

ATILIM UNIVERSITY

2023-2024 FALL

CMPE341

Project – Database Design & Management

Student Information System Database
SEEapp

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08.01.2024

Chapter 1: Introduction

This report presents the design and implementation of a Student Information System database (SEEapp) in Oracle. It covers requirements gathering, a stakeholder survey, the ER/EER and logical design, the physical design in Oracle SQL, sample data, and example queries.

Step into the dynamic world of SEEapp, a visionary project poised to reshape the educational landscape. In this chapter, we extend a warm invitation to explore the genesis of our initiative, unraveling the intricate reasoning behind the deliberate selection of the "Student Information System Database" as our project's nucleus. Our narrative is a journey through the profound importance of this system in educational institutions, unraveling the nuanced challenges it confronts with resilience.

As we embark on this intellectual odyssey, we meticulously dissect the transformative impact of the Student Information System Database on educational administrative processes. This segment transcends a traditional introduction, offering an in-depth exploration of its significance, potential benefits, and the catalytic role it plays in revolutionizing administrative functions. From augmenting data accessibility to nurturing seamless communication, SEEapp emerges as a beacon poised to redefine the educational experience. Join us on this enlightening expedition, a convergence where technology seamlessly intertwines with education. Witness firsthand how SEEapp takes center stage in the avant-garde of innovation within educational information systems, promising a future where efficiency meets excellence.

Chapter 2: Requirements

In this chapter, the process of collecting and analyzing requirements for the Student Information System Database will be detailed. Various methods such as surveys, questionnaires, and interviews with stakeholders (including customers and end-users) will be discussed. The chapter will highlight the importance of understanding the real-world data that needs to be stored in the database and the operations that must be performed on this data.

A detailed breakdown of the data that needs to be stored in the database will be provided. This will include student information, course details, grades, and any other relevant data. The distinction between essential and auxiliary data will be highlighted.

An analysis of the operations that need to be performed on the data will be outlined. This includes data retrieval, updates, deletions, and any specific calculations or reporting functionalities required by the end-users.

Functional Requirements:

1)The system should be able to manage the creation, updating, and deletion of tables in the database.

2) New departments, professors, students, courses, exams, results, and other relevant data must be added to the system.

3) Existing data should be updated, for example, student information, course details, and exam dates.

4) The system should support the deletion of data such as departments, professors, students, courses, exams, and results. Updates to associated data related to deleted records should be ensured.

5) Users should be able to query student information, courses, exam results, etc. Reporting functionality, such as general student achievement reports and course statistics for a specific period, should be available.

6) Management of relationships between tables is essential. For instance, establishing and preserving accurate references between students and departments.

Non-Functional Requirements:

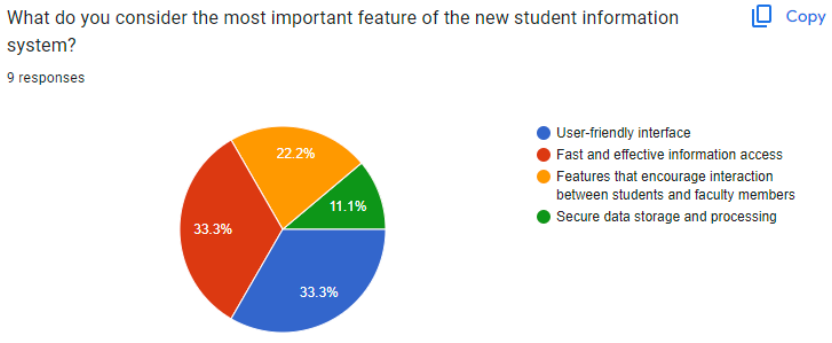
1) Data integrity in the database must be maintained, and security measures should be implemented to prevent unauthorized access to the data.

2) Authorized users should have the capability to add, update, and delete users in the system. User roles and permissions need to be defined and managed.

3) The system should effectively operate on large datasets and be scalable without experiencing performance degradation.

THE SURVEY
LINK: https://forms.gle/NxFxSp1WicKMTb5j9

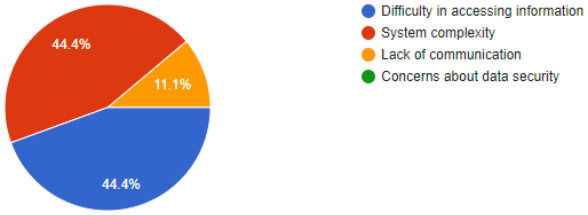
1)



2)

What is the biggest challenge you face when using the student information system? Copy

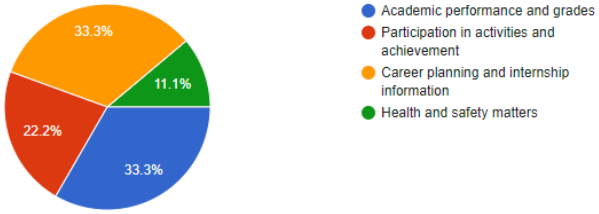
9 responses



3)

In your opinion, which type of information should be emphasized more in the student information system? Copy

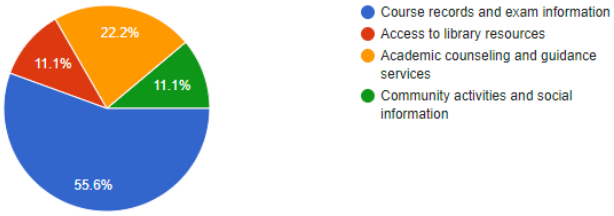
9 responses



4)

What type of information do you hope to manage more effectively using the student information system? Copy

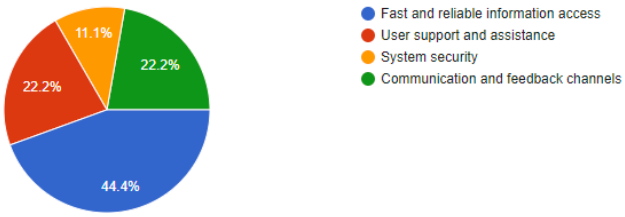
9 responses



5)

