

Subject Teacher : Md. Emon K han
 Subject Name : Water Resources Engineering.
 Subject Code : 26461
 Technology : Civil
 Semester : 7rd
 Reference Book : Hoque Publication.
 Reference Book Name : Introductory Irrigation– B C Punmia.

Subject Aims:

- To provide understanding on the influence of the climatic condition of Bangladesh on its ground water and surface water flow
- To provide understanding of recharging of underground water and ascertain its necessity in Bangladesh.
- To enable to select a suitable source of water and method of irrigation for particular situation.
- To enable to select a suitable method of drainage for particular situation.
- To enable to select a suitable method for control of rivers and flood in Bangladesh.
- To understand rain water harvesting.

Subject Outcome:

Sources of water; Rainfall and run-off; Lifting of underground water; Storing and Recharging of ground/rain water; Irrigation and its effect; Well irrigation; Water requirements for crops; and quality of irrigation water; Storage reservoir; Dam and dyke; Irrigation canals; Silt deposit; Scouring; Canal works; Drainage; River training works; Flood and flood management and flood control; Irrigation projects in Bangladesh.

Marks	Grade Point	Letter Grade	Marks	Grade Point	Letter Grade
80>	4.00	A+	55-59	2.75	B-
75-79	3.75	A	50-54	2.50	C+
70-74	3.50	A-	45-49	2.25	C
65-69	3.25	B+	40-44	2.00	D
60-64	3.00	B	0-39	0.00	F

Mark Distribution (for 150 Marks)			
Theory Marks		Practical Marks	
Midterm	20	PC	25
Class test	10	PF	25
Quiz test	10	-	-
Final	60	-	-
Total	100	Total	50

Mark Distribution (for 150 Marks)			
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Final	60	-	-
Total	100	Total	50

Lecture	Chapter	Class Supporting Equipment	Learning Area	Learning Outcome
01	SOURCES OF WATER	Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=4gSDDnIvq3w	1.1 Explain with neat sketch the hydrological cycle. 1.2 Explain the meaning of the following: a) Rainfall b) Rainfall intensity and duration frequency relationship c) Run-off d) Infiltration e) Evaporation f) Transpiration g) Evapo -transpiration h) Permeable and impermeable strata of soil i) Ground water table j) Precipitation k) Aquifer	1 Understand different hydrological terms
02	RAINFALL AND RUN-OFF	Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=gYH7Pi74Y-Y	2.1 Mention the characteristics of rainfall and run-off in Bangladesh. 2.2 Describe with sketches the various types of rain gages. 2.3 List the factors affecting the run-off an area. 2.4 Determine average annual run-off of a catchments area from given data. 2.5 Define hydrograph. 2.6 Describe the feature of hydrograph 2.6 Identify the components of storm hydrograph.	2 Understand the characteristics of rainfall and run-off in Bangladesh.
03	RAINFALL AND RUN-OFF	Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=gYH7Pi74Y-Y	3.1 State the following terms with neat sketches: a) The cone of depression b) The circle of influence c) The draw down curve 3.2 State the meaning of the following terms: a) Well screen b) Gravel packed well c) Critical velocity d) Critical head e) Depression head f) Specific yield of well 3.3 Express how to determine the yield of a well.	3 Understand the features of a well.

