

School of Life Sciences & Chemical Technology

DIPLOMA IN PHARMACEUTICAL SCIENCE

Discover what it is like to work at the forefront of drug discovery and development, and their roles in the war against the COVID-19 pandemic and other diseases when you venture into the Diploma in Pharmaceutical Science (PHARM).

This course will equip you with a solid foundation in biological, chemical and pharmaceutical sciences in your first year. In your second year, you will learn more advanced topics that include the biomedical aspects of drugs such as clinical trials, drug manufacturing, pharmaceuticals and pharmacology.

In your final year, you will get to go on a six-month internship in community and hospital pharmacies at healthcare institutes such as the National Healthcare Group polyclinics and Tan Tock Seng Hospital, or pharmaceutical companies such as Lonza. You will be involved in projects and tackle real-world issues. In addition, you will learn clinical knowledge and pharmacy skills from practising pharmacists in your third-year modules.

Plus, you will get to take electives to widen your future career choices. Choose the Complementary Medicine & Traditional Chinese Medicine elective if you want to learn how to evaluate the evidence behind alternative therapies and traditional Chinese medicines. Alternatively, you can opt for the Nutrition & Dietetic Science elective if you are interested in learning about how nutrients, supplements and weight management can impact one's health.

To prepare you for the future, you will get a chance to learn 3D printing and prototyping skills that will help you to develop innovative solutions that can improve patients' healthcare journeys. You can also explore the inner workings of a pharmacy through our interactive 360 virtual community pharmacy, and immerse in this 3D experience from the comfort of your home.

YEAR 1 COURSE MODULES

LEVEL 1.1

Anatomy & Physiology

This module introduces the anatomy and functions of the human body. It equips students with an understanding of the anatomy and physiology of the cardiovascular, respiratory, renal, gastrointestinal, neuromuscular, skeletal, endocrine and reproductive systems.

Biosafety & Risk Management

This module is designed based on the curriculum of the WSQ "Follow Good Biosafety Practices" course. This module aims to equip students with essential knowledge and skills for safe handling of chemicals and biological agents as well as fundamentals of decontamination and waste management. Topics such as follow biosafety and biosecurity principles and practices, risk assessment and mitigation, national and international biosafety guidelines and legislation, and emergency response programme will also be covered.

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.

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Fundamentals in Pharmaceutical Science

This module introduces students to pharmaceuticals and the roles, responsibilities and job scopes of pharmacy technicians and other jobs related to pharmaceutical sector. The module provides a foundation for subsequent modules in the course. Introductory topics on pharmacology, pharmaceutical science, pharmacy laws and pharmaceuticals will be covered. Students will also learn how to perform pharmaceutical calculations to determine dosage.

Organic & Biological Chemistry

In this module, students are introduced to the chemistry of hydrocarbons, alcohols, amines, aldehydes, ketones, carboxylic acids and their derivatives. The structures, functions and chemical reactions of biological molecules, including carbohydrates, lipids and proteins and their derivatives are also covered.

LEVEL 1.2

Biostatistics

This module is designed to provide students with basic statistical skills to analyse and interpret simple biological, pre-clinical and clinical data. The basic statistical skills covered are descriptive statistics, data distribution, set sample size, measurement of central tendency, scatter diagram, cluster analysis, and simple linear correlation and regression analysis for linear data. Students will learn about the presentation of data in graphical forms using Microsoft Excel, including selection and preparation of different types of graphs, how to write titles and legends, and the interpretation of results and draw conclusions.

Cell Biology

This module provides a fundamental overview of cellular systems specifically eukaryotes and prokaryotes. There will also be an introduction to pathogenic microorganisms, including bacteria, fungi and viruses. Topics include the fundamental chemicals of life, structure and function of cells and organelles, cell division, cytogenetics, DNA structure, cell communication, principles of hereditary, apoptosis and cancer.

Inorganic & Physical Chemistry

The module covers the structure of matter, chemical bonding, thermochemistry, chemical equilibria, kinetics, electrochemistry and redox reactions, transition metal chemistry, and chemistry of solutions, including acids, bases and buffers, polarity and solubility.

Mathematics

This module provides students with a fundamental analytical knowledge of mathematics essential for the study of pharmaceutical and life science. The rules of conversion of one unit of measurement to another as well as basic mathematical operations will be covered. Students will also learn the properties governing the operation of polynomial, exponential and logarithmic functions and understand their applications in chemistry and biology.

YEAR 1 COURSE CURRICULUM

Module Name	Credit Units
Level 1.1 (19 hours per week)	
Anatomy & Physiology	4
Biosafety & Risk Management	2
Level 1.1 (19 hours per week)	
Career & Professional Preparation 1	1
English Language Express*	NA
Fundamentals in Pharmaceutical Science	4
Innovation Made Possible^	3
Organic & Biological Chemistry	5
Level 1.2 (20 hours per week)	
Biostatistics	3
Cell Biology	5
Communication Essentials^	3
Health & Wellness^	1
Inorganic & Physical Chemistry	5
Mathematics	3

Notes:

^ For more details on Interdisciplinary Studies (IS) electives, please log on to 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

Current Good Manufacturing Practice

This module aims to equip students with an understanding of current Good Manufacturing Practice regulations for pharmaceuticals and related products. Various aspects, such as attributes of materials, labelling, materials in process, finished pharmaceuticals, manufacturing validation, quality control, personnel and facilities are covered.

Pathology

This module helps students to understand the causes and mechanisms of diseases. Students will learn about disease processes affecting common organ systems. The mechanisms of disease, natural history and progression and implications for treatment and prevention will be discussed.

Pharmaceutical Analysis

This module studies modern analytical techniques that are used for the detection, identification and quantitative determination of drugs and related substances. Techniques for the evaluation of analytical data and validation of analytical methods will be discussed.

