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W-01 IWRM - why and how

Objective:	To obtain a general overview of benefits and implications of Integrated Water Resources Management (IWRM)
Contents:	<ul style="list-style-type: none">• Water demand, availability and use; in-stream and off-stream demand; the economic, social and environmental perspectives• Water as an economic good; water pricing; Total Economic Value (TEV) of water• Sector planning and integrated planning; multi-criteria decisions; scenario analysis; optimization• Demand management• Case study: The Lower Mekong Basin; institutional implications; cross-border implications
Who should attend:	Professional (administrative or technical) staff from the public and private sector with an interest in contemporary multi-disciplinary water resources management
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	3 lessons (2 hours each) plus some homework
Costs:	\$ 400 per participant (inclusive of GST) <i>A discount of 20 percent applies to 3 or more participants from the same organization in the same course</i>
Enquiries and registration:	Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

W-03 Rivers and reservoirs

Objective: To obtain a general, inter-disciplinary, introductory overview of river engineering and reservoir technology

Contents:

- Hydrological context
- River hydrodynamics and hydraulics; mass budgets; sediment transport; morphology; bank protection; flood control; salinity control
- Water quality; fish habitats; environmental flows
- River deltas and estuaries; case studies
- Reservoirs: Hydraulic design; hydraulic operation; bank erosion; siltation; water quality
- Monitoring and operation

Who should attend: Professional (administrative or technical) staff from the public and private sector with an interest in management, design, operation and/or maintenance of rivers and reservoirs

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 2 lessons (2 hours each)

Costs: \$ 300 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

W-04 Climate change and climate proofing

Objective: Scientific evidence indicates an ongoing development - and perhaps a fast development - towards an increased climate variability that is expected to affect the water availability, the flood risk, and the aquatic environment. This, in turn, can affect land use, vital production systems, and indeed the wealth of nations

The participants will learn about scenarios for climate change and related options for preparedness and response

Contents:

- Risk management - brief introduction
- What we know about climate change - and what we don't know
- Projections and scenarios; the global, the regional and the national perspective
- Risk characterization: Water availability; inland floods; coastal floods; the aquatic environment; potential economic and social implications
- Management options; climate proofing at the project (design) level and the sector (planning) level

Who should attend: Planners, engineers and technical specialists from the public and private sector with a need of an introduction to the subject.

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 2 lessons (2 hours each)

Costs: \$ 300 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

W-07 Aquatic chemistry

Objective: The participants will achieve a basic knowledge about chemical principles governing aquatic systems. They will be able to apply the basic concepts of aquatic chemistry to both natural and engineered systems

Contents:

- Overview of aquatic chemistry; speciation; acid/base equilibrium
- Heterogeneous systems, mineral solubility, precipitation and dissolution
- Chemistry of metal in aquatic solution, ligands, complex formation

Who should attend: Engineers and technical specialists from the public and private sector with a need of an introduction to the subject

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 3 lessons (2 hours each)

Costs: \$ 400 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

W-08 Membrane bioreactor for water reclamation: Design and operation

Objective:	The course aims to inform senior technical and business managers on the latest technology development in MBR (membrane bioreactor) technology, including technical issues and engineering design and operation; illustrate industrial applications through case studies; and promote dialogue and exchange experiences with R&D researchers, government officials, plant managers and operators
Contents:	<p>This course is primarily concerned with the development of MBR for water reclamation. It covers the following topics:</p> <ul style="list-style-type: none">• Overview of MBR for water reclamation - potential, advantages and limitations• Present and future MBR applications for water treatment• MBR concepts and design• Operation and maintenance implications; microbial behaviour; membrane separation; fouling control• Application examples and case studies
Who should attend:	Researches, practitioners involved in development, senior managers, technical managers, environmental engineers from private and government bodies
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	2 lessons (2 hours each)
Costs:	\$ 300 per participant (inclusive of GST)
	<i>A discount of 20 percent applies to 3 or more participants from the same organization in the same course</i>
Enquiries and registration:	Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

W-09 Innovative bioprocesses in water and wastewater treatment

Objective: The participants will achieve an understanding of innovations in biotreatment of water and wastewater and their importance for Singapore

Contents:

- Bioagents of water and wastewater treatment
- Conventional and innovative bioprocesses
- Environmental innovative biobusiness

Who should attend: Engineers and technical specialists from the public and private sector with a need of an introduction to the subject

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 3 lessons (2 hours each) and homework

Costs: \$ 400 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

ENV-01 EIA - why and how

Objective: The participants will achieve a comprehensive introduction to environmental impact assessment (EIA)

