COURSE OVERVIEW TE0312
Microbial Analysis of Wastewater

Course Title
Microbial Analysis of Wastewater

Course Reference
TE0312

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Date/Venue

Session(s)	Course Date	Venue
1	May 25-29, 2025	Meeting Plus 9, City Centre Rotana, Doha, Qatar
2	August 24-28, 2025	
3	November 02-06, 2025	

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Microbial Analysis of Wastewater. It covers the fundamentals of environmental microbiology, importance of microbial analysis in wastewater and microbial ecology of wastewater; the sampling techniques for microbial analysis, biosafety and good laboratory practices (GLP) and common microbial tests; the culture-based detection techniques, indicator organisms in wastewater and advanced microscopy techniques; the molecular techniques in wastewater microbiology, enzyme-based and rapid tests and data recording and interpretation.

Further, the course will also discuss the microbial role in primary and secondary treatment and monitoring activated sludge microbiology; the anaerobic digestion microbiology, biofilm and fixed film system analysis as well as assess disinfection efficiency and troubleshoot microbial imbalances; the pathogen detection and quantification, emerging microbial contaminants and risk assessment based on microbial data; the regulatory guidelines and microbial standards, microbial analysis in water reuse applications and biosensors and rapid detection innovations.

During this interactive course, participants will learn the laboratory quality assurance and method validation and the interpretation of microbial results; preparing lab reports and summaries, interpret microbial data for stakeholders and communicate risk to non-technical teams; integrating with process control and automation through linking microbial monitoring to SCADA/HMI systems and triggering alarms from microbial surrogates.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an advanced knowledge on microbial analysis of wastewater
- Discuss the fundamentals of environmental microbiology, importance of microbial analysis in wastewater and microbial ecology of wastewater
- Identify sampling techniques for microbial analysis, biosafety and good laboratory practices (GLP) and common microbial tests
- Recognize culture-based detection techniques, indicator organisms in wastewater and advanced microscopy techniques
- Explain molecular techniques in wastewater microbiology, enzyme-based and rapid tests and data recording and interpretation
- Recognize microbial role in primary and secondary treatment and monitor activated sludge microbiology
- Discuss anaerobic digestion microbiology, biofilm and fixed film system analysis as well as assess disinfection efficiency and troubleshoot microbial imbalances
- Identify pathogen detection and quantification, emerging microbial contaminants and risk assessment based on microbial data
- Apply regulatory guidelines and microbial standards, microbial analysis in water reuse applications and biosensors and rapid detection innovations
- Discuss laboratory quality assurance and method validation and the interpretation of microbial results
- Prepare lab reports and summaries, interpret microbial data for stakeholders and communicate risk to non-technical teams
- Integrate with process control and automation through linking microbial monitoring to SCADA/HMI systems and triggering alarms from microbial surrogates