Pharmaceutics

This module focuses on the design and formulation of two-phase pharmaceutical products, including suspensions, emulsions and solid pharmaceutical products, and how they relate to absorption and drug delivery routes. Topics include drug formulations, preparation and dispensing of pharmaceuticals, introduction to biopharmaceutics, pharmacokinetics, bioavailability, specialised dosage forms, prodrugs, liposomes, targeted drug delivery, drug stability of various formulations and shelf life.

Pharmacology

This module covers the basic principles of pharmacology, the mechanism of drug action, dose response relation, adverse reaction, pharmacokinetics (absorption, distribution, metabolism, elimination) and major drug classes.

LEVEL 2.2

Applied Biostatistics

This module covers advanced statistical skills to analyse and interpret a wide range of biological, pre-clinical and clinical data, and preparation of data for scientific presentation. The statistical skills covered are biological experiment design, hypothesis testing, quantitative data analysis by parametric and non-parametric methods, qualitative data analysis by Chi-square and Fisher tests, and simple correlation and regression analysis for non-linear data. The scientific presentation section covers how to organise data, prepare and incorporate statistical results on graphs and interpretation of results.

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.

Medicinal Chemistry & Drug Discovery

The first part of this module highlights the drug discovery process and how compounds are identified and developed into drugs. The second part of the module introduces students to the chemistry of drugs and drug systems, with

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emphasis on heterocyclic chemistry and the major drug classes. They will also learn about the relationship between activity and functional group chemistry, and drug design.

Microbiology & Immunology

This module covers fundamental knowledge regarding the role of microbial pathogenesis and the role of immune cells in protective immunity against bacterial, viral, fungal and parasitic infections. Topics include mechanisms of disease production, antibiotic resistance, contamination, sterilisation and disinfection, infection control, methods of treatment and prevention of disease, innate and adaptive immune system. Students will gain an understanding in medical microbiology, microbial pathogenesis, functions of the immune system and immunological concepts for the understanding of drugs that target components of the immune system.

Molecular & Cellular Biochemistry

This module builds upon knowledge covered in foundation modules and encompasses molecular biology, protein structure, and cell function with a focus on cellular metabolism. Students will learn not only how molecules function in healthy cells but also how disruption of their function leads to disease. This module equips students with an understanding of molecular biology, cellular metabolism and biochemical techniques.

YEAR 2 COURSE CURRICULUM

Module Name	Credit Units
Level 2.1 (20 hours per week)	
Current Good Manufacturing Practice	2
Pathology	3
Pharmaceutical Analysis	5
Pharmaceutics	5
Pharmacology	5
Level 2.2 (20 hours per week)	
Applied Biostatistics	3
Career & Professional Preparation 2	2
Medicinal Chemistry & Drug Discovery	3
Microbiology & Immunology	5
Molecular & Cellular Biochemistry	5
World Issues: A Singapore Perspective [^]	2

Notes:

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YEAR 3 COURSE MODULES

LEVEL 3.1

6-Month Internship (Local/Overseas)

The six-month internship provides students with exposure to the real work environment, providing opportunities to relate and apply the knowledge acquired during the course to work situations and facilitate the transition into the workplace. Clear learning outcomes, close mentorship, meaningful and real work activities allow for structured learning throughout the duration of the internship. Students will be attached to companies in various healthcare and pharmaceutical industries. Students will also have opportunity to go for overseas internships.

LEVEL 3.2

Clinical & Pharmacy Practice

In this module, students will study foundational concepts in patient care, pharmacy law and professional ethics. They will develop effective communication skills for interacting with patients, caregivers and other healthcare professionals. The application of clinical data in interpreting results and the optimisation of drug therapy in a clinical setting will be the focus of the clinical component. The module will also review medication safety and error prevention.

Pharmacotherapeutics & Good Dispensing Skills

In this module, students will study the therapeutic effects of drugs, their mechanisms of action, common doses for disease states, and the concept of rational drug selection. This will be simultaneously integrated with the fundamentals of good dispensing practice. Students will learn how to dispense medications in a safe, timely and effective manner and further develop their competencies in counselling through role play.

Pharmacy Management & Logistics

This module focuses on business aspects relating to the operation of hospital and retail pharmacies. Topics include procurement, logistics and inventory management, business automation, marketing and principles of finance pertaining to the operations of a pharmacy.

ELECTIVES: Choose any 1

Complementary Medicine & Traditional Chinese Medicine

This module describes how philosophies of alternative medicines and therapies are used to complement those of conventional medicine. The mechanism of action, dosage forms and pharmacological aspects of selected complementary medicines and traditional Chinese medicines will be covered, including the responsibilities associated with the sale and marketing of complementary medicines.

Nutrition & Dietetic Science

This module provides students with a basic understanding of nutritional and dietetic concepts, including the role of micro and macronutrients in the diet and their effects on health. Principles of clinical nutrition and dietary requirements for special medical conditions and at different life stages will also be covered. Students will also learn to evaluate evidence behind the use of common nutraceuticals and functional foods for health benefits as well as the regulations associated with the sale and marketing of such therapies.

YEAR 3 COURSE CURRICULUM

Module Name	Credit Units
Level 3.1 (20 hours per week)	
6-Month Internship (Local/Overseas)	20
Level 3.2 (18 hours per week)	
Clinical & Pharmacy Practice	4
Pharmacotherapeutics & Good Dispensing Skills	6
Pharmacy Management & Logistics	2
Project ID: Connecting the Dots [^]	4
Electives: Choose any 1 Complementary Medicine & Traditional Chinese Medicine OR Nutrition & Dietetic Science	2

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