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CIVIL ENGINEERING

CLASS NOTES

RCC and PSC

(For all Competitive Exams in INDIA)

VIVEK GUPTA

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ESE (AIR-10)
GATE (AIR-17)
M. Tech (IIT Delhi, Structure)

This is the class notes of course taught on UNACADEMY PLUS during 22.02.2022 to 26.04.2022 in 110 hours. This course will be very helpful for all students who are preparing for any competitive examination in India.

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(Please don't call without taking time to call)

A

very special thanks

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(All names mentioned here are with consent of Individuals)

CONTENTS

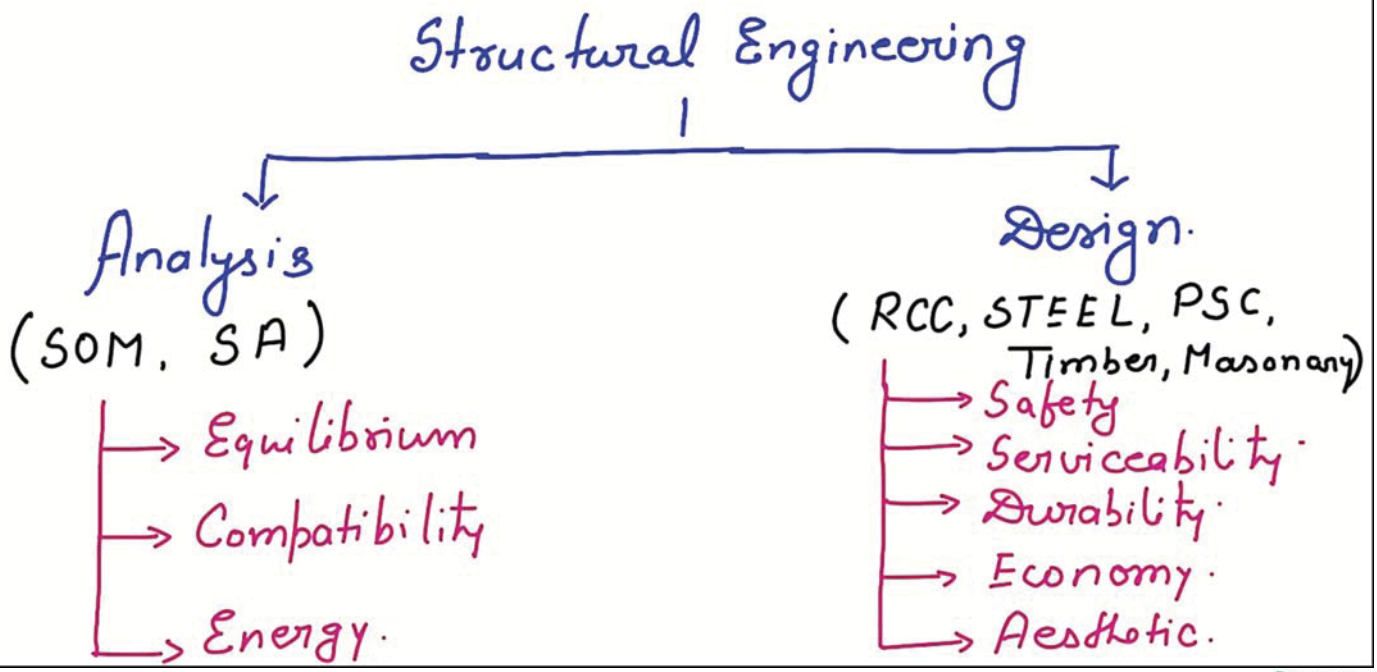
Recommended Literature.

- Pillai & Menon, 4th Edition.
- My Class Notes.
- Previous Year Questions of GATE & ESE.
- My Work Book.

CHAPTER - 1

BASIC CONCEPTS

1.1. Introduction:



1. Safety – A structure must be safe with appropriate factor of safety (FOS) for loading that may come on it during its intended life.

2. Serviceability – A structure should provide the service for which it is constructed.

3. Durability – A structure should sustain loading for which it was designed and should perform well with safety and serviceability upto its whole life.

Durability without serviceability or with less margin of safety (FOS) has no meaning.

Economy – Design and Construction of any structu should be economical without affecting safety, serviceability and durability.

Aesthetic – If huge investment is involved in design and construction then only Aesthetic comes into picture.

For Example – Considering a beam.

Safety – Reinforcement is provided.

Serviceability – Doubly R/F Section is provided to reduce depth of beam and increase clear height.

Durability – Nominal Cover, Selection of material.

Economy – Monolithic casting of beam and slab and designed as T- beam.

Aesthetic – Half round section instead of rectangular section.

1.2. Cement Concrete.

It is a mixture of binding material (Cement), fine aggregate (FA), Coarse aggregate (CA), water and admixture in proper proportion to acheive concrete of desired properties at fresh state and hardened State.

Admixture – It is added to concrete to enhance properties of Concrete.

1.2.1. Concrete Mix.

(A) Nominal Mix.

1. Based on experience.
2. Mixing may be by weight or by volume. By weight is preferable.
3. Quantity of water is not fixed. It is provided as per site requirement.
4. Nominal Mix is allowed for M5 to M20.

Mix → M20 ← strength in N/mm^2.

	C	FA	CA.
M10	1	3	6
M15	1	2	4
M20	1	1.5	3.

(B) Design Mix.

1. Based on calculation as per IS10262.
2. Proportioning must be by weight.
3. Quantity of water is also fixed.
4. Design Mix is allowed for M10 to M100.

1.2.2. Fresh Concrete.

Workability is the most important property of fresh Concrete which is simply defined as "Ease to work with".

S.No.	Degree of Workability	Use.	Slump.	Compacting Factor	Vee-Bee Time.
1.	Very low.	• Road Construction • Shallow Section.	—	0.75 – 0.8	10 – 20 Sec
2.	Low.	• Mass Concreting. • Lightly R/F Section.	25 – 75 mm	0.8 – 0.85	5 – 10 Sec.

3.	Medium.	• Heavily R/F Section • Concreting by Concrete pump.	50-100 mm.	0.85-0.92	2- 5 Sec.
4.	high.	• Piling.	100-150	0.92- above.	—
5.	Very high.	• Tremie pipe Concreting.	—	0.92- above	—

Placing Conditions	*Degree of Workability*	*Slump (mm)*
(1)	(2)	(3)
Blinding concrete; Shallow sections; Pavements using pavers	Very low	*See* 7.1.1
Mass concrete; Lightly reinforced sections in slabs, beams, walls, columns; Floors; Hand placed pavements; Canal lining; Strip footings	Low	25-75
Heavily reinforced sections in slabs, beams, walls, columns;	Medium	50-100
Slipform work; Pumped concrete	Medium	75-100
Trench fill; *In-situ* piling	High	100-150
Tremie concrete	Very high	*See* 7.1.2

NOTE — For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall be determined based on the density and spacing of reinforcement bars and thickness of sections. For tremie concrete, vibrators are not required to be used (*see also* 13.3).