Are you satisfied with the services provided by the student information system? If not, in which areas would you like to see improvements? Copy

9 responses



SAMPLE DATABASE

Table 1 YALOVA UNIVERSITY

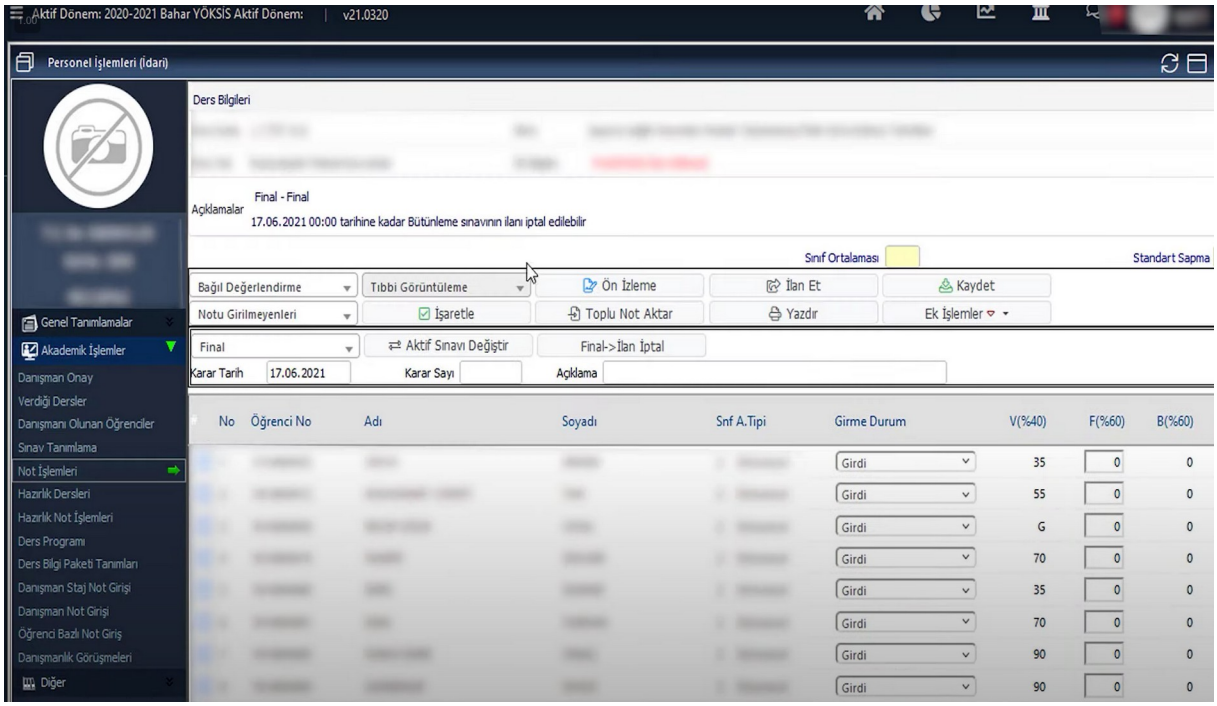


Table 2 ISTANBUL TEKNIK UNİVERSITY

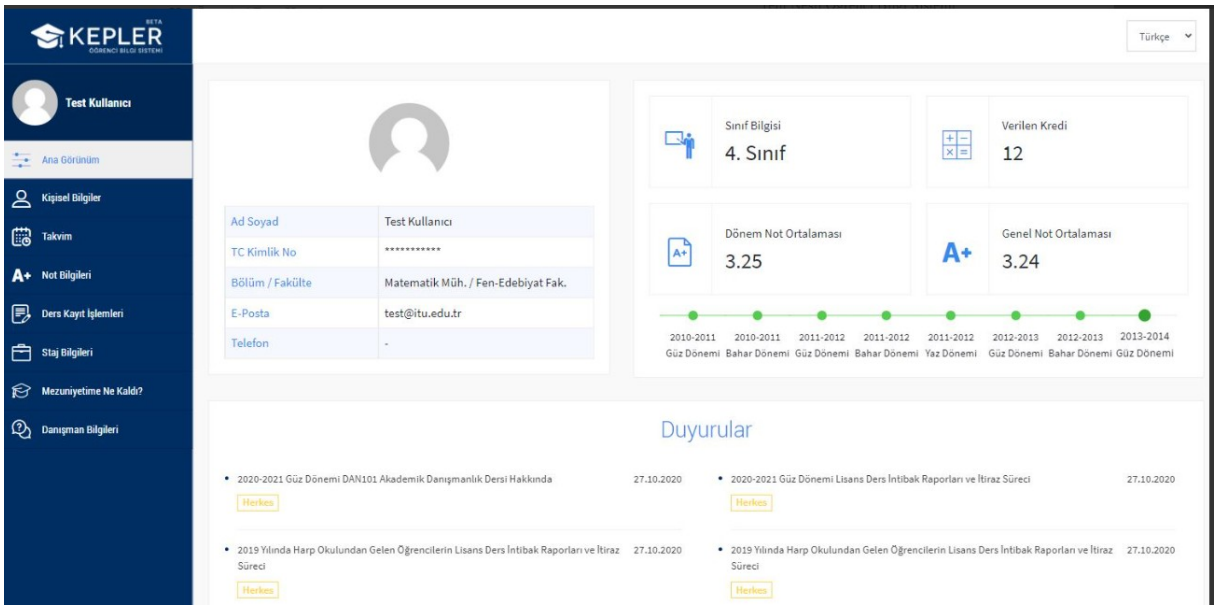
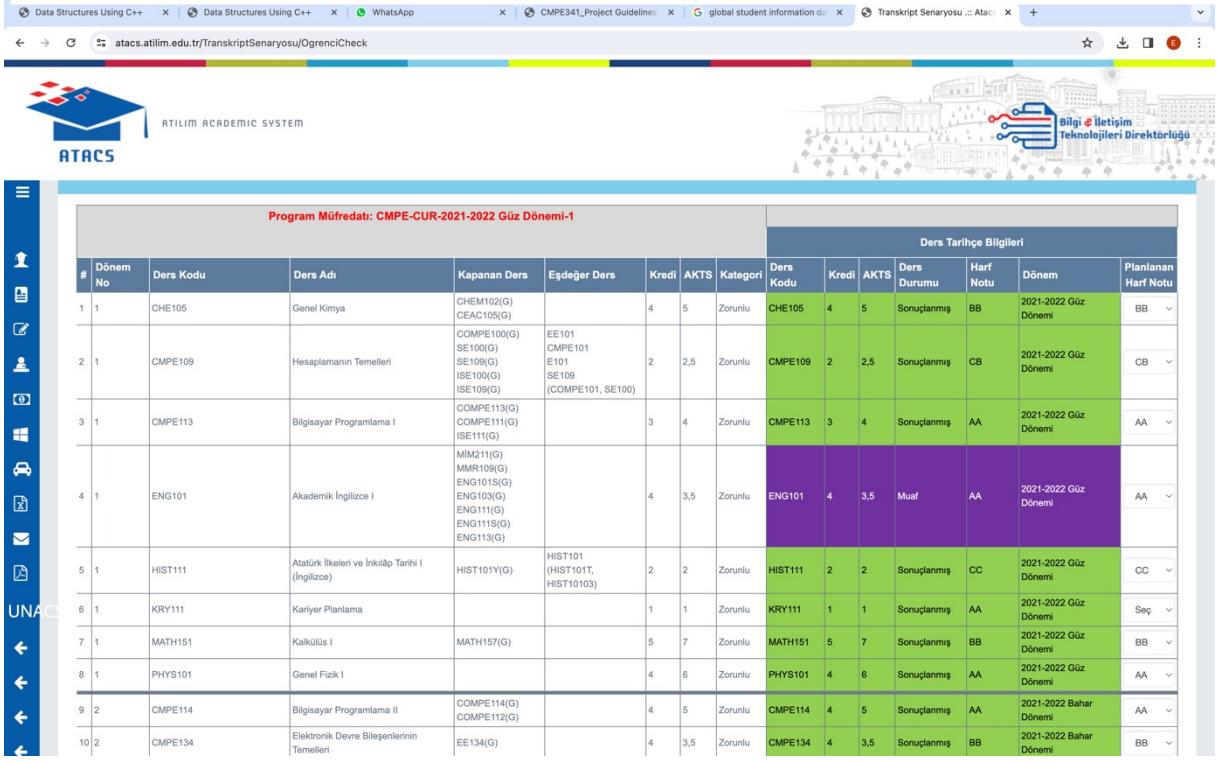


