Water Engineering

University of Babylon/ College of Engineering/Environmental Eng. Department

Subject: Water Engineering

Stage : Third

Lecturer: Prof. Dr. Jabbar H. Al-Baidhani

Water Engineering

REFERENCES:

1-Environmental Engineering

By: Howard S. Peavy, Donald R. Rowe, George Tchobanoglous

2-Wastewater Treatment Plants, Planning, Design, and Operation

By: Syed R. Qasim

3-Wastewater Engineering Treatment Disposal and Reuse, Second Edition

By: Metcalf &Eddy, INC.

4-Water Works Engineering

By: Planning, Design &Operation

By: Syed Qasim, Edward M. Motley, Guang Zhu

Treatment Plants

5- Water and Wastewater Engineering , Design Principles and Practice

By: Mackenzie L. Davis

6-Principles of Water Quality Control, fifth edition

By: T. H. Y. Tebbutt

Water Engineering

7- Water Supply and Sewerage, Fifth & Sixth Edition, By:E. W. Steel and Terence J. McGhee,1979,1985,McGraw-Hill, Inc.

Water Enineering

The development of water engineering has paralleled and contributed to the growth of cities. Without an adequate supply of safe water, the great city could not exist, and the live in it would be both unpleasant and dangerous unless human and other wastes were promptly removed. The concentration of pollution in relatively small areas has main the task of the sanitary or the environmental engineers more complex.

Water Engineering

Groundwater supplies are frequently inadequate to the huge demand and surface waters, polluted by cities, towns, and villages on watersheds, must be treated more and more elaborately as the population density increases. Industry also demands more and better water from all available sources.

Water Enginering

The rivers receive ever- increasing amounts of sewage and industrial wastes, thus requiring more attention to sewage treatment, stream pollution, and the complicated phenomena of self – purification.

The design, construction, and operation of water works are the treated in the course of water engineering.

Water Engineering

The water engineering includes two courses , each course extended on fifteen weeks. The syllabus for each course are shown in the following tables:

Water Engineering Syllabus:

No.	ITEM
.1	**WATER SUPPLY SYSTEM** • ANATOMY OF A WATER SYSTEM • OBJECTIVES OF A WATER SUPPLY SYSTEM • CONSTIUENTS OF A WATER SUPPLY SYSTEM
.2	**POPULATION ESTIMATION AND FORECASTING** • METHODS OF POPULATION ESTIMATIONS • DESIGN PERIOD (THE DESIGN LIFE) • POPULATION DENSITY
.3	**COMPONENTS OF MUNICIPAL WATER DEMAND** • DOMESTIC OR RESIDENTIAL WATER DEMAND • INDUSTRIAL DEMAND • INSTISTUTION AND COMMERCIAL DEMAND • PUBLIC WATER USE • LOSSES AND WASTES • FACTORS AFFECTING PER CAPITA DEMAND • VARIATIONS IN RATE OF CONSUMPTION • FIRE DEMAND
.4	**QUALITY OF WATER SUPPLIES** • PHYSICAL CHARACTERISTICS OF WATER • CHEMICAL CHARACTERISTICS OF WATER • BIOLOGICAL CHARACTERISTICS OF WATER • RADIOLOGICAL ASPECTS OF WATER • PARTICULAR PAREMETERS GROUPS • DRINKING WATER QUALITY STANDARDS

Water Engineering Syllabus:

.5	**PUMPS AND PUMPING STATIONS** • TOTAL DYNAMIC HEAD • MATHEMATICAL MODELS AND CALCULATIONS OF HEAD • WORK POWER AND EFFICIENCY • NET POSITIVE SUCTION HEAD (NPSH) • CAVITATION • CLASSIFICATION OF PUMPS • AFFINITY LAWS OF PUMPS • SPECIFIC SPEED , N_s • PUMP SELECTION • PUMP CHARACTERISTIC CURVES
.6	**SOURCES OF WATER** • GROUNDWATER • SURFACE WATER • FACTORS FOR SOURCE SELECTION
.7	**RAW WATER INTAKES , SCREENING AND AERATION** • TYPES OF INTAKES • FACTORS GOVERING LOCATION OF INTAKES • DESIGN CONSIDERATIONS • DESIGN OF INTAKES AND SCREENS
.8	**WATER TREATMENT**
.9	**WATER COAGULATION** • SUSPENDED SOLIDS • CHARACTERISTICS OF COLLOIDS • ZETA POTENTIAL • COAGULANTS • RAPID MIX (FLASH MIX) • POWER REQUIREMENTS • MIXER POWER • DESIGN LIMITATIONS

Water Engineering Syllabus:

.10	**FLOCCULATION** • TYPES OF FLOCCULATORS • TYPES OF FLOCCULATORS • DESIGN CRITERIA FOR FLOCCULATION BASINS • POWER IMPARTED AND VELOCITY GRDIENT OF FLOCCULATION BASIN
.11	**GRAVITY SEPARATION THEORY**
.12	**DISCRETE PARTICLE SETTLING THEORY (TYPE 1 SETTLING)** • SETTLING IN THE LAMINAR REGION • SETTLING IN THE TRANSITION REGION • SETTLING IN THE TURBULENT REGION • IDEAL DESECRET PARTICLE SETTLING
.13	**FLOCCULANT PARTICLE DETTLING (TYPE 2 SETTLING)**
.14	**HINDERED (ZONE) SEDIMENTATION (TYPE 3 SETTLING)**
.15	**COMPRESSION SEDIMENTATION (TYPE 4 SETTLING)**
.16	**SEDIMENTATION BASINS** • SEDIMENTATION BASINS DESIGN • PRESEDIMENTATION FACILITIES • RECTANGULAR SEDIMENTATION BASINS • INLET STRUCTURE • OUTLET STRUCTURE • SLUDGE ZONE • HORIZONTAL FLOW VELOCITY • CIRCULAR SEDIMENTATION BASINS AND UPFLOW CLARIFIERS • TUBE AND LAMELLA PLATE CLARIFIERS • PROCESS CONFIGURATION

Water Engineering Syllabus:

7	**WATER FILTRATION (FLOW THROUGH POROUS MEDIAS)** • SLOW SAND FILTER • OPEN RAPID SAND FILTER (GRAVITY FILTER) • CLOSED RAPID SAND FILTER (PRESSURE FILTER) • FILTRATION RATE (LOADING RATE) • FILTER MEDIA AND TYPE (Grain Size Characteristics by sieve analysis) • HEAD LOSSES • THE KOZENY EQUATION • THE FAIR AND HATCH EQUATION • THE ROSE EQUATION • BACHWASHING
8	**DISINFECTION AND STERILIZATION** • MEDIA • PHYSICAL METHODS OF DISINFECTION: • CHEMICAL METHODS OF DISINFECTION: • CHLORINATION • CHLORINE-BASED ALTERNATIVE DISINFECTANTS • NON-CHLORINE ALTERNATIVE DISINFECTANTS • CHLORINE DEMAND CURVE • DISINFECTION KIENETICS • CT , CONCEPT • LOG INACTIVATION, CONCEPT • CT, FORMULATION • CT AND LOG INACTIVATION CALCULATION OVERVIEW • FACTORS INFLUENCING DISINFECTION