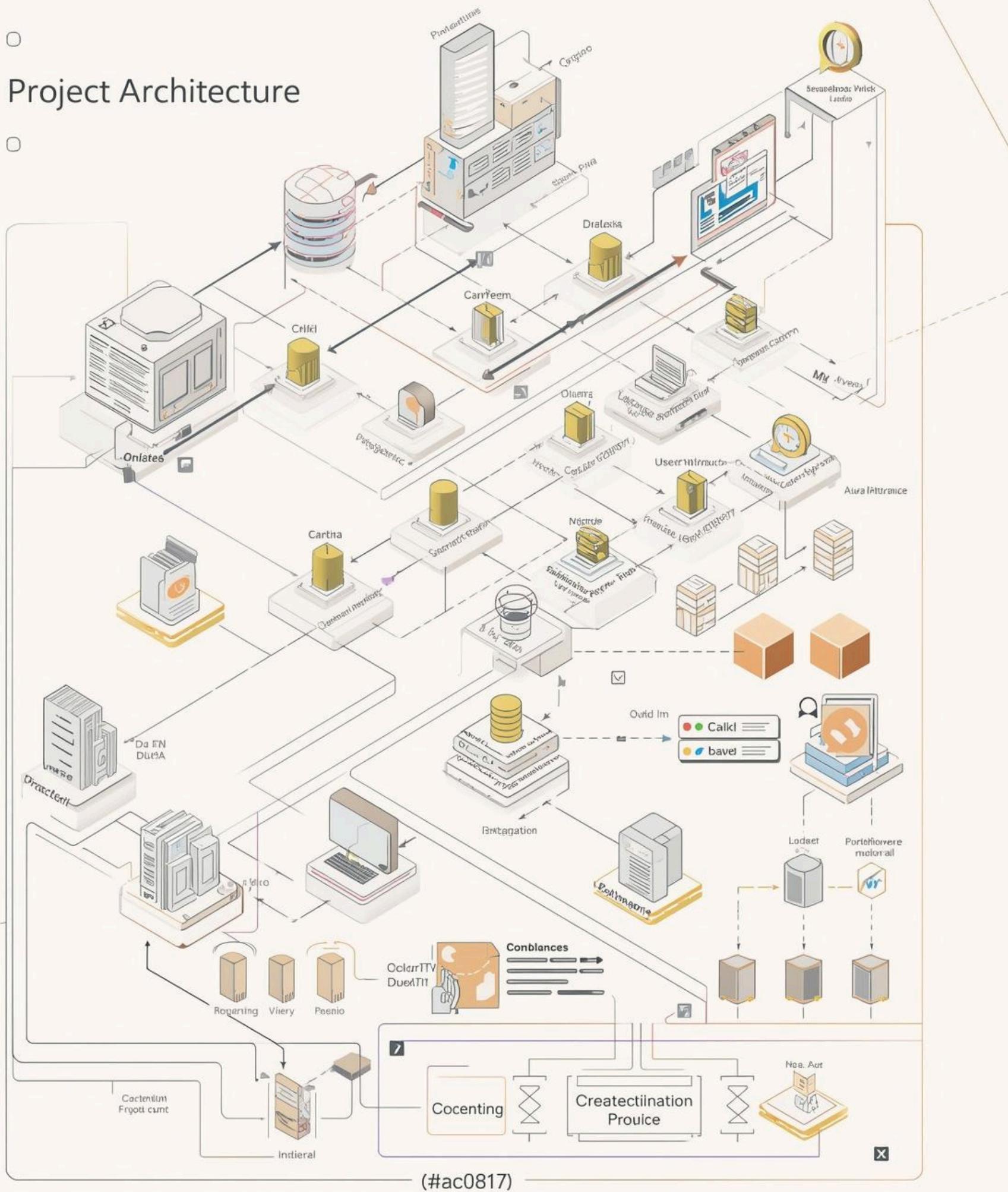


○

Project Architecture

○

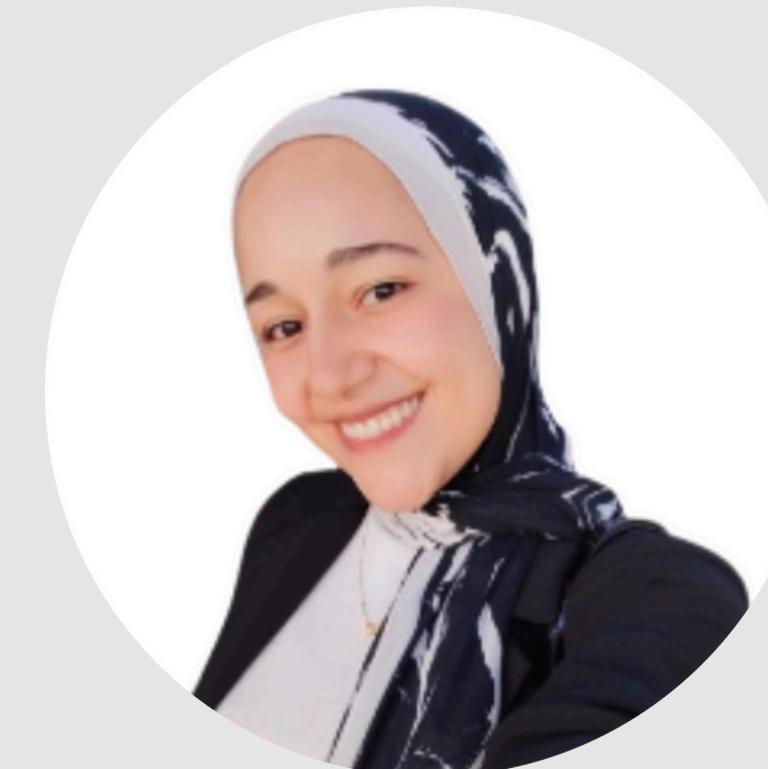


ITI Examination System

Meet Our Team



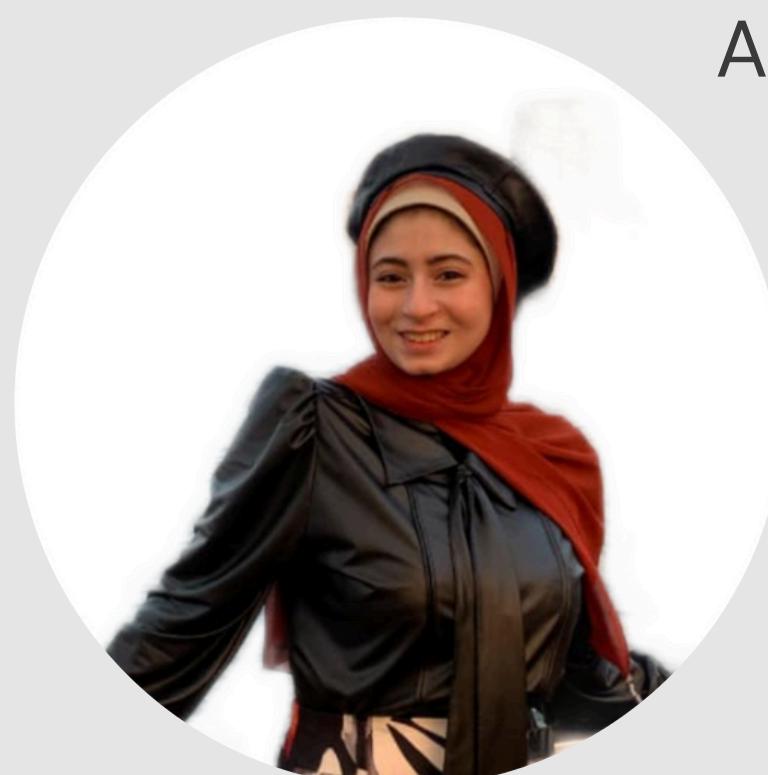
Sarah Hani



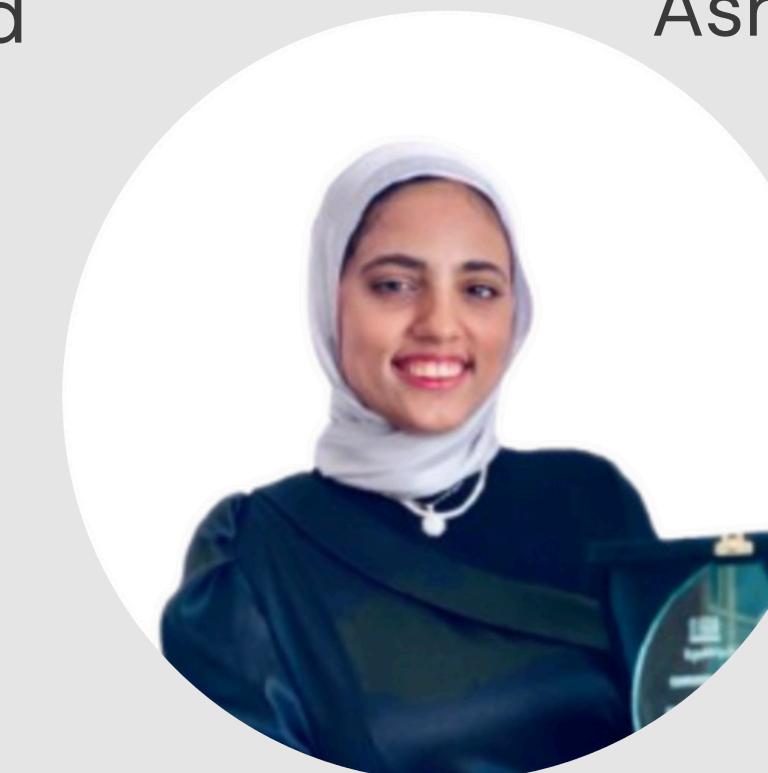
Amira Maged



Ashraqat Mohamed



Doha Waleed



Walaa Ahmed

Agenda

- Project Overview
- System Objectives
- Tools & Technologies
- Database Design Timeline
- Data Preparation & Loading
- Reporting & Visualization
- Web Application
- Conclusion

Project Overview

The ITI Examination System is a **full-stack educational platform** designed to streamline the examination process, enhance data management, and support effective learning outcomes for students and instructors.