Table 3 ATILIM UNIVERSITY



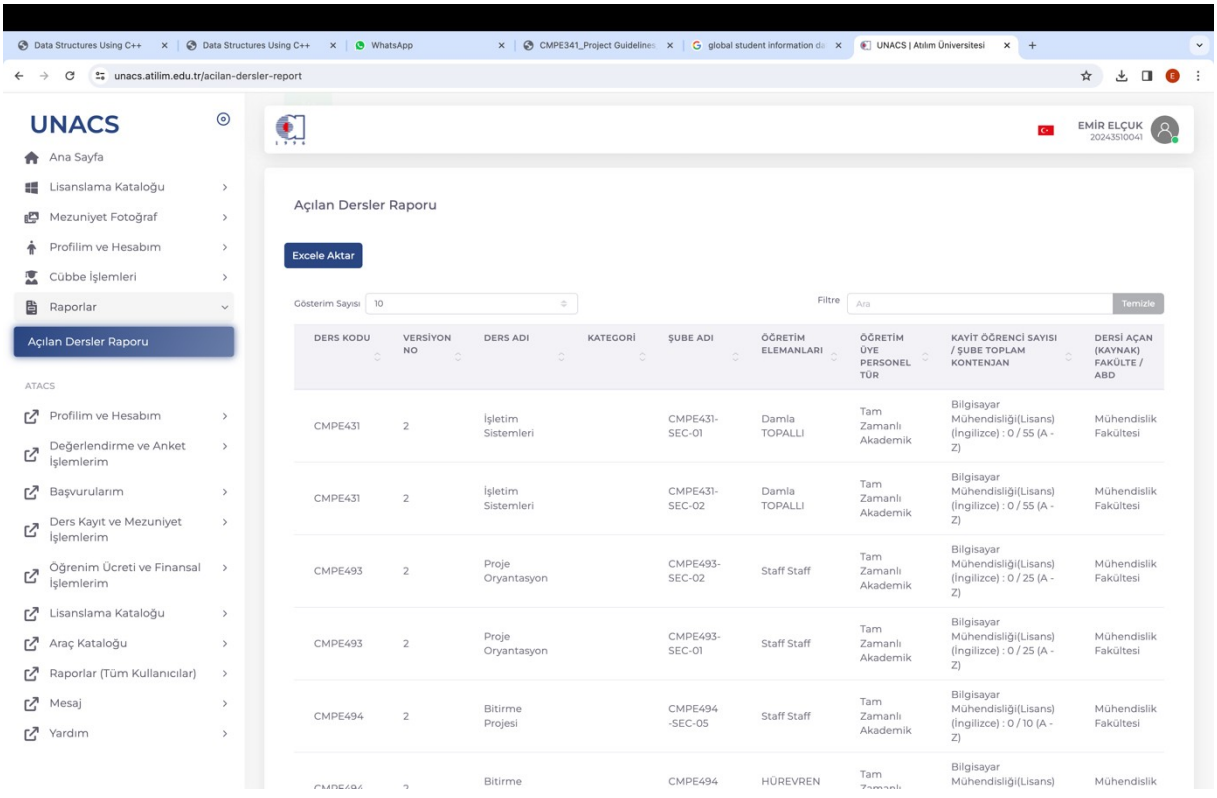
ATILIM ACADEMIC SYSTEM

ATACS

Bilgi & İletişim Teknolojileri Direktörlüğü

Program Müfredatı: CMPE-CUR-2021-2022 Güz Dönemi-1

#	Dönem No	Ders Kodu	Ders Adı	Kapanan Ders	Eşdeğer Ders	Kredi	AKTS	Kategori	Ders Tarihçe Bilgileri: Ders Kodu	Kredi	AKTS	Ders Durumu	Harf Notu	Dönem	Planlanan Harf Notu
1	1	CHE105	Genel Kimya	CHEM102(G) CEAC105(G)		4	5	Zorunlu	CHE105	4	5	Sonuçlanmış	BB	2021-2022 Güz Dönemi	BB
2	1	CMPE109	Hesaplamanın Temelleri	COMPE100(G) SE100(G) SE109(G) ISE100(G) ISE109(G)	EE101 CMPE101 E101 SE109 (COMPE101, SE100)	2	2,5	Zorunlu	CMPE109	2	2,5	Sonuçlanmış	CB	2021-2022 Güz Dönemi	CB
3	1	CMPE113	Bilgisayar Programlama I	COMPE113(G) COMPE111(G) ISE111(G)		3	4	Zorunlu	CMPE113	3	4	Sonuçlanmış	AA	2021-2022 Güz Dönemi	AA
4	1	ENG101	Akademik İngilizce I	MİM211(G) MMR109(G) ENG101S(G) ENG103(G) ENG111(G) ENG111S(G) ENG113(G)		4	3,5	Zorunlu	ENG101	4	3,5	Muaf	AA	2021-2022 Güz Dönemi	AA
5	1	HIST111	Atatürk İlkeleri ve İnkılâp Tarihi I (İngilizce)	HIST101Y(G)	HIST101 (HIST101T, HIST10103)	2	2	Zorunlu	HIST111	2	2	Sonuçlanmış	CC	2021-2022 Güz Dönemi	CC
6	1	KRY111	Kariyer Planlama			1	1	Zorunlu	KRY111	1	1	Sonuçlanmış	AA	2021-2022 Güz Dönemi	Seç
7	1	MATH151	Kalkülüs I	MATH157(G)		5	7	Zorunlu	MATH151	5	7	Sonuçlanmış	BB	2021-2022 Güz Dönemi	BB
8	1	PHYS101	Genel Fizik I			4	6	Zorunlu	PHYS101	4	6	Sonuçlanmış	AA	2021-2022 Güz Dönemi	AA
9	2	CMPE114	Bilgisayar Programlama II	COMPE114(G) COMPE112(G)		4	5	Zorunlu	CMPE114	4	5	Sonuçlanmış	AA	2021-2022 Bahar Dönemi	AA
10	2	CMPE134	Elektronik Devre Bileşenlerinin Temelleri	EE134(G)		4	3,5	Zorunlu	CMPE134	4	3,5	Sonuçlanmış	BB	2021-2022 Bahar Dönemi	BB



UNACS

Ana Sayfa
Lisanslama Kataloğu
Mezuniyet Fotoğraf
Profilim ve Hesabım
Cübbe İşlemleri
Raporlar
Açılan Dersler Raporu

ATACS

Profilim ve Hesabım
Değerlendirme ve Anket İşlemlerim
Başvurularım
Ders Kayıt ve Mezuniyet İşlemlerim
Öğrenim Ücreti ve Finansal İşlemlerim
Lisanslama Kataloğu
Araç Kataloğu
Raporlar (Tüm Kullanıcılar)
Mesaj
Yardım

