The nature of a database.

Essential features of databases, examples. Formal data models: resilience to change, data independence. The role of metadata.

Mutation rate of data items. Benefits and cost of indexing.

The architecture of a DBMS.

ANSI/SPARC architecture for DBMS. The need for a Data Definition Language. Brief history of Data Models and DBMS. Corporate evolution and the need for Standards. Schema evolution.

Transaction processing, physical database design.

Recap of ACID properties of transactions. Rotating storage devices, space allocation, the need for synchronised atomic change.

Indexing and inverted files (B-trees assumed). Extensible hashing schemes.

Database design.


Relationships between entities. Entity-Relationship (E/R) diagrams. Degree and multiplicity of relationships.

Entity types as classes. Object-based design methodology. UML.

Network model of data.

Historical review of DBMS. The CODASYL/DBTG proposals as an example of the ANSI/SPARC architecture.


Relational model: basic semantics.


Relational algebra.

Relational schema design.


Relational calculus and SQL.


Semantic considerations in the SQL data model.


Generalisation. Referential integrity and Foreign keys. The need for transitive closure. Fixed-point semantics. Deductive databases. DATALOG.

Distributed applications.


The Object Database Standard ODMG 3.0.

The ODMG Object Model. ODMG/ODL as a Data Definition Language. Metaobjects and the ODL Schema Repository. Type system: atomic objects (user-defined), collection objects, literal types, structures.


Operations and exceptions. Transactions. Lock types, Two-Phase Locking (2PL) as the default concurrency control policy. Databases.


The final lecture of the course will take place on May 22nd 2001, when we are lucky enough to have Hugh Darwen as guest lecturer. Hugh served (for many years!) on the SQL3 Standard Committee.

The SQL1999 Standard (SQL3).


Ken Moody