

MODULE DESCRIPTIONS

APPLIED NETWORKS

Whereas the pre-requisite and co-requisite Networking modules dealt with the basic concepts, theory and technologies of Computer Networks, the aim of this module is to study typical networks that students will encounter in industry, such as wireless and mobile networks, as well as proprietary networks such as IBM's SNA.

Furthermore, as more organisations implement Web-based applications, there is an increasing need to understand the implications of the associated Internet technologies. A further aim of this module is to provide an introduction to Internet server management through the use of a network operating system. This module will link server management with other major operating system topics such as network administration and security and networking concepts, with particular emphasis on the TCP/IP protocol stack. Students will develop an understanding of the necessary network infrastructure that has to be in place, the administrative tasks required, and security implications and possible solutions related to the hosting of a secure Internet site. Learners will also gain experience with different type of servers such as DNS and AD.

CLOUD COMPUTING

The availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualisation, service-oriented architecture and autonomic and utility computing, has led to growth in cloud computing.

The aim of this module is to equip students with a sound knowledge of the underlying principles of cloud computing, its basic functioning and architecture. They will acquire the insight and skills needed to evaluate different cloud platforms and services, develop an understanding of the process (including how to manage the process), and gain experience in developing cloud applications. In addition, students will gain hands-on experience in using a Cloud Platform such as Microsoft Azure and using API technology to create a hybrid cloud.

COMPUTATIONAL THINKING AND INTRODUCTION TO PROGRAMMING

Efficient and effective problem solving is a skill that is of benefit to any individual in his/her everyday life. In the field of computing, problem solving as well as familiarity with computer programming concepts, development of computer programs, and the syntax and semantics of programming languages are fundamental to successful software development.

This module first introduces computational thinking as a systematic approach to problem solving with the solution expressed in such a way that it can be carried out by a computer. Thereafter, all aspects of programming, from designing an algorithm and coding this algorithm to develop a program, to debugging and executing the program, are covered. The main focus of the module is on the coding aspect, where students will be exposed to the Python programming language, from the basic programming constructs (sequencing, decisions and looping) and data structures (such as simple types and lists) to more advanced constructs (such as the use of functions and recursion) and more complex data structures (such as dictionaries).

No prior programming experience is required to complete this module. Students will be taken from first principles to being able to develop a non-trivial Python program. The module will be useful to students from diverse fields by offering a systematic way of approaching problem-solving and providing a solid introduction to programming.

Having completed this module, students will have a solid foundation of problem-solving and programming experience, thereby facilitating the comprehension of the more advanced aspects of programming, including object-oriented design and the use of abstract data structures, as taught in later modules.

COMPUTER HARDWARE AND OPERATING SYSTEMS

A sound knowledge and understanding of the basic concepts and functioning of computer hardware and operating systems is important to IT professionals. This module focuses on the fundamentals of computer hardware and software and how they can be integrated so as to construct the essential components of IT systems. The module also includes an overview of computer configurations, ranging from large supercomputers to hand-held devices such as tablets and "smart phones".

This module provides students with the skills they need to work confidently with the hardware components of a basic microcomputer. Students will be able to identify the basic parts of a computer, be aware of their function, and perform basic hardware installation. They will also gain experience in operating system installation, learn to troubleshoot and rectify basic faults, and perform basic operating system tasks.

CYBERSECURITY

The field of Information Technology Security is becoming more important due to increased reliance on computer systems, the Internet and wireless network standards such as Bluetooth and Wi-Fi; as well as the growth of "smart" devices, including smartphones, televisions, and the various devices that constitute the Internet of Things.

One aim of this module is to equip students with a sound knowledge of the underlying principles of information security and to provide them with the skills needed to analyse and evaluate information security problems. A second aim is to familiarise students with the concept of cybersecurity (also referred to as computer security or IT security), which refers to the broader concept of the protection of computer systems from theft of or damage to an organisation's hardware, software, or electronic data; as well as from the disruption or misdirection of the services that the organisation provides.

FUNDAMENTALS OF INFORMATION TECHNOLOGY

The increased importance and global reach of computing technology in today's society was the basis for the emergence of the information technology discipline. Information Technology is the study of systemic approaches to select, develop, apply, integrate, and administer secure computing technologies to enable users to accomplish their personal, organizational and societal goals.