Designed as a simulation of Information Technology Institute's (ITI) intensive code camp scholarship to cover the period from 2017 to 2024.

Architecture of Semp Educationa Platform



System Objectives

- Centralized Data Management
- Exam Automation
- Performance Tracking
- Data Integration
- Analytical Reporting
- User-Friendly Interface
- Scalability & Efficiency

Tools & Technologies

This section highlights the **tools and technologies** employed in the project for database and data modeling, ensuring robust and efficient data management.



draw.io

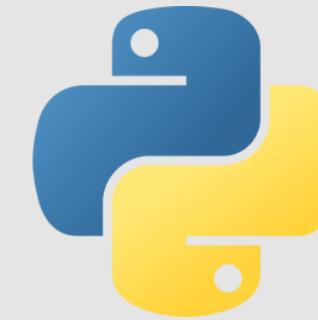
- ERD Designing



- ERD Mapping



- Data sample Creating



- Data Generating
- Website Building



- Data Generating
- Website Building



- SSIS
- SSRS



- Database Management
- SQL Code



Power BI

- Data Modelling
- Dashboards



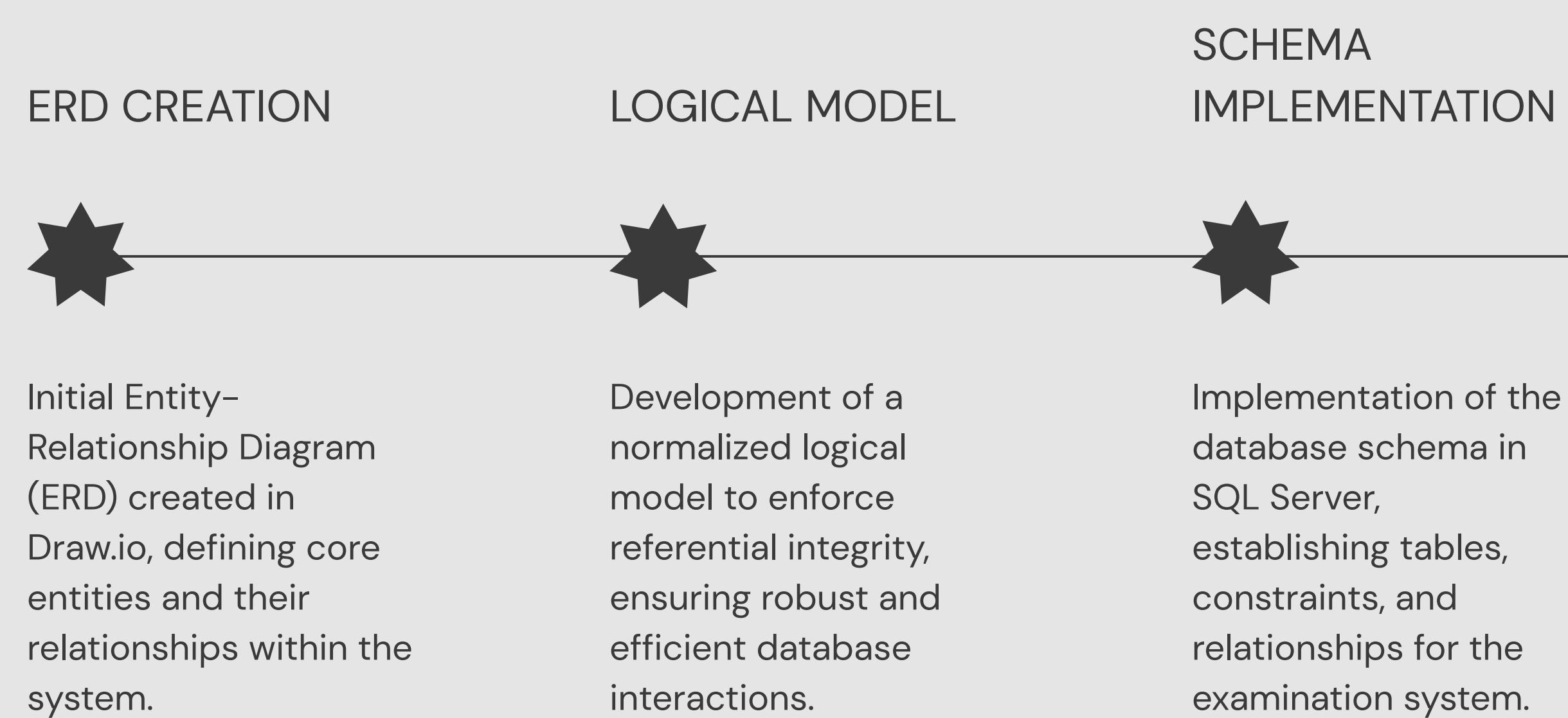
- Team Meetings



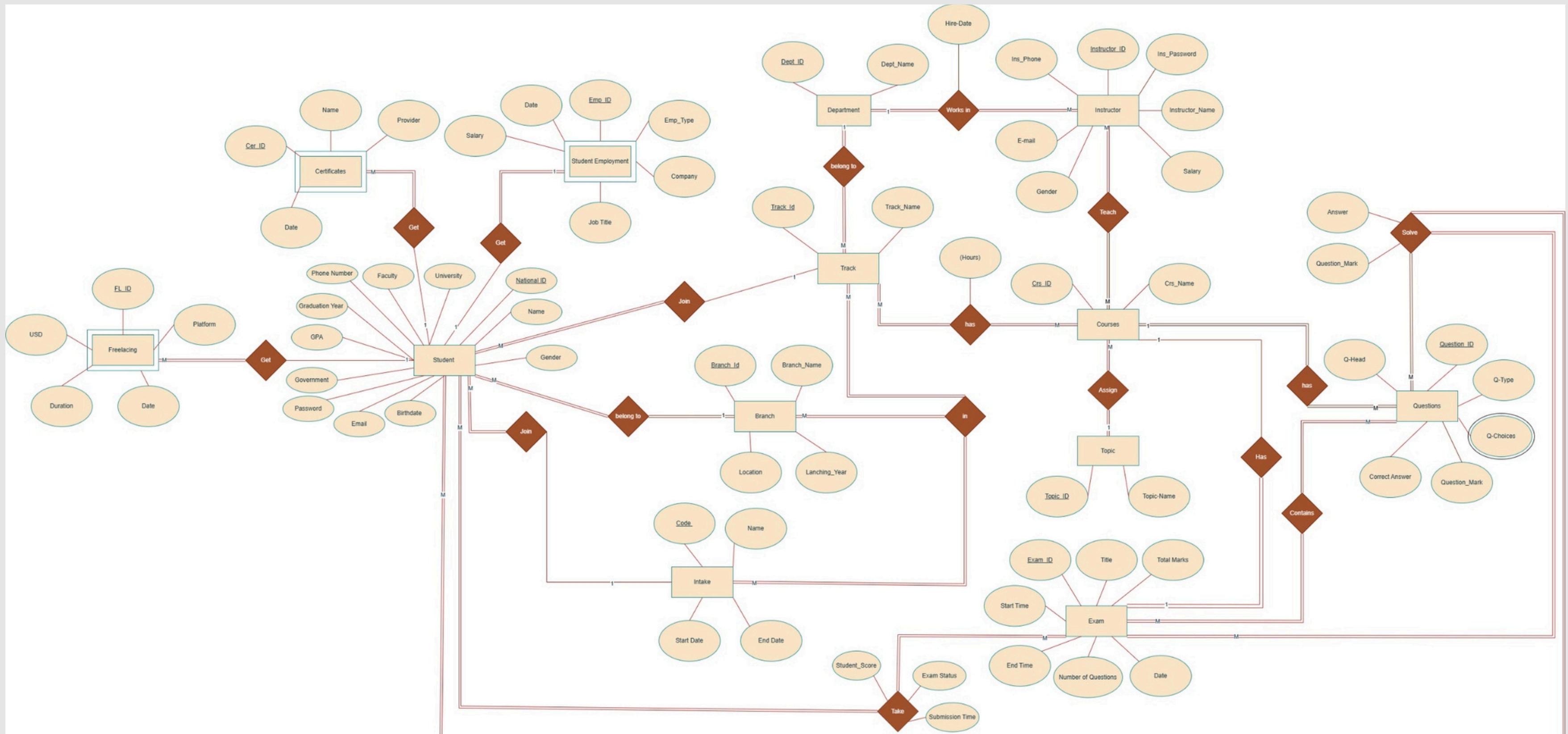
Notion

- Tasks Management

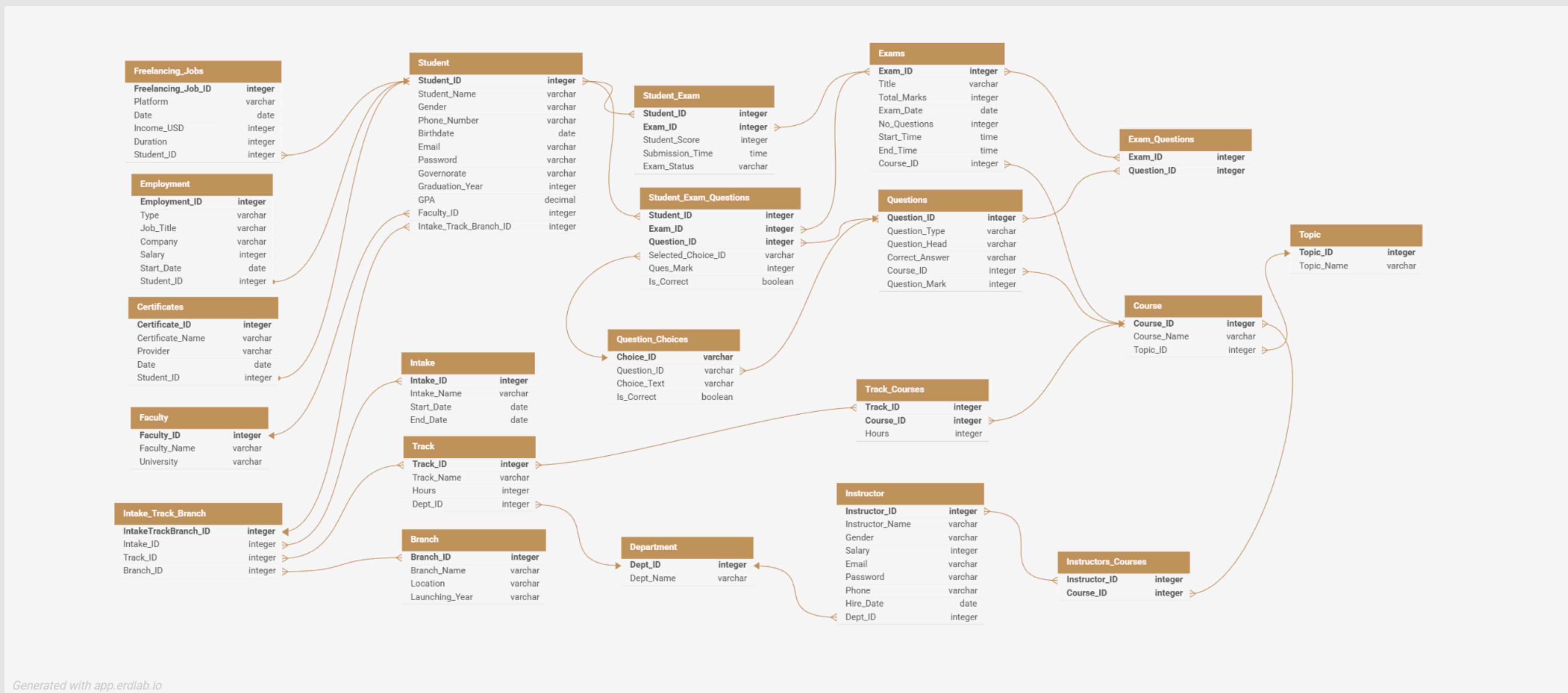
Database Design Timeline



ERD Creation



Logical Model



Database Implementation

This section details the crucial aspects of **database integrity and logic**, establishing tables, focusing on constraints, indexing, and triggers to ensure data validation and optimized performance in SQL Server.

- Tables

```
1  CREATE DATABASE ITI_System
2
3  CREATE TABLE [Student] (
4      [Student_ID] BIGINT NOT NULL,
5      [Student_Name] VARCHAR(60) NOT NULL,
6      [Gender] VARCHAR(6) NOT NULL,
7      [Phone_Number] VARCHAR(11) NOT NULL,
8      [Birthdate] DATE NOT NULL,
9      [Email] VARCHAR(100) UNIQUE NOT NULL,
10     [Password] VARCHAR(255) NOT NULL,
11     [Governorate] VARCHAR(15) NOT NULL,
12     [Graduation_Year] INT NOT NULL,
13     [GPA] decimal(3,2) NOT NULL,
14     [Faculty_ID] INT NOT NULL,
15     [Intake_Track_Branch_ID] INT NOT NULL,
16     PRIMARY KEY ([Student_ID])
17 );
18
19 CREATE TABLE [Certificates] (
20     [Certificate_ID] INT NOT NULL,
21     [Certificate_Name] VARCHAR(60) NOT NULL,
22     [Provider] VARCHAR(20) NOT NULL,
23     [Date] DATE NOT NULL,
24     [Student_ID] BIGINT NOT NULL,
25     PRIMARY KEY ([Certificate_ID])
26 );
27
28 CREATE TABLE [Freelancing_Jobs] (
29     [Freelancing_Job_ID] INT NOT NULL,
30     [Platform] VARCHAR(15) NOT NULL,
31     [Date] DATE NOT NULL,
32     [Income_USD] DECIMAL(10,2) NOT NULL,
33     [Duration] INT NOT NULL,
34     [Student_ID] BIGINT NOT NULL,
```

Foreign key Constraints

```
--  
187  ALTER TABLE [Student] ADD CONSTRAINT [Student_Faculty_FK] FOREIGN KEY ([Faculty_ID]) REFERENCES [Faculty]([Faculty_ID]);  
