

**CE 498 SPECIAL PROJECT**  
**LECTURE NOTES**

Prepared by Prof. Dr. ATA ATUN  
Department of Civil Engineering  
Faculty of Engineering  
Near East University

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## **CE 498- SPECIAL PROJECT**

### **Outline:**

- In this class you are required to design a 3-story reinforced concrete residential building.
- A typical architectural floor plan has been provided for the project.
- All three floors of the building have the same layout.
- The framing system of the building consists of reinforced concrete slabs, columns and beams and shearwalls if you choose to use them for lateral stability for the building.
- The typical floor heights are 3.06 m. The ground floor elevation is +0.50 m.

### **Requirements:**

- A complete set of detailed design calculations and a set of structural drawings are required to be submitted at the end of the semester.

### **Things to be done during the semester:**

- **All structural calculations of the slabs, beams, columns, tie beams and footings will be done in the class manually without using computer software.**
- **Structural calculations for all foundations, columns, beams, slabs and shear walls per TS 500 by hand manually. A report will be drafted for the assumptions and submitted.**
- **Structural drawings should be provided for the building. All of the drawings will be done using AutoCAD.**
- **On the first stage;**
  - a- **A plan showing all the axes, columns and shear walls will be drawn by AUTOCAD.**
  - b- **Gravity Center (GC) and Center of Rigidity (CR) will be calculated and submitted written on paper. The difference between these two centers will not be more than 2 cm.**
- **The drawings required on size A3 paper, are as follows:**
  - **Foundation plan showing all of the footings, connection beams, two sections through the building as well as a typical detail. Scale of plan and sections will be 1/50.**

- **Column plan for a typical plan including a column detail. The plan should show the column longitudinal reinforcement and stirrups. Plan scale 1/50 and column details scale should be 1/20.**
- **Typical framing plan with two sections, the plan should include all of the beam sizes as well as reinforcement of slabs as well as a beam reinforcement table. Slab detail should also be provided with scale 1/10. Plan and section scales will be 1/50.**
- **One beam detail with scale 1/20 and staircase plan with scale 1/50 and detail 1/20 showing all the reinforcement.**

### **Gravity Loads:**

- The minimum slab thickness used should be 15cm.
- Flooring (tiles etc) -  $0.05 \text{ t/m}^2$
- Mechanical and electrical ductwork-  $0.15 \text{ t/m}^2$
- Miscellaneous -  $0.05 \text{ t/m}^2$
- Interior walls (partitions) are made of 10 cm brick with 2 cm plaster on each side.
- Exterior walls are typically 25 cm brick wall with 2 cm plaster on each side.
- Use TS 498 for the live loads.

### **Lateral Loads:**

- Lateral loads (wind or earthquake loads) should be calculated. Seismic design should be done according to the Turkish Seismic Code 2007.
- The building is located in Lefkoşa, Cyprus. The seismic design parameters should be chosen accordingly.

### **Soil Properties:**

- Allowable soil bearing capacity is  $20 \text{ t/m}^2$ .
- Local site class for soil is Z2 and soil group is C.

### **Rules Concerning Blueprints**

- 1- Handwritings on blueprint is not allowed
- 2- No corrections are allowed/accepted on blueprints
- 3- When folded, the blueprint should be reduced in the size of A4 paper and the legend should be on top.
- 4- The blueprints should be signed and stamped by the relevant civil engineer.

### **Types of Civil Engineering Projects**

1. Building Survey
2. New building project
3. Additional building project
4. Refurbishment project
5. Plot division project
6. Building & Site division project
7. Building division project
8. Fencing project

### **Statical Analyses Report should include**

- a- The design concept
- b- Types of standards of building material
- c- Construction standard/rules and regulations used.

Complete Statically Analysis

Earthquake analyses and its details.

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**COMPLETED PROJECT SHOULD INCLUDE**

**A) General**

- a- Construction application plan
- b- Foundation application plan
- c- Fencing, wall or retaining wall plan

**B) Foundation Plan**

- a- Drawing to the scale 1:50
- b- All the axes, foundation titles and sizes
- c- Minimum 2 cross sections to the scale 1:50
- d- 1:20 scale drawings of typical foundations showing level, cross section and reinforcing
- e- Foundation table showing the sizes of all foundations and reinforcing detail
- f- The beam detail to the scale 1:20 and table showing size and reinforcing
- g- If any, stair offshoot details including size, chamber and spacing
- h- Cross section hatching
- i- For each of single or double footing, reinforcing drawing and detail
- j- 1:20 scale (cross section) drawing of continuous footing
- k- 1:20 scale drawing of continuous footing reinforcing detail
- l- If any, complete details of reinforcing of a raft foundation including size, number, length and spacing of reinforcing bars in 1:50 scale.
- m- If any, details of pile foundation,
  - 1- Axes to the scale of 1:50
  - 2- 1:20 or 1:25 scale drawing of pile cross section
  - 3- 1:20 scale drawing of pile lengthwise
- n- Offshoot reinforcing details

**C) Columns and Shear Wall application**

- a- For each floor, axes drawing 1:50 scale
- b- 1:20 or 1:25 scale horizontal cross section of columns and/or shear walls
- c- Name of axes, reinforcing details (diameter, number, spacing), length of offshoots,
- d- 1:20 scale column or shear wall vertical cross section, levels and reinforcing details
- e- 1:20 scale stirrup detail for each floor
- f- 1:20 scale shear wall main reinforcing and stirrup detail for each floor
- g- If any, details of size reducing columns or shear walls

