

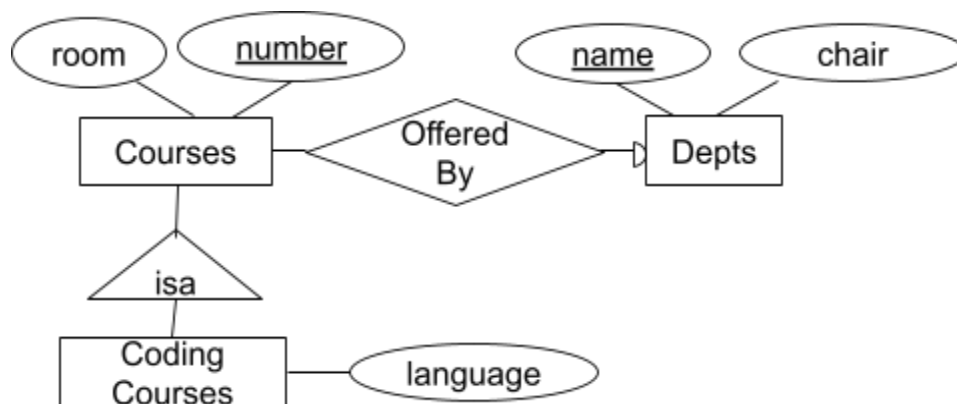
FD and BCNF Problems

Q1. Convert the E/R diagram below to relations in BCNF form. Assume no values are NULL, and the arrow between OfferedBy and Depts is a round one. Include all keys and foreign keys. Use the following notation and explicitly state foreign key relationships.

For instance:

$R(\underline{a}, b)$

$S(\underline{c}, d) \text{ -- } c \text{ is a foreign key to } R$



BCNF algorithm (for reference)

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Normalize(R)
   $C \leftarrow$  the set of all attributes in  $R$ 
  find  $X$  s.t.  $X^+ \neq X$  and  $X^+ \neq C$ 
  if  $X$  is not found
  then "R is in BCNF"
  else
    decompose  $R$  into  $R_1(X^+)$  and  $R_2((C - X^+) \cup X)$ 
    Normalize(R1)
    Normalize(R2)
```

Q2. Given $R(A, B, C, D, E, F)$, and functional dependencies: $B \rightarrow A$; $E \rightarrow B$; $D \rightarrow C$; $A \rightarrow C$

Decompose R into BCNF. In each step, explain which functional dependency you used to decompose and explain why further decomposition is needed. Your answer should consist of a list of table names and attributes. Make sure you indicate the keys for each relation.

Q3. **(17WI Final Q4)** Given $R(A, B, C, D, E)$, and functional dependencies: $A \rightarrow C$, $BD \rightarrow A$, $D \rightarrow E$

Decompose R into BCNF. In each step, explain which functional dependency you used to decompose and explain why further decomposition is needed. Your answer should consist of a list of table names and attributes. Make sure you indicate the keys for each relation.