Modeling and Control of Wastewater Treatment Plants

(November 19 – 23, 2018)

Department of Chemical Engineering, NIT WARANGAL, India

1. Overview

Water plays a vital role and influences all spheres touching people, planet and prosperity. Water used by households and industry is typically collected via sewer systems bringing it to centralized wastewater treatment plants (WWTP). Managing this waste water is becoming increasingly crucial for ensuring a clean environment and public health in light of significant water scarcity being faced by many nations including India. The focus in the past was mainly on understanding and improving the biological processes and to achieve combined removal of organics and nutrients to levels below effluent limits. Today's waste water treatment goes much beyond conventional processes of bringing down BOD and COD below prescribed level and now encompasses a plethora of different technologies with increasing focus on water recycle and reuse. Energy consumption has become another driver for WWTP optimization as well as carbon footprint. Wastewater treatment systems are becoming complex integrated systems. A trans-disciplinary approach is essential to design, develop and optimize new age wastewater treatment technologies and facilities. In order to understand these complex integrated systems, advanced tools such as advanced mathematical modelling, optimization, control and decision support systems are useful and provide incentives for efficient operation of WWTP. With this view in mind, this course will focus on recent trends in wastewater treatment, development of computational models for design, control and optimization.

The course will introduce participants in approaches and tools for the mathematical modeling and control of WWTP and will provide hands-on experience with simulation software WEST/GPS-X and model-based design, optimization and control of WWTP.

Leading international academics and researchers with extensively recognized expertise, and demonstrated ability in teaching, consultancy, research, and training in the field of WWTP, modelling and dynamic optimization and control will deliver lectures and discuss industrially relevant case studies in the course.

2. Objectives

On completion of the training, participants will be able to:

i) Understand the key modeling aspects of wastewater treatment plants
ii) Estimate the kinetic parameters based on experimental data using respirometric methods
iii) Understand key concepts of the modeling and control of key unit operations in WWTPs
iv) Understand the energy requirements and measures to improve the energy efficiency while operating WWTPs
v) Formulate mathematical models, develop dynamic simulations and optimization as well as parameter estimation based on experimental data using dedicated simulation software packages.

Dates	19 – 23 November, 2018
Modules	• Introduction, Incentives for modeling in wastewater treatment; management and state of the art modeling practice, Mixing and hydraulics modelling • Biokinetics modelling: Activated sludge models for WWTPs, Benchmark simulation models for WWTPs • Control of WWTPs for improved effluent quality and energy efficiency. • Energy efficient treatment of A-stage effluent: pilot-scale experiences with shortcut nitrogen removal • Computational Fluid Dynamics for Wastewater treatment, Improved mixing modelling with compartmental models • Detailed off-gas measurements for improved modelling of the aeration performance – Case study of Eindhoven WWTP. • Population balance modeling applied to WWTP
You Should Attend If…	▪ you are a faculty member/research scientist in Chemical /Environmental/Civil/Biotechnology/relevant engineering discipline interested in modeling, simulation and control of wastewater treatment plants. ▪ you are a professional engineer interested or working in wastewater treatment industries. ▪ you are a UG/PG student or research scholar interested in learning modeling, simulation and control of wastewater treatment plants.
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $300** **Industry/ Research Organizations: Rs. 10,000/-** **Faculty: Rs. 5,000/-** **Students & Research Scholars:** **Without award of Grade: Rs. 1,500/-** **With award of Grade: Rs. 2,000/-** The above fee includes all instructional materials, computer use for tutorials and assignments. The participants from academic/research institutes and Industry will be provided with boarding and lodging on additional payment of Rs. 5,000/- in NIT campus on sharing basis. Students & Research Scholars will be provided with boarding and lodging in Institute Hostels on additional payment of Rs. 2,500/-.

The Faculty

Prof. Ingmar Nopens, is an associate professor at Ghent University leading the BIOMATH research group. His work focuses on model-based analysis and optimization of bioprocesses. One system that is studied intensively at BIOMATH is wastewater treatment. Different modeling frameworks (kinetic models, Computational fluid dynamics and Population Balance Models) as well as modeling methodologies are used to achieve this. He is heavily involved in the International Water Association (IWA) and also is member of its Fellow programme.
http://biomath.ugent.be/biomath/biomath_staff.php

Dr. A. Seshagiri Rao is an Associate Professor in the Department of Chemical Engineering at NIT Warangal, India. His research interests include Process control, nonlinear dynamics, time delay systems, model based control, waste water treatment. He is recipient of INAE young engineer award and IIChE young researcher award in 2014.
http://www.nitw.ac.in/nitw/div/view.php?facultyid=16460

Dr. G. Uday Bhaskar Babu is an Assistant Professor in the Department of Chemical Engineering at NIT Warangal, India. His research interests include energy integration, process modeling and simulation, model predictive control, fractional order controllers, fuel cells.
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Course Coordinators

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