			3.4 Solve the problems regarding lifting water from well. 3.5 Describe the different tests for yield of a well.	
04	Quiz Test-1	Theoretical	Chapter-1,2,3	knowlwdge about scourec of water and rainfall
05	RECHARGING OF GROUND WATER	Laptop or Desktop, Projector, Etc https://www.youtube.com/watch?v=utdyYvlznJE	4.1 State what is meant by recharging of ground water. 4.2 Mention the condition when recharging of ground water is required. 4.3 List the methods of recharging of ground water. 4.4 Mention the advantages and disadvantages of recharging of ground water. 4.5 Predict the need for recharging of ground water in Bangladesh.	4 Understand the recharging of ground water.
06	RECHARGING OF GROUND WATER	Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=sH8XmG1Bvz8	5.1 State the meaning of irrigation. 5.2 Explain the necessity of irrigation in Bangladesh. 5.3 Mention the benefits of irrigation. 5.4 Mention the bad effects of irrigation. 5.5 Describe about the present development of irrigation in Bangladesh .	5. Understand the significance of irrigation and its effect.
07	RECHARGING OF GROUND WATER	Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=cH2yBGI-6Fg	6.1 Name different types of irrigation including sub-divisions. 6.2 Describe flow irrigation including sub-divisions. 6.3 Distinguish between perennial and inundation irrigation. 6.4 Differentiate canal or direct irrigation with reservoir (tank) or indirect irrigation. 6.5 Relate natural and artificial irrigation. 6.6 Mention the advantages of natural irrigation. 6.7 Mention the disadvantages of natural irrigation. 6.8 State the meaning of lift irrigation. 6.9 Describe different methods for lifting water for irrigation manually and by power.	6 Understand the different methods of irrigation

			6.10 Mention different types of well irrigation. 6.11 Mention the advantages and disadvantages of well irrigation. 6.12 Explain the necessity of tube-well irrigation in Bangladesh. 6.13 Describe the favorable conditions for tube-well irrigation. 6.14 Mention the advantages and disadvantages of tube-well Irrigation.	
08	Class test-2	Theoretical	Chapter-4,5,6	Judge students
Practical	Prepare a model for a typical irrigation project.	Color paper, Cock sheet, gum ,Etc Or Learn from video Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=pbcnBiKhu6o	Understand the irrigation project	Judge students practical knowledge
09	RECHARGING OF GROUND WATER	Test Book, white board ,marker https://www.youtube.com/watch?v=7r74WHPwZTM	7.1 State the meaning of water requirement for crops. 7.2 Define the terms duty, delta, base period and crop period. 7.3 Express the relation among duty, delta and base period. 7.4 Mention the factors for improvement of duty of water for irrigation. 7.5 Solve problems on duty, delta and base period. 7.6 Explain the various methods of applying irrigation water to the land. 7.7 Describe the quality of irrigation water. 7.8 List the impurities which make the water unfit for irrigation.	7. Understand the concept of water requirement for crops and Quality of irrigation water.
10	RECHARGING OF GROUND WATER	Test Book, white board ,marker https://www.youtube.com/watch?v=7r74WHPwZTM	8.1 State the meaning of storage reservoir. 8.2 Explain the necessity of storage reservoir 8.3 Mention the requirements of an ideal reservoir.	8. Understand the concept of storage reservoirs.

			<p>8.4 Explain the meaning of commendable area and irrigable area.</p> <p>8.5 Calculate the capacity of a storage reservoir by using appropriate methods.</p> <p>8.6 Mention the factors that determine the height of the dam of a reservoir.</p> <p>8.7 Mention the section of a dam of reservoir with different components.</p>	
11	RECHARGING OF GROUND WATER	<p>Laptop or Desktop, Projector, Etc</p> <p>Link: https://www.youtube.com/watch?v=gihU4_Cmzko</p>	<p>9.1 State the meaning of dam.</p> <p>9.2 Give classification of dam (rigid and non-rigid).</p> <p>9.3 Mention the favorable conditions for location of an earthen dam.</p> <p>9.4 Mention the favorable conditions for location of a masonry dam.</p> <p>9.5 Mention the advantages and disadvantages & limitations of an earthen dam.</p> <p>9.6 Mention the advantages and disadvantages of masonry dam.</p> <p>9.7 Classify earthen dam.</p> <p>9.8 Describe drainage system under a dam.</p> <p>9.9 State the term core wall and line of saturation with sketches.</p> <p>9.10 Describe the construction procedure of an earthen dam.</p> <p>9.11 Mention the causes of failure of an earthen dam.</p> <p>9.12 Mention the remedies for preventing the failure of an earthen dam.</p> <p>9.13 Describe the different features of rubber dam</p>	9 Understand the features of different types of dam.
12	Quiz test-2	Theoretical	Chapter-7,8,9	Revised previous topic
13	RECHARGING OF GROUND WATER	<p>Test Book, white board ,marker</p> <p>https://www.youtube.com/watch?v=Nboq5zsLxFE</p>	<p>10.1 State the meaning of dyke.</p> <p>10.2 Differentiate between dam and dyke.</p>	10 Understand the features of a dyke.