EMİR ELÇUK
20243510041

Açılan Dersler Raporu

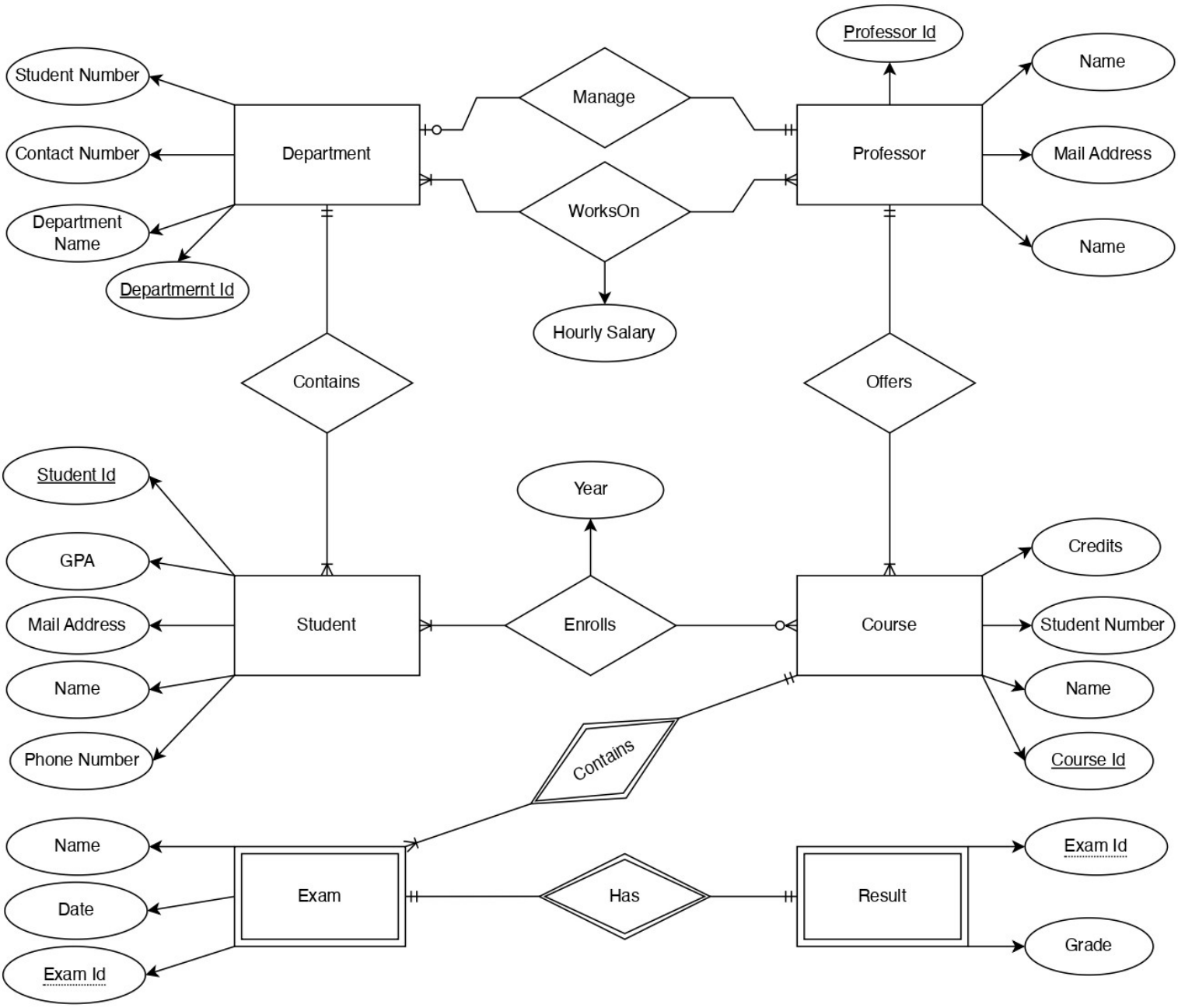
Excele Aktar

Gösterim Sayısı: 10

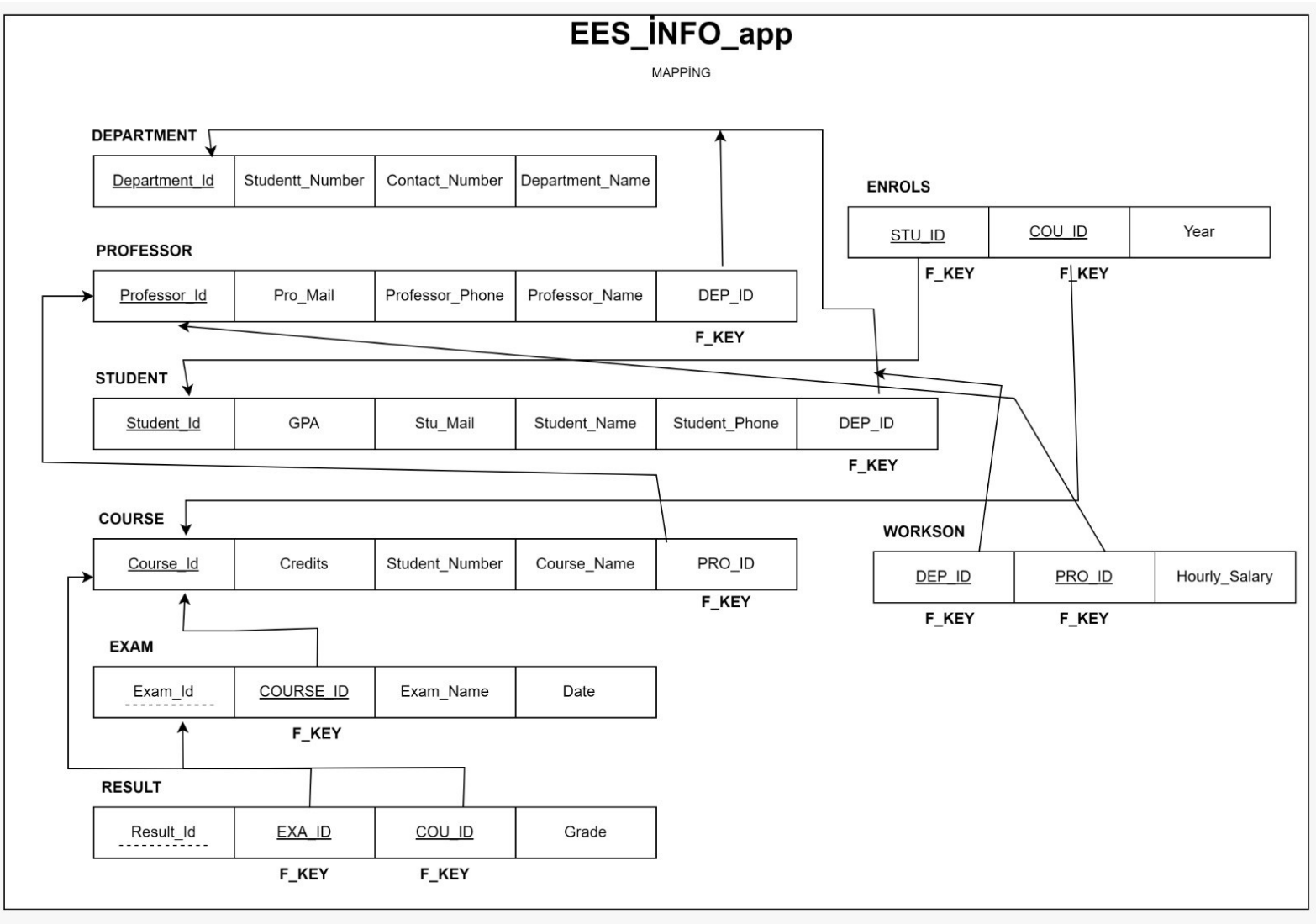
Filtre: Ara — Temizle

DERS KODU	VERSİYON NO	DERS ADI	KATEGORİ	ŞUBE ADI	ÖĞRETİM ELEMANLARI	ÖĞRETİM ÜYE PERSONEL TÜR	KAYİT ÖĞRENCİ SAYISI / ŞUBE TOPLAM KONTENJAN	DERSİ AÇAN (KAYNAK) FAKÜLTE / ABD
CMPE431	2	İşletim Sistemleri		CMPE431-SEC-01	Damla TOPALLI	Tam Zamanlı Akademik	Bilgisayar Mühendisliği(Lisans) (İngilizce) : 0 / 55 (A - Z)	Mühendislik Fakültesi
CMPE431	2	İşletim Sistemleri		CMPE431-SEC-02	Damla TOPALLI	Tam Zamanlı Akademik	Bilgisayar Mühendisliği(Lisans) (İngilizce) : 0 / 55 (A - Z)	Mühendislik Fakültesi
CMPE493	2	Proje Oryantasyon		CMPE493-SEC-02	Staff Staff	Tam Zamanlı Akademik	Bilgisayar Mühendisliği(Lisans) (İngilizce) : 0 / 25 (A - Z)	Mühendislik Fakültesi
CMPE493	2	Proje Oryantasyon		CMPE493-SEC-01	Staff Staff	Tam Zamanlı Akademik	Bilgisayar Mühendisliği(Lisans) (İngilizce) : 0 / 25 (A - Z)	Mühendislik Fakültesi
CMPE494	2	Bitirme Projesi		CMPE494 -SEC-05	Staff Staff	Tam Zamanlı Akademik	Bilgisayar Mühendisliği(Lisans) (İngilizce) : 0 / 10 (A - Z)	Mühendislik Fakültesi
CMPE494	2	Bitirme		CMPE494	HÜREVREN	Tam	Bilgisayar Mühendisliği(Lisans)	Mühendislik

Chapter 3. ER/EER Diagram of the System



Chapter 4. Logical Design



Chapter 5. Physical Design in Oracle

```
CREATE TABLE DEPARTMENT (
   Department_Id NUMBER PRIMARY KEY,
   Studentt_Number NUMBER,
   Contact_Number VARCHAR2(20),
   Department_Name VARCHAR2(50)
);

CREATE TABLE PROFESSOR (
   Professor_Id NUMBER PRIMARY KEY,
   Pro_Mail VARCHAR2(50),
   Professor_Phone VARCHAR2(20),
   Professor_Name VARCHAR2(50),
   DEP_ID NUMBER REFERENCES DEPARTMENT(Department_Id)
);

CREATE TABLE STUDENT (
   Student_Id NUMBER PRIMARY KEY,
   GPA NUMBER,
   Stu_Mail VARCHAR2(50),
   Student_Name VARCHAR2(50),
   Student_Phone VARCHAR2(20),
