

COURSE MODULES

LEVEL 1.1

Career & Professional Preparation I

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, and basic teamwork and interpersonal skills.

Computer Aided Design

This module provides students with the principles and techniques of preparing computer-aided design (CAD) drawings in environmental related applications and construction projects. Students will be exposed to applications of AUTOCAD in environmental project work including noise mapping, sewerage and drainage diagrams, process plant diagrams and site plans. Students will also be trained to interpret and extract information from CAD drawings and prepare CAD drawings according to CP 83. Emphasis will be placed on preparing CAD drawings accurately so that information can be used electronically. AutoCAD is used in this module as it is widely adopted in the AEC industry.

Engineering Mathematics 1

Students will study mathematical subjects relevant to engineering applications. This module provides them with the necessary mathematical skills required in other engineering subjects. Topics include algebra, exponential and logarithmic functions, trigonometry, combination and permutation, plane analytical geometry, binomial expansion, determinants and matrices.

Environmental Microbiology & Biotechnology

Sustainable development calls for newer approaches towards developmental activities and technologies, so that eco-health is preserved alongside conservation of invaluable natural resources. Environmental biotechnology is a tool that provides such an approach for understanding, managing, preserving and restoring environmental quality. Students will be exposed to the fundamentals of microbiology and biotechnological methodologies that can be suitably utilised 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.

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 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.

Organic & Biological Chemistry

This practical-oriented module is designed to give students an introduction to organic and biological chemistry. Students will be introduced to the chemistry of hydrocarbons, alcohols, amines, carboxylic acids and their derivatives. The structure, function and chemical reactions of carbohydrates, lipids, proteins, nucleic acids, enzymes and coenzymes are also covered.

LEVEL 1.2

Engineering Mathematics 2

A continuation of the Engineering Mathematics 1 module, topics in this module include complex numbers, statistical techniques, differentiation, integration, further integration techniques and numerical methods for evaluating definite integrals. Emphasis is placed on their applications in solving engineering- related problems. A mathematical software package is also used to solve these problems.

Environmental Health & Biology

The module introduces students to the field of environmental health science and provides a foundation for further studies and application in environmental law, safety and health management. Students will be trained in the areas of microbiology, parasitology, entomology, vector control, epidemiology and communicable disease control, human biology and food hygiene.

Global Environmental Issues

With globalisation, the growth of the human population and technological advances, pressures on the planet's natural systems are becoming increasingly intense and complex. This module discusses current global environmental issues and the interaction between human activities, resources, and the environment. Contributing social, political and economic factors will be covered. Mitigation measures such as research, conservation, role of media, volunteer work and technology will be emphasised. The aim of this module is to promote greater environmental awareness and nurture social responsibility towards the environment.

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 the open channel flow, the design of surface water drainage systems and pumping pipeline systems.

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.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (30 hours per week)	
Career & Professional Preparation I	1.5
Computer Aided Design	3
Environmental Microbiology & Biotechnology	3.5
Organic & Biological Chemistry	6
Noise Monitoring & Control	4
Innovation Toolkit ^	4
Sports & Wellness ^	2
Level 1.2 (26.5 hours per week)	
Engineering Mathematics 2	6
Environmental Health & Biology	3.5
Global Environmental Issues	2
Hydraulics	5

Inorganic & Physical Chemistry	6
Critical Thinking and Communication ^	4

Notes:

^ For more details on Interdisciplinary Studies (IS) electives, please log on to www.np.edu.sg/is/

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.

COURSE MODULES

LEVEL 2.1

Career & Professional Preparation II

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 of 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.

Engineering Mathematics 3

Building upon the materials covered in Engineering Mathematics 1 and 2, this module provides students with an adequate knowledge of mathematics to solve problems encountered in their future work. Topics include vector algebra, first and second order differential equations and their applications, Laplace Transform technique and its applications, and Regression Analysis. Students will also use a mathematical software package to solve these problems.

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.

Water & Environmental Chemistry

This practice-oriented 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 have hands-on exposure to practical aspects of environmental chemistry, quantitative measurements and analysis of solid wastes, water and wastewater. Principles of measurement, instrumentation and analysis are emphasised using an application-oriented approach.

Water & Marine Pollution

Students will be given an overview of water pollution and the impact of pollution on different types of waterbodies like rivers, lakes and seas. They will learn the characteristics of polluted waterbodies, types of waste streams and indicators of water pollution, waste disposal into river and the self-purification of river systems. Effects of pollution in lakes and reservoirs, marine pollution, sources and impacts of pollution in sea and oil spill control at sea and beaches will also be covered.

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 on the conventional water treatment technologies. The 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

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.

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 Process Systems

Students will focus on reactor design principles. Topics include reactor kinetics, analysis of batch reactors, continuous stirred tank reactors and plug flow reactors. It also covers material balance calculations as well as aspects of the design, construction and operation of chemical and biological reactors, process control systems and diagrams. Examples from the water, wastewater and environmental industry will be used to reinforce the content.

Workplace Safety & Health

The 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. The topics will include risk assessment and control, safety management systems, job safety analysis, accident reporting and investigation. Students will be issued WSHC recognized bizSAFE Level 2 certificates upon completion of this module.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 2	
Level 2.1 (24.5 hours per week)	
Career & Professional Preparation II	2
Engineering Mathematics 3	4
Solid & Hazardous Waste Management	3

Water & Environmental Chemistry	5
Water & Marine Pollution	3
Water Supply Technology & Design	5.5
Interdisciplinary Studies (IS) elective [^]	2
Level 2.2 (23 hours per week)	
ABC Waters Management	4
Air Quality Monitoring & Control	5
Civil Engineering Fundamentals	6
Environmental Process Systems	3
Workplace Safety & Health	3
Interdisciplinary Studies (IS) elective [^]	2

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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 Management Systems

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.

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.

Water Reclamation Technology

The module introduces students to sewage characteristics, sewer design and maintenance and unit operations in a conventional wastewater treatment plant. The module will also cover 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 also learn about sludge

treatment and disposal technologies. Emerging technologies in water reclamation and water recycling will be emphasised.

LEVEL 3.2

4-Month Internship

In this module, students will be attached to organisations for a period of four months. This is to prepare them for future employment in their particular discipline of study. During their internship, students will undertake projects and tasks assigned by the organisations. This allows them the opportunity to take initiative as well as to develop self-confidence, and interpersonal and adaptation skills.

Sustainable Environment Practices

This module covers the integration of sustainable practices in various aspects of the environment- namely air quality, water resources and quality, noise & waste management, resource efficiency, renewable energy, ecosystem restoration and heritage conservation, using a model eco-city. Students will have first-hand exposure to a practical and integrated approach to the implementation of the various solutions covered in previous modules.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 3	
Level 3.1 (24.5 hours per week)	
Environmental Innovation & Research	8
Environmental Management System	3
Industrial Wastewater & Membrane Technology	5.5
Water Reclamation Technology	4
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (20 hours per week)	
4-Month Internship	16
Sustainable Environment Practices	4

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