			<p>10.3 Describe the construction procedure of a dyke.</p> <p>10.4 Mention the causes of failure of a dyke.</p> <p>10.5 Mention the remedies for preventing the failure of a dyke.</p> <p>10.6 State the functions of core wall.</p> <p>10.7 Mention the factors to be considered in determining the location of core wall.</p> <p>10.8 State the meaning of barrage, Weir, spillway, riprap and cut-off.</p>	
14	RECHARGING OF GROUND WATER .	<p>Test Book, white board ,marker</p> <p>https://www.youtube.com/watch?v=E8bZyJ9CHFQ</p>	<p>11.1 State the meaning of main, branch, distributor and field canal.</p> <p>11.2 Mention the points to be considered in fixing the alignment of an irrigation canal.</p> <p>11.3 Mention the factors to be considered for designing an irrigation canal.</p> <p>11.4 Describe with sketches the distributor system of irrigation canals.</p> <p>11.5 Describe the steps for excavating a new canal and old canal.</p>	11 Understand different type of irrigation canals.
15	RECHARGING OF GROUND WATER	<p>Laptop or Desktop, Projector, Etc</p> <p>Link: https://www.youtube.com/watch?v=Hq5gqb4NwaM</p>	<p>12.1 State the meaning of canal lining.</p> <p>12.2 Mention the necessity of canal lining.</p> <p>12.3 Describe different types of canal lining.</p> <p>12.4 Mention the advantages and disadvantages of canal lining.</p> <p>12.5 Describe the process of canal lining.</p>	
16	RECHARGING OF GROUND WATER	<p>Test Book, White board ,Marker</p> <p>https://www.youtube.com/watch?v=EMwGPPJ1Umk</p>	<p>13.1 State the meaning of silt and siltration.</p> <p>13.2 Mention the causes of siltration.</p> <p>13.3 Mention the merits and demerits of siltration.</p> <p>13.4 Describe the methods of preventing entry of silt into canal.</p>	13 Understand the causes of silt deposition& the causes of scouring.

			13.5 Describe the methods of removing silt from the canal.	
17	RECHARGING OF GROUND WATER	Test Book, White board ,Marker https://www.youtube.com/watch?v=qNTOq1uEObc	13.6 Differentiate between silt excluder and silt ejector. 13.7 State the meaning of scouring. 13.8 Mention the causes of scouring. 13.9 Describe the effect of scouring. 13.10 Describe the methods of preventing scouring.	13 Understand the causes of silt deposition& the causes of scouring.
18	Class tesr-2	Theoretical	Chapter-10,11,12,13	Judge students
Practical	Visit an irrigation project in Bangladesh.	Learn from video Laptop or Desktop, Projector, Etc	Understand an irrigation project in Bangladesh.	Understand an irrigation project in Bangladesh.
19	RECHARGING OF GROUND WATER	Test Book, White board ,Marker	14.1 State the meaning of head works. 14.2 Name the different components of a head works. 14.3 Explain the functions of each of the component of a head works.	14.Understand the features of head works.
20	RECHARGING OF GROUND WATER	Test Book, White board ,Marker https://www.youtube.com/watch?v=spKGq-0H8	15.1 State the meaning of land reclamation. 15.2 Explain the necessity of land reclamation. 15.3 Mention the steps for reclamation of salt affected land. 15.4 State the meaning of water logging.	15 Understand the principles of reclamation of salt affected water logged land.
21	RECHARGING OF GROUND WATER	Test Book, White board ,Marker https://www.youtube.com/watch?v=qlKeP4sdHns	15.5 Mention the effects of water logging. 15.6 Describe the remedial procedure of water logging. 15.7 Describe the procedure for reclamation of water logged land.	15 Understand the principles of reclamation of salt affected water logged land.