   DEP_ID NUMBER REFERENCES DEPARTMENT(Department_Id)
);

CREATE TABLE COURSE (
   Course_Id NUMBER PRIMARY KEY,
   Credits NUMBER,
   Student_Number NUMBER,
   Course_Name VARCHAR2(50),
   PRO_ID NUMBER REFERENCES PROFESSOR(Professor_Id),
   DEP_ID NUMBER REFERENCES DEPARTMENT(Department_Id)
);

CREATE TABLE EXAM_ (
   Exam_Id NUMBER PRIMARY KEY,
   Course_Id NUMBER REFERENCES COURSE(Course_Id),
   Exam_Name VARCHAR2(50),
   Date_Time DATE
);

CREATE TABLE RESULT_ (
   Result_Id NUMBER PRIMARY KEY,
   EXA_ID NUMBER REFERENCES EXAM_(Exam_Id),
   COU_ID NUMBER REFERENCES COURSE(Course_Id),
   Grade VARCHAR2(5)
);
```

```
CREATE TABLE ENROLS (
   STU_ID NUMBER REFERENCES STUDENT(Student_Id),
   COU_ID NUMBER REFERENCES COURSE(Course_Id),
   YEARS NUMBER,
   CONSTRAINT enrolls_pk PRIMARY KEY(STU_ID, COU_ID)
);

CREATE TABLE WORKSON (
   DEP_ID NUMBER REFERENCES DEPARTMENT(Department_Id),
   PRO_ID NUMBER REFERENCES PROFESSOR(Professor_Id),
   Hourly_Salary NUMBER,
   CONSTRAINT workson_pk PRIMARY KEY (DEP_ID, PRO_ID)
);
```

Oracle: Populated Tables (Sample Data)

Table 1 DEPARTMENT

	DEPARTMENT_ID	STUDENTT_NUMBER	CONTACT_NUMBER	DEPARTMENT_NAME
1	1	100	1234567890	Computer Science
2	2	150	9876543210	Electrical Engineering
3	3	120	5555555555	Mechanical Engineering
4	4	90	777-9876543	Civil Engineering
5	5	110	999-5551234	Chemical Engineering
6	6	95	888-2223333	Biomedical Engineering
7	7	85	666-4445555	Aerospace Engineering
8	8	105	444-1112222	Environmental Engineering
9	9	115	222-8889999	Industrial Engineering
10	10	75	999-3336666	Materials Science
11	11	125	888-7770000	Software Engineering
12	12	130	555-6661111	Information Technology
13	13	70	111-4447777	Nuclear Engineering
14	14	135	333-9998888	Robotics Engineering
15	15	80	222-5554444	Mathematics
16	16	95	111-2223333	Physics
17	17	105	777-3331111	Biology
18	18	110	555-7772222	Chemistry
19	19	120	333-1115555	Statistics
20	20	100	666-4449999	Economics

