

Lab #1 CS 166

Professor Tsotras

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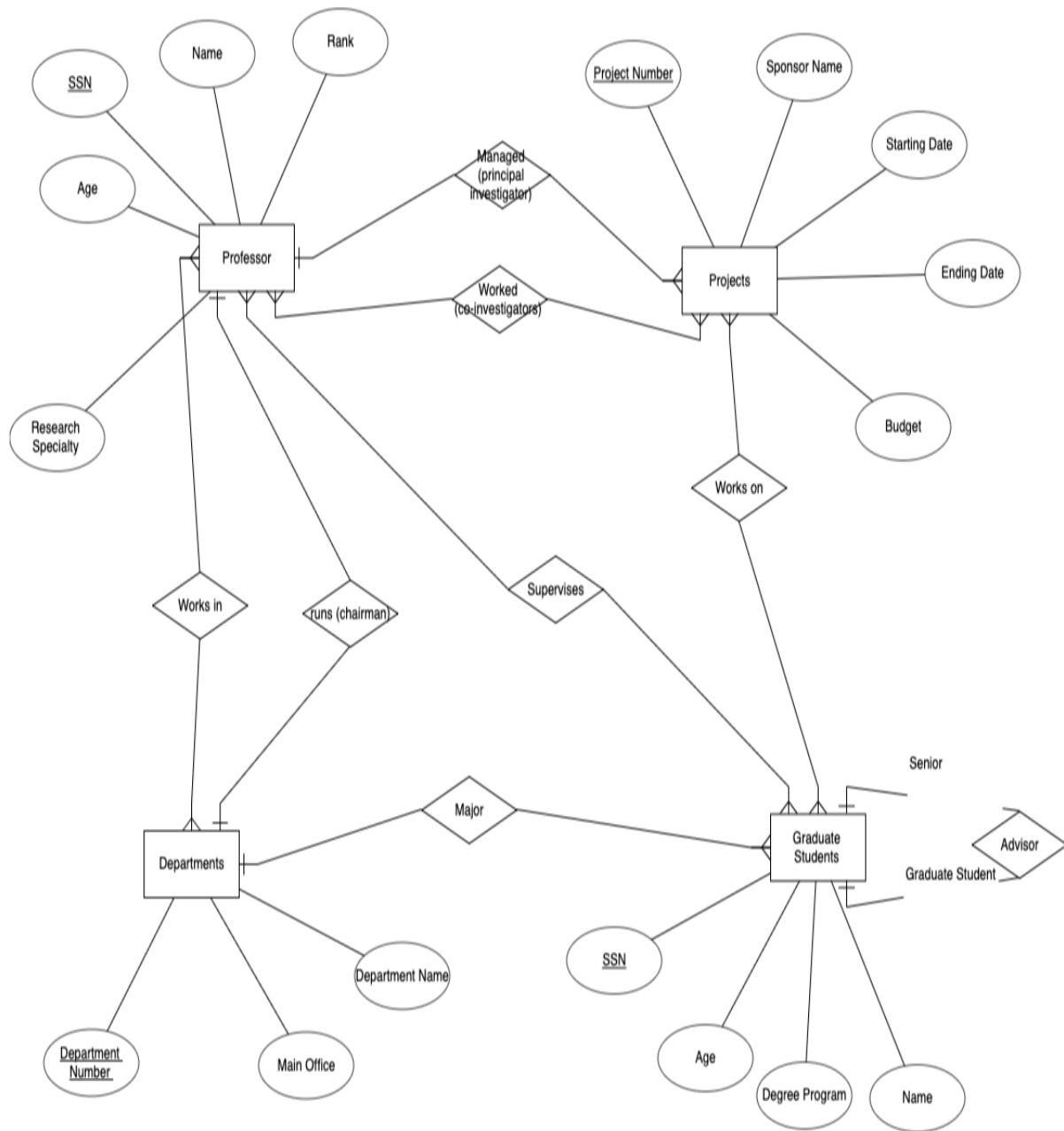
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Part 1: University

- Professors have an SSN, a name, an age, a rank and a research specialty:
 - Professor is the entity
 - SSN (unique key), name, age, rank, research specialty are all attributes
- Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date and a budget:
 - Projects is the entity
 - Project number (unique key), sponsor name, starting date, ending date, and budget are all attributes
- Graduate students have an SSN, a name, an age and a degree program (e.g., M.S. or Ph.D):
 - Graduate Students is the entity
 - SSN (unique key), name, age, and degree program are the attributes
- Each project is managed by one professor (known as the projects principal investigator):
 - This is a **mandatory many-to-one relationship** because each project needs a single professor to manage it, but many professors can work on multiple projects.
- Each project is worked on by one or more professors (known as the projects co-investigators):
 - This is a **mandatory many-to-many** relationship because each project needs at least one professor to work on the project, but does not need more than one professor. However, many professors can work on multiple projects.
- Each project is worked on by one or more graduate students (known as the projects research assistants):

many-to-many relationship because a single project can be worked on by more than one graduate student

- When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one:
 - This is a **mandatory many-to-many** relationship because many graduate students may work on a single project with possibly a different supervisor, which indicates that those working on multiple projects will have many supervisors.
- Departments have a department number, a department name and a main office:
 - Departments is the entity
 - Department number (unique key), department name, and main office are attributes
- Departments have a professor (known as the chairman) who runs the department:
 - This is a **mandatory one-to-one relationship** as a single professor must run a single department
- Professors work in one or more departments and for each department that they work in, a time percentage is associated with their job:
 - This is a **mandatory many-to-many relationship** with an association of time percentage (not pictured in diagram) because a single professor can work in one or multiple departments, but since departments can hold many professors, there is a many-to-many relationship between the two.
- Graduate students have one major department in which they are working on their degree:
 - This is a **mandatory many-to-one relationship** as many grad students must be in one department.
- Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take:
 - This is a **mandatory one-to-one** relationship as one graduate student must have one senior graduate student as an advisor



Part 2: Notown

- Each musician that records at Notown has an SSN, a name, an address and a phone number. Poorly paid musicians often share the same address, and no address has more than one phone:
 - Musician is the entity
 - SSN (unique key), name, address, phone number are all attributes
- Each instrument that is used in songs recorded at Notown has a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, E):
 - Instrument is the entity
 - Name (unique key) and musical key are the attributes
- Each album that is recorded on the Notown label has a title, a copyright date, a format (e.g., CD or MC), and an album identifier:
 - Album is the entity
 - Title, copyright date, format, and album identifier (unique key) are the attributes
- Each song recorded at Notown has a title and an author:
 - Song is the entity
 - Title and author are the attributes
- Each musician may play several instruments, and a given instrument may be played by several musicians:
 - This is an **optional many-to-many** relationship because one musician can play multiple instruments and a single instrument can be played by more than one musician
- Each album has a number of songs on it, but no song may appear on more than one album:
 - This is a **mandatory many-to-one** relationship because an album has multiple songs, but a single song can only be on one album
- Each song is performed by one or more musicians, and a musician may perform a number of songs:
 - This is a **mandatory many-to-many** relationship because more than one musician may perform a single song and a song is performed by one or more musicians, making this part o

- Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course:
 - This is a **mandatory many-to-one** relationship because only one musician may produce one album