This module provides an overview of the discipline of IT, and how it relates to other computing disciplines. The goal is to help students understand the diverse contexts in which IT is used and the challenges inherent in the diffusion of innovative technology.

HUMAN-CENTRIC DESIGN AND BUSINESS INTELLIGENCE

This module introduces students to key elements of human-centric design, including the use of personas and scenarios; principles for ensuring usability, acceptability and engagement; techniques for eliciting, visualising and evaluating application requirements; the role of metaphors in interaction design; and general guidelines for visual interface design.

The module opens with a discussion of the basic principles of organisational decision-making and the types of data that are generally available in organisations. This is followed by an overview of data warehousing and basic analytic techniques that are commonly used for data exploration. More advanced topics include cluster identification; principal component analysis; association rules and social network analysis; regression analysis; nearest neighbour and anomaly detection; prediction and forecasting techniques; and neural networks. Students will gain hands-on experience in the application of some of these techniques through a series of practical exercises based on case studies with accompanying datasets. Potential risks associated with the use of big data are also discussed. By the end of the module, students will have acquired a solid understanding of how data science can be used to support the strategic objectives of an organisation.

INFORMATION MANAGEMENT

The growth of the Internet and an increasing demand for information has changed data handling and transactional and analytical processing, leading to the creation of special purpose databases.

This module builds on the first year 'Introduction to Databases' module, which focused on the design of a database and the retrieval of information from a database. The aim of the current Information Management module is to take a broader view of information management by focusing on topics such as the manipulation and analysis of enterprise data, the evaluation of database performance, the use of special purpose databases, and the efficient and effective management of information. These activities will determine the extent to which data can be made meaningful to the organisation, produce useful knowledge from information, and help to guarantee the safety and security of information.

INFORMATION SYSTEMS PROJECT MANAGEMENT

Information Systems development projects are initiated for a variety of reasons, e.g. to address an existing problem, leverage a potential opportunity, support a business merger, or achieve regulatory compliance. The project manager plays a critical role in achieving project success, by effectively planning, leading and monitoring a project from inception to delivery.

In this module, students will learn the key responsibilities of a project manager and the scope of activities that are typically performed by project managers during the different stages of an information systems development project. In doing so, they will familiarise themselves with the methods and tools used to plan project activities and to monitor progress and budgets. They will also learn the importance of maintaining accurate project documentation. Role-playing scenarios will be used to practice relevant communication skills including techniques for conflict resolution. During the module, students will submit several individual and group assignments relating to different aspects of the project manager's job.

INFORMATION TECHNOLOGY DEVELOPMENT PROJECT

In this module, students will be expected to integrate and apply the knowledge and skills they have acquired during their studies towards the Bachelor of Information Technology degree. Teams of between two and four students each will analyse, design, test and implement a particular technology, algorithm or process. Project teams will be allowed to follow their preferred development approach and modelling paradigm, as long as this is consistently applied throughout the project. Because teamwork and project management are important aspects of technical projects, any student wishing to undertake an individual projects will first need to obtain permission from the lecturer in charge.

The final project deliverables should include at least a project proposal ('business case'); project management documentation; a requirements specification document; a design specification document; a test plan including test results; an implementation plan; user documentation; and a post-implementation review report. At the end of the module, each team will be expected to demonstrate a working prototype comprising at least three different use cases and including at least two reports. In addition, a complete set of project documentation must be submitted for summative assessment. If it is difficult to align a particular project with the requirements specified above, then the lecturer in charge will need to approve the project.

INTRODUCTION TO BUSINESS MANAGEMENT

This module Introduction to Business Management introduces the student to the fundamental principles of management and the essential skills and competencies for effective management. The student will be exposed to the primary management tasks: planning, organising, leading and controlling. Supporting management tasks, such as communication, motivation and delegation, are also covered. The student is introduced to how these management competencies and tasks are applied across management functions; notably, operations, financial, marketing and human resources management. The focus of assessment will be on practical application of tasks such as planning and organising.