188  ALTER TABLE [Student] ADD CONSTRAINT [Student_ITB_FK] FOREIGN KEY ([Intake_Track_Branch_ID]) REFERENCES [Intake_Track_Branch]([Intake_Track_Branch_ID]);  
189  
190  ALTER TABLE [Employment] ADD CONSTRAINT [Employment_Student_FK] FOREIGN KEY ([Student_ID]) REFERENCES [student]([Student_ID]);  
191  ALTER TABLE [Freelancing_Jobs] ADD CONSTRAINT [Freelancing_Student_FK] FOREIGN KEY ([Student_ID]) REFERENCES [Student]([Student_ID]);  
192  ALTER TABLE [Certificates] ADD CONSTRAINT [Certificates_Student_FK] FOREIGN KEY ([Student_ID]) REFERENCES [Student]([Student_ID]);  
193  
194  ALTER TABLE [Intake_Track_Branch] ADD CONSTRAINT [ITB_Intake_FK] FOREIGN KEY ([Intake_ID]) REFERENCES [Intake]([Intake_ID]);  
195  ALTER TABLE [Intake_Track_Branch] ADD CONSTRAINT [ITB_Track_FK] FOREIGN KEY ([Track_ID]) REFERENCES [Track]([Track_ID]);  
196  ALTER TABLE [Intake_Track_Branch] ADD CONSTRAINT [ITB_Branch_FK] FOREIGN KEY ([Branch_ID]) REFERENCES [Branch]([Branch_ID]);  
197  
198  ALTER TABLE [Track] ADD CONSTRAINT [Track_Department_FK] FOREIGN KEY ([Dept_ID]) REFERENCES [Department]([Dept_ID]);  
199  
200  ALTER TABLE [Course] ADD CONSTRAINT [Course_Topic_FK] FOREIGN KEY ([Topic_ID]) REFERENCES [Topic]([Topic_ID]);  
201  
202  ALTER TABLE [Track_Courses] ADD CONSTRAINT [Track_Courses_Track_FK] FOREIGN KEY ([Track_ID]) REFERENCES [Track]([Track_ID]);  
203  ALTER TABLE [Track_Courses] ADD CONSTRAINT [Track_Courses_Course_FK] FOREIGN KEY ([Course_ID]) REFERENCES [Course]([Course_ID]);  
204  
205  ALTER TABLE [Instructor] ADD CONSTRAINT [Instructor_Department_FK] FOREIGN KEY ([Dept_ID]) REFERENCES [Department]([Dept_ID]);  
206  
207  ALTER TABLE [Instructors_Courses] ADD CONSTRAINT [Instructors_Courses_Ins_FK] FOREIGN KEY ([Instructor_ID]) REFERENCES [Instructor]([Instructor_ID]);  
208  ALTER TABLE [Instructors_Courses] ADD CONSTRAINT [Instructors_Courses_CS_FK] FOREIGN KEY ([Course_ID]) REFERENCES [Course]([Course_ID]);  
209  
210  ALTER TABLE [Exams] ADD CONSTRAINT [Exams_Course_FK] FOREIGN KEY ([Course_ID]) REFERENCES [Course]([Course_ID]);  
211  
212  ALTER TABLE [Questions] ADD CONSTRAINT [Questions_Course_FK] FOREIGN KEY ([Course_ID]) REFERENCES [Course]([Course_ID]);  
213  
214  ALTER TABLE [Question_Choices] ADD CONSTRAINT [Question_Choices_Q_FK] FOREIGN KEY ([Question_ID]) REFERENCES [Questions]([Question_ID]);  
215  
216  ALTER TABLE [Exam_Questions] ADD CONSTRAINT [Exam_Questions_Exam_FK] FOREIGN KEY ([Exam_ID]) REFERENCES [Exams]([Exam_ID]);  
217  ALTER TABLE [Exam_Questions] ADD CONSTRAINT [Exam_Questions_Q_FK] FOREIGN KEY ([Question_ID]) REFERENCES [Questions]([Question_ID]);
```

