***Introduction to Computers***

**Introduction to Databases**

**Databases**

A database is structured collection of data. Thus, student record, dictionary and telephone directories are all examples of databases. Databases may be stored on a computer and examined using a program. These programs are often called `databases', but more strictly are database management systems (DMS). There are many ways, or models, by which a computerized database may be organized. One of the most common and powerful models is the `relational' model, and programs which use this model are known as relational database management systems (RDMS).

**Need of Database**

In the early days, database applications were built on top of file systems. That is registers were maintained or word documents were used for data storage. Drawbacks of using file systems to store data:

* Data redundancy and inconsistency
* Multiple file formats, duplication of information in different files
* Difficulty in accessing data
* Need to write a new program to carry out each new task
* Failures may leave database in an inconsistent state with partial updates carried out.
* Uncontrolled concurrent accesses can lead to inconsistencies – E.g. two people reading a balance and updating it at the same time
* Security problems.

Database systems offer solutions to all the above problems. It has the following features:

* Databases can store very large numbers of records efficiently (they take up little space).
* It is very quick and easy to find information.
* It is easy to add new data and to edit or delete old data.
* Data can be searched easily, eg 'find all Ford cars'.
* Data can be sorted easily, for example into 'date first registered' order.
* More than one person can access the same database at the same time - multi-access.
* Security is better than in paper files.

**Relational database** – is useful for maintaining and analyzing complex information stored in a number of tables. For example, in addition to storing student names, you can list TAKS test scores, or demographic information related to the students in other tables in the same database.  Use of this model often results in a database with many tables.

**Tables**

Computer-based databases are usually organized into one or more tables. A table stores data in a format similar to a published table and consists of a series of rows and columns. To carry the analogy further, just as a published table will have a title at the top of each column, so each column in a database table will have a name, often called a field name. The term field is often used instead of column. Each row in a table will represent one example of the type of object about which data has been collected. Table 1 is a an example of a table from a database of English towns. Each row, in this case a town, is an entity, and each column represents an attribute of that entity. Thus, in this table `population' is an attribute of `town.'

**Table 1:** Example tables from a geographical database



**Table 2: Table of counties**

 

**Query**

A query is a type of command that retrieves data from the server. One advantage of computer-based tables is that they can be presented on screen in a variety of orders, formats, or according to certain criteria, all the towns in Hertfordshire, or all towns with a cathedral.

### **Primary and foreign keys**

Every row in a table in a relational database must be unique, there must not be two identical rows. One or more columns are therefore designated the *primary key* (sometimes called the unique identifier) for the items contained within it. Thus, in Table [1](https://www.ucl.ac.uk/archaeology/cisp/database/manual/node1.html#extable) the column `town' could act as the primary key, your NIC is a primary key, students roll No is also example of primary key.

Foreign keys are columns in a table which provide a link to another table. In our geographical example, the county column in our table of towns provides a link to the table of counties (**Table 2**), and is thus a key field in that relationship. It is very important therefore to ensure that entries in the both tables are identical, that both tables use the full county name (Hertfordshire).

Database Design Process

Database Design is a collection of processes that facilitate the designing, development, implementation and maintenance of enterprise data management systems. ...

The main objectives of database designing are to produce logical and physical designs models of the proposed database system