#### **D) Slab Plan**

- a- 1:50 scaled plans of all the slabs
- b- Names and thickness of slabs on the plan
- c- Reinforcing details (diameter, spacing) on the plan
- d- Names, sizes of beams on the plan
- e- 1:50 scale, two cross sections of slabs with relevant information (thickness, material, reinforcing diameter and spacing, cover)
- f- If any, void spaces to be shown on the plan with full size and dimension
- g- Details to the 1:20 scale of critical or typical slab, balcony or parapet detail
- h- 1:20 scale drawing of ribbed floor with full details, if any.
- i- Table showing all the beams for each floor detailing complete size and reinforcing
- j- 1:20 scale detailed drawing showing cross section/size and reinforcing of critical beams
- k- Cross section hatching in the plan
- l- If any, details of column heads

### **E) Stair Plan**

- a- For each floor, 1:20 scale of stair plan
- b- Thickness of rise and platforms
- c- Reinforcing size and spacing for each rise and platform
- d- 1:20 scale drawing of lengthwise cross section of rise and platform
- e- 1:20 scale plan showing width, length and rise of each step, thickness and reinforcing details (diameter & spacing)

### **F) Details**

Details in the scale of 1:20 of special or critical sections of the concrete structure

### **STATICAL ANALYSIS REPORT**

- a- Choice of system
- b- Choice of material
- c- Analyses
- d- Criteria of modeling
- e- Rules and regulations
- f- Form plans of all floors

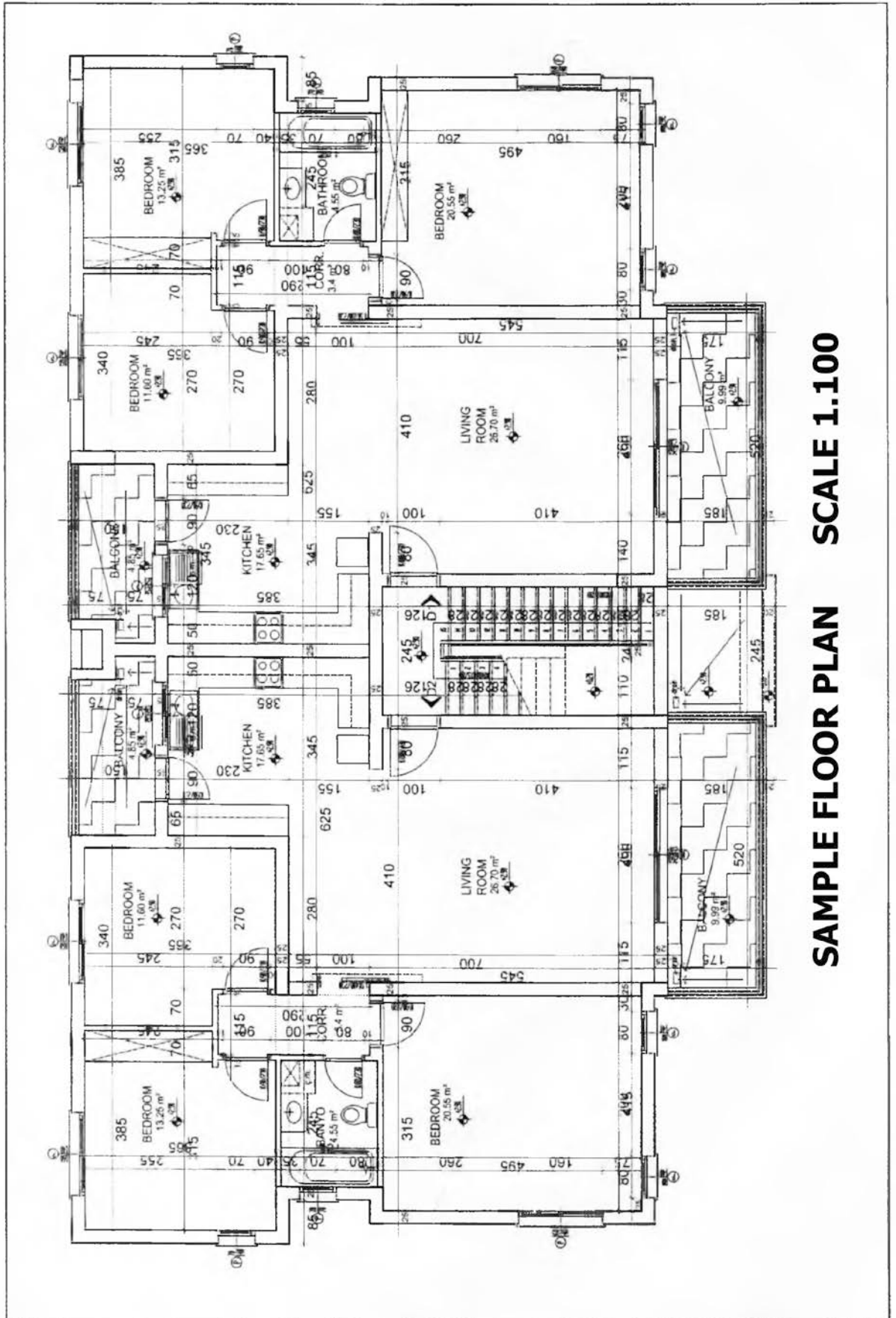
Calculations should include footings and all the building completely.

### **STATICAL ANALYSES STEPS**

- a- Slabs and stairs analyses
- b- Statical & Dynamical analyses
- c- Beam analyses
- d- Column analyses
- e- Tie beam and footing analyses
- f- Retaining wall analyses
- g- Analyses of special members
- h- All the necessary analyses required by the standard







**SAMPLE FLOOR PLAN SCALE 1:100**

