INFORMATION TECHNOLOGY COURSE MODULES

Develop innovative IT solutions that increase business competitiveness and enhance the quality of life, or even start your very own e-business, with a Diploma in Information Technology (IT).

In your first year, you will focus on core computing skills in programming, networking, databases and enterprise information systems. You will also be given the opportunity to investigate IT-related topics and develop your digital portfolio.

In your second year and third year, you are free to choose from a myriad of electives that suit your interests and passion.

In your final year, you will round off your learning journey with a six-month local or overseas internship with organisations such as KPMG, IBM, Singtel and Microsoft, or launch your own IT business ideas at our technology hubs. You can also work on a capstone project which will beef up your digital portfolio and impress your future employer!

Depending on your passion, you may choose electives from the following areas of interest:

Business & Data Analytics
Acquire knowledge and skills in business intelligence, quantitative analysis, data visualization and predictive analytics to help companies gain a competitive edge.

Cloud Computing
Learn about cloud architecture and technologies, design cloud databases, develop cloud applications, and understand data centre management.

Enterprise Solutioning
Develop business strategies and offerings for the service economy, fulfil customer needs, and improve an organisation's competitive edge.

Games Programming
Create computer games by applying knowledge and skills related to programming, physics and artificial intelligence.

Infocomm Sales & Marketing
Market IT goods or services to businesses and consumers, develop sales and marketing strategies, and understand sales life cycle management.

Mobile Business Applications
Learn about mobile commerce by designing, developing, securing and optimising mobile apps.

Solutions Architect
Design and implement computer solutions using algorithms and data structures to solve business problems efficiently and cost-effectively.

LEVEL 3.1
Internship
This module provides students with the opportunity to apply the knowledge and skills gained to develop an IT solution to solve a practical problem. Students may undertake an in-house industry-driven project, a Technopreneurship Enterprise project or a real-life IT project in a local or overseas organisation. These projects may include problem definition, requirements analysis, design, development and testing, delivery and presentation of the solution. Through the project, students will learn to appreciate the finer points of project planning and control issues relating to IT project development.

LEVEL 3.2

In this semester, students will take any five elective modules offered by the school that are aligned with their interest and passion.

ELECTIVE MODULES

AREA OF INTEREST: BUSINESS & DATA ANALYTICS

Big Data
This introductory module covers the fundamentals of elements of Big Data: volume, velocity and variety. Students will learn various technologies & tools used to create a big data ecosystem which is able to handle storing, indexing & search. This module also covers the whole technology stack of Big Data: infrastructure, data management and analytics. Tools such as Hadoop, HDFS, and MapReduce will be taught in this module.

Data Visualisation
This module covers the techniques and tools for creating effective visualisations based on principles from graphic design, perceptual psychology and cognitive science. Students will learn how to process large volumes of data to create interactive visualisations for ease of exploration. Topics that are covered include visualising patterns, proportions, relationships, spatial and temporal elements, and multi-dimensional visualisations.

Descriptive Analytics
Descriptive Analytics refers to a discipline used by many companies to analyse their data for improved decision making. Descriptive Analytics describes what happened in the past. It can include various forms of reports, queries and dashboards. This module aims to teach students the descriptive analytics lifecycle. Students will learn to ask the appropriate analytics questions, identify and aggregate data sources and create data models. They will apply techniques to analyse the data captured in these models. They will also create appropriate visualisation components to gain insights from the data. These visualisation components will be synthesized into dashboards that add value and can be readily consumed by business users.

Predictive Analytics
This module introduces students to the statistical techniques used to make predictions about future trends in business or financial services. Students are taught the assessment techniques that are used to identify risks and opportunities patterns found in historical and transactional data, and to make intelligent decisions by evaluating the prediction models developed using software tools. Topics covered include data mining methods, such as association, classification and cluster analysis, forecasting methods and prediction models.

Quantitative Analysis
This module aims to introduce students to the statistical concepts and methods that are used to analyse and interpret business or financial data. Students will be equipped with the technical know-how to formulate statistical models, and make informed decisions by evaluating the statistical models using software tools. Topics covered include frequency distribution, probability distribution, quantitative modelling, correlation analysis and linear regression analysis.

