

LESSON PLAN

Discipline: Civil Engg. ,UGMIT Rayagada
 Semester: 5TH
 Name of the Teaching Faculty:
 Subject: **WATER SUPPLY AND WASTE WATER ENGINEERING (Th-4)**

No of Days/week class allotted: 05
 Session: 2020-21

Week	Class Day	Theory/Practical Topics	Remarks
1	1-5	1.0 INTRODUCTION: 1.1 Necessity of treated water supply 1.2 Historical development 2.0 QUANTITY OF WATER 2.1 Water requirements for different uses 2.2 Per capita demand, variation in demand and factors affecting demand 2.3 Methods of forecasting population, Numerical problems using different methods 3.0 SOURCES OF WATER ; 3.1 Surface sources – Lake, stream, river and impounded reservoir 3.2 Underground sources – aquifer type & occurrence – Infiltration gallery, infiltration well, springs, well – types, suitability 3.3 Yield from well- method s of determination, Numerical problems using yield formulae (deduction excluded) 3.4 Sinking of wells, Well components, Well development 3.5 Sanitary protection of wells and maintenance of well 3.6 Well pumps – type, selection, installation	
2	6-10	4.0 CONVEYANCE OF WATER : 4.1 Intakes – types, description of river intake, reservoir intake, canal intake 4.2 Pumps for conveyance & distribution – types, selection, installation, most economic diameter of pumping main 4.3 Pipe materials – necessity, suitability, merits & demerits of each type, selection of pipe material 4.4 Pipe joints – necessity, types of joints, suitability, methods of jointing [Note : Detailed study covered under practical, hence students may be asked to prepare detailed sketches as home assignment] 4.5 Laying of pipes – method, testing 4.6 Pipe corrosion – cause and remedies 5 QUALITY OF WATER : 5.1 Impurities in water – organic and inorganic, classification 5.2 Harmful effects of impurities 5.3 Analysis of water – sampling and tests for physical, chemical	

		and bacteriological quality, significance of tests (detailed methods of tests will be discussed in laboratory class)	
3	11-15	5.4 Water quality standards for different uses 6 TREATMENT OF WATER : 6.1 Flow diagram of conventional water treatment system 6.2 Treatment process / units : 6.2.1 Aeration ; Necessity, types of aerators, essential features 6.2.2 Plain Sedimentation : Necessity, working principles, Sedimentation tanks – types, essential features, operation & maintenance	
4	16-20	6.2.3 Sedimentation with coagulation: Necessity, principles of coagulation, types of coagulants, determination of coagulant dose (procedure of jar test to be covered under practical) <input type="checkbox"/> Flash Mixer – types, essential features, operation <input type="checkbox"/> Flocculators - types, essential features, operation & maintenance <input type="checkbox"/> Clarifier - types, essential features, operation & maintenance 6.2.4 Filtration : Necessity, principles, types of filters <input type="checkbox"/> Slow Sand Filter - essential features, operation, clearing & maintenance <input type="checkbox"/> Rapid Sand Filter - essential features, operation, clearing & maintenance, comparison with slow sand filter, description & working of operating accessories – rate controller, head – loss gauge etc., Filter operational troubles & remedies <input type="checkbox"/> Pressure Filter - essential features, operation, & maintenance, suitability of use	
5	21-25	6.2.5 Disinfection : Necessity, methods of disinfection, types of chemical disinfectants, criterion for ideal disinfectants <input type="checkbox"/> Chlorination – free and combined chlorine demand, available chlorine, residual chlorine, pre-chlorination, break point chlorination, super- chlorination, determination of chlorine dose (testing procedure to be covered under practical), chlorinators – types, feeding 6.2.6 Miscellaneous treatment methods : <input type="checkbox"/> Removal of iron & manganese – Necessity, working principles <input type="checkbox"/> Softening of water – Necessity, Methods of softening – Lime soda process, Ion exchange method, working principles <input type="checkbox"/> Removal of arsenic & fluoride – Necessity, working principles 6.3 Chemicals required in various treatment units, their uses and feeding devices .	
6	26-30	6.4 Determination of dosage of chemical requirement for coagulation, chlorination, (jar test, Residual chlorine test to be discussed in laboratory), softening, numerical problems on dosage calculation. 7 DISTRIBUTION SYSTEM : 7.3 General requirements, types of distribution system-gravity, direct and combined 7.1 Methods of supply – intermittent and continuous	