Contents: • What is an EIA?
 • EIA in the project cycle; stages of EIA - screening, bounding, scoping, mitigation, planning, reporting, monitoring, review/audit; examples
 • Impact categories: Location, design, construction, operation, accidents
 • Scoping of EIA; strategic EIA; cumulative impacts
 • Multi-criteria ranking
 • Identification and assessment of mitigation measures

Who should attend: Engineers and technical specialists from the public and private sector with a need of an introduction to the subject. Participants would have some background from environmental or water management. The course is also suited for environmental managers in private companies

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 3 lessons (2 hours each) plus some homework

Costs: \$ 400 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Mr Julien Oliver, DHI Water & Environment, tel. 6777 6330, e-mail: juo@dhi.com.sg

ENV-02 EIA in Singapore - and elsewhere

Objective:	The participants will achieve an overview of Singaporean and international EIA regulation and modalities
Contents:	<p>The EIA process is adopted in the national legislation in most countries and is based on more or less the same principles. In Singapore EIAs are conducted for all major construction works to ensure that environmental impacts that may arise from the project are taking into account in the approval process. The course covers</p> <ul style="list-style-type: none">• Overview of EIA scoping and approach; when and how to conduct an EIA• Overview of national EIA regulation: Background, history, legal and administrative framework, policies and practices• Transboundary EIA: Examples of transboundary and international environmental policies and practices
Who should attend:	Engineers and technical specialists from the public and private sector with a need of an introduction to the subject. Participants would have some background from environmental or water management. The course is also suitable for environmental managers in private companies
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	2 lessons (2 hours each) plus some homework
Costs:	<p>\$ 300 per participant (inclusive of GST)</p> <p><i>A discount of 20 percent</i> applies to 3 or more participants from the same organization in the same course</p>
Enquiries and registration:	Mr Julien Oliver, DHI Water & Environment, tel. 6777 6330, e-mail: juo@dhi.com.sg

ENV-03 Surface water quality

- Objective:** The participants will achieve an introduction to the quality of inland and coastal surface waters, and to concepts and methods for quality classification and impact analysis
- Contents:**
- Overview of mass budgets and water quality in rivers/streams, estuaries and coastal areas: Advection, dispersion, entrainment, settling, decay, chemical processes, biological processes
 - Case studies and exercise
 - National water quality standards
- Who should attend:** Engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 3 lessons (2 hours each)
- Costs:** \$ 400 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

ENV-05 Marine environmental monitoring

Objective:	The participants will achieve an introduction to advanced modalities for marine environmental monitoring in a Singaporean perspective
Contents:	<ul style="list-style-type: none">• Scoping and conceptualization• Monitoring network, time and space resolution, data routing• Selection of indicators – accuracy and validity• Hydrometeorological referencing• Data processing, management, reporting and dissemination• Operation, quality management and documentation
Who should attend:	Engineers and technical specialists from the public and private sector with a need of an introduction to the subject
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	3 lessons (2 hours each)
Costs:	\$ 400 per participant (inclusive of GST) <i>A discount of 20 percent applies to 3 or more participants from the same organization in the same course</i>
Enquiries and registration:	Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

ENV-06 Environmental management of dredging and reclamation

- Objective:** The participants will achieve an introduction to the subject, including an overview of management options, in a Singaporean perspective
- Contents:**
- Design of reclamation schemes
 - Dredging and reclamation technology
 - Project impacts and mitigation; process impacts and mitigation; and operational impacts and mitigation
 - National standards and practice
 - Management options
 - Monitoring design; monitoring and management implementation
 - Case studies
- Who should attend:** Engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 3 lessons (2 hours each)
- Costs:** \$ 400 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

ENV-09 National environmental standards and regulation

Objective:	The participants will achieve an introduction to applicable standards and regulation related to effluents and states of coastal and inland surface waters in a Singaporean perspective
Contents:	<ul style="list-style-type: none">• Overview and history; coastal and inland surface waters; effluents and related concerns• Indicators and criteria• National policies and regulation; overview of practices abroad
Who should attend:	Engineers and technical specialists from the public and private sector with a need of an introduction to the subject
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	3 lessons (2 hours each) plus some homework
Costs:	\$ 400 per participant (inclusive of GST) <i>A discount of 20 percent applies to 3 or more participants from the same organization in the same course</i>
Enquiries and registration:	Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