INTRODUCTION TO DATABASES

Information and raw data are the life blood of the various computing disciplines, either for their use in creating a solution to a given problem, or for storing after having been generated by information systems and other computational applications. As such algorithms for the efficient and effective collection, transformation, storage, access and updating of data, as well as for the representation, organization and presentation of the resulting information, constitute vital knowledge for computing professionals.

Relational databases, which rely on the use of structured tables to store data, have traditionally been used for data storage. However, with the ever-increasing volume of data needed to be processed and stored by information systems, non-traditional, unstructured alternatives have recently become more popular. The main aim of this module is to introduce students to the theoretical concepts of databases as well as provide practical experience in designing and extracting information from both relational and semi-structured databases.

This module introduces fundamental database concepts related to the design and creation of relational databases, as well as the extraction of information in the form of query building using SQL (structured query language). Also covered in the module are considerations of transactional processing and security of databases as well as an introduction to non-relational database models using XML to apply the theoretical concepts in semi-structured databases.

Having completed this module, students will be able to manipulate a variety of databases, as well as design, implement and manage a database system.

INTRODUCTION TO RESEARCH

It covers principles, concepts and processes pertaining to academic scientific research. Aspects covered include the features of scientific research, types of research, as well as common aspects in the execution of a research assignment, such as problem identification, motivation of the study, formulating a hypothesis, research objectives, selecting suitable methods, planning and preparing the research action, as well as the gathering of data, and performing analysis and interpretation of results leading to a research report.

IT GOVERNANCE, RISK AND CONTINUITY

The module opens by reviewing the principles and practices contained in the Technology and Information Governance section of the King IV report, and the ISO/IEC 38500 standard for IT governance. Students are then introduced to relevant frameworks that support IT Governance implementation and management, including the Control Objectives for Information and Related Technology framework (COBIT), the Open Group Architecture Framework (TOGAF), Capability Maturity Model Integration (CMMI), and the IT Infrastructure Library (ITIL). Thereafter, the module explores key challenges and success factors related to IT governance, presents a set of criteria that can be used to evaluate information technology governance within an organisation, and provides examples of best practices in the governance of digital transformation initiatives.

Business continuity planning encompasses the identification and documentation of critical business functions; the evaluation and ranking of internal and external risks based on their likelihood of occurrence and severity of impact; evacuation and communication plans; and the implementation of measures intended to limit the impact of a disaster (including regular backups of software and data). The disaster recovery plan includes issues such as ensuring the safety of buildings and the provision of utility services, but with a key focus on the restoration of IT systems and software, data recovery procedures, and system testing. This module also considers the role of the planning team; relevant business policies and manuals; and business insurance options.

MATHEMATICS AND STATISTICS FOR IT

Given the integrative nature of the information technology (IT) discipline and the breadth of possible career paths that it offers, a robust IT education program should include an introduction to aspects of discrete mathematics and statistics so as to prepare a competent IT professional for employment in the mid-2020s. To provide the necessary mathematical foundation, this module covers topics in discrete mathematics, linear algebra, statistics, probability, and modeling directed to the needs of the IT industry.

This module aims to develop both mathematical and statistical skills appropriate to the IT discipline. The main skills addressed are: critical thinking, which is required in order to read and understand the problem; algorithmic thinking, which relates to the use of algorithms to solve certain classes of problems, and in so doing using mathematical principles to ensure the efficient use of computational and memory resources; working with discrete structures, which are the mathematical structures used to represent discrete objects, and their relationships; analytical and mathematical reasoning to apply appropriate methods in the solution of the problem; and finally modeling, whereby discrete mathematics is used to represent real-world solutions and statistical models can be constructed to interpret complex data sets.

The following topics are covered in an introductory manner in this module: number systems, basic mathematical structures, propositional logic, sequences, graph theory, probability theory and descriptive statistics. The module would be useful to anyone that requires discrete mathematics and statistical knowledge with basic applicability in affiliate disciplines. Exit-level secondary school mathematics is a prerequisite for this module.

NETWORK ANALYSIS AND DESIGN

In this module students get the opportunity to apply the analysis and design concepts and methods covered in earlier Networking modules. It includes the design of a wireless LAN and an Internetwork.

