

Biological wastewater treatment and anaerobic digestion: theory, design and practice

Course lecturer: Professor Davide Dionisi, School of Engineering, University of Aberdeen

Course programme

Description: This advanced course is aimed at professionals, graduates and PhD students working or interested in the sector of biological wastewater treatment. The course describes how to optimise and design biological wastewater treatment and anaerobic digestion processes in order to maximise treatment efficiency while minimising the capital and operating costs. The course starts from the fundamental of biological wastewater treatment and shows step-by-step how to develop and solve the design equations. The course includes tutorials where the students will be able to work hands-on solving numerical and design problems.

Programme

Day 1

9:00-10:30 Lecture 1. Introduction; Lecture 2. Fundamentals. Microorganisms and processes

10:30-10:45 Coffee break

10:45-12:00 Lecture 3. Fundamentals. COD and BOD, COD balance

12:00 -13:00 Lunch break

13:00:14:00 Tutorial 1. COD balance

14:00-15:30 Lecture 4. Fundamentals. Stoichiometry and kinetics

15:30-15:45 Coffee break

15:45-17:00 Lecture 5. Fundamentals. Oxygen transfer theory

Day 2

9:00-10:30 Lecture 6. Fundamentals. Settling theory; Lecture 7. Fundamentals. Mass balances

10:30-10:45 Coffee break

10:45-12:00 Lecture 8. Fundamentals. Parameter estimation

12:00 -13:00 Lunch break

13:00:14:00 Tutorial 2. Mass balances and parameter estimation

14:00-15:30 Lecture 9. Fundamentals. Heat balances

15:30-15:45 Coffee break

15:45-17:00 Lecture 10. Fundamentals. pH calculations

Day 3

9:00-10:30 Lecture 11. Activated sludge-Theory and design; Lecture 12. Activated sludge-Aeration design

10:30-10:45 Coffee break

10:45-12:00 Lecture 13. Activated sludge-Settling design; Lecture 14. Waste sludge

12:00 -13:00 Lunch break

13:00:14:00 Tutorial 3. Activated sludge design

14:00-15:30 Lecture 15. Activated sludge for carbon and nitrogen removal-Theory and design

15:30-15:45 Coffee break

15:45-17:00 Tutorial 4. Activated sludge for carbon and nitrogen removal

Day 4

9:00-10:30 Lecture 16. Anaerobic digestion-Introduction

10:30-10:45 Coffee break

10:45-12:00 Lecture 17. Anaerobic digestion-Theory and design

12:00 -13:00 Lunch break

13:00:14:00 Tutorial 5. Anaerobic digestion

14:00-15:30 Lecture 18. SBR-Theory and design

15:30-15:45 Coffee break

15:45-17:00 Lecture 19. Attached growth

Day 5

9:00-10:30 Tutorial 6. Attached growth

10:30-10:45 Coffee break

10:45-12:00 Lecture 20. Temperature calculation

12:00 -13:00 Lunch break

13:00:14:00 Lecture 21. pH calculation in activated sludge

14:00-15:30 Lecture 22. Xenobiotics; Lecture 23. Innovative biological processes

15:30-15:45 Coffee break

15:45-17:00 Lecture 24. Key messages