



Cursusomvang (nominale waarden; effectieve waarden kunnen verschillen per opleiding)

Studiepunten 5.0 Studietijd 150 u Contacturen 50.0 u

Aanbodssessies en werkvormen in academiejaar 2019-2020

A (semester 2) Engels hoorcollege 50.0 u

Lesgevers in academiejaar 2019-2020

Rabaey, Korneel LA25 Verantwoordelijk lesgever
Zhuiykov, Serge KR01 Medelesgever

Aangeboden in onderstaande opleidingen in 2019-2020

	stptn	aanbodssessie
Bachelor of Science in Environmental Technology	5	A

Onderwijstalen

Engels

Trefwoorden

Wastewater treatment, drinking water, environmental biotechnology, water quality

Situering

This course presents an engineering based approach towards sanitation processes based on microbial conversions as well as physico-chemical processes. These conversions are the foundation of a wide variety of environmental technical constructions. The course mainly deals with wastewater treatment, but also to a lesser extent discusses drinking water preparation. Not only conventional activated sludge is discussed, we also highlight novel technological solutions such as membrane bioreactors. The practical exercises consist of design calculations and process measurements in the context of a case study. Laboratory exercises focused on the *hands-on* experience of measurement various water contaminants.

Inhoud

Section Biotechnological processes discusses the key aspects of the activated sludge process. This is then extended with new or other types of treatment systems including membrane bioreactors and biofilm based systems. Finally, biological aspects of drinking water production, such as slow sand filtration, are highlighted.

1	Wastewater treatment	11
2	Activated sludge	14
3	Special types of activated sludge processes	82
4	Membrane bioreactors	87
5	Biofilm based wastewater treatment	99
6	Resource recovery from wastewater	118
7	Biological aspects of drinking water production	128

This section is complemented with theoretical exercises, in which the different unit processes for wastewater treatment are calculated through, ending with the design of a complete wastewater treatment plant.

Section Physico-chemical processes focuses on different aspects of physico-chemical water treatment, including sedimentation, coagulation and flocculation, aeration and filtration. Various design aspects of these processes are discussed. Finally, state-of-the-art water quality sensors are considered in details.

1. Physico-chemical wastewater treatment plant
2. Sedimentation
3. Coagulation and Flocculation

4. **Aeration**
5. **Filtration and filtration by powdered activated carbon**
6. **Water quality sensors**

Physico-chemical section is completed with theoretical and designs examples, in which modern approaches are presented. Laboratory practical exercises invigorated the theoretical knowledge obtained.

Begincompetenties

Students need to have followed:

Environmental Chemistry, Biochemistry, Physics 1, 2, 3 and 4, Microbiology

Eindcompetenties

- 1 1 Capacity to evaluate the biotechnology of clean water production and of aerobic waste treatment.
- 2 2 Capable to comprehend the engineering principles of the processes covered in the course.
- 3 3 Be able to design the important biotechnological unit processes.
- 4 4 Have the attitude to judge the various processes in terms of performance and order of magnitude of overall opex and capex.
- 5 5 Capacity to evaluate main approaches for design of the modern wastewater treatment plant for non-bio-degradable waste and its main parts.
- 6 6 Have a knowledge about main process of the wastewater plant and modern trends in development water quality measuring instruments.
- 7 7 Have insight and deep knowledge with regard to modern physical and chemical wastewater treatment.
- 8 8 Have insight in the latest development of water quality sensors.

Creditcontractvoorwaarde

Dit opleidingsonderdeel kan niet via creditcontract gevolgd worden

Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

Didactische werkvormen

Hoorcollege, werkcollege: geleide oefeningen

Toelichtingen bij de didactische werkvormen

Theory and theoretical exercises for section biotechnology are provided as lectures.

Leermateriaal

Course notes are provided via pdf, accessible on Minerva

Referenties

Environmental Biotechnology – Principles and Applications. (B.E. Rittmann & P.L. McCarty, Eds.). McGraw-Hill International Editions, Biological Sciences Series, 754 p. ISBN 0-07-118184-9
 W. Verstraete and E. Van Vaerenbergh. 1986. Aerobic activated sludge, p. 44 112. Chapter 2. In : Biotechnology Vol. 8. H.J. Rehm and G. Reed (Eds.). VCH Verlagsgesellschaft, Weinheim

Vakinhoudelijke studiebegeleiding

Evaluatiemomenten

periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Schriftelijk examen met open vragen, openboekexamen

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Schriftelijk examen met open vragen, openboekexamen

Evaluatievormen bij niet-periodegebonden evaluatie

Tweede examenkans in geval van niet-periodegebonden evaluatie

Niet van toepassing

Toelichtingen bij de evaluatievormen

Section biotechnology: several reasonably brief questions spanning the course, as well as one or two longer, open questions aimed to examine general understanding of technological concepts

Eindscoreberekening

Part biotechnological processes 12/20 from which 3 credits exercises
Part physicochemical processes 8/20