Delete & Update CASCADE

```
1  ✓ -- Student Relations
2  └ -- Student with Faculty
3  ✓ ALTER TABLE [Student] DROP CONSTRAINT [Student_Faculty_FK];
4
5  ✓ ALTER TABLE [Student]
6    ADD CONSTRAINT [Student_Faculty_FK]
7    FOREIGN KEY ([Faculty_ID])
8    REFERENCES [Faculty]([Faculty_ID])
9    ON UPDATE CASCADE;
10
11 -- Student's Certificates
12 ALTER TABLE [Certificates] DROP CONSTRAINT [Certificates_Student_FK];
13
14 ✓ ALTER TABLE [Certificates]
15   ADD CONSTRAINT [Certificates_Student_FK]
16   FOREIGN KEY ([Student_ID])
17   REFERENCES [Student]([Student_ID])
18   ON DELETE CASCADE;
19
20 -- Student's Employment
21 ALTER TABLE [Employment] DROP CONSTRAINT [Employment_Student_FK];
22
23 ✓ ALTER TABLE [Employment]
24   ADD CONSTRAINT [Employment_Student_FK]
25   FOREIGN KEY ([Student_ID])
26   REFERENCES [Student]([Student_ID])
27   ON DELETE CASCADE;
28
29 -- Student's Freelancing jobs
30 ALTER TABLE [Freelancing_Jobs] DROP CONSTRAINT [Freelancing_Student_FK];
31
32 ✓ ALTER TABLE [Freelancing_Jobs]
33   ADD CONSTRAINT [Freelancing_Student_FK]
34   FOREIGN KEY ([Student_ID])
```

Indexes

```
1  --INDEXES
2
3  ✓ CREATE INDEX IX_Student_Email ON Student (Email);
4  CREATE INDEX IX_Student_Email ON Instructor (Email);
5
6  CREATE INDEX IX_Student_Intake_Track_Branch_ID ON Student (Intake_Track_Branch_ID);
7
8  CREATE INDEX IX_Certificates_Student_ID ON Certificates (Student_ID);
9  CREATE INDEX IX_Employment_Student_ID ON Employment (Student_ID);
10 CREATE INDEX IX_Freelancing_Jobs_Student_ID ON Freelancing_Jobs (Student_ID);
11
12 CREATE INDEX IX_Track_Dept_ID ON Track (Dept_ID);
13
14 CREATE INDEX IX_ITB_Intake_ID ON Intake_Track_Branch (Intake_ID);
15 CREATE INDEX IX_ITB_Track_ID ON Intake_Track_Branch (Track_ID);
16 CREATE INDEX IX_ITB_Branch_ID ON Intake_Track_Branch (Branch_ID);
17
18 CREATE INDEX IX_Instructors_Courses_Instructor_ID ON Instructors_Courses (Instructor_ID);
19 CREATE INDEX IX_Instructors_Courses_Course_ID ON Instructors_Courses (Course_ID);
20
21 CREATE INDEX IX_Instructor_Dept_ID ON Instructor (Dept_ID);
22
23 -----
24 CREATE INDEX IX_Exams_Course_ID ON Exams (Course_ID);
25
26 CREATE INDEX IX_Questions_Course_ID ON Questions (Course_ID);
27 CREATE INDEX IX_Questions_Type ON Questions (Question_Type);
28
29 CREATE INDEX IX_Choices_Question_ID ON Question_Choices (Question_ID);
30
31 CREATE INDEX IX_Exam_Questions_Exam_ID ON Exam_Questions (Exam_ID);
32 CREATE INDEX IX_Exam_Questions_Question_ID ON Exam_Questions (Question_ID);
```

Prevent deletion triggers

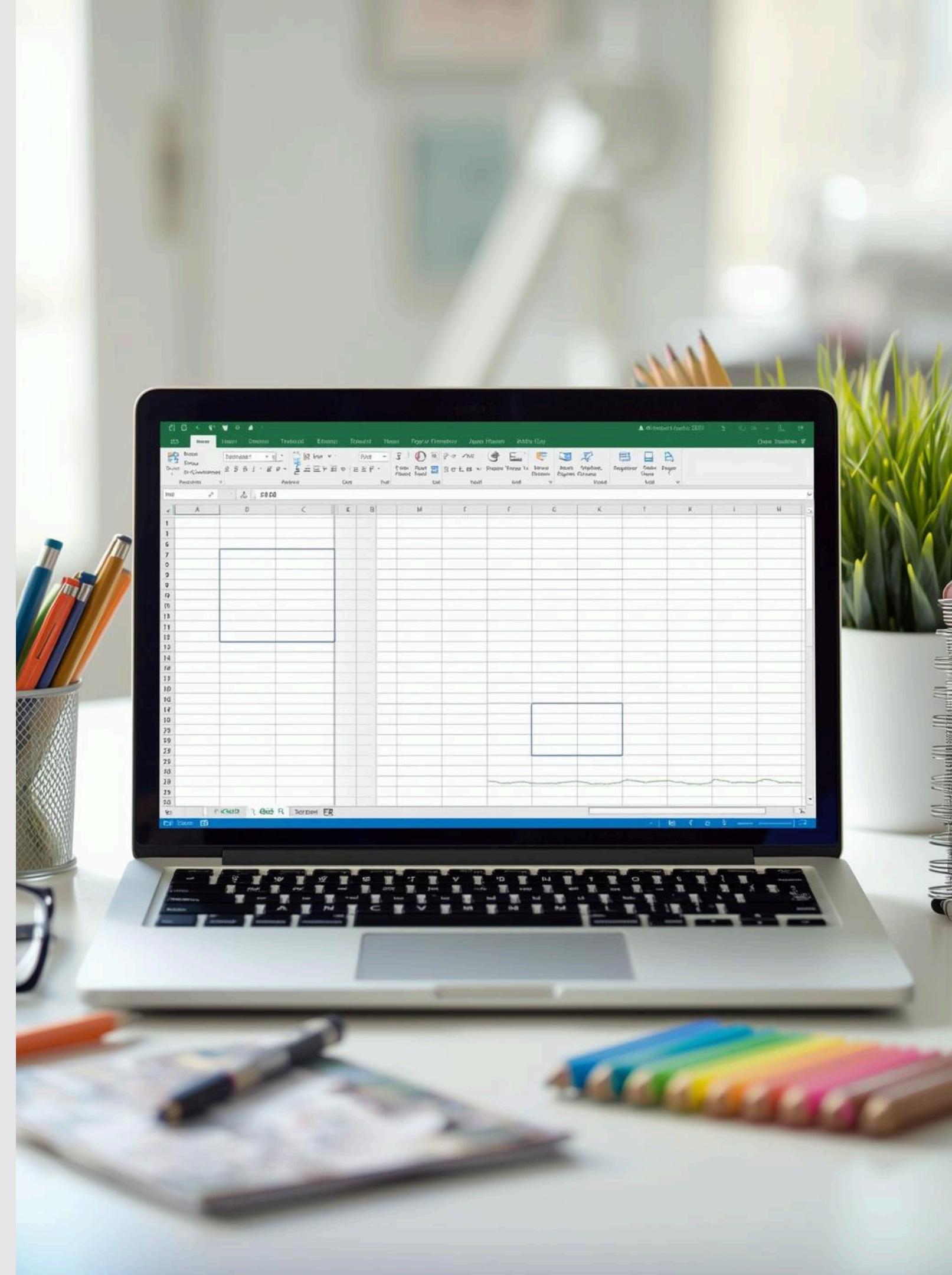
Preventing deletion from critical tables:

- Tracks
- Intakes
- Branches
- Departments
- Topics

```
1   |-- Prevent deletion
2   |  |-- Tracks
3   |  \-- CREATE TRIGGER Prevent_Delete_From_Track
4   |    ON [Track]
5   |    INSTEAD OF DELETE
6   |    AS
7   |    BEGIN
8   |      RAISERROR('Deleting Tracks is not allowed', 16, 1);
9   |      ROLLBACK TRANSACTION;
10  |    END;
11  \-- -----
12  |-- Branches
13  \-- CREATE TRIGGER Prevent_Delete_From_Branch
14  |  ON [Branch]
15  |  INSTEAD OF DELETE
16  |  AS
17  |  BEGIN
18  |    RAISERROR('Deleting Branches is not allowed', 16, 1);
19  |    ROLLBACK TRANSACTION;
20  |  END;
21  \-- -----
22  |-- Intakes
23  \-- CREATE TRIGGER Prevent_Delete_From_Intake
24  |  ON [Intake]
25  |  INSTEAD OF DELETE
26  |  AS
27  |  BEGIN
28  |    RAISERROR('Deleting Intakes is not allowed', 16, 1);
29  |    ROLLBACK TRANSACTION;
30  |  END;
31  \-- -----
32  |-- Departments
33  \-- CREATE TRIGGER Prevent_Delete_From_Department
34  |  ON [Department]
```

Data Preparation

This section details the process of creating initial data sample manually in Excel, the using Faker python library to generate larger datasets with all relationship / bridge tables based on the data sample to simulate realistic scenarios, enforcing integrity constraints and consistency between tables.

