**DEPARTMENT OF COMPUTER SYSTEMS ENGINEERING**

**Subject information (overview of syllabus)**

The syllabus content is subject to change to accommodate industry changes. **Please note:** A more detailed syllabus is available at the department or in the study guide that is applicable to a particular subject. On 21 August 2015, syllabus content was defined as follows:

<table>
<thead>
<tr>
<th>A</th>
<th>ADVANCED INTELLIGENT INDUSTRIAL SYSTEMS IV (ADK401T)</th>
<th>1 X 3-HOUR PAPER</th>
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<tr>
<td></td>
<td><em>(Subject custodian: Department of Computer Systems Engineering)</em></td>
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<tr>
<td></td>
<td>The design and implementation of advanced intelligent systems. (Total tuition time: ± 40 hours)</td>
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**APPLICATION TECHNOLOGY IV (ATE401T)**

*(Subject custodian: Department of Computer Science)*

The purpose of this subject is to equip students with skill and knowledge in the use of software design patterns. The subject exposes students to the commonly used creational, structural and behavioural design patterns. (Total tuition time: ± 40 hours)

<table>
<thead>
<tr>
<th>B</th>
<th>BUSINESS FUNDAMENTALS IV (BAB401T)</th>
<th>1 X 3-HOUR PAPER</th>
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<tr>
<td></td>
<td><em>(Subject custodian: Department of Informatics)</em></td>
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<td>Business analysis is critical in identifying the business needs of end users and other stakeholders to determine the appropriate solution to a business problem. Focus is primarily on business analysis, and discusses how to obtain success in business analysis. Six business analysis knowledge areas are discussed in detail. On successful completion of this subject, the student will be able to: specify and model requirements for an IT business solution, investigate business problem or opportunity within an organisation, analyse and document solution requirements for an IT organisation and support project manager throughout solution development, implementation and testing to ensure that requirements are met. (Total tuition time: ± 54 hours)</td>
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<thead>
<tr>
<th>C</th>
<th>COMMUNICATION SKILLS I (COS101T)</th>
<th>CONTINUOUS ASSESSMENT</th>
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<tr>
<td></td>
<td><em>(Subject custodian: Department of Applied Languages)</em></td>
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<td></td>
<td>Communication theory, non-verbal communication (body language, etc.), oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence. (Total tuition time: ± 20 hours)</td>
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<thead>
<tr>
<th>C</th>
<th>COMMUNICATION SKILLS (EXTENDED) I (FPCOS03)</th>
<th>CONTINUOUS ASSESSMENT</th>
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<td></td>
<td><em>(Subject custodian: Department of Applied Languages)</em></td>
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<td></td>
<td>Speaking and communication skills, listening skills, reading for academic understanding, academic vocabulary, learning strategies and information gathering, writing, business and life skills. Oral presentations, technical reports, interviews, leadership and participation skills. Emphasis is placed on the use of different communication media in IT case studies. The basic concepts of hardware, software, data communication and elementary programming skills are covered in the theoretical component. The Windows operating system is studied. Application packages such as Microsoft Word and Excel are covered in the practical component. (Total Tuition time: ± 100 hours)</td>
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<table>
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<tr>
<th>C</th>
<th>COMPUTER SKILLS I (CSK101T)</th>
<th>CONTINUOUS ASSESSMENT</th>
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<td><em>(Subject custodian: Department of End-User Computing)</em></td>
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<tr>
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<td>Students have to acquire practical skills as end-users in operating systems and MS Office Suite applications (MS Word, MS Excel and MS PowerPoint) on an introductory level, as well as in MS Access Essentials. Students will do online and computer-based tests. The modules are mapped with SAQA. (Total tuition time: ± 40 hours)</td>
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</table>
COMPUTER SKILLS (EXTENDED) I (FPCSK02)  CONTINUOUS ASSESSMENT  
(Subject custodian: Department of End-User Computing)  
Students have to acquire theoretical knowledge (computing fundamentals) and practical skills as end-users in operating systems and MS Office Suite applications (MS Word, MS Excel, MS Excel Intermediate, MS PowerPoint, MS Access Essentials and MS Visio Professional), graphic design and dealing with the Internet, networks and how to search for information. Students will do online and computer-based tests. The modules are mapped with SAQA and IC3 Essential Skills for Digital Literacy (international certification). (Total tuition time: ± 80 hours)