Table 2 PROFESSOR

	PROFESSOR_ID	PRO_MAIL	PROFESSOR_PHONE	PROFESSOR_NAME	DEP_ID
1	101	prof1@email.com	1112223344	RESAT	1
2	102	prof2@email.com	5556667788	NURI	2
3	103	prof3@email.com	9998887766	GUNTEKIN	3
4	104	pro104@example.com	104-1112233	SELIM	1
5	105	pro105@example.com	105-1112234	ERBIL	2
6	106	pro106@example.com	106-1112235	EMIR	3
7	107	pro107@example.com	107-1112236	JONE	4
8	108	pro108@example.com	108-1112237	HARRY	5
9	109	pro109@example.com	109-1112238	MATTER	6
10	110	pro110@example.com	110-1112239	HATT	7
11	111	pro111@example.com	111-1112240	MING	8
12	112	pro112@example.com	112-1112241	ORHAN	9
13	113	pro113@example.com	113-1112242	PAMUK	10
14	114	pro114@example.com	114-1112243	ZULFU	11
15	115	pro115@example.com	115-1112244	LIVANELI	12
16	116	pro116@example.com	116-1112245	HALIDE	13
17	117	pro117@example.com	117-1112246	EDIPEDIP	14
18	118	pro118@example.com	118-1112247	ADIVAR	15
19	119	pro119@example.com	119-1112248	OMER	16
20	120	pro120@example.com	120-1112249	SEYFETTIN	17
21	121	pro121@example.com	121-1112250	PEYAFI	18
22	122	pro122@example.com	122-1112251	SAFA	19
23	123	pro123@example.com	123-1112252	KEMAL	20

Table 3 STUDENT

	STUDENT_ID	GPA	STU_MAIL	STUDENT_NAME	STUDENT_PHONE	DEP_ID
1	201	3,5	stu1@email.com	Alice	1231231234	1
2	202	3,2	stu2@email.com	Bob	9879879876	2
3	203	3,8	stu3@email.com	Charlie	4564564567	3
4	207	3,7	stu207@example.com	Emily	207-1112236	4
5	208	3,9	stu208@example.com	Daniel	208-1112237	5
6	209	3,1	stu209@example.com	Sophia	209-1112238	6
7	210	3,6	stu210@example.com	Michael	210-1112239	7
8	211	3,4	stu211@example.com	Olivia	211-1112240	8
9	212	3,3	stu212@example.com	James	212-1112241	9
10	213	3,8	stu213@example.com	Ava	213-1112242	10
11	214	3,2	stu214@example.com	William	214-1112243	11
12	215	3,5	stu215@example.com	Emma	215-1112244	12
13	216	3,6	stu216@example.com	Liam	216-1112245	13
14	217	3,4	stu217@example.com	Isabella	217-1112246	14
15	218	3,7	stu218@example.com	Jackson	218-1112247	15
16	219	3,3	stu219@example.com	Sophie	219-1112248	16
17	220	3,9	stu220@example.com	Noah	220-1112249	17
18	221	3,1	stu221@example.com	SELIM	221-1112250	18
19	222	3,5	stu222@example.com	EMIR	222-1112251	19
20	223	3,8	stu223@example.com	ERBIL	223-1112252	20

Table 4 COURSE

	COURSE_ID	CREDITS	STUDENT_NUMBER	COURSE_NAME	PRO_ID	DEP_ID
1	301	3	50	Database Systems	101	1
2	302	4	40	Digital Signal Processing	102	2
3	303	3	60	Fluid Mechanics	103	3
4	304	3	45	Data Structures	123	2
5	305	4	55	Artificial Intelligence	123	3
6	306	3	50	Software Engineering	122	3
7	307	4	60	Web Development	122	4
8	308	3	40	Algorithms	121	4
9	309	4	55	Computer Graphics	121	5
10	310	3	50	Cybersecurity	120	5
11	311	4	60	Data Science	120	6
12	312	3	40	Mobile App Development	119	6
13	313	4	55	Operating Systems	118	7
14	314	3	50	Network Security	117	7
15	315	4	60	Cloud Computing	116	8
16	316	3	40	Big Data Analytics	116	8
17	317	4	55	Embedded Systems	117	9
18	318	3	50	Computer Vision	118	9
19	319	4	60	Software Testing	119	10
20	320	3	40	Natural Language Processing	120	10
21	321	4	55	Human-Computer Interaction	121	11
22	322	3	50	Robotics	122	11
23	323	4	60	Computer Architecture	123	12
24	324	3	45	Database Design	101	12
25	325	4	55	Information Retrieval	102	13
26	326	3	50	Computer Ethics	103	13
27	327	4	60	Game Development	104	14
28	328	3	40	Network Programming	104	14
29	329	4	55	Artificial Neural Networks	105	15
30	330	3	50	Computer Forensics	106	15
31	331	4	60	Quantum Computing	107	16

Table 5 EXAM

	EXAM_ID	COURSE_ID	EXAM_NAME	DATE_TIME
1	403	303	Quiz	10/03/2023
2	401	301	Midterm	15/04/2023
3	402	302	Final	20/05/2023
4	404	304	Homework	25/03/2023
5	405	305	Project Presentation	18/04/2023
6	406	306	Lab Test	05/05/2023
7	407	307	Research Paper	30/03/2023
8	408	308	Group Project	22/04/2023
9	409	309	Lab Practical	12/05/2023
10	410	310	Peer Review	28/03/2023
11	411	311	Coding Challenge	15/04/2023
12	412	312	Oral Presentation	08/05/2023
13	413	313	Simulation Test	22/03/2023
14	414	314	Problem Solving	12/04/2023
15	415	315	Critical Thinking	02/05/2023
16	416	316	Essay Writing	18/03/2023
17	417	317	Debate	05/04/2023
18	418	318	Case Study Analysis	25/05/2023
19	419	319	Code Review	20/03/2023
20	420	320	Interview	08/04/2023

