

Water Treatment PRO – Online Course

The fundamentals of water treatment



www.cropaia.com/water-treatment-pro

General Details	
Course Code:	WT108
Course Name:	Water Treatment PRO
Language of Instruction:	English
Delivery Method:	Online Course – Live sessions via a web conferencing platform. Recordings will be provided.
Start Date:	See our website
End Date:	See our website
Lecture Days:	See our website
Hours:	See our website
Level and Prerequisites:	Intermediate. Understanding in basic chemistry and physics is recommended.
Certificate	Certificate of completion – Fundamentals of Water Treatment.

Speaker	
Name:	Mr. Guy Sela
Credentials:	<p>Water treatment expert</p> <p>BS.c Water and Soil Sciences</p> <p>Chemical Engineering</p> <p>Founder and former CEO at SMART! Fertilizer Management</p> <p>Founder at Cropaia</p>
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Delivery Method:	<p>Online Course – Live sessions via a web conferencing platform.</p> <p>Recordings will be provided.</p>

Text:	Text: pdf texts and PowerPoints will be provided throughout the course.
Certificate	Certificate of completion – Fundamentals of Water Treatment.

Course overview

This course focuses on the processes required for water and wastewater treatment. Quality criteria for different water uses (potable water, irrigation water, water reuse and more) will be discussed, as well as the characteristics of the different water sources - surface water, groundwater, wastewater.

The chemical, physical and biological processes involved in water treatment will be described.

There will be a focus on the operational units and processes, e.g. sand filtration, membrane filtration, disinfection, flocculation-coagulation, water softening etc.

The course will begin by covering the fundamentals that are necessary to understand water qualities and criteria and what process units are required. We will continue with the description and understanding of each of the units – theory, practice and problem solving. We will end the course with an exercise, which will include a design scheme of various water treatment processes and solving problems that might occur during the process.

A short exam will be given to the participants. The exam is not obligatory, but required for receiving the course certificate.

Intended course outcome

1. You will understand the water quality criteria for different water sources and usage purposes.
2. You will understand the fundamentals of the operational units that are part of the water treatment process
3. You will be able to propose a water treatment process for various water sources and usage purposes.
4. You will be able to avoid and solve common and less common problems.
5. You will gain expertise in water treatment practices.
6. You will become familiar with new technologies.

How it works

We will have weekly live sessions, according to the schedule described at: <https://cropaia.com/water-treatment-pro>

We do the sessions in a form of a webinar, using a webinar platform. Each week you will receive a link to connect to the live session.

The sessions are recorded and we will send you the recording after the repetition session, so you can learn at your own pace. The recordings will be available for one year.

You may ask questions during the live sessions and we will do our best to answer your questions within the time frame of the session.

Additional questions can be sent to the instructor by email.

There will be a short test at the end of the course. You can take the test up to one year after the completion of the course. A certificate of participation will be granted to registrants who completed the test.

Topic 1 – Introduction – water sources, water quality, regulations and standards.

Available water sources
Water quality parameters
Impurities in the water
Characteristics of different water sources
Vulnerability of the water sources to contamination
Water quality criteria
Examples of water treatment units

Topic 2 – Sand Filtration

Filtration mechanisms
Filters classification
Slow sand filtration

- Characteristics
- Efficiency
- How it works
- Schmutzdecke layer
- Design parameters
- The filter media
- Performance
- Operation
- Cleaning
- Advantages and disadvantages

Rapid sand filtration

- Characteristics
- Efficiency
- Types of filters
- Design parameters
- The filter media
- Performance
- Cleaning
- Advantages and disadvantages

Topic 3 – Coagulation and flocculation

Suspended impurities– properties and parameters

Coagulation

- Introduction to coagulation
- The double electrical layer
- Mechanisms of coagulation
- Enhanced coagulation
- Coagulants
- Jar test
- Rapid mixing – principles, types of mixing systems, design parameters

Flocculation

- Introduction to flocculation
- Types of flocculation
- Flocculation systems
- Design considerations

Topic 4 – Water softening and adsorption processes

Water hardness

- What it causes
- Types of hardness
- Units
- Classification
- LSI

Chemical precipitation

- Principles of lime softening
- Removal of permanent hardness
- Removal of temporary hardness
- Recarbonation
- Process configurations
- Lime materials

Ion exchange

- Introduction and applications
- The resin
- Adsorption principles
- Exchange capacity
- Resin selectivity
- Design parameters
- Regeneration
- Equipment and operation
- Backwash
- Satabilizing the water
- Fouling and breakdown

Topic 5 – Membrane filtration

Introduction to membrane filtration

Microfiltration

Ultrafiltration

Nanofiltration

Flow regimes

Dead-end and cross-flow filtration

Membrane materials

Membrane configurations

Membrane fouling

Membrane scaling

Reverse osmosis

- Principles of reverse osmosis
- Applications
- Types of membranes
- Performance parameters
- Design– stages, passes
- Potential problems and how to avoid them
- Pre-treatment
- Membrane cleaning

Topic 6 – Water disinfection

Inactivation of microorganisms

Disinfection byproducts

Factors that affect the disinfection process and its efficiency

- Chlorine forms
- Chlorine demand
- Residual chlorine
- Combined chlorine
- Breakpoint chlorination
- Formation of chloramines
- Disinfection with chloramines

Disinfection with chlorine dioxide

Dechlorination

UV disinfection

- Principles
- Photoreactivation
- UV lamps

Topic 7 – Activated carbon

Principles of activated carbon filtration

Applications

Activated carbon

- Production
- Forms
- Properties

Factors affecting the filtration with activated carbon

Design parameters

Properties of the contaminants

Adsorption isotherms

Bacterial growth and how to avoid it

Competitive adsorption

Pilot plant

Operation of GAC filters

Topic 8 – Wastewater treatment

Introduction to wastewater treatment

Preliminary treatment

- Screening
- Communitors and grinders
- The grit
- Grit chambers – principles, configurations, design parameters
- Skimming tanks

Primary treatment – sedimentation

Secondary treatment

- Types of processes
- Activated sludge – biological treatment
- Configurations
- Factors that affect the efficiency of the treatment
- Terms – mixed liquor, MLSS, MLVSS, HRT, RAS, WAS, CRT etc.
- F/M ratio
- Design parameters

Topic 9 – New technologies

We will discuss new technologies and water treatment methods, including:

New membrane separation processes

Graphene membranes

- Graphene – structure, properties, potential
- Graphene oxide
- Generating pores in the graphene
- Graphene oxide membranes
- Filtration mechanisms

Membrane bioreactors (MBR)

- Description
- Advantages
- MBR vs. CAS
- MBR configuration
- sMBR
- iMBR
- Fouling in MBR
- Cleaning

Bio electrochemical systems

- Biological fuel cells
- Microbial desalination

Topic 10 - Exercise

Basic design of a water treatment plant
Problems and their solution