		7.2 Maintenance of required pressure in distribution system head loss in system, Calculation of size of pipes – application of Hazen – William’s formula, numerical problems on determination of size of pipes	
7	31-35	7.3 Storage – necessity, types – underground, ground level, overhead reservoirs, suitability, accessories 7.4 Distribution system layout – types, comparison, suitability 7.5 Loss and wastage – cause, detection, remedial measure 8 APPURTENANCE IN DISTRIBUTION SYSTEM : 8.1 Valves-types, features, uses, purpose-slucice valves,	
8	36-40	check valves, air valves, scour valves 8.2 Fire hydrants 8.3 Water meters – types, uses, fixing <i>[Note: detailed study covered under practical. Students may be asked to prepare sketches as home assignment]</i> 9 W/S PLUMBING IN BUILDING : 9.1 Method of connection from water mains to building supply	
9	41-45	9.2 General layout of plumbing arrangement for water supply in single storied and multi-storied building as per I.S. code. 9.3 Water supply fittings-features, uses, purpose, fixing and jointing 9.4 Hot water supply – Electric water supply, Solar water heater features, fittings and fixing B:SANITARY ENGINEERING 10 INTRODUCTION 10.1 Aims and objectives of sanitary engineering 10.2 Definition of terms related to sanitary engineering 10.3 Systems of collection of wastes– Conservancy and Water Carriage System – features, comparison, suitability 11 QUANTITY OF SEWAGE : 11.1 Quantity of sanitary sewage – domestic & industrial sewage, variation in sewage flow, numerical problem on computation quantity of sanitary sewage, Storm water flow-rational method of computation of flow	
10	46-50	11.2 Computation of size of sewer, application of Chazy’s formula, Limiting velocities of flow : self-cleaning and scouring 12 SEWARAGE SYSTEM : 12.1 Types of system-separate, combined, partially separate , features, comparison between the types, suitability 12.2 Shapes of sewer – rectangular, circular, avoid-features, suitability 12.3 Sewer materials-features, suitability, handing & maintenance – stoneware, cast iron, cement concrete, asbestos cement, precast & cast in situ sewer 12.4 Laying of sewer-setting out sewer alignment, excavation and supporting, checking the gradient, preparation of bedding, handling, lowering, laying and jointing, testing of sewer, backfilling, ventilation of sewer, cleaning 13 SEWER APPURTENANCES ;	

		<p>13.1 Manholes and Lamp holes – types, features, location, function, construction</p> <p>13.2 Inlets, Grease & oil trap – features, location, function, construction</p> <p>13.3 Storm regulator, inverted siphon - features, location, function, construction</p> <p>13.4 Sewage Pumping – necessity, ejectors, location, components of pumping station, types of pumps and selection.</p>	
11	51-55	<p>14 SEWAGE CHARACTERISTICS :</p> <p>14.1 General importance, strength of sewage, Characteristics of sewage-physical, chemical & biological</p> <p>14.2 Analysis of sewage-sampling, tests for – solids, pH, dissolved oxygen, BOD, COD, Nitrogen(Detailed methods of tests to be discussed in laboratory)</p> <p>14.3 Significance of parameters</p> <p>14.4 Bacteriology of sewage-decomposition cycles of sewage – aerobic & an-aerobic – C, N, S cycle</p> <p>15 SEWAGE DISPOSAL :</p> <p>15.1 Disposal on land – sewage farming, sewage application and dosing, sewage sickness-causes and remedies</p> <p>15.2 Disposal by dilution – standards for disposal in different types of water bodies, self purification of stream</p> <p>16.1 Principles of treatment, flow diagram of conventional treatment</p>	
12	56-60	<p>16.2 Primary treatment – necessity, principles, essential features, functions, operation and maintenance of different units – Screens and racks, Grit chamber, primary sedimentation tank</p> <p>16.3 Secondary treatment – necessity, principles, essential features, functions, operation and maintenance of different units – contact bed, tricking filter,</p>	
13	61-65	<p>activated sludge process, aerated lagoon, oxidation ditch, rotating biological disc</p> <p>16.4 Sludge disposal – sludge digestion - necessity, principles, essential features, operation, construction of sludge digesters, disposal of digested sludge</p> <p>16.5 Isolated treatment units – features, principles, operation, construction, maintenance of septic tank and soak pit/soak trench,</p>	
14	66-70	<p>design of septic tank according to I.S. code; oxidation pond – principles & essential features</p> <p>17 SANITARY PLUMBING FOR BUILDING :</p> <p>17.1 Requirements of building drainage, layout of lavatory blocks in residential buildings, layout of building drainage</p> <p>17.2 Plumbing arrangement of single storied & multi storied building as per I.S. code practice</p>	
15	71-75	<p>17.3 Sanitary fixtures – features, function, and maintenance and fixing of the fixtures – water closets, flushing cisterns, urinals, inspection chambers, traps, anti-syphonage pipe</p> <p>17.4 Inspection, testing and maintenance of sanitary fixtures</p>	

	18 RURAL WATER SUPPLY & SANITATION : 18.1 Spring water source – development, sanitary protection, Maintenance 18.2 Roof top rain water harvesting – techniques, elementary Treatment, storage, maintenance 18.3 Single pit & two pit latrine – features, construction, Maintenance, disposal of sludge	
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Signature of HOD: