

School of Life Sciences & Chemical Technology

## **DIPLOMA IN ENVIRONMENTAL & WATER TECHNOLOGY**

With life in Singapore set to be much greener under the Singapore Green Plan 2030, new sustainability initiatives will change the way people work, study and play. Be at the forefront of developing sustainable environmental solutions when you join the Diploma in Environmental & Water Technology (EWT). Jointly developed with PUB, this diploma will equip you with a firm grounding in the key areas of water technology, waste management and resource conservation, as well as pollution monitoring and control.

In your first year, you will be introduced to basic concepts of environmental science, engineering and technology with modules such as Fundamentals of Engineering Principles, Environmental Microbiology & Biotechnology, and Hydraulics. You will also learn basic data analysis and technical drawing skills in the Data Analytics & Drafting module.

From the second year onwards, you will gain depth through modules covering various aspects of environmental engineering and water technology, including air and water quality monitoring & control, stormwater management, and closing the water loop.

In your final year, you will work on an environmental innovation & research project and go on a six-month internship. You can opt for hands-on learning opportunities at our Environmental & Water Technology Centre of Innovation (EWTCOI), where you will work alongside research engineers and scientists on industry-based projects.

What's more, you will also learn more about emerging technologies such as Internet of Things and 3D printing techniques for environmental applications, thanks to our enhanced curriculum. You will get to apply what you have learnt in multidisciplinary projects or hands-on activities such as operating drones for environmental monitoring. There will also be opportunities for you to showcase your skills in competitions such as WorldSkills Singapore, Singapore Junior Water Prize and Sembcorp Greenwave Competition. You will also gain additional skill certifications that will give you an edge in the industry.

### **YEAR 1 COURSE MODULES**

#### **LEVEL 1.1**

##### **Data Analytics & Drafting**

The module provides an introduction to basic data analytics which includes understanding of statistics, data processing, and data visualisation. In addition, the module also provides hands-on practice of AutoCAD in engineering drafting allowing students to apply it in environmental project work, including noise mapping, sewerage and drainage diagrams, process plant diagrams and site plans.

##### **Engineering Mathematics 1**

The module provides students with an adequate foundation of Engineering Mathematics that will enable them to acquire the necessary mathematical skills required in other engineering subjects. Students will also use a mathematical software package to solve mathematical problems.

##### **Fundamentals of Engineering Principles**

The module introduces students to basic engineering concepts and applications, for example, units and dimensions, mass balance calculations, and reaction stoichiometry. Upon completion of this module, students will be able to undertake basic engineering calculations.

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### **Inorganic & Physical Chemistry**

This module covers the principles of physical chemistry as well as the reactions and properties of inorganic compounds. Students will study the structure of matter, chemical bonding, chemical calculations, electrochemistry and redox reactions, chemical equilibria, ionic equilibria, chemical kinetics, thermochemistry, transition metal chemistry and chemistry of solutions, including acids and bases.

### **LEVEL 1.2**

#### **Career & Professional Preparation 1**

This module is part of the Education and Career Guidance framework to provide students with the tools and resources necessary for their career and/or further education. In this first module, students will undergo personal discovery and exploration of industry and career prospects. Students will learn how to plan and set achievable goals in preparation for their future. Students will also learn the importance of passion and professionalism, along with basic teamwork and interpersonal skills.

#### **Engineering Mathematics 2**

A continuation of the Engineering Mathematics I module, this module provides students with an adequate foundation of Engineering Mathematics that will enable them to apply the mathematical skills for their careers and/or further studies. The emphasis of this module is placed on their applications in solving engineering related problems. Students will also use a mathematical software package to solve mathematical problems.

#### **Environmental Microbiology & Biotechnology**

The module covers fundamentals of microbiology and biotechnological methodologies to assess the well-being of ecosystems, transform pollutants to harmless substances, generate biodegradable materials from renewable sources, and develop eco-friendly manufacturing and disposal processes. Applications, including recent developments in the field of microbiology and biotechnology in aspects relating to the environment will be covered.

#### **Hydraulics**

Students will learn the basic hydraulic principles and concepts which are essential for the study of water and wastewater treatment technologies. Students will be exposed to properties of fluids, manometers, hydrostatics and fundamental principles of fluid flow. Head losses in pipeline, design of pipeline, flow measurements and pipe network analysis will be covered. Students will also learn about open channel flow, the design of surface water drainage systems and pumping pipeline systems.

#### **Solid & Hazardous Waste Management**

In this module, students will be taught how solid and hazardous waste is generated, methods of collection, handling, treatment, disposal of waste and related pollution impacts. Concepts of waste minimisation such as recycling, reuse, reduction and waste exchange will be highlighted as effective tools for sustainable waste management. Issues in hazardous waste with emphasis on biomedical waste generation, collection and treatment will be addressed. Local legislation for solid and hazardous waste will be explained in relation to the overall waste management system.

### **YEAR 1 COURSE CURRICULUM**

<b>Module Name</b>	<b>Credit Units</b>
<b>Level 1.1 (20 hours per week)</b>	
Data Analytics & Drafting	3
Engineering Mathematics 1	6
English Language Express*	NA
Fundamentals of Engineering Principles	3

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Innovation Made Possible^	3
Inorganic & Physical Chemistry	5
<b>Level 1.2 (20 hours per week)</b>	
Career & Professional Preparation 1	1
Communication Essentials^	3
Engineering Mathematics 2	6
Environmental Microbiology & Biotechnology	2
Health & Wellness^	1
Hydraulics	4
Solid & Hazardous Waste Management	3

**Notes:**

^ For more details on Interdisciplinary Studies (IS) electives, please log on to [www.np.edu.sg/is](http://www.np.edu.sg/is) \*  
This module is only offered to students who are weaker in the English Language.

**IS Modules**

The School of Interdisciplinary Studies (IS) delivers a broad-based curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge economy. IS offers both prescribed modules and electives to challenge boundaries. Prescribed modules develop students' competencies in core areas such as Communication, Innovation and Enterprise, Culture and Communication, and Personal Mastery and Development, while elective modules provide insights into Arts and Humanities, Business, Design, and Science and Technology.

**YEAR 2 COURSE MODULES**

**LEVEL 2.1**

**ABC Waters Management**

Singapore has an extensive network of waterways and waterbodies allowing efficient stormwater management. This module provides an introduction to the Active, Beautiful and Clean (ABC) Waters Programme as part of the initiative to remake Singapore into a vibrant 'City of Gardens and Water'. Students will be taught about the role of ABC Waters design features in keeping Singapore's waterways and waterbodies clean by retaining and treating stormwater close to the source. Other topics covered include design concepts of sedimentation basins, vegetated swales and bioretention systems.

**Career & Professional Preparation 2**

This module is part of the Education and Career Guidance framework to provide students with the tools and resources necessary for their further career and/or education. In this module, students will explore basic job search strategies, practice writing effective resumes and cover letters, and learn interview skills. Students will also learn professional and intercultural communication skills to prepare them for a dynamic and diverse workplace.

**Environmental Laboratory 2**

This module integrates the practical aspects of Environmental Microbiology and Chemistry. Students will harness their laboratory skills in sample preparation and testing. They will also learn about laboratory operations management. Basic Internet of Things aspect in water monitoring will also be introduced.

**Noise Monitoring & Control**

Singapore's rapid economic growth towards an industrialised and urbanised society coupled with an affluent population has resulted in a greater need to control noise in the general environment. The control of noise pollution is essential in all aspects of work and students will be taught the fundamentals of how noise pollution arises, health impacts of noise, measurement and monitoring of noise levels, preventive and control measures and local

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environmental legislation. The module provides for two WSQ recognised certifications under Competency unit of Monitor Noise and Vibration (Competency Code: OH-PH-501C-1) and Competency unit of Control Noise and Vibration (Competency Code: OH-PH-502C-1), if students qualify based on the WSQ assessment plan.

### **Water & Environmental Chemistry**

This module introduces students to key aspects of environmental and water chemistry for application in pollution control, resource recovery, and water and wastewater treatment. Students will learn quantitative measurements and analysis of solid wastes, water and wastewater. Principles of measurement, instrumentation and analysis are emphasised using an application-oriented approach.

### **Water Supply Technology & Design**

This module introduces the concepts of water treatment technologies for treating raw water from various sources. The focus in this module is to impart knowledge of conventional water treatment technologies. Topics covered include pre-treatment, sedimentation, filtration and disinfection techniques for the treatment of potable water.

Adverse effects of hardness and hardness treatment using chemical methods and the use of ion-exchange processes are covered in detail. Practical problems associated with the operation and maintenance of water treatment plants including mechanical & electrical equipment and possible solutions for these problems will be emphasised.