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of microbial analysis of wastewater for environmental scientists and technicians, wastewater treatment plant operators and engineers, laboratory analysts and microbiologists, environmental consultants and those involved in environmental science, wastewater management, and laboratory analysis.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Kyle Bester is a **Senior Water Engineer** with extensive years of practical experience within the **Oil & Gas**, **Power & Water Utilities** and other **Energy** sectors. His expertise includes **Water Reservoir**, **Water Tanks**, **Water Pumping** Station, **Water Distribution** System, **Water Network** System, **Water Pipes & Fittings**, **Water Hydraulic** Modelling, **Water Storage Reservoir**, **Reservoirs & Pumping** Stations Design & Operation, **Pumping** Systems, Interconnecting **Pipelines**, **Water Network Hydraulic** Simulation Modelling, **Water Supply** Design, **Water Balance Modelling**, **Water Distribution Network**, **Water Network** System Analysis, **Water Forecasts** Demand, **Water Pipelines** Materials & Fittings, **Water Network** System Design, Pump Houses & Booster Pumping Stations, **Potable Water Transmission**, **Water Distribution Network**, Districts Meters Areas (DMAs), **Water Supply & Desalination Plants** Rehabilitation, **Water Reservoirs & Pumping Stations**, **Water Network System** Extension, Water Network System Replacement & Upgrade, **Water Networks** Optimization, **Water Supply & Distribution** Systems Efficiency & Effectiveness, **Pipe** Materials & Fittings, **Service Reservoir** Design & Operation, **Pipes & Fittings**, **Water Network** System Design & Operation, **Supply Water Network** Rehabilitation, **Water Loss** Reduction, **Main Water** System Construction, **Main Water Line** Construction, Transmission & Distribution **Pipelines**, **Water Distribution** Design & Modelling, **Water Supply** System, Oilfield **Water Treatment**, Best Practice in **Sewage** & Industrial **Wastewater Treatment** & Environmental Protection, **Water Distribution** Design & Modelling, **Desilting**, Treating & Handling Oily **Water**, **Water Chemistry** for **Power Plant**, **Water** Sector Orientation, Environmental Impact Assessment (**EIA**), **Potable Water**, **Reverse Osmosis** Treatment Technology and **Chlorination** System, **Well** Inventory, Monitoring & Conservation, **Qualitative Analysis** of Soil & Ground Water, **Water** Networking, **Hydraulic Modelling** Systems, **Pumping** Stations, **Centrifugal Pumps**, **Pipelines & Pumping**, **Water Reservoirs**, **Water Storage Tanks**, Extended Activated **Sludge** Treatment, **Sewage & Industrial Wastewater** Treatment & Environmental Protection, Supervising & Monitoring **Sewage Works**, **Water Desalination** Technologies, **Water Distribution & Pump** Station, Best **Water Equipment** Selection & Inspection, **Hydraulic Modelling** for Water Network Design, **Water Utility** Industry, **Water Desalination** Technologies & New Development, **Water Hydrology**, **Water Conveyors**, **Water Networks** Rehabilitation. He is currently the **Part Owner & Manager** of Extreme Water SA wherein he manages, re-designed and commissioned a water and wastewater treatment plants.

During his career life, Mr. Bester has gained his practical and field experience through his various significant positions and dedication as the **Project Manager**, **Asset Manager**, **Manager**, **Water Engineer**, **Supervisor**, **Team Leader**, **Analyst**, **Process Technician**, **Landscape Designer** and **Senior Instructor/Trainer** for various international companies, infrastructures, water and wastewater treatment plants from New Zealand, UK, Samoa, Zimbabwe and South Africa, just to name a few.

Mr. Bester holds a **Diploma** in **Wastewater Treatment** and a **National Certificate** in **Wastewater & Water Treatment**. Further, he is a **Certified Instructor/Trainer**, an **Approved Chemical Handler** and has delivered numerous courses, trainings, conferences, seminars and workshops internationally.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Fundamentals of Environmental Microbiology*** *Overview of Microbial Life: Bacteria, Viruses, Fungi, Protozoa • Microbial Classification and Characteristics • Role of Microbes in Natural and Engineered Environments • Pathogens versus Beneficial Microorganisms*
0930 – 0945	*Break*
0945 – 1030	***Importance of Microbial Analysis in Wastewater*** *Indicators of Contamination and Pollution • Microbes in Biological Wastewater Treatment • Public Health Significance • Regulatory Requirements for Microbial Monitoring*
1030 – 1130	***Microbial Ecology of Wastewater*** *Microbial Community Structure in Influent and Effluent • Anaerobic versus Aerobic Zones • Microbial Dynamics in Activated Sludge Systems • Factors Influencing Microbial Populations*
1130 - 1230	***Sampling Techniques for Microbial Analysis*** *Grab versus Composite Sampling • Sample Preservation and Storage Conditions • Avoiding Contamination in the Field and Lab • Chain of Custody and Documentation*
1230 – 1245	*Break*
1245 – 1335	***Biosafety & Good Laboratory Practices (GLP)*** *Personal Protective Equipment (PPE) • Sterilization Techniques (Autoclaving, Flame, Filtration) • Safe Handling and Disposal of Biological Materials • Laboratory Quality Control and Assurance*

