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INFORMATION
TECHNOLOGY

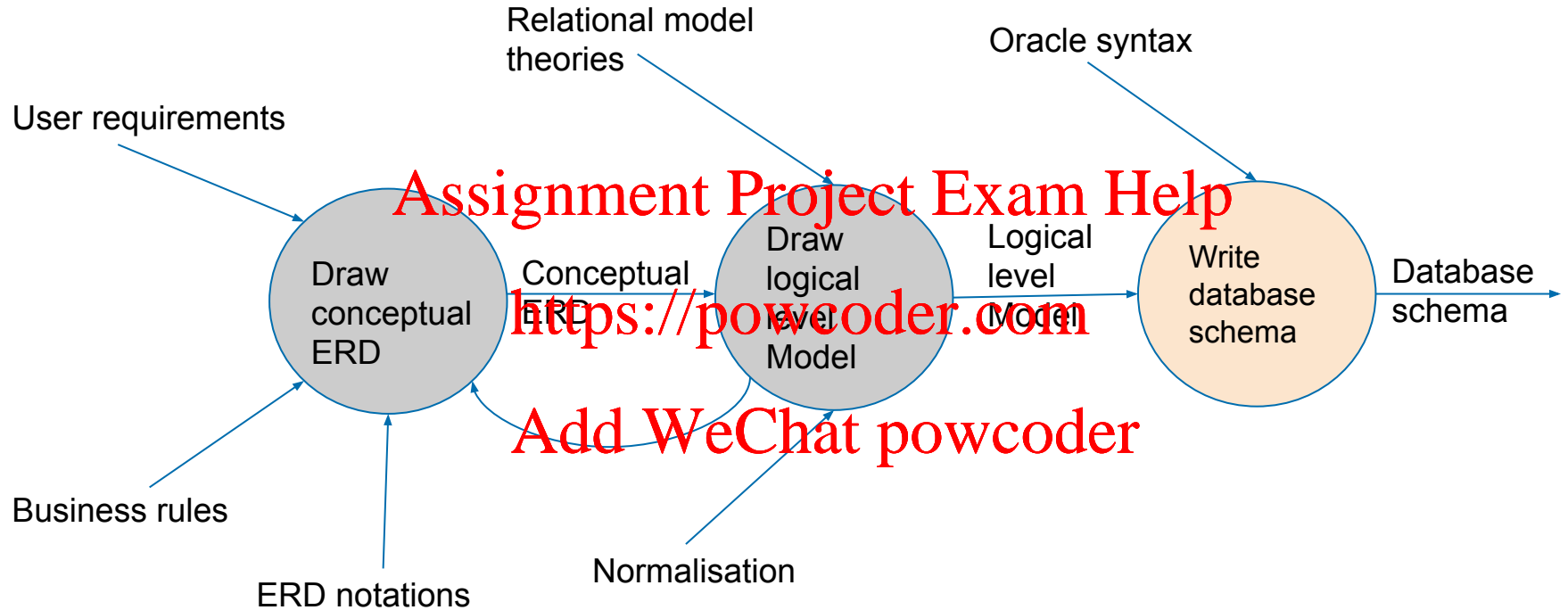
Creating & Populating the Database – Data
Definition Language

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SQL general syntax

- A single statement is ended with SEMICOLON.
- Predefined KEYWORDS represent clauses (components) of a statement.
- Keywords are NOT case sensitive.
- Examples:

```
CREATE TABLE unit
(
    unit_code    CHAR(7) NOT NULL,
    unit_name    VARCHAR2(50) CONSTRAINT uq_unit_name UNIQUE NOT NULL,
    CONSTRAINT pk_unit PRIMARY KEY (unit_code)
);

SELECT * FROM student;
```

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SQL Statements

- Data Definition Language (DDL)
 - Creating database structure
 - CREATE TABLE, ALTER TABLE, DROP TABLE
 - Data Manipulation Language (DML)
 - Adding and Manipulating database contents (rows)
 - INSERT, UPDATE, DELETE
 - Retrieving data from database
 - SELECT
 - Data Control Language (DCL)
 - Set permissions on objects
 - GRANT
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CREATE A TABLE (DDL)

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Common ORACLE data types

- **Text:** CHAR(size), VARCHAR2(size)

- e.g., CHAR(10), VARCHAR2(10)

- CHAR(10) → 'apple' = 'apple '

- VARCHAR2(10) → 'apple' = 'apple'

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- **Numbers:** NUMBER(precision, scale)

- Weight NUMBER(7) or NUMBER(7,0) → Weight = 7456123

- Weight NUMBER(9,2) → Weight = 7456123.89

- Weight NUMBER(8,1) → Weight = 7456123.9

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- **Data/Time:** DATE, TIMESTAMP

