Design procedure for double reinforced beams (Week 4-5)

- **Step # 1:**

  Find the strength Mu of a singly reinforced beam

  Mu > 0.156Fcubd2

  Md = 0.156Fcubd2

  If Mu required > Md of simply reinforced beam . Proceed with doubly reinforced beam design.
- **Step # 2:**

  Find excess moment i.e

  Mu1 = Mu – Md
- and determine the resulting compression steel area As’ = As and tentatively assume that fs = fy, then

  As' = Mu1 /0.95 fy (d - d')
- **Step# 3:**

  Find the total tensile steel area i.e

  As = As' + As2

  As2 = 0.156Fcubd2/0.95fyz
- **Step # 4:**

  Check for satisfactory minimum and maximum reinforcement ratios and check for shear and design for shear reinforcement
- **Step # 5:**

  Select appropriate bar size and draw the sketches.

Design procedure for reinforced solid slabs (Week 6-7)

- **Step # 1:**

  Find the strength M for two -ways slab by using the BS 8110 slab coefficient factors

  M for one way slab can be obtained depending on the orientation of the slab, for a simply supported one way slab, use $wl^2/8$. for a continuous slab use 0.086fl.

- **Step # 2:**

find $K = m / f_{cu}bd^2$, where b = 1000 mm and d is the effective depth of slab

- **Step # 3:**

  Check for area of steel, for both main and distribution steel,

  As = m/0.95fyz

- **Step # 4:**

  Select appropriate bar size, check for deflection on the short span and draw the sketches.

Design procedure for reinforced concrete columns (Week 7-8)

- Design of different types of columns
- Classified the column to: Braced and Unbraced.
- Determine whether the column is short or slender: For a short column

  l_{ex}/h and $l_{ey}/h < 15$ for braced and <10 for unbraced column.

l_{ex} and l_{ey} are effective heights on the x and y axis of the column. H is the overall depth of column.

Determine the axial load and moments on the column.

Use N=0.45FcuAc +0.95FyAsc. Or column charts to determine the reinforcements.

A minimum of 4 bars and 6 bars are required for rectangular and circular columns respectively.