AREA OF INTEREST: CLOUD COMPUTING

Cloud Architecture & Technologies
This module gives insight into the key concepts and technologies of cloud computing which include cloud characteristics, service models (SaaS, PaaS, and IaaS), deployment models (Public cloud, Private cloud, Community cloud, and Hybrid cloud), and the features of cloud computing technologies. It also covers the cloud computing architecture, emerging trends and issues such as clouds for mobile applications, cloud portability and interoperability, scalability, manageability, and service delivery in terms of design and implementation issues.

The module discusses the benefits and challenges of cloud computing, standards of cloud computing service delivery, and Service Level Agreement (SLAs) for cloud services. Hands-on activities are included to expose students to various cloud computing services offered by major cloud computing providers such as Amazon Web Services (AWS), Google App Engine (GAE), and Microsoft Windows Azure.

Designing & Managing Cloud Databases

This module covers analysis, design, and implementation of cloud database models, data management life cycle, and data governance to manage master data. Students will be introduced to query languages for cloud database development and best practices for implementing the extract, transform and load (ETL) process cycle. The module provides insight into cloud storage components, and data transformation and integration methodologies for data migration into cloud databases. It will further explore laws and regulations governing data access, usage, storage and transmission.

The module will also introduce the concepts and technologies of Distributed and Parallel Databases which include their design, structures, theories, algorithms and implementation. Examples of distributed and parallel platforms and frameworks for processing Big Data, such as MapReduce and Hadoop, will be also be discussed.

Developing Cloud Applications

This module covers the analysis of business and technical requirements of a cloud-based system, implementation of a cloud strategy with appropriate programming tools, deployment, and testing and debugging the cloud application. Analysis of business requirements to determine how they can be mapped into a cloud environment is discussed in this module. The module extends its discussion to cloud computing design patterns, best practices, cloud migration issues and considerations. Students are exposed to a cloud computing platform such as Windows Azure to get extensive hands-on practice to build, migrate, host and scale web applications and services through the vendor's data centres.

Virtualisation & Data Centre Management

This module introduces the foundations of virtualisation, and creating and managing virtual machines for cost efficiency and agility in delivering IT services. Hands-on sessions are included to give students practical experience in virtualisation tools such as Windows Server and VMWare. It will also explore the impact of virtualisation technologies on cloud database development. The module will then proceed to provide an understanding of basic data centre design principles, and physical infrastructure, and a framework for managing a data centre using appropriate tools. Tools and methods for usage metering and billing in a cloud environment are also covered in this module.

AREA OF INTEREST: ENTERPRISE SOLUTIONING

Business Process Modelling & Development

This module equips students with the skills for eliciting, documenting, modelling and analysing business processes within an organisation. Processes in sales, purchasing, inventory management and finance will be discussed and investigated. Students will learn to use a Business Process Management tool to model and develop solutions that improve process efficiency and quality.

Customer Experience Management

With SMAC (Social, Mobility, Analytics and Cloud) technologies resulting in a new competitive environment, the control has shifted from the seller to buyer. This module provides students with the knowledge and understanding of Customer Experience Management (CXM) as a business strategy in this new environment. The buyer's experience is not limited to a single transaction but includes the sum of all experiences across all touch points and channels between a buyer and a seller over the duration of their relationship.

This strategy aims to achieve a sustainable competitive advantage to help sellers manage the buyer's experience that is both collaborative and personalized. Students will have an opportunity to have hands-on experience with customer management systems used by sellers that collect and create customer data, segment that data into manageable data sets, make sense of the data and make it available for timely delivery. This allows companies to deliver consistent customer experiences that delight customers or achieve other organisational goals.

Enterprise Business Solutions

This module educates students on the importance of backend cloud-based enterprise business systems and the role it plays in helping organisations increase productivity, enable collaboration and improve overall effectiveness. Students will learn to use cloud-based enterprise business systems to drive workflows and gather insights from analytics dashboards. Students will also be exposed to the next generation of enterprise business solutions that hinges on the interoperability of various backend enterprise systems with frontend Internet of Things (IoT) devices. With such holistic exposure,

students will be better prepared to support the Smart Nation initiatives and gain hands on experience on information technologies/concepts such as IoT, programming, cloud computing, analytics and enterprise computing.

AREA OF INTEREST: GAME PROGRAMMING

Artificial Intelligence for Games

This module introduces the various approaches for injecting intelligence into games. Topics covered include AI architecture (e.g. rule-based systems, finite state machines), movement, pathfinding and planning (both strategic and tactical). AI-related game design issues such as realistic non-player character behaviour and game difficulty will also be taught.