22. Review class about problem solving

Midterm Examination

23	RECHARGING OF GROUND WATER	Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=mZP5cCxZrsc	16.1 State the meaning of drainage. 16.2 Mention the different methods of drainage. 16.3 State the meaning of cross drainage works. 16.4 Mention the functions of cross drainage works. 16.5 Mention the difference between aqueduct and super passage. 16.6 Mention the need for drainage in Bangladesh.	16 Understand the principles of drainage.
24	Quiz Test-3	Theoretical	Chapter-16	Understand the principles of Drainage.
25	RECHARGING OF GROUND WATER	Test Book, White board ,Marker	17.1 State the meaning of river training. 17.2 Outline the objectives of river training works. 17.3 Mention the different methods of river training works. 17.4 Mention the functions of guide bank, groyne, spur, afflux, marginal bund and stone apron. 17.5 Explain the necessity of river training works in Bangladesh.	17. Understand the necessity of river training works.
26	Class Test-3	Theory Base	Chapter-17	Understand the necessity of river training works

27	RECHARGING OF GROUND WATER	Test Book, White board ,Marker https://www.youtube.com/watch?v=5mCJh5SJEis	18.1 State the meaning of flood. 18.2 Mention the causes of flood. 18.3 Mention the different methods of controlling flood. 18.4 Specify the causes of flood in Bangladesh. 18.5 Suggest the suitable method(s) for flood control in Bangladesh. 18.6 Give introduction to coastal embankment project and inland river embankment project.	18 Understand the concept of flood and flood control.
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28	RECHARGING OF GROUND WATER	Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=sPE9Zs7dyGc	19.1 Define rain water harvesting. 19.2 Draw the schematic diagram of rain water harvesting system. 19.3 Component of rain water harvesting system. a) Catchment area. b) filtration c) storage d) ground water research e) use of rain water 19.4 Potential and challenges of rain water harvesting in Bangladesh. 19.5 Rain water harvesting around the world.	19. Understand the rain water harvesting.
29	RECHARGING OF GROUND WATER	Test Book, White board, Marker https://www.youtube.com/watch?v=H-saT2FnRr0	20.1 State the meaning of multipurpose project. 20.2 Give introduction of Karnaphuly Multipurpose Project. 20.3 Give introduction of Jamuna Multipurpose Bridge Project. 20.4 Give introduction of Borendra Project at Rajshahi.	20. Understand the concept of Multipurpose project.
30	Quiz Test-4	Theory Base	Chapter-18,19,20	Judge students
Practical	Visit a drainage project in Bangladesh.	Learn from video Laptop or Desktop, Projector, Etc Link: https://www.youtube.com/watch?v=xgmp7YyXgCI	Understand a drainage project in Bangladesh Understand	Understand a drainage project in Bangladesh Understand
31	RECHARGING OF GROUND WATER	Test Book, White board, Marker https://www.youtube.com/watch?v=xgmp7YyXgCI	21.1 Write short history of irrigation in Bangladesh. 21.2 Give an overview of Ganga-Kapatakhha (G-K) Project. 21.3 Give an overview of Teesta Barrage Project.	21. Understand different irrigation projects in Bangladesh.
32	RECHARGING OF GROUND WATER	Test Book, White board, Marker	21.4 Give an overview of Chalan Beel Project.	21. Understand different irrigation projects in Bangladesh.

			21.5 Give an overview of Chandpur Irrigation Project. 21.6 Give an overview of Barisal Irrigation Project. 21.7 Give an overview of North Bengal Deep Tube Well Project	
33	Review class about problem solving			
34	Review class about problem solving			
Final Examination				