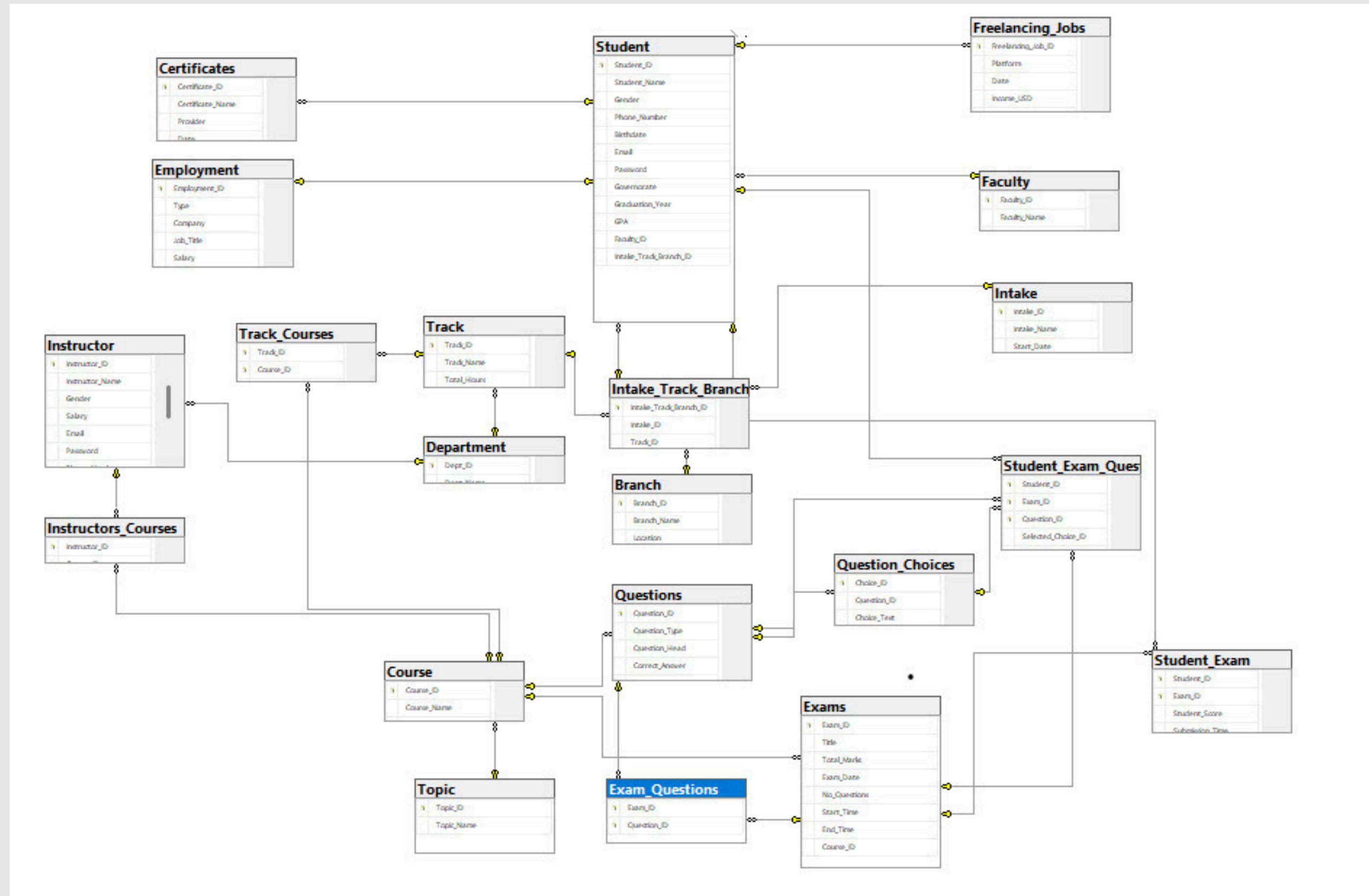


Data Loading

This section details the process of Using SQL Server Integration Service (SSIS) as the ETL tool to extract data from Excel files, transform and match SQL data types, and loaded into SQL Server tables.



Physical Model



CRUD Procedures

- Implemented complete CRUD procedures for all tables.
- Standardized structure ensures consistency and data integrity.
- Includes input validation, error handling, and transactions.
- Provides a secure and efficient way for the system to modify data.

Exam Management Procedures

- Exam Generation: Creates randomized, rule-based exams for each student.
- Start Exam: Validates eligibility and securely begins the exam session.
- Exam Answers: Stores student responses efficiently using TVPs.
- Exam Correction: Automatically grades answers and updates final scores.

Reporting & Visualization

This section focuses on **analytical insights** and dynamic dashboards that provide comprehensive student performance tracking, empowering informed decision-making within the ITI Examination System.



SSRS Reports

- SSRS is used to track student performance, exam outcomes, instructor activity, and academic trends.
- Reports are powered by specialized stored procedures for accurate and dynamic insights.

Department's students

Enter Department ID

|◀ |◀ | 1 | of 2 ? | ▶ | ▶| | 100% | Find | Next |

ITI System  Information Technology Institute

Department's Students

Department Name	Student ID	Student Name	Gender	Phone Number	Email	Track Name	Intake Name	Branch Name
Cyber Security, Cloud, and Infrastructure Services	13642482551807	Nada Ahmed Ali Hassan	Female	1263187332	nada.1807@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482552015	Sara Ali Said El-Masry	Female	1244784649	sara.2015@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482553419	Hany Adel Walid Ali	Male	1116119031	hany.3419@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482554014	Nourhan Ahmed Kamel Salem	Female	1034796232	nourhan.4014@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482555043	Hana Ahmed Adel El-Sayed	Female	1266249548	hana.5043@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482555770	Youssef Ahmed Ali Shaker	Male	1128087739	youssef.5770@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482556168	Youssef Adel Rashad Farag	Male	1039399526	youssef.6168@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482557737	Nour Said Fouad El-Masry	Female	1032791327	nour.7737@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482557776	Ibrahim Mohamed Ahmed Mohamed	Male	1191406123	ibrahim.7776@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482559631	Fatma Ali Mahmoud El-Sayed	Female	1095551347	fatma.9631@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena
	13642482559883	Aya Ibrahim Nabil	Female	1233317095	aya.9883@gmail.com	Cyber Security Associate	Round 2 - 2024	Qena

Student's grades

Enter Student ID

|◀ < 1 of 1 > ▶| ⌂ ⌂ ⌂ Find | Next

ITI_System

Student's Grades

Khaled Mohamed Kamel Shaker			
Course Name	Total Marks	Student Score	Percentage
Microsoft SQL Server Programming	30	28	93.33
Version Control using Git	30	30	100.00

Report2
Page 2

Instructor's courses & students

Enter Instructor ID

|< < 1 of 1 > >| ⌂ ⌃ ⌄ ⌅ | 100% ⌂ ⌃ ⌄ ⌅ | Find | Next |

ITI_System

 Information
Technology
Institute

Instructor's Courses and Student Count

Instructor Name	Course Name	Number of Students
Mohamed Ali Shaker	Business Analysis Essentials for Software Projects	285
Mohamed Ali Shaker	Oracle Advanced PL/SQL	285
Mohamed Ali Shaker	User Analytics & Tracking	285
Total Students		855

Report3
Page 3

Topic's Courses

Enter Topic ID

|< < 1 of 2 ? > >> ⌂ ⌃ 100% ⌄ ⌅

ITI_System  Information Technology Institute

Topic's Courses

Topic Name	Course Name
Programming Fundamentals	Introduction to Programming using C
	Object-Oriented Programming using C++
	Object-Oriented Programming using C#
	Object-Oriented Programming using Python

Exam Questions

Enter Exam ID

|◀ < **1** of 2 ? > ▶ | ⌂ ⌄ ⌁ ⌃ ⌂ ⌄ ⌁

ITI_System  Information Technology Institute

Exam Questions and Choices

Question ID: 201

Question: JavaScript is a dynamically typed language.	T/F	Question Mark: 2
	The sentence is True	Correct

Question ID: 201

Question: JavaScript is a dynamically typed language.	T/F	Question Mark: 2
	The sentence is False	Not Correct

Question ID: 205

Question: null and undefined are the same type.	T/F	Question Mark: 2
	The sentence is True	Not Correct