Game Interactivity

This module introduces game interactivity and the various game interaction devices to the students. Topics include current and experimental game devices, console usability, player profiling and psychology, measuring playability and testing techniques. Students will be required to research and develop a game prototype demonstrating their understanding of game interactivity.

Game Production

This module provides an overview of the game development process and introduces game design. Key concepts of game design such as storytelling, game mechanics and level design will be covered. Students will have the opportunity to design and prototype a game using an industry standard game creation system.

Gameplay Programming

This module presents fundamental concepts of game implementation and architecture, such as the game loop, gamesystem component separation, the game state manager, input/output handling and frame rate control. Basic concepts in computer graphics, such as collision detection and back buffering, will also be introduced. Consequently, students will have the opportunity to develop a game prototype without the use of a game engine.

Mathematics for Games

This module provides an in-depth examination of the various mathematical concepts that are relevant to games programming. Topics covered may include vector geometry (e.g., vector arithmetic, dot product, cross product), linear transformations (e.g., rotations, reflections), matrices, trigonometry (e.g., trajectory) and physics (e.g., acceleration/deceleration, gravity).

AREA OF INTEREST: INFOCOMM SALES & MARKETING

Customer Decision Making & Negotiation Skills

Students will be introduced to soft skills in understanding customer biases and concerns, building rapport, handling objections, identifying informal and formal decision makers, selling functions/features/ benefits, negotiating and closing sales techniques. They will also learn about reference selling and proofs of concept as well as pick up presentation and communication skills. The module offers opportunities to role play and develop value proposition in sales calls within the context of ICT.

Infocomm Sales & Marketing Strategies

This module will introduce students to the concept of market segmentation and the development of sales and marketing strategies for each segment. They will acquire an understanding of industry and customer segmentation from corporate, small and medium businesses to consumers. They will also delve into the different go-to-market strategies and selling techniques required in the context of ICT (such as consultative selling, major account selling and management, territory selling and management, partner management and consumer marketing).

Infocomm Sales Life Cycle Management

This module introduces students to a customer's ICT purchase decision making process and sales life cycle management. Students will also pick up some fundamental concepts in interpreting customer annual reports, financial ratios, industry analysis and competitive strategies so that they can recognise customer needs and wants. They will follow the sales life

cycle from prospecting, qualifying, developing solutions, negotiating and closing the sales to post-sale support and services, up-selling and cross-selling.

AREA OF INTEREST: MOBILE BUSINESS APPLICATIONS

Mobile Applications Development

This module focuses on the design and development of applications for mobile devices like hand phones, personal digital assistants (PDAs) and handheld computers. Due to the nature of these handheld devices, issues such as memory storage, user interface and data input methods require more careful consideration and planning. At the end of this module, students will be able to develop applications that can run on mobile devices and interact wirelessly with serverside programmes.

Mobile Applications Development II

This module builds upon the skills and knowledge that students have acquired from the Mobile Applications Development module. It will focus on the development of advanced applications and emerging mobile operating systems. For example, students could develop applications for industries such as entertainment, games and healthcare. They will learn to develop applications for emerging operating systems such as the iPhone OS and Android.

Mobile Device Security & Forensics

This module covers techniques and tools in the context of a forensic methodology to extract and utilise digital evidence on mobile devices. Students will learn how to use current forensic tools to preserve, acquire and examine data stored in a mobile device. The module covers basic SIM Card examination and cell phone forensics on multiple platforms such as iPhone, Android and Windows Mobile. The module takes a practice- oriented approach to performing forensics investigation on mobile phones.

AREA OF INTEREST: SOLUTIONS ARCHITECT

Software Engineering

This module covers the design artifacts and analysis techniques required to model, document and design complex software systems. Students will learn how to model system states and apply design patterns when developing software. Students will also learn design principles for maintainable and extensible software, as well as appropriate testing and deployment methodologies in relation to the best practices that the industry recommends.

This module leverages on the core analysis and design skills acquired in Object Oriented Analysis & Design (OOAD) to introduce complex design artifacts and relevant methodologies, enabling the student to appreciate the design, deployment and management of complex software systems.