NETWORKING 1

The importance of computer network solutions in business and industry is increasing rapidly. As a result, a sound knowledge and understanding of the basics of computer networking is essential to professionals and users alike.

The field of Computer Networks and Data Communication can be divided into Networking and Applied Networks. Networking covers the areas of network standards and models, components, topologies, and requirements of network protocols, as well as Network Management. Applied Networks, on the other hand, deals with topics such as proprietary networks and network programming, the Internet, mobile network architectures and wireless communications. Also included in Applied Networks is the analysis and design of networks and common applications of networks.

NETWORKING 2

This module builds on the introductory "Networking 1" module by covering the physical layer through to the routing layer of the OSI model in more detail. Higher layers related to applications and security, such as functions and design, are included; as well as approaches to designing and modelling latency, throughput and error rate. Web technology is also introduced as well as e-mail and database applications. This solid conceptual foundation will enhance students' understanding of the functioning of proprietary networks and enable them to design and develop a networking infrastructure that will meet specific networking design requirements. Students will also be introduced to an example of an internetwork operating system.

OBJECT-ORIENTED PROGRAMMING

One of the main competences required for employment in any of the computing disciplines is good programming skills. The object-oriented paradigm is extensively used in industry for developing large information systems. This module aims to impart both the theory and practice of this paradigm and further develop the overall programming skills of the students by introducing a second programming language, Java.

Students must have completed the "Computational Thinking and Introduction to Programming" module as prerequisite before attempting this module, which builds on the first principles of programming already covered and focuses on the design and implementation of larger more complex programs through a widely used industry language. In addition to providing the corresponding Java syntax for the constructs previously covered in the Python programming language, this module introduces object-oriented programming concepts, such as encapsulation and information hiding, data objects and inheritance, as well as additional imperative programming concepts and constructs, such as garbage collection and reference types. Practical experience using an object-oriented language is included by way of computer-based programming assignments.

SOFTWARE ENGINEERING

Software engineering is the use of an organized and regulated approach for the design, development, testing, documentation and maintenance of software by applying principles from engineering, project management, computer science, programming, cost management and other areas.

The Software Engineering module specifically aims to lay a solid foundation in the discipline of developing and maintaining software systems that behave reliably and efficiently, are affordable to develop and maintain, and satisfy all the requirements that customers have defined for them. The student will acquire broad knowledge about the Software Engineering process and the range of methods, tools, and techniques utilised, illustrated by means of a variety of case studies.

TECHNOLOGY AND SOCIETY

The cyber world is a world with countless interactions in different forms. Online interaction has become part of our daily routine and it presents a number of challenges to both developers, owners and users. Given the different types of personal and corporate data that can be generated, it is important to establish awareness of possible ethical contraventions in which we can unintentionally participate. The development of new technologies also potentially poses threats to the livelihoods of many. Ethical behaviour by all stakeholders is crucial in sustaining the fair development and implementation of technologies. It is also important to ensure fair online interaction and the sharing of information. This module aims to establish an initial awareness of ethical issues in students as they start their studies in technology. It will assist with understanding the rights of people in the world of technology.

VIRTUAL SYSTEMS AND SERVICES

New software, from operating systems to applications, constantly demands more resources - more data, more processing power, more memory. Virtualization makes a single physical machine act like multiple machines, thus saving the cost of more servers and workstations.

The Virtual Systems and Services module introduces this important technology which is in widespread use. The aim is to equip students with a sound knowledge of the underlying principles and concepts of virtualization, and to provide them with the basic skills needed to be able to implement virtualization for desktops, servers, and network platforms. Examples of virtualized applications will be discussed, and students will be required to explore and evaluate further examples.

WEB SYSTEMS AND TECHNOLOGIES

With the ever-growing demand for availability of application programmes on the web, and on mobile devices such as smartphones, the inclusion of a module on the development of these applications is essential in an IT programme.

The aim of this module is to lay a solid foundation in the discipline of developing application software for the web and for mobile devices. The student will gain a breadth of knowledge about the development platforms and underlying technology, as well as the range of methods, tools, and techniques utilized in developing web applications. The student will also gain experience in developing applications for the Web and mobile devices.