Student Answers

Exam ID 823 Student ID 13642482516707

|< < 1 of 2 ? > >| 100% | Find | Next

ITI_System ITI Information Technology Institute

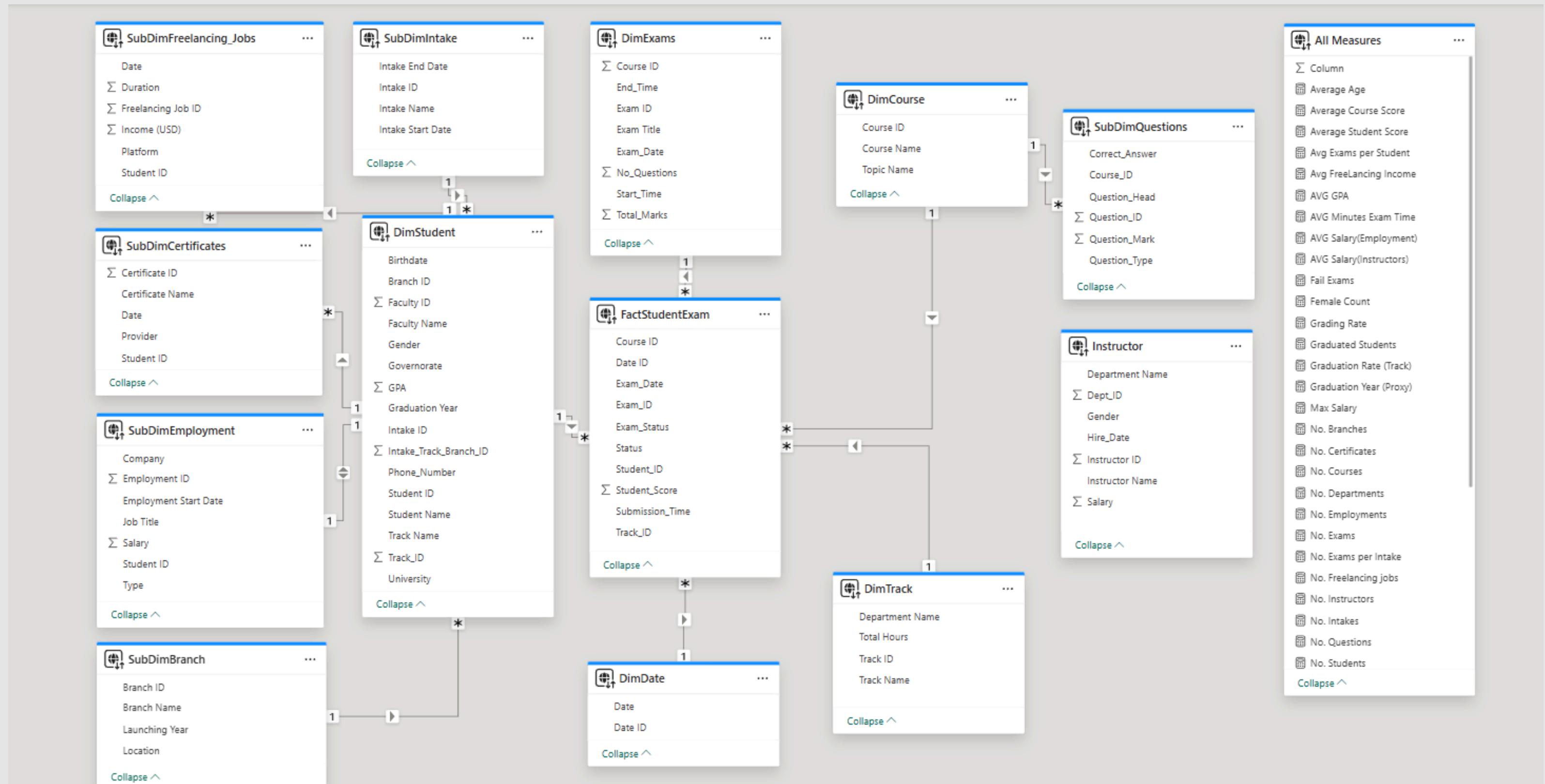
Student Answers

Khaled Mohamed Kamel Shaker				
Exam Title	Question Head	Student Choice	Is Correct	Ques Mark
Microsoft SQL Server Programming Exam	SQL Server is a relational database management system developed by Microsoft.	The sentence is True	True	28
	The default port number for SQL Server is 1433.	The sentence is True	True	2
	SQL Server Management Studio (SSMS) is used to manage SQL Server databases.	The sentence is True	True	2
	The SELECT statement is used to retrieve data from a table.	The sentence is True	True	2
	SQL Server supports the T-SQL (Transact-SQL) language.	The sentence is True	True	2
	The DELETE command removes the structure of a table.	The sentence is False	True	2
	Which command is used to create a new database in SQL Server?	CREATE DATABASE	True	2
	Which SQL Server feature ensures atomicity, consistency,	ACID properties	True	2

Power BI

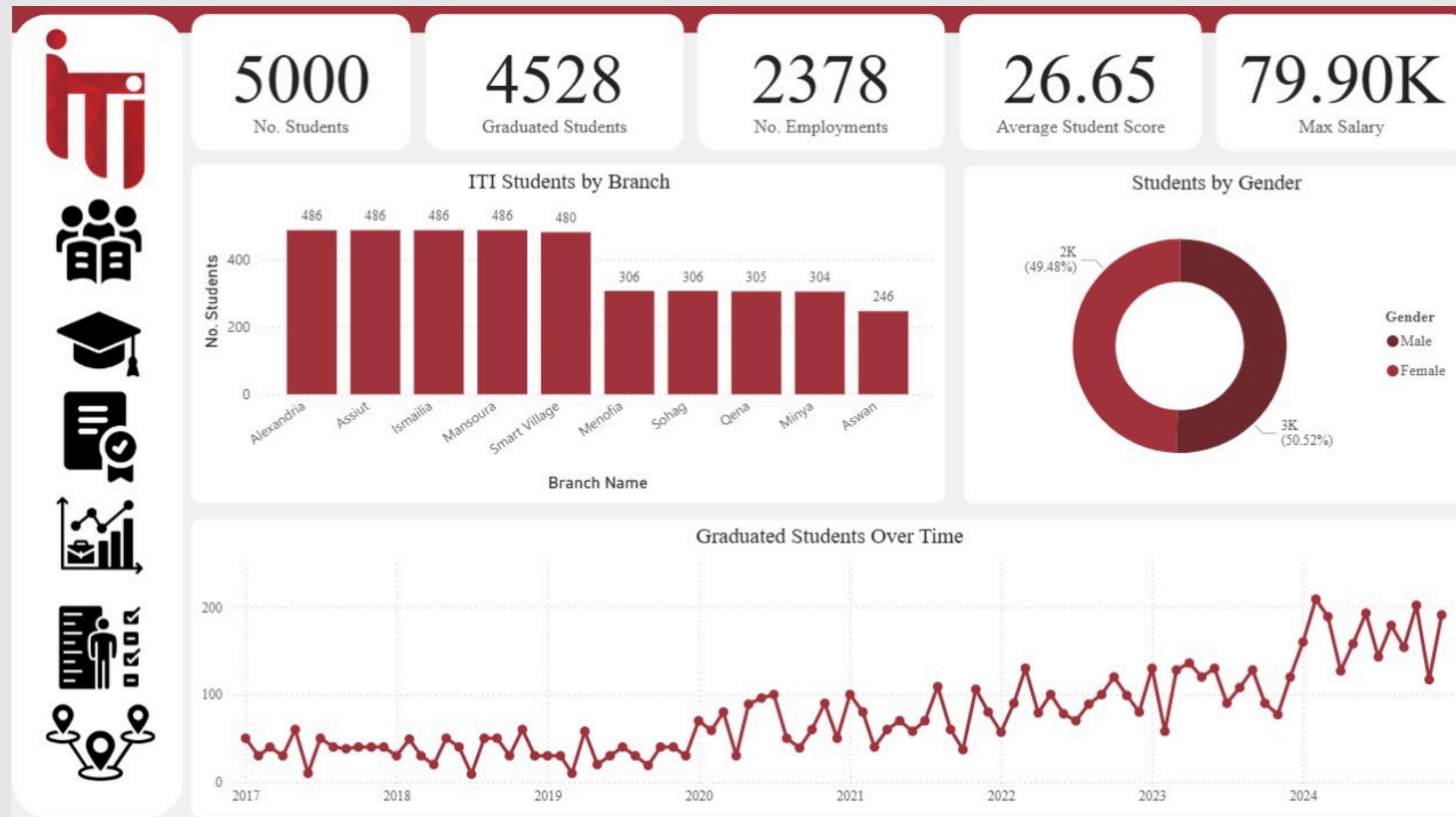
- Performed data cleaning and transformation in Power Query.
- Designed a Snowflake Schema with Date Dimension.
- Created DAX measures for performance, comparison, and trend analysis.
- Used a Power BI Semantic Model as the single source of truth.
- Developed 20 dashboards with drill-through, tooltips, and consistent visuals.
- Developed an additional API-based report and deployed it alongside the main reports.
- Created a Power BI App to combine all reports into one organized, user-friendly hub.