COMPUTING FUNDAMENTALS IA (CFS10AT)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
The student is introduced to the fundamentals of computers and information systems, computer organisation and data processing. (Total tuition time: ± 90 hours)

COMPUTING FUNDAMENTALS IB (CFS10BT)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
The basic concepts of system development, data management, management information systems, ethics, privacy and security, purchasing and maintaining microcomputers, number systems and binary logic. (Total tuition time: ± 54 hours)

COMPUTING SKILLS IA (CMK10AT)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Informatics)  
This subject aims to equip the student with fundamentals of IT Soft skills for both the ICT industry and other working environments upon which a successful career can be built. In addition, it will also improve the student's relation and interaction abilities needed within the dynamic ICT industry. The student who successfully completes this subject must identify and implement various thinking skills and learning styles, state the legal and cultural sensitivity issues of IT, identify and explain the variety of soft skills including study skills and strategies, research, presentation as well as communication skills, and identify and explain interpersonal skills in relation to character, time management and team building dynamics and conflict resolution. (Total tuition time: ± 60 hours)

COMPUTING SKILLS IB (CMK10BT)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Informatics)  
The aim of this subject is to extend the skills in CMK10 AT so as to improve on student’s relations and interaction capabilities that will be applicable within the dynamic ICT industry and the external environment. The student who successfully completes this subject must describe, distinguish and portray changes in terms of personality profiles, emotional intelligence, self-management, stress management and relationship management; identify and apply the notion of team dynamics; deal with conflict and understand the dynamics behind change; report on effective correspondence; produce meeting documents; conduct meetings; and demonstrate the required communication skills to develop interpersonal business relationships through means of group work. (Total tuition time: ± 60 hours)

COMPUTING SYSTEMS IA (CGS10AT)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
Introduction to hardware, operating systems, motherboards, processors, memory, hard drives, installing and supporting I/O devices, multimedia devices and mass storage, PC maintenance and troubleshooting strategies, and installing and maintenance of Windows. (Total tuition time: ± 54 hours)

COMPUTING SYSTEMS IB (CGS10BT)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Information Technology)  
Provides the foundation of data communications and local area management, OSI model and/ or TCP/IP protocol stack model, data transmission principles, media, major protocols, topologies, routing methods, introduction to networking principles and network operating system fundamentals. (Total tuition time: ± 54 hours)

DATABASE ADMINISTRATION IV (DBA401T)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
An introduction to the management of database systems. Problems in current database administration, as well as possible solutions to those problems, are discussed. The subject focuses on the design of data structures and storage techniques, tuning, distributed systems, database administration and support tools. (Total tuition time: ± 40 hours)
DATA ENGINEERING IV (DEG401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Science)
The aim of this subject is to address the issues of data representation for data mining. OBJECTIVE: On completion of this subject, students should be able to prepare and process data for meaningful interpretations. KEY TOPICS: Data engineering models, data mining tool, normalisations and redistributing variables, introduction to Neural network. (Total tuition time: ± 40 hours)

DATABASE PRINCIPLES III (DBR311T) 1 X 4-HOUR COMPUTER-BASED
(Subject custodian: Department of Computer Science)
An introduction to databases and database management principles. Theoretical principles are applied in the query language SQL, using Oracle SQL. Students' insight and skills are tested in the development, design and implementation of a relational database. (Total tuition time: ± 60 hours)

