(40%)	on (1-4)			
	Class Participation	5%	CO1 , CO3	
	Mid Term	15%	CO1 ,CO2	
Final Exam		60%	CO1	C4
			CO2	C4
			CO3	C2, C5
			CO4	C4
			CO5	C4
Total Marks		100%		

(CO = Course Outcome, C = Cognitive Domain, P = Psychomotor Domain, A = Affective Domain)

REFERENCES BOOKS

1. Structural Analysis, R C. Hibbeler, Prentice Hall, 8th Edition.
2. Elementary Structural analysis – C.H.Norris, J.B.Wilbur, I, utku
3. Theory of simple structures- TC Shedd and J. Vawter
4. Structural Analysis – Aslam Kassimali
5. Bangladesh National Building Code (BNBC,1993/2017)

REFERENCE SITE

http://classroom.google.com/...../.....

COURSE INFORMATION	
Course Code: EWCE 331	Credit Hour: 3.0
Course Title: Water Supply Engineering	Contact Hour: 3.0

PRE-REQUISITE

EWCE-261 (Fluid Mechanics)

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

In this course students will be presented with basic knowledge on water supply system, surface water collection, treatment and distribution, and water quality requirement. Knowledge gained from this course will be used in later semesters and also in professional life.

OBJECTIVE

1. To gain knowledge on the basics of water supply technology.
2. To become skilled at the design and construction of surface water treatment plant, ground water well and water distribution networks.
3. To get acquainted with low cost water supply options for rural communities and draught vulnerable areas
4. To devise the theories for well hydraulics.

COURSE OUTCOMES & GENERIC SKILLS

No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods

CO 1	Be able to **estimate** the fresh water demand and **assess** the requirements for preferred water supply system in urban as well as rural areas	PO – 1	C2	1		1, 3	T, F
CO 2	Be expert in **identifying** problem specific solutions to provide fresh water supply options including groundwater well and RWH in urban as well extremely water shortage areas	PO – 1	C2	1, 3		1, 4	T, M, F
CO 3	Be able to **apply** engineering perception to construct complex water supply distribution networks in terms of economic, public health, Environment and sustainability	PO – 2, 7	C3	1, 3		4, 7	Asg/ CT, F
CO 4	Be proficient to **analyze** water quality data and related treatment methods to **design** and construct efficient and cost effective water treatment plant, with appropriate consideration for public health and safety	PO – 2, 3	C4	1, 3		1, 5	F, Pr

**Level of Bloom's Taxonomy:*

C1 - Remember | C2 - Understand | C3 - Apply | C4 - Analyze | C5 - Evaluate | C6 - Create

(CP – Complex Problems, CA – Complex Activities, KP – Knowledge Profile, T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)

COURSE CONTENT

Introduction to Water Supply Engineering, Water requirement in urban and rural communities, low-cost water supply option, Sources of water supply, Theory of ground water, well hydraulics, types of wells and pumps, Design, drilling, construction and maintenance of wells, Rain water harvesting system and alternative water supplies for water stressed areas, Surface water collection, transportation, Analysis and design of distribution network, Fire hydrants, Water meters, Water loss control, Water quality requirements, Bangladesh and international standards, Water treatment methods, Climate resilient water safety plan (CRWSP).

SKILL MAPPING (CO – PO MAPPING)

No	Course Outcome	PROGRAM OUTCOMES (POs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	Be able to **estimate** the fresh water demand and **assess** the requirements for preferred water supply system in urban as well as rural areas	3											
CO2	Be expert in **identifying** problem specific solutions to provide fresh water supply	3											

	options including groundwater well and RWH in urban as well extremely water shortage areas												
CO3	Be able to **apply** engineering perception to construct complex water supply distribution networks in terms of economic, public health, Environment and sustainability		3					2					
CO4	Be proficient to **analyze** water quality data and related treatment methods to **design** and construct efficient and cost-effective water treatment plant, with appropriate consideration for public health and safety		3	2									

(Numerical method used for mapping which indicates 3 as high, 2 as medium and 1 as low level of matching)

JUSTIFICATION FOR CO – PO MAPPING

	Mapping	Corresponding Level of Matching	Justifications
	CO1 – PO1	3	Knowledge of mathematics, natural science and engineering fundamentals has to be applied to estimate the fresh water demand and assess the requirements for preferred water supply system in urban as well as rural areas.
	CO2 – PO1	3	In order to identify the problem specific solutions for providing fresh water supply options in urban as well in the extremely water shortage areas, the knowledge of mathematics, natural science and engineering fundamentals is required.
	CO3 – PO3	3	To outline the water supply distribution networks within the constraints of economic, public health, environment and safety, the ability to design the system along with its component is required.
	CO3 – PO7	2	Ability to understand and evaluate the sustainability and impact of constructing community water supply distribution networks are required from societal and environmental context.
	CO4 – PO2	3	Ability for problem formulation and analysis using mathematics, natural science and engineering fundamentals are

			required for capabilities are required to design and construct efficient and cost-effective water treatment plants for the community
	CO4 – PO3	2	Ability to design and construct efficient and cost-effective water treatment plant is required, with appropriate consideration for public health and safety, societal and environmental concerns.