Power BI Model (Snowflake)

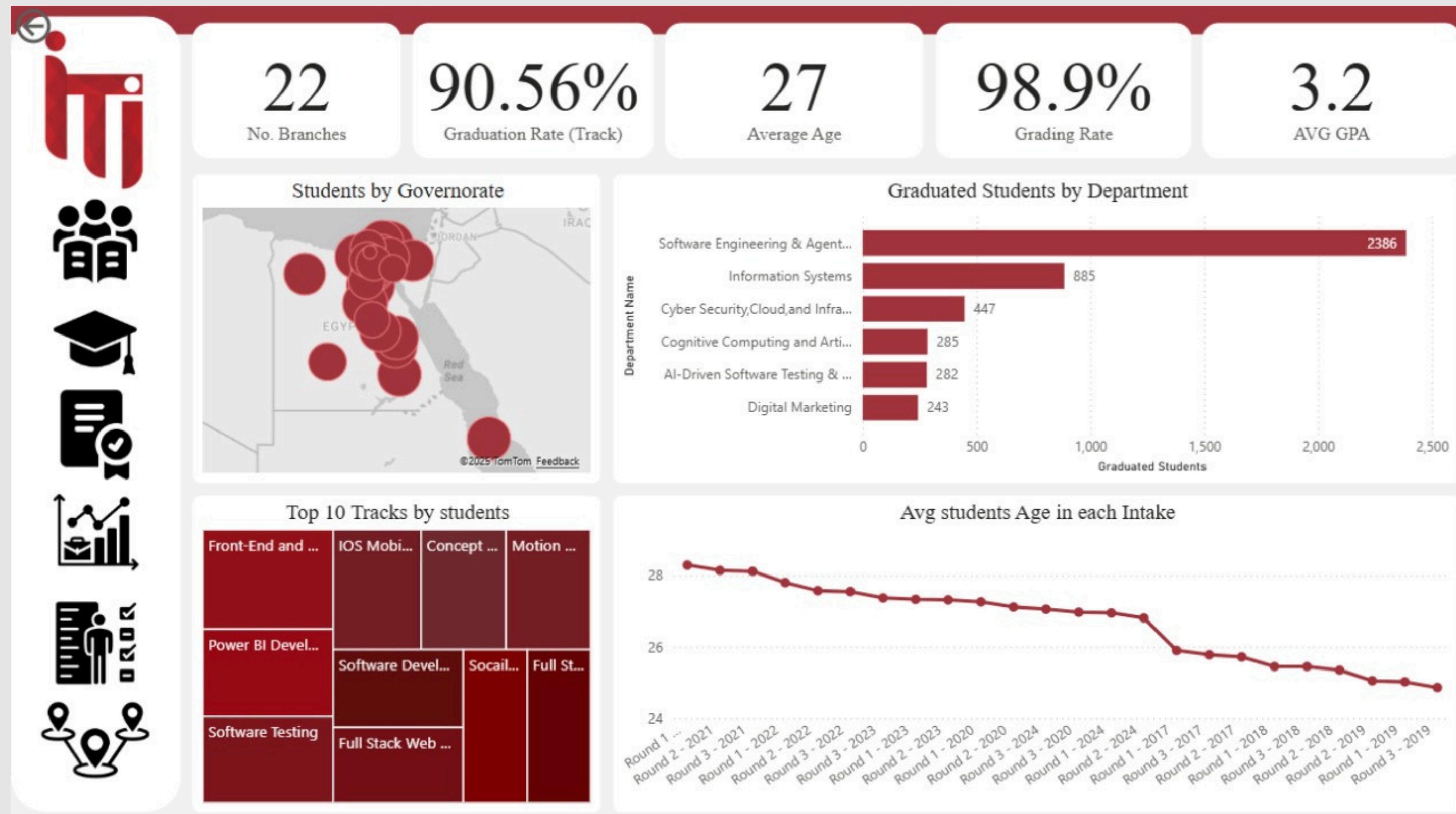


Dashboards

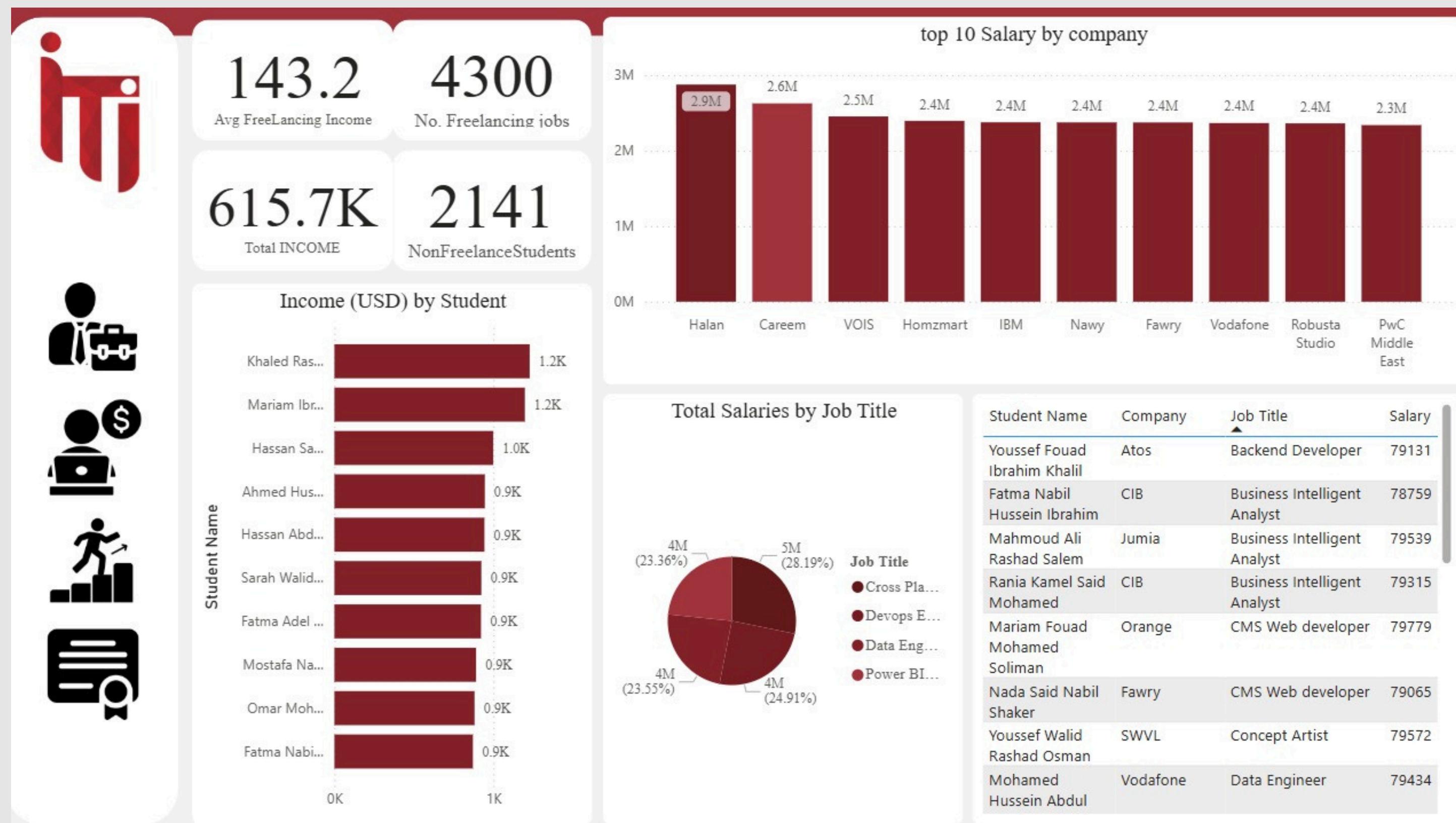
Students Overview



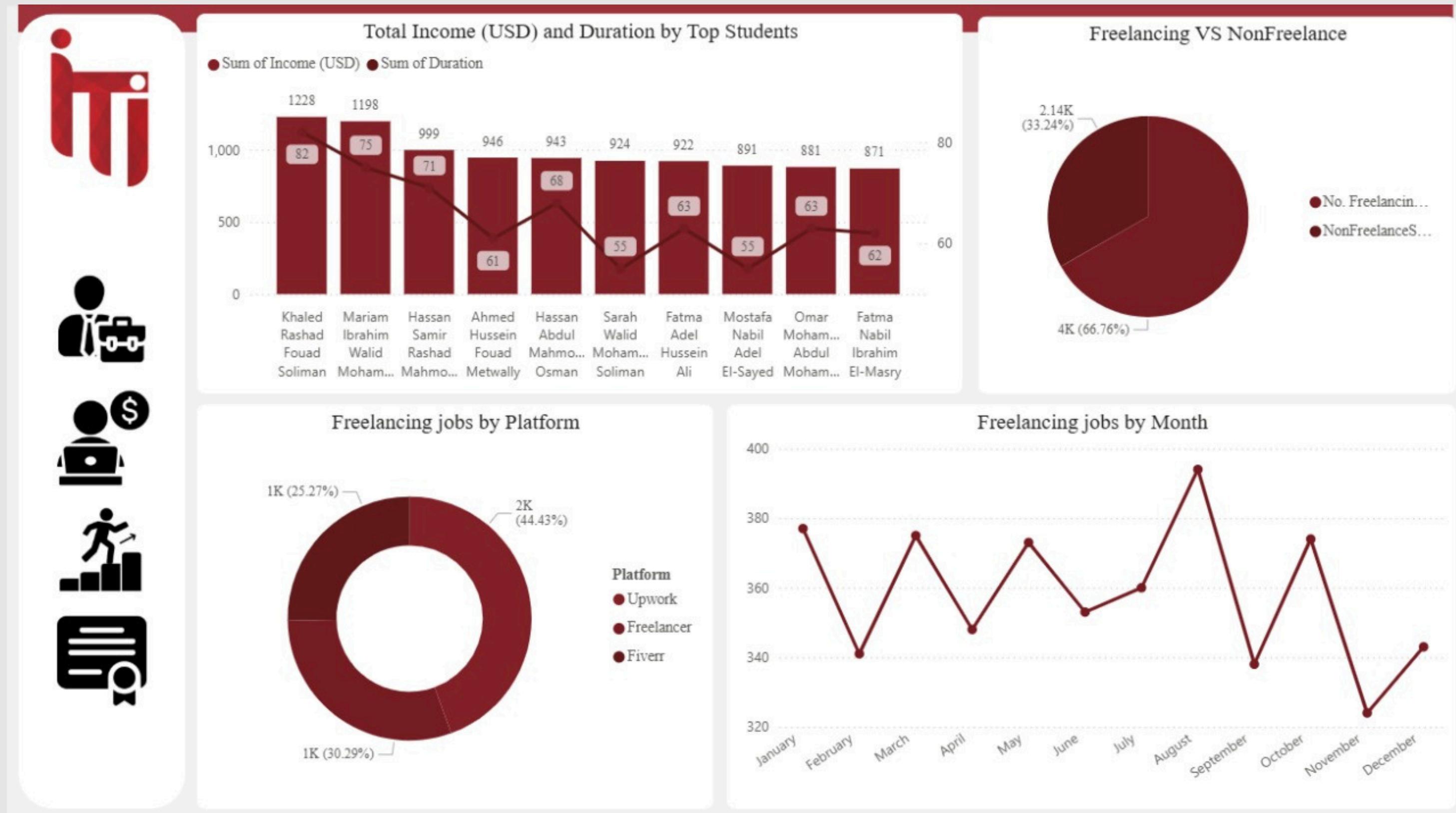
Students Enrollment & Graduation



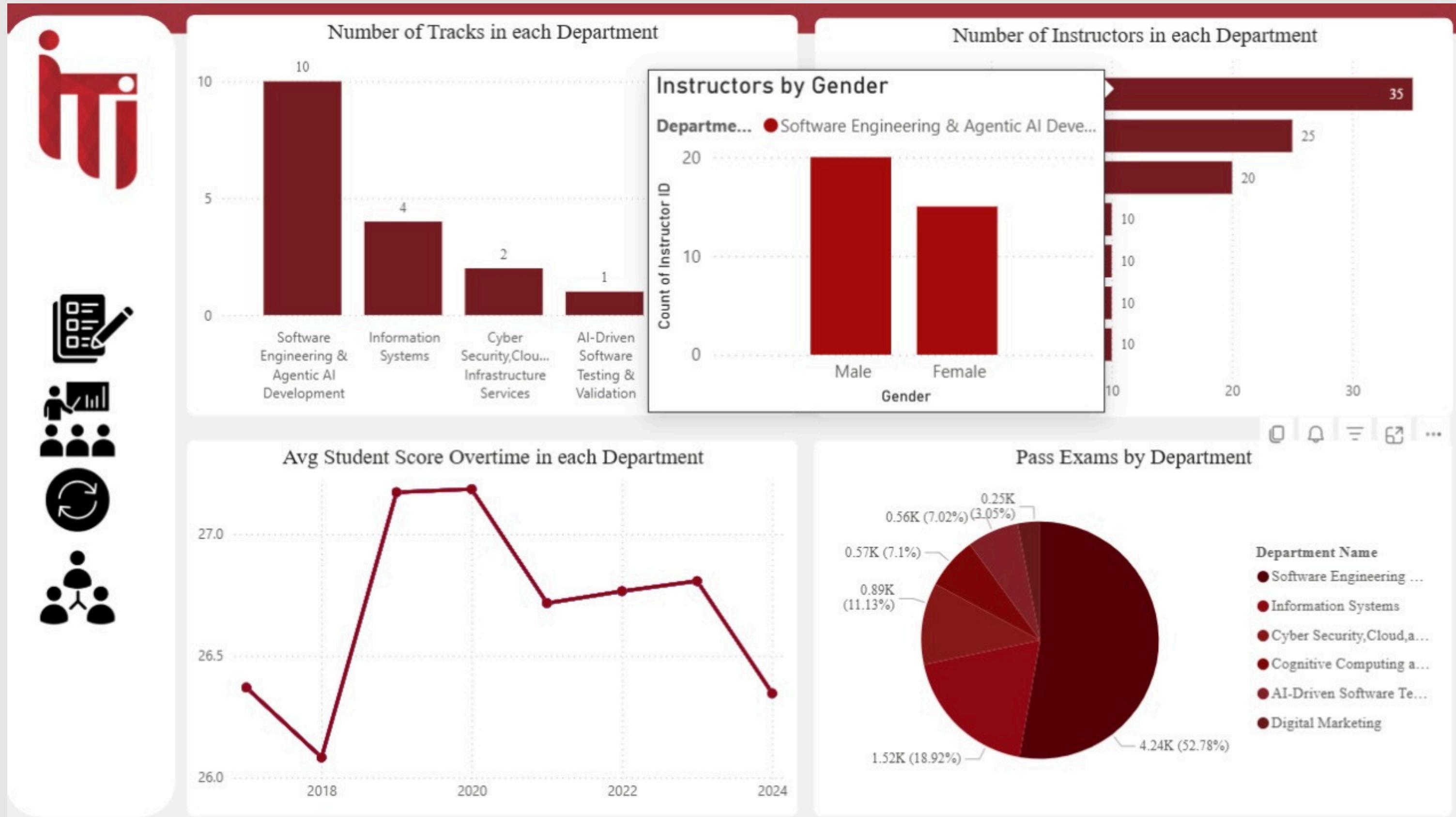
Career Outcome



Freelancing Jobs



Instructors Analysis



API Dashboard

ITI EXAMINATION SYSTEM

Team Members



Walaa Ahmed



Ashraqat Mohamed



Doha Waleed



Amira Maged



Sara Hani

Power App

The screenshot shows a Microsoft Power BI app interface. On the left, a sidebar lists various reports under the main heading "ITI_Power bi app". The "Home" report is currently selected. The main content area displays a central logo for "Information Technology Institute" and nine red rectangular buttons arranged in a grid, each with white text: "Students", "Certificates", "Track", "Freelancing Jobs", "Intakes", "Exams", "Courses", "Instructors", and "Employments". The "Copilot" icon is visible in the top right corner of the main area.

ITI_Power bi app

Copilot

API

PowerBIFinal

Home

Students Overview

Students Enrollment & ...

Students Skills Insights

Students Job Market

Academic Performance

Students Distribution

Employment Analysis D...

Freelancing Jobs Dashb...

Career Outcome Dashb...

Go back

File ▾ Share ▾ Export ▾ Explore Subscribe Monitor ...

Copilot

Students

Certificates

Track

Freelancing Jobs

Intakes

Exams

Courses

Instructors

Employments

Branches

Activate Windows

Go to Settings to activate Windows.

89%

Web Application

The **interactive** web application enables secure exam management, offering role-based access for students and instructors while facilitating seamless integration with backend databases for real-time data synchronization.

The application integrates directly with SQL Server stored procedures to manage all core exam operations. Through this integration, exams are generated dynamically, access and timing are controlled in real time, and grading is performed automatically. This ensures accurate, consistent, and efficient behavior throughout the entire examination process.



Student & Instructor logins



Information Technology Institute
Examination System

ABOUT ITI

SERVICES

BRANCHES

NEWS

Welcome to ITI Exam System

Select your role to continue

Student

Take exams and view results

STUDENT LOGIN

Instructor

