Seagull
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Design of Activated Sludge Systems

Module 1.0
Introduction

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Course Schedule

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General Schedule

Time	Agenda Item
08:30 – 09:50	Summary/repetition of main subjects from yesterday Discussion of results homework assignment
09:50 – 10:00	Break
10:00 – 11:20	Part 1 of todays program
11:20 – 11:30	Break
11:30 – 12:30	Part 2 of todays program
12:30 – 13:30	Lunch
13:30 – 14:50	Part 3 of todays program
14:50 – 15:00	Break
15:00 – 16:20	Part 4 of todays program
16:20 – 16:30	Break
16:30 – 17:30	Part 5 of todays program Homework assignment

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Day 1 - Monday

- Module 1.0 Introduction
- Module 1.1 Organic Material and Bacterial Metabolism
  - > Measurement of organic material in wastewater
  - > Bacterial metabolism
- Module 1.2 Influent Composition and Biomass Fractions
  - > Influent characterization
  - > Biomass fractions
  - > Model notation
  - > Mass balance of organic material

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Day 2 - Tuesday

- Module 1.3 Steady State Activated Sludge Model
  - > Sludge age and hydraulic retention time
  - > Steady state model for COD removal
  - > Model summary
  - > Sludge mass and composition
  - > Nutrient demand
  - > Biolological reactor volume
  - > Influence of temperature
  - > Comparison F/M ratio and sludge age
  - > Control of the sludge age

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Day 3 - Wednesday

- Module 1.4 Nitrogen Removal
  - > Fundamentals of nitrogen removal
  - > Nitrification kinetics
  - > Nitrification potential and capacity
  - > Denitrification kinetics
  - > System configuration
  - > Denitrification capacity
  - > Calculation of nitrogen removal capacity
  - > Optimized design procedure

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Day 4 – Thursday (morning)

- Module 1.5 Final Settling
  - > Sludge settleability parameters
  - > Solids Flux Theory
  - > Determination of maximum allowable hydraulic loading rate
  - > Optimized settler design using the solids flux theory
  - > Optimizing reactor- and final settler volume or -costs
  - > Empirical methods for settler design
  - > Settlers under dynamic loading conditions (static point)

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Day 4 – Thursday (afternoon)

- Module 1.6 Sludge Treatment
  - > Sludge quantity and composition
  - > Sludge thickening
  - > Anaerobic sludge digestion
    - Stoichiometrics
    - Digester configurations
    - Influence of operational parameters
    - Performance of the high rate anaerobic digester
    - Methane generation
    - Optimized design of thickener – digester system
  - > Sludge dewatering and drying (optional)

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Day 4 – Thursday (afternoon)

- Optional Module 1.11 Aeration
  - > Aeration equipment
  - > Aeration theory
  - > Sizing of aeration equipment
    - Surface aeration
    - Diffused aeration
  - > Determination of aeration efficiency
    - Oxygen transfer coefficient
    - Determination of aeration efficiency

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Day 5 – Friday

- Module 1.12 Integrated Design
  - > Basis of design
    - Wastewater characteristics / Costing data
    - Performance objectives
  - > Treatment configurations
    - Basic system layouts
    - Reactor types
  - > Design guidelines
  - > Optimized design approach – integration examples:
    - Conventional secondary treatment
    - Nitrogen removal
  - > Integration Exercise

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Optional

- Optional Module 1.15 Sludge Separation Problems
  - > Microbiology of sludge bulking
  - > Types of filamentous sludge bulking
  - > Generic measures agains sludge bulking
  - > Causes and control of foaming/scum formation

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Course Format

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Course Format

Format:

- Presentation of theory
- Many examples
- Multiple choice test per module
- Homework exercises
- A final take-home assignment

You will get:

- Copy of the handbook + printed handouts
- A diploma
- Three design spreadsheets to use as a starting point for your own designs
- Worked out exercises in spreadsheet format