TEACHING AND LEARNING STRATEGY		
	Teaching and Learning Activities	Engagement (Hours)
	Face-to-face Learning • Lecture • Practical/ Tutorial/ Studio • Student – Centered Learning	 42 -- --
	Self- Directed Learning • Non-face-to-face learning • Revision of the previous lecture at home • Preparation for final examination	 9 18 46
	Formal Assessment • Continuous Assessment • Final Examination	 2 3
	Total	120

TEACHING METHODOLOGY
Lecture and Discussion, Problem Based Method

COURSE SCHEDULE			
		Intended Topics to be Covered	Assessment
Week 1			
	Class 1	Water supply, health and sanitation, history and development of water supply Engineering	
	Class 2	Importance of water supply Engineering, Elements of public water supply, Sources of water supply	
	Class 3	Environment and Environmental impacts on Human Life, Water supply, health and sanitation, Ecology and Environment, Role of Environmental Engineer	
Week 2			
	Class 4	Population Estimation and water demand forecasting	CT 1
	Class 5	Fire demand calculation and fire hydrant design	
	Class 6	Suitability of sources with regards to quantity and quality, Choice of sources for water supply	
Week 3			Mid Term Exam
	Class 7	Aquifer properties, basic definitions, types of aquifers, confined and unconfined aquifers	
	Class 8	Groundwater hydraulics, porosity, seepage,	

		infiltration, permeability	
	Class 9	Surface water collection units, Water treatment units,	
Week 4			
	Class 10	Darcy's law, discharge equation for confined aquifers with example problems	
	Class 11	Discharge equation for unconfined aquifers with example problems	
	Class 12	Water distribution system, Distribution methods	
Week 5			
	Class 13	Withdrawal of excessive groundwater, consequences of groundwater abstraction	
	Class 14	Basic concept of water well design, sieve analysis, bore hole construction	
	Class 15	Water transmission line design	
Week 6			
	Class 16	Gravel pack design	
	Class 17	Well drilling and construction	
	Class 18	Single pipe design, Serial and branched networks	
Week 7			
	Class 19	Water well maintenance	
	Class 20	Problems of groundwater in Bangladesh	
	Class 21	Looped networks, Hardy Cross Method	
Week 8			
	Class 22	Pump and pumping machineries, Requirement of water pump	
	Class 23	Water impurities Water quality requirements	CT 2
	Class 24	Water quality standards	
Week 9			
	Class 25	Plain sedimentation	
	Class 26	Coagulation, Flocculation	
	Class 27	Pump performance curve	
Week 10			
	Class 28	Filtration	
	Class 29	Disinfection	
	Class 30	Surface water intake design	
Week 11			
	Class 31	Iron and Manganese removal	
	Class 32	Arsenic removal	
	Class 33	Water supply in coastal saline affected areas	
Week 12			
	Class 34	Alternative and Low cost water supply options	CT 3
	Class 35	Taste and odor control	
	Class 36	Water softening	
Week 13			
	Class 37	Auditing of water, Leak detection in water mains, Using water efficient appliances and fixture	
	Class 38	Membrane technologies – reverse osmosis	

	Class 39	Water safety through water safety plans	
Week 14			
	Class 40	Water demand management, Water charging/ tariff, Water conservation	
	Class 41	Developing a WSP	
	Class 42	Review of water treatment options with examples	

ASSESSMENT STRATEGY

Components		Grading	CO	Bloom's Taxonomy
Continuous Assessment (40%)	Class Test/ Assignment (1-3)	20%	CO1, CO4	
	Class Participation	5%	CO2	
	Mid Term	15%	CO2, CO3	
Final Exam		60%	CO1	C1, C2
			CO2	C2
			CO3	C3, C4
			CO4	C2, C3, C4
Total Marks		100%		

(CO = Course Outcome, C = Cognitive Domain, P = Psychomotor Domain, A = Affective Domain)

REFERENCES BOOKS

1. A Text Book of Water Supply Engineering - M. A. Aziz, 1st ed., Hafiz Book Center.
2. Water Supply and Sanitation - M. Feroz Ahmed, Md. Mujibur Rahman, 1st ed., ITN-BUET.
3. Water and Environmental Engineering - M. Habibur Rahman, Abdullah Al-Muyeed , 1st ed., ITN-BUET.
4. Environmental Engineering - Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, International Edition, McGraw Hill Companies.
5. Water Safety Plan (WSP) – A Risk Based Approach for Water Safety, 1st ed., ITN-BUET.

REFERENCE SITE

http://classroom.google.com/...../.....

COURSE INFORMATION		
Course Code: EWCE 332	Credit Hour: 1.5	
Course Title: Environmental Engineering Sessional-I	Contact Hour: 3.0	
PRE-REQUISITE		
EWCE105, CHEM-102, CE-331		
CURRICULUM STRUCTURE		
Outcome Based Education (OBE)		
SYNOPSIS/ RATIONALE		
This is the practical course on environmental engineering where students will be trained and practiced on various water and wastewater sampling and testing methods. Experience gained from this course will be used in later semesters and also in professional life.		