DATABASE PROGRAMMING IV (DBP401T) 1 X 4-HOUR COMPUTER-BASED
(Subject custodian: Department of Computer Science)
The focus is on PL/SQL programming using Oracle 10g/11g as a tool, the content includes PL/SQL architecture, and PL/SQL nested control structures, PL/SQL iterative structures, records, exception handling, PL/SQL tables, explicit cursors, PL/SQL procedures and functions. (Total tuition time: ± 40 hours)

DATABASE SYSTEMS IV (DBS401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Science)
This subject assumes knowledge of databases and builds on this existing database knowledge by presenting database design and technology concepts. Fundamental database concepts are covered as well as relational database models and normalisation; entity-relationship modelling; transaction management and concurrency control; distributed database management systems; object-orientated databases; client/server systems; data warehousing, data mining and also databases in electronic commerce. (Total tuition time: ± 40 hours)

DECISION SUPPORT SYSTEMS IV (DPY401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Science)
The subject focuses on decision support systems and business intelligence, human decision making processes, decision making, systems, modeling and support, decision support systems concepts, methodologies and technologies, modeling and analysis, data mining for business intelligence, artificial neural networks for data mining, text and web mining, data warehousing and the CART algorithm. (Total tuition time: ± 40 hours)

DESIGN PROJECT III (PJD301B) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Computer Systems Engineering)
The planning, design and implementation of an industry-related project by applying the knowledge obtained and the tools students were introduced to in the programme. The project should deal with an actual computer science problem and should include hardware and software elements. This subject is supported by short project management and entrepreneurship programmes. (Total tuition time: ± 10 hours)

DEVELOPMENT SOFTWARE IA (DSO15AT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Science)
AIM: To learn to solve programs using the basic programming principles, and then practically apply that knowledge in VB.NET. OBJECTIVES: To enable the student to understand problems and know how to solve them by using a computer, understand the general concepts and arithmetic used in programming, write algorithms containing sequential steps, selection and iteration control structures, applying them in VB.NET. KEY TOPICS: Basics of problem solving, solving problems using the sequential control structure, the selection control structure, the iteration control structure and these three control structures together, all applied in VB.NET. (Total tuition time: ± 72 hours)

DEVELOPMENT SOFTWARE IA (DSO17AT) 1 X 4-HOUR COMPUTER-BASED
(Subject custodian: Department of Computer Science)
AIM: To learn to solve problems using the basic programming principles, and then practically apply that knowledge in C++. OBJECTIVES: To enable the student to understand problems and know how to solve them by using a computer; understand the general concepts and arithmetic used in programming, sequence, selection and iteration control structures and a variety of built-in data types, including strings. The students are exposed to the concept of event-driven programming in a visual programming environment focusing on the development of graphical user interfaces to solve real-life practical programming problems. (Total tuition time: ± 72 hours)
DEVELOPMENT SOFTWARE IB (DSO15BT)  
1 X 4-HOUR COMPUTER-BASED  
(Subject custodian: Department of Computer Science)  
AIM: To expand on the already obtained knowledge of DSO15AT, to solve programs using the basic programming principles, and then practically apply that knowledge in VB.NET. OBJECTIVES: The knowledge obtained in DSO15AT enables the student to write an algorithm using functions and sub-procedures, write an algorithm containing one-dimensional arrays, do string manipulation and use standard functions, all applied in VB.NET. KEY TOPICS: Modularisation, functions, procedures and one-dimensional arrays, applied in VB.NET. (Total tuition time: ± 72 hours)

DEVELOPMENT SOFTWARE IB (DSO17BT)  
1 X 4-HOUR COMPUTER-BASED  
(Subject custodian: Department of Computer Science)  
AIM: To broaden the programming skills base of the student by adding the following topics: write an algorithm and applying it in VB.NET/C++ using functions and subprocedures, and write an algorithm containing one-dimensional arrays. String manipulation will be continued as well as a brief introduction to text file processing. (Total tuition time: ± 72 hours)

DIGITAL PROCESS CONTROL II (DPC201T)  
1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
Introduction to basic digital control techniques using an emulated PLC. Various realistic and practical projects are studied using the printer port as PLC. (Total tuition time: ± 80 hours)

