CYBERSECURITY & DIGITAL FORENSICS COURSE MODULES

Mitigate cyber threats Singapore faces in our quest to be a smart nation. IT security professionals are in high demand to help Singapore succeed in this quest. With rapid growth in the area of Financial Technology, information security will be even more critical to protect our financial institutions, Join the fight against cybercrime with our Diploma in Cybersecurity & Digital Forensics (CSF).

In your first year, you will build a strong foundation in basic IT and security through modules such as Programming, Cyber Security Fundamentals, Front-end Development, Databases, Cryptography and Operating Systems Fundamentals.

In your second year, you will develop skills in the areas of network security, software security and digital forensics. You will learn to set up secure web servers, develop secure software applications and investigate cybercrimes. You will also learn how to secure codes and processes that go into developing applications, so that they are protected from external threats right from the start. This is called the Security Development Lifecycle, and is a highly valued skill in the industry.

In your final year, you will put your skills into practice by performing penetration tests on software, systems and networks, conducting in-depth forensic investigations on digital devices and networks, and analyzing malicious software or malware. You will get to do all these as well as work on information security projects in cutting-edge CSF labs.

What's more, you will attend masterclasses by information security professionals, and hone your skills in the real world with internships at the Ministry of Home Affairs and leading IT security organisations, such as Palo Alto Networks, SecureAge, Microsoft, NCS, CrimsonLogic, KPMG, Ernst & Young, CSIT and Ensign Infosecurity. You can also attain the highly sought-after CompTIA Security+ professional certification.

LEVEL 1.1

Computing Mathematics

This module introduces the basic concepts of relations and functions, matrices, statistical methods and relevant applications. The main emphasis is to develop students' ability in solving quantitative problems in computing mathematics, probability and statistics.

Cyber Security Fundamentals

This module provides an overview of the various domains of cyber security. It helps develop an understanding of the importance of cyber security in today's digital world. It aims to provide an appreciation of cyber security from an end-to-end perspective. It covers fundamental security concepts, tools and techniques in domains such as data, end-user, software, system, network, physical, organisation, and digital forensics. It also helps develop knowledge and skills in identifying common cyber threats and vulnerabilities, and to apply techniques to tackle these issues. In this module, students are assessed by coursework only.

Enterprise Information Systems

Companies today are adopting the use of technology not just to assist them in their day-to-day operations but also gain an advantage over their competitors. Many companies are implementing enterprise-wide information systems that provide them with platforms to integrate and coordinate their business processes. The use of enterprise information systems has become a necessity in multi-national companies (MNCs) as well as small and medium enterprises (SMEs). Within an enterprise information system, there is an intricate relationship between business strategy, organisational structure, business processes and technology resulting in challenges and issues during implementation.

This module introduces students to the different components that build up an enterprise information system. Different types of information systems are used for business processes, from communication and order processing to data analysis for decision making, and in almost all business functions ranging from marketing, sales, procurement, and human resource, to product development and manufacturing, accounting and finance.

Fundamentals for IT Professionals I

This module provides an introduction to the field of IT by exploring the roles, professional practices, ethical expectations and career development paths of IT professionals. Through a guided inculcation of interpersonal and team work skills with strong team bonding spirit, the module aims to deepen students' commitment to the sector that the course prepares them for. In addition, students will be required to begin charting their career path in the IT industry by considering crucial aspects such as personal preferences and aptitude, job roles and responsibilities, skills needed and further education.

Programming I

This module introduces the fundamentals of programming and how to develop programs using appropriate problem-solving techniques in a modular style. In this practice-oriented module, students are taught how to apply problem-solving skills using a top- down structured programming methodology and given ample practice in translating solutions into computer programs, then test and debug the programs.

Topics include data types, variables, expressions, statements, selection structures, loops, simple computation and algorithms, and the use of libraries. Students will also practise the use of pseudocodes, best practices of programming, debugging techniques with the help of tools, development of test cases, and suitable program documentation. In addition, they will study various areas where application software plays a prominent part in helping organisations solve problems. Students will be given ample opportunity for independent and self- directed learning.

LEVEL 1.2

Cryptography

This module covers the essential concepts of Cryptography, including Public Key Infrastructure (PKI), Digital Signature and Certificate, and the various encryption/decryption algorithms. Students will understand how Symmetric and Asymmetric (Public- Key) cryptographic techniques are used to support different security implementations, and the encryption/ decryption algorithms used in these techniques. The role of the Certificate Authority, how the digital certificates are generated, managed and distributed will also be covered in detail.

Databases

Today's business organisations depend on information systems in virtually all aspects of their businesses. Corporate databases are set up to hold the voluminous business transactions generated by these information systems. This module introduces students to the underlying concepts of database systems and on how to model and design database systems that reflect business requirements. Students will be taught how to analyse data needs, model the relationships amongst the data entities, apply normalisation process to relations and create the physical database. Skills to be taught include data modelling technique, transformation of data model to relations, normalisation technique and SQL (Structured Query Language).

Front-End Development

This module teaches the fundamental skills required to develop responsive websites that are optimised for mobile and desktop viewing. The students would attain skills and knowledge in programming languages such as HTML, CSS, JavaScript, jQuery, and AJAX which are used to develop interactive websites. This allows students to develop a website with interactive elements, providing them with a tangible product that they can develop into an interactive resume application and e-Portfolio website.

Operating Systems & Networking Fundamentals

This module focuses on the fundamentals and principles of Operating Systems. It explains what general operating systems are and what they do. The module teaches concepts that are applicable to a variety of operating systems such as Windows and Linux. Students will learn about the different number and character representation methods such as binary, hexadecimal and ASCII. Concepts including processes, physical and virtual memory, files and directories, file systems, shell and OS commands will be covered.

The module also covers the terminology and technologies in current networking environments and provides a general overview of the field of networking as a basis for subsequent related modules in the course. The topics related to types of networks, network topologies, network technologies and layered protocol architecture will be taught. In

addition, the students will also learn the OSI model as a reference model to understand data networks and understand the commonly used network systems such as Ethernet. The topic on TCP/IP as it forms most of the network architecture will be discussed in details. An overview of internetworking will also be presented to allow the students to have a global picture of how local area networks and wide area networks are interconnected in the real world.

In this module, students are assessed by coursework only.

Programming II

This module builds upon the knowledge and skills acquired in Programming 1 (PRG1). It aims to provide opportunities for the students to develop medium- scale applications based on the Object-Oriented (OO) approach. A suitable object-oriented high-level programming language will be used for students to continuously apply their problem-solving skills. The main concepts of OO and the implementation of applications using the OO approach will be taught in this module. The module may also cover the concepts of Abstract Data Types (ADTs) and the implementation of some selected ADTs using the OO approach.

Suitable sorting and search algorithms and the use of Application Protocol Interface (API) will be introduced when required. Other key topics include the introduction of system design concepts such as the class diagram. Software robustness and correctness, and good programming practices will be emphasised throughout the module. Independent and self-directed learning will also be encouraged.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (25 hours per week)	
Computing Mathematics	4
Cyber Security Fundamentals	4
Enterprise Information Systems	4
Fundamentals for IT Professionals I	3
Programming I	4
Innovation Made Possible ^	3
Sports & Wellness ^	3
Level 1.2 (24 hours per week)	
Cryptography	4
Databases	4
Front-End Development	4
Operating Systems & Networking Fundamentals	4
Programming II	4
Communication Essentials^	3

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.