Create exams and manage results

INSTRUCTOR LOGIN

Branches Page

The screenshot shows the ITI website's branches page. At the top, there is a navigation bar with the ITI logo, the text "Information Technology Institute", "Our Branches", and links for "HOME", "ABOUT ITI", "SERVICES", "BRANCHES" (which is highlighted in red), and "NEWS". Below the navigation bar, a large red banner features the text "ITI Branches Across Egypt" and "Serving students nationwide with quality technology education since 1993". Underneath the banner, three white cards provide key statistics: "TOTAL BRANCHES" (22), "FIRST BRANCH" (1996), and "LATEST BRANCH" (2024).

This screenshot displays the "Our Branches" section of the website. It lists six branches in a grid format:

Branch Name	Location	Launch Year	Action Buttons
Smart Village	Giza	2009	VIEW ON MAP SINCE 2009
New Capital	New Administrative Capital	2022	VIEW ON MAP SINCE 2022
Cairo University	Giza	2022	VIEW ON MAP SINCE 2022
Alexandria	Alexandria	1996	VIEW ON MAP SINCE 1996
Assiut	Assiut	2007	VIEW ON MAP SINCE 2007
Aswan	Aswan	2021	VIEW ON MAP SINCE 2021

Exam Creating

Create New Exam

Generate an exam with random questions from your course

Course Name *

HTML & CSS

Exam Date * Start Time * End Time *

11/07/2025 02:23 AM 03:30 AM

Number of True/False Questions Number of MCQ Questions

3 3

Max 10 questions Max 15 questions

Exam Summary

Total Questions: 6
Total Marks: 12
Duration: 1 hour 7 minutes

GENERATE EXAM **CANCEL**

Taking Exams

 **Information Technology Institute**

Exam: HTML & CSS Exam

[DASHBOARD](#) [LOGOUT](#)

HTML & CSS Exam

Course:

- Read each question carefully and select your answer.
- You have limited time to complete the exam.
- Click submit when you're finished - you cannot go back!

Total Questions: 6 | Total Marks: 12

Question 1

CSS is used to structure page content semantically.

The sentence is True

Automatic Grading



Information Technology Institute

Exam Results

DASHBOARD

LOGOUT

Exam Results: Advanced Power BI & DAX Exam

Course:

Your Final Score

6/10

60.0%

Excellent! You passed the exam!

Conclusion

The ITI Examination System provides a **complete educational technology solution** by integrating database, web, and analytics layers to enhance the educational experience and foster data-driven decisions.

A TECATUCAL MEJOR WORLD ITI
STATUS EDUCATION.



Thank You