URB-01 Introduction to urban hydrology

- Objective:** The participants will achieve an overview of impacts of urbanization on hydrological processes, and hence urban stormwater quantity and quality, urban storm drainage, and general concepts of urban stormwater management
- Contents:**
- Impacts of urbanization on urban micro-climate and hydrology, intensity-duration-frequency analyses of rainfall data for urban storm drainage design, selection of design storm and hydrologic risk
 - Rainfall-runoff relationships and modelling
 - Impacts of urbanization on stormwater quality; stormwater quality characterization; impacts of stormwater pollution on receiving waters
 - Urban storm drainage design, local design standards, regulations and procedures
 - Sustainable urban stormwater quantity and quality management; sustainable drainage system (SUDS) and best management practices
- Who should attend:** Planners, engineers, technical managers and others from the public and private sector in need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 4 lessons (2 hours each) plus some homework
- Costs:** \$ 500 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

URB-02 **Statistical hydrology**

Objective:	The participants will achieve an overview of tools for statistical analysis of hydrological time series, and an impression of their applications and limitations, together with some hands-on experience
Contents:	<ul style="list-style-type: none">• Hydrological data and their origin; data quality in terms of accuracy, resolution, validity, and transparency (documentation); time and length scales; time series; distribution models• Correlations; gap filling; trends and time evolutions; identification of discrete events; extreme value analysis• Extrapolations, generalizations in time and space; empirical data and cause-effect relations; predictions; data summaries; communication of findings and assumptions made• Synthetic data: Examples, generation techniques, applications
Who should attend:	Engineers and others from the public and private sector with prior basic knowledge about statistics and/or hydrology
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	4 lessons (2 hours each) plus some homework
Costs:	\$ 500 per participant (inclusive of GST) <i>A discount of 20 percent applies to 3 or more participants from the same organization in the same course</i>
Enquiries and registration:	Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

URB-04 Water treatment and process design

- Objective:** The participants will achieve a thorough impression of water treatment options and implications in a Singaporean perspective
- Contents:**
- Raw water characteristics
 - Treatment processes: Overview, characteristics, costs and benefits
 - Excursion
- Who should attend:** Engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 3 lessons (2 hours each) and an excursion plus some homework
- Costs:** \$ 400 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

URB-05 Urban floods

- Objective:** The participants will achieve an update regarding contemporary technology for urban flood management
- Contents:**
- Overview of urban flood management
 - Urban flood modelling: Hindcast and real-time applications for risk assesment, impact prediction and operational control
 - Sensitivities and uncertainties
 - Quantification of flood risk and flood exposure
 - Urban flooding & climate change
 - A look into the future
- Who should attend:** Engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 2 lessons (2 hours each) *or* one half day (4 hours)
- Costs:** \$ 300 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

URB-13 Flood estimation methods - how good are they?

- Objective:** The participants will learn about the theoretical background and the accuracy of two flood estimation methods (flood frequency analysis and rational method)
- Contents:**
- Flood frequency analysis: Theoretical background and accuracy
 - Hydrologic data series. Plotting position and return period formulas. Probability distributions
 - Theoretical background and accuracy of rational method. Deterministic approach and probabilistic approach.
 - Upstream control; partial-area effect; drainage design
- Who should attend:** Managers, professionals and engineers who are interested to find out the background and accuracy of the flood estimation methods
- Courseware:** Background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 2 lessons (2 hours each)
- Costs:** \$ 300 per participant (inclusive of GST)
- A discount of 20 percent applies to 3 or more participants from the same organization in the same course*
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

URB-14 **Urban stormwater quality - monitoring and modelling**

Objective: The participants will acquire an understanding of the principles and methodologies of urban stormwater quality monitoring and modelling

Contents:

- Introduction to urban stormwater
- Stormwater quality characterization
- Stormwater quality monitoring: Concepts, data analysis
- Urban sediment discharge and modelling sediment discharge from urbanised areas
- Modelling concepts: Build-up and washoff functions; event mean concentrations; loadings

Who should attend: Engineers and technical specialists from the public and private sector with good prior understanding of urban hydrology and stormwater drainage

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 3 lessons (2 hours each) plus some homework

Costs: \$ 400 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

IND-03 Treatment of industrial and hazardous wastes

Objective: The short course aims to (i) inform senior technical and business managers on the latest technology development in industrial and hazardous wastes including technical issues; (ii) illustrate industrial application through case studies; and (iii) promote dialogue and exchange experiences with R&D researchers, government officials, plant managers and operators

