MADE EASY

Leading Institute for IES, GATE & PSUs

ENVIRONMENTAL ENGINEERING

WATER SUPPLY ENGINEERING

CLASSROOM NOTES

~ Session : 2025-26 ~

Faculty : Sagar Dodeja (Ex. IES)

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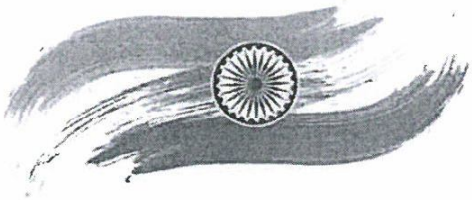


5 RULES OF PREPARATION

1. Jaan Laga Do Ya Jaane Do
2. Practice & Revise Not Until You Are Right, Do It Until You Cannot Get It Wrong
3. The Key to Effective Time Utilisation is to Follow The Teacher As It Is
4. A Systematic Approach Is Always The Right Approach
5. Pray Daily

JAI HIND

Faculty : Sagar Dodeja (Ex. IES) MADE EASY EDUCATION PRIVATE LIMITED

ENVIRONMENTAL ENGINEERING FOR ESE AND GATE

BY
SAGAR DODEJA (EX IES)
SR. FACULTY, MADE EASY

INSTRUCTIONS

These interactive notes are designed exclusively for Made Easy Classroom Students and Made Easy Online Students. While these notes provide a comprehensive overview of the fundamental concepts, it is essential to attend lectures regularly for in-depth explanations and the resolution of WorkBook questions.

All blank spaces within the notes are intentionally left for students to fill in during lectures, facilitating active participation and retention of the material.

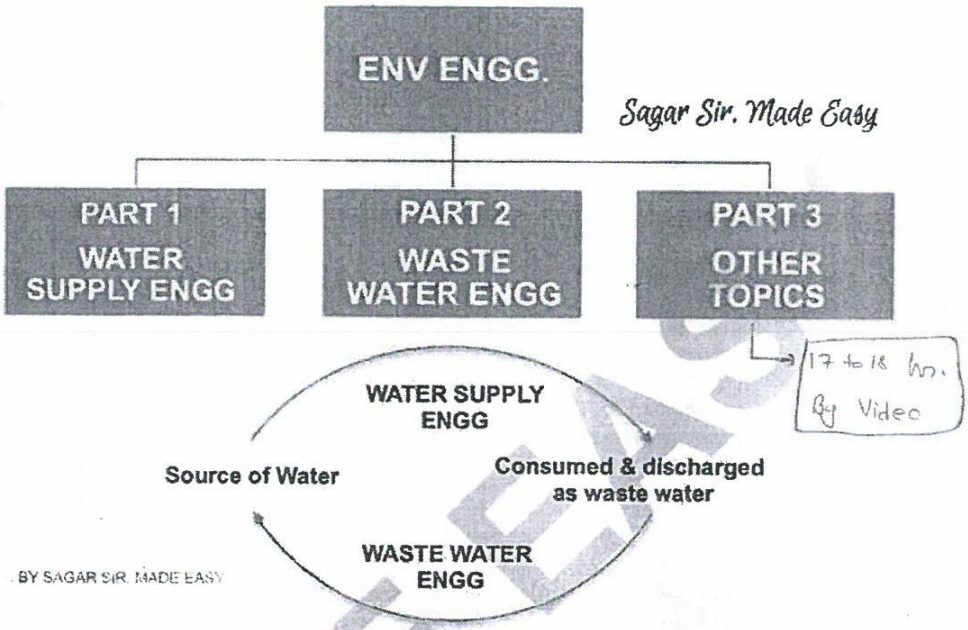
It is strongly recommended that students maintain a separate notebook which span approximately 200 pages. This separate notebook will serve as a valuable resource for solving WorkBook questions and ensuring comprehensive understanding of the subject matter.

These notes have been extensively tested and proven effective on thousands of students, demonstrating their ability to enhance academic performance and reduce time spent on problem-solving.