1335 - 1420	***Overview of Common Microbial Tests*** *Total Coliforms and E. coli (Fecal Indicators) • Heterotrophic Plate Count (HPC) • Fecal Streptococci and Enterococci • Viruses and Helminths (Overview)*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 - 0830	***Culture-Based Detection Techniques*** *Membrane Filtration Method • Multiple-Tube Fermentation (MPN Method) • Spread Plate and Pour Plate Techniques • Interpretation of Colony-Forming Units (CFU)*
0830 - 0930	***Indicator Organisms in Wastewater*** *Definition and Use of Indicator Organisms • Total Coliforms, Fecal Coliforms, and E. coli • Comparison of Indicators for Surface and Treated Water • Detection Limits and Method Sensitivity*
0930 – 0945	*Break*
0945 – 1100	***Advanced Microscopy Techniques*** *Staining Techniques (Gram Stain, Acid-Fast, Fluorescent) • Use of Phase Contrast and Fluorescence Microscopy • Counting Microbial Cells Under a Microscope • Image Capture and Software-Assisted Analysis*
1100 – 1230	***Molecular Techniques in Wastewater Microbiology*** *DNA Extraction from Wastewater Samples • Polymerase Chain Reaction (PCR) Applications • Quantitative PCR (qPCR) for Gene Quantification • 16S rRNA Sequencing for Microbial Identification*
1230 – 1245	*Break*
1245 – 1330	***Enzyme-Based & Rapid Tests*** *Colilert and Enterolert Tests • Enzyme Substrate Testing for Specific Indicators • Advantages and Limitations • Use in Field Testing and Regulatory Compliance*
1330 - 1420	***Data Recording & Interpretation*** *Logbooks and Electronic Records • Statistical Treatment of Microbiological Data • Correlation with Physicochemical Parameters • Validation of Outliers and Repeat Tests*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 - 0830	***Microbial Role in Primary & Secondary Treatment*** *Microbial Activity in Sedimentation and Stabilization • Biofilm and Activated Sludge Systems • Nitrifying and Denitrifying Bacteria • Methanogens in Anaerobic Digesters*
0830 - 0930	***Monitoring Activated Sludge Microbiology*** *Identification of Filamentous Bacteria • Sludge Bulking and Foaming Causes • Sludge Volume Index (SVI) and Microbial Observations • Floc Formation and Disintegration*

0930 – 0945	*Break*
0945 – 1100	***Anaerobic Digestion Microbiology*** *Acidogens, Acetogens, and Methanogens • Volatile Fatty Acids and pH Relationship • Inhibition by Heavy Metals and Toxicants • Gas Yield and Microbial Activity Correlation*
1100 – 1230	***Biofilm & Fixed Film System Analysis*** *Trickling Filters and Rotating Biological Contactors • Biofilm Sampling and Scraping Methods • Microscopic Analysis of Biofilm Architecture • Biofilm Performance Evaluation*
1230 – 1245	*Break*
1245 – 1330	***Assessing Disinfection Efficiency*** *Microbial Log Removal During Chlorination/UV • Resistance of Spores and Viruses • Testing Before and After Disinfection • Residual Disinfectant Impact on Microbial Counts*
1330 - 1420	***Troubleshooting Microbial Imbalances*** *Toxic Shock Events and Microbial Die-Off • Organic Overload and Microbial Stress • Corrective Measures (Aeration, Dosing, pH Adjustment) • Predictive Indicators of Failure*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 - 0830	***Pathogen Detection & Quantification*** *Detection of Salmonella, Shigella, Vibrio • Pathogenic E. coli (EHEC, EPEC, etc.) • Waterborne Viruses (Norovirus, Adenovirus) • Protozoa: Giardia and Cryptosporidium*
0830 - 0930	***Emerging Microbial Contaminants*** *Antibiotic-Resistant Bacteria (ARB) • Antibiotic Resistance Genes (ARGs) • Fecal Indicator Viruses (F+ Coliphages) • Use of Metagenomics in Emerging Risk Detection*
0930 – 0945	*Break*
0945 – 1100	***Risk Assessment Based on Microbial Data*** *Quantitative Microbial Risk Assessment (QMRA) • Dose-Response Relationships • Exposure Routes (Recreational, Occupational, Reuse) • Hazard Identification and Risk Communication*
1100 – 1230	***Regulatory Guidelines & Microbial Standards*** *WHO Microbial Standards for Reuse • USEPA Wastewater and Sludge Microbiological Criteria • Local Standards for Effluent Discharge and Reuse • Compliance Testing and Reporting Requirements*
1230 – 1245	*Break*
1245 – 1330	***Microbial Analysis in Water Reuse Applications*** *Potable versus Non-Potable Reuse Microbiology • Monitoring Protocols for Recycled Water • Validation of Advanced Treatment Barriers • Role of Microbial Surrogates in Reuse Systems*