*Table 6 RESULT_*

	RESULT_ID	EXA_ID	COU_ID	GRADE
1	1	401	301	A
2	2	402	302	B+
3	3	403	303	C
4	4	404	304	A-
5	5	405	305	B
6	6	406	306	C+
7	7	407	307	A
8	8	408	308	B+
9	9	409	309	C
10	10	410	310	A-
11	11	411	311	B
12	12	412	312	C+
13	13	413	313	A
14	14	414	314	B+
15	15	415	315	C
16	16	416	316	A-
17	17	417	317	B
18	18	418	318	C+
19	19	419	319	A
20	20	420	320	B+

Table 7 ENROLS

	STU_ID	COU_ID	YEARS
1	213	313	2023
2	221	321	2023
3	220	320	2023
4	207	307	2023
5	208	308	2023
6	209	309	2023
7	210	310	2023
8	211	311	2023
9	212	312	2023
10	222	322	2023
11	214	314	2023
12	215	315	2023
13	216	316	2023
14	217	317	2023
15	218	318	2023
16	219	319	2023
17	203	302	2021
18	202	303	2021
19	201	301	2021

Table 8 WORKSON

	DEP_ID	PRO_ID	HOURLY_SALARY
1	1	102	50,5
2	2	103	45,5
3	3	101	65,5
4	4	104	60
5	5	105	55,5
6	6	106	65
7	7	107	70
8	8	108	45
9	9	109	58
10	10	110	52,5
11	11	111	63
12	12	112	42
13	13	113	75
14	14	114	68,5
15	15	115	50
16	16	116	47,5
17	17	117	62
18	18	118	55,5
19	19	119	48
20	20	120	70

Queries:

Query 1

Query 1 lists each student with the courses they are enrolled in and the grade information recorded for those courses (LEFT OUTER JOINs across STUDENT, ENROLS, RESULT_ and COURSE; students without enrolments are kept).

```
SELECT
   s.Student_Name,
   r.grade AS GRADES,
   c.course_name AS "COURSE NAME"
FROM
   STUDENT s
LEFT OUTER JOIN
   ENROLS e ON s.Student_Id = e.STU_ID
LEFT OUTER JOIN
   RESULT_ r ON e.COU_Id = r.COU_ID
LEFT OUTER JOIN
   COURSE c ON e.COU_Id = c.COURSE_ID;
```

	STUDENT_NAME	GRADES	COURSE NAME
1	Alice	A	Database Systems
2	Charlie	B+	Digital Signal Processing
3	Bob	C	Fluid Mechanics
4	Emily	A	Web Development
5	Daniel	B+	Algorithms
6	Sophia	C	Computer Graphics
7	Michael	A-	Cybersecurity
8	Olivia	B	Data Science
9	James	C+	Mobile App Development
10	Ava	A	Operating Systems
11	William	B+	Network Security
12	Emma	C	Cloud Computing
13	Liam	A-	Big Data Analytics
14	Isabella	B	Embedded Systems
15	Jackson	C+	Computer Vision
16	Sophie	A	Software Testing
17	Noah	B+	Natural Language Processing
18	ERBIL	(null)	(null)
19	SELIM	(null)	Human-Computer Interaction
20	EMIR	(null)	Robotics

Query 2

Query 2 lists each professor with the highest hourly salary recorded in WORKSON for the professor's department (aggregation with GROUP BY and ORDER BY).

```
SELECT
   p.Professor_Name,
   MAX(w.Hourly_Salary) AS Max_Workson_Hourly_Salary
FROM
   PROFESSOR p
LEFT OUTER JOIN
   WORKSON w ON p.DEP_ID = w.DEP_ID
GROUP BY
   p.Professor_Name
ORDER BY
   p.Professor_Name DESC;
```

	PROFESSOR_NAME	MAX_WORKSON_HOURLY_SALARY
1	ZULFU	63
2	SEYFETTIN	62
3	SELIM	50,5
4	SAFA	48
5	RESAT	50,5
6	PEYAFI	55,5
7	PAMUK	52,5
8	ORHAN	58
9	OMER	47,5
10	NURI	45,5
11	MING	45
12	MATTER	65
13	LIVANELI	42
14	KEMAL	70
15	JONE	60
16	HATT	70
17	HARRY	55,5
18	HALIDE	75
19	GUNTEKIN	65,5
20	ERBIL	45,5
21	EMIR	65,5
22	EDIPEDIP	68,5
23	ADIVAR	50

Query 3

Query 3 lists students in descending order of GPA, together with the highest grade value found through nested subqueries (student department, courses, exams, results).

```
SELECT
   s.Student_Id,
   s.Student_Name,
   s.GPA,
   MAX(
      (SELECT MAX(r.Grade) FROM RESULT_ r
       WHERE r.EXA_ID IN
         (SELECT Exam_Id FROM EXAM_ e
          WHERE e.Course_Id IN
            (SELECT Course_Id FROM COURSE c WHERE c.DEP_ID = s.DEP_ID))
      )
   ) AS Max_Grade
FROM
   STUDENT s
GROUP BY
   s.Student_Id, s.Student_Name, s.GPA
```

ORDER BY
s.GPA DESC;

	STUDENT_ID	STUDENT_NAME	GPA	MAX_GRADE
1	208	Daniel	3,9	C
2	220	Noah	3,9	(null)
3	213	Ava	3,8	B+
4	203	Charlie	3,8	C+
5	223	ERBIL	3,8	(null)
6	207	Emily	3,7	B+
7	218	Jackson	3,7	(null)
8	216	Liam	3,6	(null)
9	210	Michael	3,6	B+
10	201	Alice	3,5	A
11	222	EMIR	3,5	(null)
12	215	Emma	3,5	(null)
13	217	Isabella	3,4	(null)
14	211	Olivia	3,4	C
15	212	James	3,3	C+
16	219	Sophie	3,3	(null)
17	202	Bob	3,2	B+
18	214	William	3,2	(null)
19	221	SELIM	3,1	(null)
20	209	Sophia	3,1	C+