- DATE can store a date and time (time to seconds), stored as Julian date

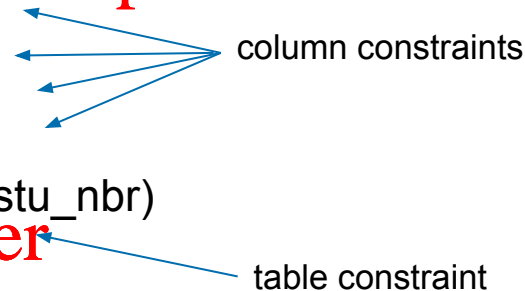
- TIMESTAMP can store a date and a time (up to fractions of a second)

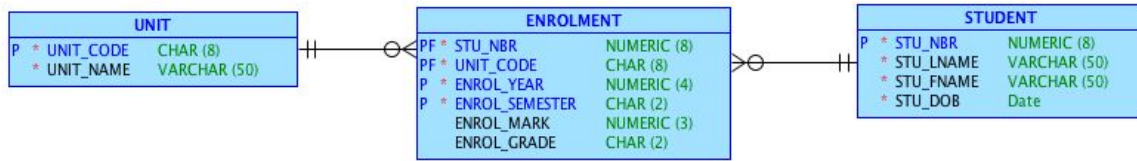
- TIMESTAMP WITH TIME ZONE



Column VS Table Level Constraints

```
CREATE TABLE STUDENT (  
  stu_nbr NUMBER(6) NOT NULL,  
  stud_lname VARCHAR2(50) NOT NULL,  
  stud_fname VARCHAR2(50) NOT NULL,  
  stu_dob DATE NOT NULL,  
  CONSTRAINT STUDENT_PK PRIMARY KEY (stu_nbr)  
);
```





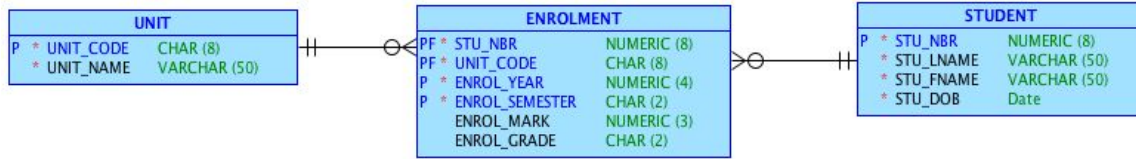
CREATE TABLE student

```
(
  stu_nbr      NUMBER(8)      NOT NULL,
  stu_lname    VARCHAR(50)    NOT NULL,
  stu_fname    VARCHAR(50)    NOT NULL,
  stu_dob      DATE           NOT NULL,
  CONSTRAINT pk_student PRIMARY KEY (stu_nbr)
);
```

CREATE TABLE unit

```
(
  unit_code    CHAR(8)        NOT NULL,
  unit_name    VARCHAR(50)    CONSTRAINT uq_unit_name UNIQUE NOT NULL ,
  CONSTRAINT pk_unit PRIMARY KEY (unit_code)
);
```





CREATE

TABLE enrolment

(

stu_nbr NUMBER(8) NOT NULL,

unit_code CHAR(8) NOT NULL,

enrol_year NUMBER(4) NOT NULL,

enrol_semester CHAR(2) NOT NULL,

enrol_mark NUMBER(3),

enrol_grade CHAR(2),

CONSTRAINT pk_enrolment PRIMARY KEY (stu_nbr, unit_code, enrol_year, enrol_semester),

CONSTRAINT fk_enrolment_student FOREIGN KEY (stu_nbr) REFERENCES student (stu_nbr),

CONSTRAINT fk_enrolment_unit FOREIGN KEY (unit_code) REFERENCES unit (unit_code)

);

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Alternative method of defining FKs

```
CREATE TABLE enrolment
(
  stu_nbr          NUMBER(8)    NOT NULL,
  unit_code        CHAR(8)      NOT NULL,
  enrol_year       NUMBER(4)    NOT NULL,
  enrol_semester   CHAR(2)      NOT NULL,
  mark            NUMBER(3),
  grade            CHAR(2),
  CONSTRAINT pk_enrolment PRIMARY KEY (stu_nbr, unit_code, enrol_year, enrol_semester)
);
```

```
ALTER TABLE enrolment
ADD
  ( CONSTRAINT fk_enrolment_student FOREIGN KEY (stu_nbr)
    REFERENCES student ( stu_nbr),
    CONSTRAINT fk_enrolment_unit FOREIGN KEY (unit_code)
    REFERENCES unit (unit_code));
```