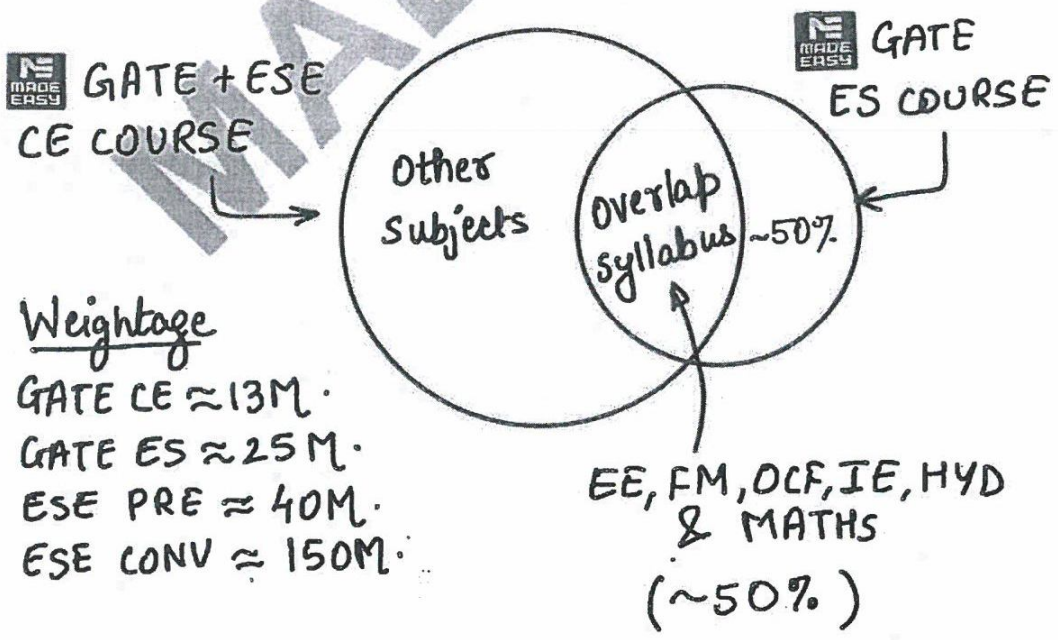
By utilizing these notes, students can concentrate solely on concept development and problem-solving skills. The clear and concise presentation of basic theory, diagrams, and facts in the notes minimizes the likelihood of errors during writing and facilitates a deeper understanding of the subject matter.

Let's Begin

INTRODUCTION



SYLLABUS OF GATE CE AND ES COURSE



Weightage
GATE CE ≈ 13M.
GATE ES ≈ 25M.
ESE PRE ≈ 40M.
ESE CONV ≈ 150M.

ADDITIONAL PAGE

- Environmental Engineering :- It is a multi Diciplinary branch of engineering in which the interaction bw the biotic and abiotic components of the environment are studied. The biotic components includes human animals, plants, insects & microorganism. The abiotic component include rocks, soil, air and water

⇒ In India, the following acts were passed which were related to environment :

1) Water Act 1974
2) Air Act 1981
3) Environmental Protection Act 1986, ammended 1991 (EPA)
4) National Green Trigonal (NGT) Act, 2010

⇒ Various agencies are formed as follows

CPCBs → Central Pollution Control Boards
Pollution control Committies of Union Teritories
CPHEEO Central Public Health & Environmental Engineering Organisation
NEERI Nation Environmental Engineering Research

APPENDIX

I. Useful Elements, Atomic Numbers & Masses.

Element	Atomic Number	Atomic Mass	Element	Atomic Number	Atomic Mass
Aluminium	13	27	Nitrogen	7	14
Boron	5	11	Oxygen	8	16
Calcium	20	40	Phosphorus	15	31
Carbon	6	12	Potassium	19	39
Chlorine	17	35.5	Silicon	14	28
Copper	29	63.5	Silver	47	108
Fluorine	9	19	Sodium	11	23
Hydrogen	1	1	Sulphur	16	32
Iodine	53	127	Zinc	30	65
Iron	26	56			
Magnesium	12	24			
Manganese	25	55			

II. SI Units

1. Length – m
2. Mass – kg
3. Time – s
4. Electric current – A (Ampere)
5. Temperature – K
6. Amount of substance – mol (mole)
7. Force – N ($kg\text{-}m/s^2$)