Contents: The course is primarily concerned with the development of comprehensive treatment technologies for industrial and hazardous wastes. It covers several topics in treatment technologies including sources, definition, legislation, treatment technologies and evaluation methods. Major technical issues to illustrate current industrial application through case studies will be discussed. The programme covers

- Overview of industrial and hazardous wastes: Characteristics, origin, transport, fate, potential impacts
- Overview of regulation
- Overview of management strategies; monitoring and documentation
- Overview of disposal options
- Treatment technologies
- Case studies illustrating major technical issues and current industrial applications

Who should attend: Professional practitioners with a relevant background or otherwise with an interest in industrial and hazardous wastes: Researchers, managers, environmental engineers from private and government bodies

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 3 lessons (2 hours each)

Costs: \$ 400 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

COAST-01 Coastal flows and mass budgets

- Objective:** The participants will achieve an introduction to coastal flows and transport of solutes
- Contents:**
- The physics: Wind, currents, tidal streams; salinity, density
 - Mixing, dispersion, entrainment
 - Overview of analytical and numerical methods
 - Mass budgets for solutes; dilution, accumulation; decay, settling, bioaccumulation in the water column and at the seabed
 - Surface drift; littoral drift; flow around intakes and outfalls
- Who should attend:** Engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 3 lessons (2 hours each)
- Costs:** \$ 400 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

COAST-02 Sediment transport and morphology

Objective: Management of sediment processes - erosion and siltation - are sometimes decisive to operation and maintenance costs, and hereby, sometimes, to the feasibility of a planned project. The participants will achieve an introduction to sediment transport processes and to prediction of coastal erosion and sedimentation

Contents:

- Erosion and transport mechanisms; wind, waves, wave currents, ocean currents, tidal streams; inlets and estuaries
- Origin and characteristics of sediments
- Transport rates and mass budgets for sediments; analytical and numerical methods; examples
- Siltation in harbour basins and navigation channels; coastline erosion and accretion; causes and effects; impacts of changed flow patterns; control, mitigation, maintenance

Who should attend: Engineers and technical specialists from the public and private sector with a need of an introduction to the subject

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 3 lessons (2 hours each)

Costs: \$ 400 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

DATA-01 **Basic statistics made easy**

- Objective: The participants will achieve an introduction to basic statistics
- Contents: Data sets; time series; discrete events; distribution models
Correlations; time series analysis; gap filling; synthetic data series
Probabilities; extreme value analysis
- Who should attend: Planners, engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware: Selected slides and background documents as handouts and/or electronic files
- Certification: Attendance certificate (subject to 80 percent attendance)
- Duration: 2 lessons (2 hours each)
- Costs: \$ 300 per participant (inclusive of GST)
- A discount of 20 percent applies to 3 or more participants from the same organization in the same course*
- Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

DATA-02 Survey techniques: Sediment transport and water quality

- Objective:** The participants will achieve a general overview of techniques available for different types of hydraulic surveys
- Contents:**
- Overview and examples of typical surveys: Waves; currents; suspended and bed sediments; bed load; sediment flux; water quality
 - Survey approvals; marine safety
 - Survey scoping and planning: Parameters, time and space coverage
 - Instrumentation for data collection and positioning: Characteristics, performance, data quality assurance, practicalities, costs
 - Calibration
 - Data flows and online processing
- Who should attend:** Planners, engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 2 lessons (2 hours each)
- Costs:** \$ 300 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

DATA-03 Biological survey techniques

- Objective:** The participants will achieve a general overview of techniques available for different types of biological surveys
- Contents:**
- Overview and examples of biological surveys (corals, sea grass, other benthic organisms, pelagic organisms)
 - Survey scoping and planning: Parameters, time and space coverage
 - Tools and procedures for data collection and positioning: Characteristics, performance, practicalities, costs
 - Baseline surveys, comparative surveys, impact surveys
 - Data processing, analysis and presentation
- Who should attend:** Planners, engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 2 lessons (2 hours each)
- Costs:** \$ 300 per participant (inclusive of GST)
- A discount of 20 percent applies to 3 or more participants from the same organization in the same course*
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

DATA-04 From sensor to screen - introduction to advanced data management

Objective: To obtain an improved understanding of the management of large flows of hydrological, hydraulic and/or environmental data

Contents:

- User requirements; scoping; network design
- Sensors and sensor characteristics
- Data transmission and routing - from sensor to end user; online processing and real-time presentation
- Data quality characteristics and quality control
- Data reduction and data mining - compression, extracts, synthesization
- Offline processing and presentation
- Reporting and dissemination
- A look into the future