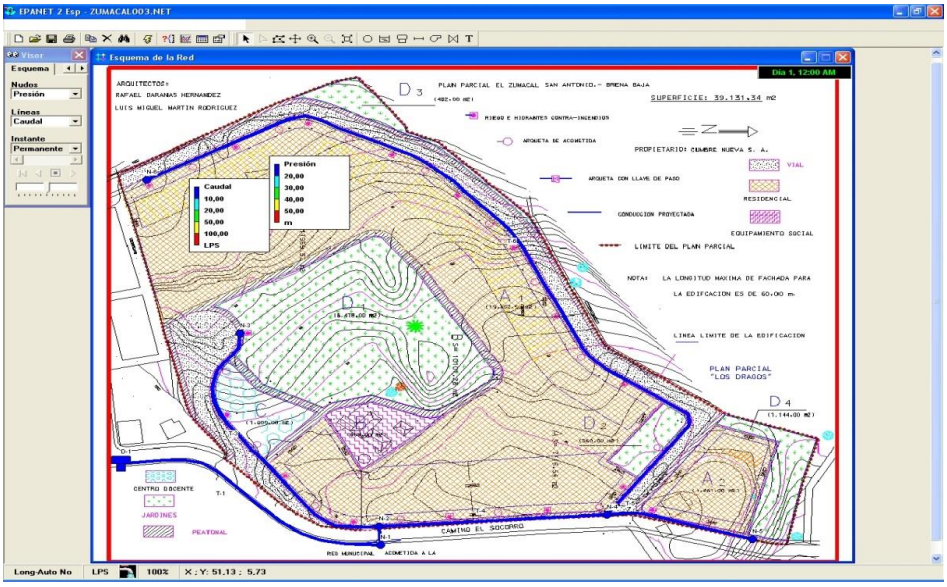
1330 - 1420	***Biosensors & Rapid Detection Innovations*** *On-Line Microbial Sensors • Biosensor Mechanisms (Optical, Electrochemical) • Use in Smart Wastewater Treatment Plants • Future Trends in Rapid Microbial Detection*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 - 0830	***Laboratory Quality Assurance & Method Validation*** *Internal and External Quality Control • Duplicate Samples and Spiked Controls • Method Validation and Limit of Detection • Accreditation and Audit Readiness*
0830 - 0930	***Interpretation of Microbial Results*** *Correlating Microbial Counts with Treatment Efficiency • Identifying Trends and Seasonal Variability • Linking Microbial Data to Operational Changes • Red Flags and Follow-Up Actions*
0930 – 0945	*Break*
0945 – 1100	***Case Studies from Municipal & Industrial Plants*** *Sludge Bulking Case and Filament ID • Failed UV Disinfection Incident • Microbial Imbalance in Anaerobic Reactor • Reuse Scheme Microbial Compliance Audit*
1100 – 1230	***Reporting, Documentation & Communication*** *Preparing Lab Reports and Summaries • Interpreting Microbial Data for Stakeholders • Communicating Risk to Non-Technical Teams • Regulatory Submission Formatting*
1230 – 1245	*Break*
1245 – 1345	***Integration with Process Control & Automation*** *Linking Microbial Monitoring to SCADA/HMI Systems • Triggering Alarms from Microbial Surrogates • Automated Samplers and Online Data Analysis • Using Microbial Trends for Process Optimization*
1345 - 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the latest revision of "EPANET" simulators.



EPANET Simulator

Course Coordinator

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