## **LEVEL 2.2**

### **Air Quality Monitoring & Control**

Monitoring and control of both outdoor and indoor air pollution are important aspects of environmental management. Students are taught the fundamentals of how air pollution arises, types of pollutants, and their environmental and health impacts. Dispersion modelling, indoor air quality audit, sampling and monitoring of pollutants, techniques of identification of pollutants, preventive and control measures, local environmental legislation and guidelines on air quality including PSI will be introduced.

### **Civil Engineering Fundamentals**

This module explores the fundamental principles and practices of civil engineering. It provides students with an understanding of the main types of civil engineering structures and construction processes. It also covers the theory of statics and mechanics of materials, with applications to a range of environmental engineering projects.

### **Environmental Management Systems**

In this module, students will learn the application of concepts and principles in environmental management. Topics covered include the fundamentals of environmental impact assessment (EIA), environmental baseline studies (EBS), environmental management systems (EMS), ISO 14001, ISO 50001, environmental auditing and renewable energy.

### **Water Pollution & Reclamation Technology**

This module introduces students to sewage characteristics, sewer design and maintenance and unit operations in a conventional wastewater treatment plant. It covers the fundamentals of sewage collection systems for domestic wastewater, wastewater treatment technologies, monitoring and operation of wastewater treatment systems and the code of practice relevant to sewerage and wastewater treatment. Students will be given an overview of water pollution and impact of pollution on different types of waterbodies. Students will also learn about sludge treatment and disposal technologies. Emerging technologies in water reclamation and water recycling will be emphasised.

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**Workplace Safety & Health**

This module covers the relevant legislation and standards pertaining to workplace safety and health. Students will be taught to identify the various types of workplace hazards and the means of protection and control against these hazards. Topics include risk assessment and control, safety management systems, job safety analysis, accident reporting and investigation. Students will be issued WSHC recognised bizSAFE Level 2 certificates upon completion of this module.

**YEAR 2 COURSE CURRICULUM**

Module Name	Credit Units
<b>Level 2.1 (20 hours per week)</b>	
ABC Waters Management	4
Career & Professional Preparation 2	2
Environmental Laboratory 2	3
Noise Monitoring & Control	4
Water & Environmental Chemistry	3
Water Supply Technology & Design	4
<b>Level 2.2 (21 hours per week)</b>	
Air Quality Monitoring & Control	4
Civil Engineering Fundamentals	6
Environmental Management Systems	2
Water Pollution & Reclamation Technology	4
Workplace Safety & Health	3
World Issues: A Singapore Perspective <sup>^</sup>	2

**Notes:**

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**YEAR 3 COURSE MODULES**

**LEVEL 3.1**

**Environmental Innovation & Research**

In this module, students are expected to integrate the knowledge they have gained in the earlier semesters to undertake an environmental project on a related topic in the field of water, environmental science and technology.

### **Environmental Laboratory 3**

This module integrates the practical aspects of Water Supply Technology & Design and Industrial Wastewater & Membrane Technology. Students will harness their water treatment process units and utilities operations skills.

### **Industrial Wastewater & Membrane Technology**

Characteristics of industrial wastewater vary with the industrial process. Treatment methodology adopted varies with the type of wastewater. Membrane applications are taking an edge as a treatment option. Topics that will be covered include unit processes and treatment technologies applicable to industrial wastewater treatment and specific industrial wastewater case studies. Students will be introduced to membrane science and applications in environmental engineering. Membrane applications in water reclamation, recycling and reuse including desalination technology will be taught. Case studies will be used to illustrate specific industrial applications.

### **LEVEL 3.2**

#### **6-Month Internship**

Students will be attached to organisations for a period of six months. This module will prepare them for future employment in their particular discipline of study. During their internship, they will undertake projects and tasks assigned by the organisations. This allows them the opportunity to take initiatives as well as to develop their soft skills.

### **YEAR 3 COURSE CURRICULUM**

<b>Module Name</b>	<b>Credit Units</b>
<b>Level 3.1 (19 hours per week)</b>	
Environmental Innovation & Research	8
Environmental Laboratory 3	3
Industrial Wastewater & Membrane Technology	4
Project ID: Connecting the Dots <sup>^</sup>	4
<b>Level 3.2 (20 hours per week)</b>	
6-Month Internship	20

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