Diagram:



Relational Schema:

1. GradProgram (**prgId**, prgName, prgDuration, prgIntake, totalCredits, feePerCredits, industryPracticum, prgAdvisorName, prgAdvisorContact, prgType)
2. Course (**courseId**, courseName, semester, courseType)
3. Faculty (**facId**, facFirstName, facLastName, facResearchArea, facExpYrs, facContact)
4. Ranking (**rankId**, rankWebName, rankYear, rankLevel, rankOverall, rankDiversity, rankEmployability, rankResearch, rankLearningExp, *prgId*)
5. AcceptanceScore (***prgId***, **scoreType**, cutOffScore)
6. Offers (***prgId***, ***courseId***, courseCredit)
7. Teaches (***courseId***, ***facId***, teachingMode)

Functional Dependencies and Normalization to 3NF:

For the GradProgram table, prgId → prgName, prgDuration, prgIntake, totalCredits,

feePerCredit, industryPracticum, prgAdvisorName, prgAdvisorContact, prgType.

For the Course table, courseId → courseName, semester, courseType.

For the Faculty table, facId → facFirstName, facLastName, facResearchArea, facExpYrs,

facContact.

For the AcceptanceScore table, the composite key (prgId, scoreType) → cutOffScore.

For the Ranking table, rankId → prgId, rankWebName, rankYear, rankLevel, rankOverall,

rankDiversity,
rankEmployability, rankResearch, rankLearningExp.

For the Offers table, the composite key (prgId, courseId) → courseCredit.

For the Teaches table, the composite key (courseId, facId) → teachingMode

Every non-key attribute is fully functionally dependent on the primary key, and there are no transitive dependencies. Hence all the tables are in 3NF.

Business Rules:

[R1] When an entire grad program is discarded from the university, the corresponding ranking information should also be deleted from the database
[R2] When the information of a grad program is updated in the database, the corresponding ranking information should also be updated in the database
[R3] When an entire grad program is deleted from the database, the information regarding the acceptance scores for the program should also be deleted from the database
[R4] When the information of a grad program is updated in the database, the corresponding information for the acceptance exam scores must also be updated
[R5] When a course is being offered by a grad program in the midst of a semester, it cannot be deleted from the database
[R6] When a course is being offered by a grad program in the midst of a semester, it cannot be updated in the database
[R7] When a course is being taught by a faculty member in the midst of a semester, it cannot be deleted from the database
[R8] When a course is being taught by a faculty member in the midst of a semester, it cannot be updated from the database

Referential Integrity:

Relation	Foreign Key	Base Relation	Primary Key	Business Rule	Constraint: ON DELETE	Business Rule	Constraint: ON UPDATE
Ranking	prgId	GradProgram	prgId	R1	CASCADE	R2	CASCADE
Acceptance Score	prgId	GradProgram	prgId	R3	CASCADE	R4	CASCADE
Offers	prgId	GradProgram	prgId	R5	NO ACTION	R6	NO ACTION
Offers	courseId	Course	courseId	R5	NO ACTION	R6	NO ACTION
Teaches	courseId	Course	courseId	R7	NO ACTION	R8	NO ACTION
Teaches	facId	Faculty	facId	R7	NO ACTION	R8	NO ACTION

Sample Data:

GradProgram: ('GP001', ‘Information Systems’, 24, 'Fall', 30, 2100, True, 'Dr. Smith', '1234567890', 'MS')
Course: ('C101', 'Data Science with Python', '1', 'Core')
Faculty: ('F001', 'John', 'Doe', ‘Data Science’, 10, 'john.doe@umd.edu')
AcceptanceScore: ('GP001', 'GRE', 320)
Ranking: ('R001', 'US News', '2023', 'State', 5, 4, 4, 5, 5, 'GP001')
Offers: ('GP001', 'C101', 3)
Teaches: ('C101', 'F001', 'Classroom')