國立臺北大學自然資源與環境管理研究所
113 學年度第一學期『環境工程科學概論』

課程講義(09-10)：水質管理與水處理技術
Water Quality Management and Water Treatment Technology

- INTRODUCTION
  - □ Water Bodies and Water Uses =>地面水體分類及水質標準
  - □ Self Clarification, Self Purification, Assimilation Capacity, Carrying Capacity
  - □ 環境部 飲用水全球資訊網 => 安全飲用水手冊 Emerging Pollutants
  - □ Effluent Standards 放流水標準 => 環境部預告修正「放流水標準」草案
  - □ Water Pollution Fee => 環境部水質保護網 => 水污費發展緣起
  - □ River Pollution Index (RPI) 河川污染指數 => WQI 水質指數
  - □ Total Maximum Daily Loads (TMDLs) vs. Total Mass Control
  - □ Public Water Supply, Sewage Systems, Industrial Wastewater, Water Reuse
  - □ 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 Standard 飲用水水質 vs. Tap Water Quality Standard
    ⇒飲用水水質標準、自來水水質標準、再生水水質標準及使用遵行辦法
    ⇒Water Reclamation and Water Reuse =>再生水資源發展條例
    ⇒開發單位使用再生水辦法 => 溫室氣體 空氣污染物 園區事業廢棄物
    ⇒蘇揆主持板新二期計畫第二階段通水 實現雙北共飲翡翠水、
    ⇒板新地區供水改善工程計畫、翡翠原水管工程計畫
  - □ Water Bill: 水費單 => 台灣自來水公司；台北自來水事業處
  - □ 水源保護區劃設、管理、回饋 => 自來水法、飲用水管理條例
  - □ 水質淨化現地處理；水質淨化工程篇；水質自然淨化工法
  - □ 生態工法 vs.以自然為本的解決方案 Nature-based Solutions (NBS)

- WATER POLLUTANTS AND THEIR SOURCES
  - □ Point Sources vs. Non-point Sources
  - □ Oxygen-Demanding Material: Organic Pollutants => “Equivalent”
  - □ Nutrients => N&P => CTSI (卡爾森指數 Carlson Trophic State Index)
  - □ Pathogenic Organisms: Virus, Bacteria, Protozoa...
  - □ Suspended Solid => SS => Air Pollutants: Particulate Matter (PM) and TSP
  - □ Salts (Dissolved Solid) => TDS and Salinity
  - □ Toxic Metals and Toxic Organic Compounds
  - □ Heavy Metals and Heat => Arsenic 核電廠溫排水=>燃煤電廠海水法除硫

- WATER QUALITY MANAGEMENT IN RIVERS
  - □ 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
- □ DO Sag Curve (De-oxygenation and Re-aeration)
- □ Effects of Other Pollutants on Water Bodies
- □ Biological Indicators

- WATER SUPPLY ENGINEERING
  - □ 自來水到我家：取水、導水、淨水、送(配)水
  - □ 自來水工程、給水工程、上水道工程
    ⇒集水工程 Collection Works
    ⇒輸(導)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_3

- SEWAGE ENGINEERING AND WASTEWATER TREATMENT ENGINEERING
  - □ 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
  - □ 「製程用水 100%全回收」（友達龍潭廠）=> 零排放？ 九年扭轉汙染黑歷史

- HOMEWORK #6:「水源保護區」=> 併入期末報告主題