

Sample Solution for Coursework C1: DTDs

The DTD below shows one possible way to satisfy the data requirements of this exercise.

We have essentially three different entity types in this task, (1) courses, (2) programs, and (3) students. Courses and students are connected in a many-to-many relationship, which is modeled by the `course-taken` elements in a `student` element. Each `course-taken` refers to the course the student has taken with an ID reference. Moreover, one can record in optional attributes the marks for coursework and exams. Also courses and programs are linked by a many-to-many relationship. It is modeled by the `availability` elements in each `course` element, which say for which program the course is available in which of the two modes `mandatory` and `optional`. Finally, students are in a many-to-one relationship to programs, which is modeled by the attribute `program` in the `student` elements.

We have used entities for the possible values of the program and availability mode range. The program values occur in two places, student and course elements. The `Programs` entity allows us therefore to defined the values only in one place. Declared by an entity, the availability modes are highlighted und thus more easily changeable.

```
<!ENTITY % Programs "( BScInCSAndEngineering | BScInAppliedCS
                        | MasterInCS | PhDInCS)">
<!ENTITY % AvailabilityModes "(mandatory | optional)">

<!ELEMENT studentlist (courses, students)>
<!ELEMENT courses (course*)>
<!ELEMENT students (student*)>
<!ELEMENT course (title, availability+)>
<!ATTLIST course
                cid ID #REQUIRED>
<!ELEMENT title (#PCDATA)>
<!ELEMENT availability EMPTY>
<!ATTLIST availability
                program %Programs; #IMPLIED
```

```
        mode %AvailabilityModes; #IMPLIED>
<!ELEMENT student (name, course-taken*)>
<!ATTLIST student
    matrNo ID #REQUIRED
    matrYear CDATA #REQUIRED
    program %Programs; #IMPLIED>
<!ELEMENT name (firstname, middlename?, lastname)>
<!ELEMENT firstname (#PCDATA)>
<!ELEMENT middlename (#PCDATA)>
<!ELEMENT lastname (#PCDATA)>
<!ELEMENT course-taken EMPTY>
<!ATTLIST course-taken
    cid IDREF #REQUIRED
    cw-mark CDATA #IMPLIED
    exam-mark CDATA #IMPLIED>
```