Data Structures & Algorithms

This module aims to provide students with the knowledge and skills to analyse, design, implement, test and document programmes involving data structures. It teaches basic data structures and algorithms within the conceptual framework of abstract data types. The emphasis here is to use the class feature of an Object-Oriented language platform to give the concrete implementation of various abstract data types.

eCommerce Applications Development

This module aims to provide students with the technical skills as well as an appreciation of the business perspective on electronic commerce (eCommerce). The main focus will be on building a Business-to Consumer (B2C) eCommerce website. Students will be taught the building blocks and enabling technologies for building eCommerce applications, the processes of eCommerce transactions and some business issues on eCommerce. The module will also provide hands-on experiences for students to build a simple B2C eCommerce website on their own.

Secure Software Development

This module provides students with the knowledge of the secure software development lifecycle. It trains students to incorporate security throughout the entire process of software development. With the knowledge gained from this module, students would be able to design, code, test and deploy software with a security mindset. The module begins

with training students on how to identify, gather and record security requirements for a software. Students will learn secure software design, where various security frameworks, considerations and methodologies are taught.

Students will understand how software vulnerabilities can be exploited and how to address the risks. Students are trained to write secure code that is resilient against critical web application attacks. Finally, students are trained in secure software testing and how to securely deploy software.

GENERAL ELECTIVES Capstone Project

In this module, students are required to complete a substantial project that is the culmination of their education in ICT. The project can be a real-world problem proposed by a client, or it can be proposed by students in pursuit of their personal interests.

Emerging Trends in IT

The revolution in computing and communications has spurred the rapid advancement of IT in modern societies, and there is little to suggest that its proliferation will slow down in the near future. In light of this trend, this module is designed to help students keep abreast of the latest IT developments to stay current and relevant in the fast moving industry. To achieve this objective, the syllabus for this module will be guided by technology research and feedback from industry partners, and both seminar-style and hands- on workshop teaching approaches may be adopted depending on the nature of the topic covered.

Technopreneurship

The rapid emergence of new infocomm technologies is empowering new capabilities as well as opportunities for creativity and entrepreneurship. This module focuses on the processes and mechanisms by which new ideas and inventions can be commercialised in the market. Students will examine case studies of real- world examples of technopreneurship. They will also learn about the issues and challenges of transforming a technological innovation into a successful product or service in the market place.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 3*	
Level 3.1	
Internship	22
Level 3.2 (24 hours per week)	
Capstone Project or 2 Elective Modules #	8
Elective Module #	4
Elective Module #	4
Elective Module #	4
Interdisciplinary Studies (IS) elective ^	2

ELECTIVES:

AREA OF INTEREST: BUSINESS & DATA ANALYTICS

Big Data

Data Visualisation

Descriptive Analytics

Predictive Analytics

Quantitative Analysis

AREA OF INTEREST: CLOUD COMPUTING

Cloud Architecture & Technologies

Designing & Managing Cloud Databases

Developing Cloud Applications

Virtualisation & Data Centre Management

AREA OF INTEREST: ENTERPRISE SOLUTIONING

Business Process Modelling & Design

Customer Experience Management

Enterprise Business Solutions

AREA OF INTEREST: GAMES PROGRAMMING

Artificial Intelligence for Games

Game Interactivity
Game Production
Gameplay Programming
Mathematics for Games

AREA OF INTEREST: INFOCOMM SALES & MARKETING**

Customer Decision Making & Negotiation Skills
Infocomm Sales & Marketing Strategies
Infocomm Sales Life Cycle Management

AREA OF INTEREST: MOBILE BUSINESS APPLICATIONS

Mobile Applications
Development Mobile Applications Development II***
Mobile Device Security & Forensics

AREA OF INTEREST: SOLUTIONS ARCHITECT

Software Engineering
Data Structures & Algorithms e-Commerce
Applications Development
Secure Software Development

GENERAL ELECTIVES
Capstone Project
Emerging Trends in IT

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.

The elective modules offered may change from year to year, depending on relevance and demand. They may also include modules available in other diplomas offered by the School.

** The Infocomm Sales & Marketing modules are offered in collaboration with Microsoft Singapore. They provided their expertise on the design, development and delivery of curriculum pertaining to the sales and marketing of infocomm products, services and solutions.

Microsoft Singapore proudly supports the School's commitment to jump-start the process of creating a pool of highly skilled and sought-after professionals in infocomm sales and marketing. Microsoft is a trademark of the Microsoft group of companies.

*** ICT is a member of the iPhone Developer University Program. Under this programme, the School has incorporated iPhone apps development into its curriculum.