

# 國立臺北大學自然資源與環境管理研究所

## 106 學年度第一學期『環境工程科學概論』

課程講義(09)：水質管理與水處理技術概要  
Introduction to Water Quality Management and Water Treatment

- INTRODUCTION
  - Water Bodies and Water Uses => Water Quality Standards 水體水質分類標準
  - Self Clarification, Self Purification, Assimilation Capacity, Carrying Capacity
  - Water Quality and River Pollution Index => Effluent Standards 放流水標準
  - Total Maximum Daily Loads (TMDLs) vs. Total Mass Control
  - Public Water Supply, Sewage Systems, Industrial Wastewater, Water Reuse
  
- WATER POLLUTANTS AND THEIR SOURCES
  - Point Sources vs. Non-point Sources
  - Oxygen-Demanding Material: Organic Pollutants
  - Nutrients => N&P => CTSI (卡爾森指數, Carlson trophic state index)
  - Pathogenic Organisms: Virus, Bacteria, Protozoa...
  - Suspended Solid => SS =>Particulate Matter (PM) and TSP
  - Salts (Dissolved Solid) => TDS and Salinity
  - Toxic Metals and Toxic Organic Compounds
  - Heavy Metals and Heat => Arsenic, 電廠溫排水=>燃煤電廠海水法除硫
  
- STREAM WATER QUALITY MANAGEMENT
  - Effect of Oxygen-Demanding Wastes on Rivers
  - Biochemical Oxygen Demand (BOD)
    - ⇒Chemical Oxygen Demand (COD)
    - ⇒Decay (Aerobic Decomposition): First Order Reaction
  - Dissolved Oxygen and Water Quality: Temperature and Indicator Species
  - Laboratory Measurement of BOD => 5-Day BOD
  - DO Sag Curve (De-oxygenation and Re-aeration)
  
- DRINKING WATER MANAGEMENT
  - Tap Water vs. Drinking Water =>自來水、飲用水
    - ⇒Infrastructure vs. Environmental Protection => Public Utility
    - ⇒社區自設公共給水設備、簡易自來水
  - Drinking Water Quality 飲用水水質
    - ⇒[飲用水水質標準](#) => [自來水水質標準](#)
    - ⇒大高雄地區自來水後續改善工程計畫、翡翠水庫原水專管

- Water Bill => [自來水費 \(台北\)](#) => [水價調整專區](#)
- Drinking Water Source Protection 水源保護區 Water Well Head Protection Area
- WATER SUPPLY ENGINEERING
  - 自來水工程、給水工程、上水道工程
    - ⇒ 集水工程 Collection Works
    - ⇒ 輸水工程 Transmission Works
    - ⇒ 抽水工程 Pumping Works
    - ⇒ 淨水工程 Purification Works
    - ⇒ 配水工程 Distribution Works
- WATER TREATMENT ENGINEERING (PURIFICATION WORKS)
  - Water Treatment Units
    - ⇒ Gas Transfer; Ion Transfer; Solid Transfer
    - ⇒ Solute Stabilization => Desalination
    - ⇒ Sanitation, Hygiene and Aesthetical Considerations (Potability)
  - Water Treatment Components (Steps)
    - ⇒ Gridding and Screening
    - ⇒ Coagulation ( 混凝 ) and Flocculation ( 膠凝 ) => PAC
    - ⇒ Sedimentation => Primary and Secondary (even Tertiary sedimentation)
    - ⇒ Filtration and Disinfection => THM (Tri-Halogen Methane)
  - Advanced Water Treatment: Potability and other Aesthetical Considerations
    - ⇒ Ion Exchange; Reverse Osmosis (RO); Ultra-filtration: Membrane; UV & O<sub>3</sub>
- SEWAGE ENGINEERING AND WASTEWATER TREATMENT ENGINEERING
  - Waste Water Treatment and Sewage Systems
    - ⇒ 民生污水處理
    - ⇒ 工業廢水處理=>工業區污水處理廠
  - 中水道系統、雨水收集利用、民生污水回收再利用
    - ⇒ [建築物生活污水回收再利用建議事項](#)；[再生水水質標準及使用遵行辦法](#)
  - Sewage Systems or Sewers: Sanitary Wastewater and Stormwater Runoff
    - ⇒ Combined vs. Separate Sewage Systems
    - ⇒ Pipelines vs. Channels: Pipe Flow vs. Open Channel (Open Surface) Flow
  - Classification of Wastewater Treatment Plants
    - ⇒ Primary Treatment 一級處理
    - ⇒ Secondary (Biological) Treatment 二級 ( 生物 ) 處理
    - ⇒ Tertiary (Advanced) Treatment 三級 ( 高級 ) 處理
  - Sludge Treatment
    - ⇒ Anaerobic Digestion; Dewatering and Drying => Water Content; Disposal
    - ⇒ Sludge and Biomass: Integrated Wastewater Treatment Plant
  - Effluent Standards and Emerging Pollutants => Water Pollution Fee