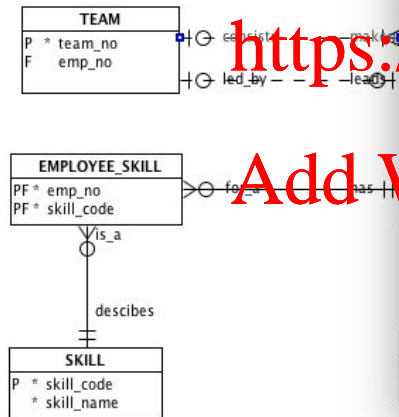
Referential Integrity

- To ensure referential integrity, SQL defines three possible actions for FKs in relations when a deletion of a primary key occurs:
 - RESTRICT (Oracle No Action basically equivalent)
 - Deletion of tuples is NOT ALLOWED for those tuples in the table referred by the FK (the table containing PK) if there is corresponding tuple in the table containing the FK.
 - CASCADE
 - A deletion of a tuple in the table referred by the FK (the table containing PK) will result in the deletion of the corresponding tuples in the table containing the FK.
 - NULLIFY
 - A deletion of a tuple in the table referred by the FK (the table containing PK) will result in the update of the corresponding tuples in the table containing the FK to NULL.



Referential Constraints SQL Data Modeller

52 UTC
48 UTC



Relation Properties - team_employee

General

Name: team_employee

Use surrogate keys: ☐

Source Cardinality

Source: TEAM

Source Key: TEAM.M_TEAM PK

Name on Source: consists

Source Entity Synonym: TEAM

Source to Target Cardinality: 1..*

Source Optional: ☐

Transferable: ☒

Identifying: ☐

Delete Rule: NO ACTION

NO ACTION
CASCADE
SET NULL
RESTRICT

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What Referential Integrity Constraint to implement?

- Use the model to decide on what referential integrity constraint to implement.
 - Mandatory vs Optional participation.
- The constraints must be decided at the design phase.

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ALTER TABLE

- Used to change a tables structure.
- For example:

- Adding column(s).
- Removing column(s).
- Adding constraint(s).
- Removing constraint(s).

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```
ALTER TABLE student
```

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```
ADD (stu_address varchar(200),  
     status char(1) DEFAULT 'C',  
     constraint status_chk CHECK (status in ('G','C'))  
);
```



Referential Integrity Definition - Example

```
ALTER TABLE enrolment  
  DROP CONSTRAINT fk_enrolment_student;
```

```
ALTER TABLE enrolment  
  DROP CONSTRAINT fk_enrolment_unit;
```

```
ALTER TABLE enrolment  
  ADD  
    ( CONSTRAINT fk_enrolment_student FOREIGN KEY (stu_nbr)  
      REFERENCES student ( stu_nbr) ON DELETE CASCADE,
```

```
    CONSTRAINT fk_enrolment_unit FOREIGN KEY (unit_code) REFERENCES unit  
      (unit_code) ON DELETE CASCADE  
  );
```



DELETING A TABLE

- Use the DROP statement.
- Examples:

- `DROP TABLE enrolment PURGE;`
- `DROP TABLE student CASCADE CONSTRAINTS PURGE;`

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ADDING TUPLES/ROWS TO A TABLE (DML)
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INSERT

- Adding data to a table in a database.
- SYNTAX:

```
INSERT INTO table [(column [, column...])]
```

```
VALUES (value [, value...]);
```

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```
INSERT INTO unit VALUES ('FIT9132', 'Databases');
```

```
INSERT INTO student VALUES (112233, 'Willa', 'Wilbur',  
'01-Jan-1995')
```

Role of: *to_date* and *to_char*

COMMIT and ROLLBACK

```
INSERT INTO enrolment VALUES (112233,  
                                'FIT9132',1,2018,45,'N');  
INSERT INTO enrolment VALUES (112233,  
                                'FIT9001',1,2018,80,'HD');  
COMMIT;
```

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COMMIT makes the changes to the database permanent.

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ROLLBACK will undo the changes.

Using a SEQUENCE

- Oracle supports auto-increment of a numeric PRIMARY KEY.
 - SEQUENCE.
- Steps to use:
 - Create sequence

```
CREATE SEQUENCE sno_seq  
INCREMENT BY 1
```

- Access the sequence using two built-in variables (pseudocolumns):
 - NEXTVAL and CURRVAL

- INSERT INTO student
VALUES(sno_seq.nextval, 'Bond', 'James', '01-Jan-1994');
- INSERT INTO enrolment
VALUES(sno_seq.currval, 'FIT9132', ...');



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PUTTING THIS TO WORK

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