



Project Phase 1

Group 1

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System Specification

DB system

The system allows us to store data of a university like the students, courses, professors data, and store exam grades for each student.

Hardware characteristics

- **OS:** Windows 10 64-bits
- **CPU:** Intel® Core™ i7-8750 CPU @2.20GHz (12 CPUs)
- **RAM:** 16 GB
- **Hard disk:** 1 TB HDD

Relational Database (SQL)

- MySQL Ver 14.14 Distrib 5.7.24, for Win32 (AMD64)

NOSQL DATABASE

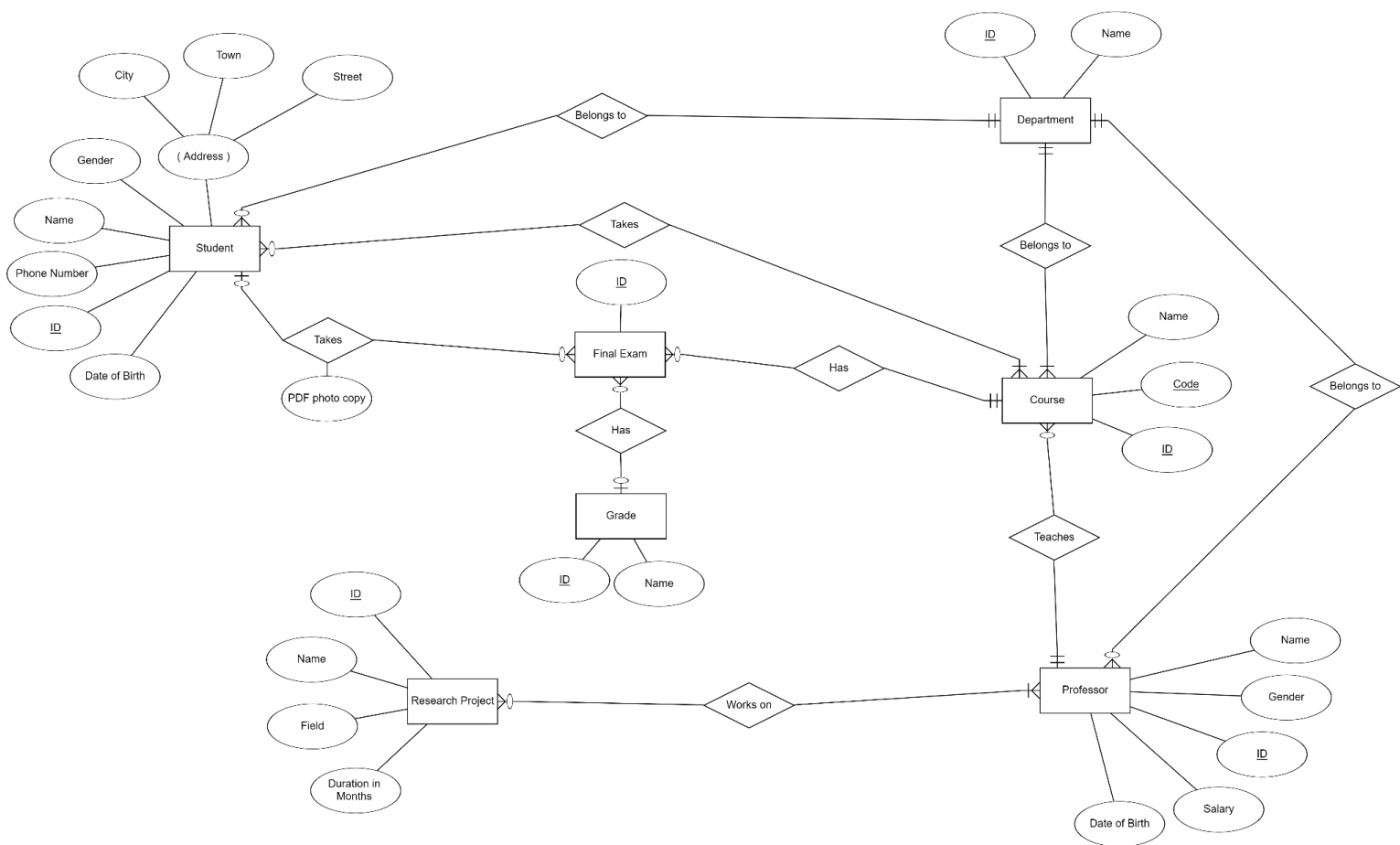
- MongoDB shell version v4.4.6

ER Diagram before optimizations

For better quality:

<https://drive.google.com/file/d/1ZaFyfwA7nHFBU90WVoirgL8Rhbm2Txd0/view?usp=sharing>

Using crow's foot notation



MySQL Statistics before optimizations

Relation Name	Row count	Main key	Index	FK	Identity column	Avg Row size in (bytes)
course	10,000	Yes	4	2	Yes	159
department	100	Yes	1	0	Yes	163
final_exam	6,000,000	Yes	4	3	Yes	36
grade	6	Yes	1	0	Yes	2730
professor	1,000,000	Yes	2	1	Yes	53
professor_research	4,000,000	Yes	3	2	Yes	30
research_project	2,000,000	Yes	1	0	Yes	50
student	4,000,000	Yes	2	1	Yes	105
student_course	7,000,000	Yes	3	2	Yes	29

Note: MySQL creates a B-tree index for any Primary key or Foreign key

MongoDB Schema before optimizations

```
{
  "course": {
    "_id": "int",
    "ID": "int",
    "Name": "string",
    "Code": "string",
    "department_id": "int",
    "professor_id": "int"
  },
  "department": {
    "_id": "int",
    "ID": "int",
    "Name": "Fire, Police & Security"
  },
  "final_exam": {
    "_id": "int",
    "ID": "int",
    "grade_id": "int",
    "course_id": "int",
    "student_id": "int"
  },
  "grade": {
    "_id": "int",
    "ID": "int",
    "Name": "string"
  },
  "professor_research": {
    "_id": "int",
    "ID": "int",
    "research_project_id": "int",
    "professor_id": "int"
  },
  "professor": {
    "_id": "int",
    "ID": "int",
    "Name": "string",
    "Gender": "string",
    "Salary": "int",
    "Date_of_Birth": "string",
    "department_id": "int"
  },
}
```

```
"research_project": {
  "_id": "int",
  "ID": "int",
  "Name": "string",
  "Field": "string",
  "Duration_in_Months": "int"
},
"student_course": {
  "_id": "int",
  "ID": "int",
  "student_id": "int",
  "course_id": "int"
},
"student": {
  "_id": "int",
  "ID": "int",
  "Name": "string",
  "Phone_Number": "string",
  "Gender": "string",
  "Date_of_Birth": "string",
  "Street": "string",
  "City": "string",
  "Town": "string",
  "department_id": "int"
}
}
```