Who should attend: Professional staff from the public and private sector who are involved (or have an interest) in monitoring and data-based operation and decision-support

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 2 lessons (2 hours each)

Costs: \$ 300 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

DATA-05 Advanced GIS applications

Objective:	To obtain an improved understanding of the potential of GIS (geographic information system) applications for water- and environment-related studies, monitoring and management
Contents:	What is GIS? Data: Origin, characteristics, capture, quality and documentation Digital elevation models (DEMs); spatial analysis; network modelling Applications: EIA; environmental monitoring; decision-support
Who should attend:	Professional (administrative or technical) staff from the public and private sector who are involved (or otherwise have an interest) in management, analysis and presentation of spatial data
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	2 lessons (2 hours each)
Costs:	\$ 300 per participant (inclusive of GST) <i>A discount of 20 percent</i> applies to 3 or more participants from the same organization in the same course
Enquiries and registration:	Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

DATA-08 Image processing techniques

Aim:	To learn about selected image processing techniques for observation of flow velocity, probability of incipient sediment movements, and velocity profile
Contents:	<ul style="list-style-type: none">• Overview of the image acquisition system including light source, CCD camera and acquisition card• Data structure of digital image files• Image coordinates to physical coordinates transformation formula• Cross correlation algorithm• Particle image velocimetry (PIV), particle tracking velocimetry (PTV), accuracy analysis of PIV and PTV• Probable incipient sediment movements and free surface elevation measurement techniques
Who should attend:	Planners, engineers and technical specialists from the public and private sector seeking an introduction to the subject
Courseware:	Selected slides and background documents as handouts and/or electronic files
Certification:	Attendance certificate (subject to 80 percent attendance)
Duration:	2 lessons (2 hours each) plus some homework
Costs:	\$300 per participant (inclusive of GST) <i>A discount of 20 percent applies to 3 or more participants from the same organization in the same course</i>
Other expenses:	Text book (optional)
Enquiries and registration:	Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

M-02 **Multi-criteria decision support, scenario analysis and optimization**

Objective: Structured and transparent multi-criteria decisions are useful for example in policy analysis, planning, design, and EIA. The participants will achieve an introduction to different concepts and models for complex but structured decision-making

Contents:

- Types of decisions; technical/economic rationality
- Basic cost-benefit analysis; multi-criteria decisions
- Scenario analysis; Pareto optimization
- Cash flows, inflation and before- & after-tax analysis
- Retirement analysis and replacement analysis
- Assumptions and sensitivities

Who should attend: Planners, engineers and technical specialists from the public and private sector with a need of an introduction to the subject

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 5 lessons (2 hours each) plus some homework

Costs: \$ 600 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

M-04 Resource economics and valuation

- Objective:** The participants will learn about tools for resource valuation and achieve an introduction to basic resource economics
- Contents:** Basics: Costs and revenue; financial and economic analysis; net present value (NPV) and internal rate of return (IRR); total economic value (TEV); opportunity costs
Valuation methods: Benefit transfer method; market price method; willingness to pay (WTP); productivity method; water valuation
Scenarios and sensitivity; economic optimization; water fees/green taxes; demand management
- Who should attend:** Planners, engineers and technical specialists from the public and private sector with a need of an introduction to the subject
- Courseware:** Selected slides and background documents as handouts and/or electronic files
- Certification:** Attendance certificate (subject to 80 percent attendance)
- Duration:** 2 lessons (2 hours each) plus some homework
- Costs:** \$ 300 per participant (inclusive of GST)
A discount of 20 percent applies to 3 or more participants from the same organization in the same course
- Enquiries and registration:** Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg

M-05 **CFD introduction with case studies**

Objective: The concept and general principles of Computational Fluid Dynamics (CFD) will be introduced, and the use of CFD as a tool for hydrodynamic analysis will be demonstrated to the participants

Contents:

- CFD analysis process
- Governing equations; discretization methods and solution algorithm; finite-volume formulation
- Boundary and initial conditions; free surface modelling

Who should attend: Engineers and technical specialists from the public and private sector with a need of an introduction to the subject

Courseware: Selected slides and background documents as handouts and/or electronic files

Certification: Attendance certificate (subject to 80 percent attendance)

Duration: 2 lessons (2 hours each)

Costs: \$ 300 per participant (inclusive of GST)

A discount of 20 percent applies to 3 or more participants from the same organization in the same course

Enquiries and registration: Ms Theresa Tan, DHI Water & Environment, tel. 6777 6330, e-mail: info@dhi-ntu.com.sg