8. Pressure - Pa ($kg/m\text{-}s^2$)
9. Energy or work - J ($\frac{kg\text{-}m^2}{s^2}$ or N-m)
10. Power - W ($\frac{kg\text{-}m^2}{s^3}$ or J/s)
11. Electric Charge - C (A-s)
12. Dynamic Viscosity - Pa-s or $\frac{N\text{-}s}{m^2}$
13. Kinematic Viscosity - $\frac{m^2}{s}$

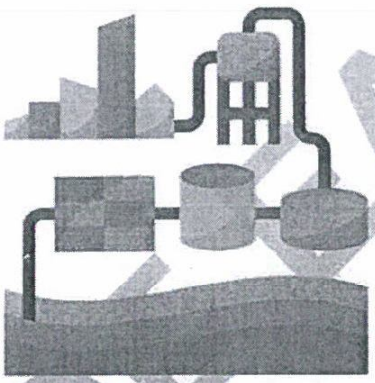
III. Some Standards

1. $g = 9.81\ m/s^2 = 32.174\ ft/s^2$
2. $1\ bar = 10^5\ N/m^2$
3. $1\ atm = 101.325\ kN/m^2$
   $= 101.325\ kPa$
   $= 1.013\ bar$
   $= 10.333\ m$ of water
4. $1\ HP = 746\ W$
   $1\ W = 0.0013\ HP$
5. $1\ ha = 10^4\ m^2$
6. $1\ acre = 4046.86\ m^2$
7. $1\ kW\text{-}h = 3600\ kJ$
8. $1\ Cal = 4.184\ J$
9. $1\ MLD = 10^6\ l/d$
10. $1\ MGD = 3.785 \times 10^6\ l/d$

MGD: Million Gallon per Day.

Water Supply Ingineering

1) Water demand
2) Sources of Water
3) Water Quality Parameter
4) Treatment of Wate
5) Distribution System



START

WATER SUPPLY ENGINEERING

CHAPTER 1
WATER DEMAND

Introduction

- Water demand implies water quantity estimation.
- Water demand computation requires the following data:-

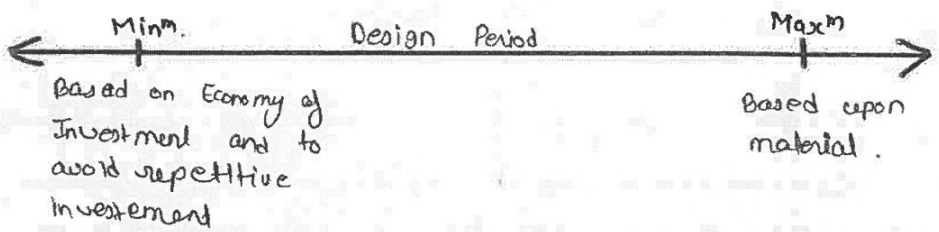
1. Forecasted Population
2. Rate of Consumption (litres per capita per day or lpcd or l/c/d or $\frac{l}{c \times d}$) $m^3/m^2/d = \frac{m^3}{m^2 \times d}$, $Kg/ha/d = \frac{kg}{ha \times d}$

Unit of Water Demand is MLD usually. ($1 MLD = 10^6 l/d$)

Design Period

- The quantity of water is worked out with due provision for requirement of future.
- The future period for which the water supply scheme is designed to cater for the future population is referred as DESIGN PERIOD.
- Design Period should always be in a range.

Note:-



Census ⇒ evaluation of each data → need for policy making
Survey ⇒ random data evaluation

PART 1

Population Forecasting → Mathematical Methods – 4
Population Forecasting → Graphical Methods. – 3

Mathematical Methods

1. Arithmetic Increase Method
2. Geometric Increase Method.
3. Incremental Increase Method.
4. Decreasing Rate of Growth Method.

ARITHMETIC INCREASE METHOD (AIM)

- Assumption → population increases at a constant rate.
- It is used for those cities which are sufficiently large and are already established.

Process :-

Year	Population (thousands)	Increase in Population $\bar{x}$
1981	60	
1991	75	$x_1 = 15$
2001	98	$x_2 = 23$
2011	130 = P_0	$x_3 = 32$

Last known Population

And the average increase in population

$$\bar{x} = \frac{x_1 + x_2 + x_3}{3} = \frac{15 + 23 + 32}{3} \Rightarrow \bar{x} = 23.33 \text{ thousand per decade}$$