DIGITAL PROCESS CONTROL III (DPC301T)  
1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
A detailed examination of the functional operations of a PLC, as used in factory automation. An introduction to robotics, electromechanical and sensory tactics and methods. (Total tuition time: ± 80 hours)

DIGITAL PROCESS CONTROL IV (DPC401T)  
1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
Review of PLC concepts and design techniques. Advanced PLC methods with applications in process control system design. (Total tuition time: ± 20 hours)

DIGITAL SYSTEMS I (DSY131C)  
1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
History and overview of digital systems, Number systems and codes, Binary arithmetic, Boolean algebra, Basic logic gates (AND, OR, NOT, NAND, NOR, XOR), Physical properties of logic gates(technology, fan-in, fan out, propagation delay), Networks of logic gates, 2-level networks (AND-OR, OR-AND, NAND-NAND, NOR-NOR), Elimination of timing hazards/glitches, Combinational systems, Arithmetic functions (adders, subtracters, carry look ahead), Introduction to memory elements. (Total tuition time: ± 70 hours)

DIGITAL SYSTEMS II (DSY231C)  
1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
Binary, octal, decimal and hexadecimal number systems. The basic components of digital circuits such as NOT, AND and OR gates. The more complex gate and logic functions are built by using these basic components. Boolean algebra and Karnaugh maps are used to simplify functions. Combination logic circuits, including adders, multivibrators, comparators, decoders, encoders, multiplexers and demultiplexers, binary adders, binary adder/subtractor and arithmetic logic units are also discussed. Clock timing and parallel versus serial transmission. Fan-in, fan-out, current ratings. Propagation delay. Digital logic gate ICs, TTL and CMOS logic families. Interfacing logic families. I/O voltages and noise margins. Powering logic families. Logic probes and logic pulsars. The theoretical information is supported by practical experiments in a laboratory. (Total Tuition time: ± 80 hours)

DIGITAL SYSTEMS III (DSY331C)  
1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
Asynchronous serial interfaces including synchronous and asynchronous communication protocols, UARTs, RS485, CAN, Interfacing logic families. Interfacing with microcontrollers and microprocessors. (Total tuition time: ± 70 hours)

DIGITAL SYSTEMS IV (DSY431C)  
1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
Computer interfacing, including serial and parallel interfaces, memory interfaces, and the use of microcontrollers and microprocessors. (Total tuition time: ± 70 hours)

Faculty of Information and Communication Technology  
Department of Computer Systems Engineering - 2016
DIGITAL SYSTEMS III (DSY341C) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Structure of a computer system (CPU, memory, I/O devices on a bus); CPU families used in microcontrollers (4-bit, 8-bit, 16-32-bit) and microprocessors; Basic I/O devices (timers/counters, GPIO, A/D, D/A), Polled I/O vs Interrupt driven I/O, Vectored and prioritised Interrupts, DMA transfers, MMU, Memory architectures and caches; Introduction of embedded application designs. (Total tuition time: ± 70 hours)

DISCRETE STRUCTURES I (DIC101T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Review of functions, relations and sets. Review of proposition and predicate logic. Methods of theorem proving, strong and weak induction, finite and infinite sets, set operations, introduction to computational complexity, theta and big-O notation. Combinatorics, including permutations and combinations. Graphs and trees, discrete probability and binomial distribution. (Total tuition time: ± 90 hours)

ELECTRICAL ENGINEERING I (EEN111C) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Students are introduced to the correct use of SI units and their applications, the construction and maintenance of batteries, a network analysis of direct current circuits and AC theory, a study of various measuring instruments. An investigation into the effects of magnetic lines of force, the application and use of magnetic fields, inductance and the factors affecting it, capacitors and their operation. (Total tuition time: ± 70 hours)

ELECTRICAL ENGINEERING (EXTENDED) I (FPEEN02) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
The subject consists of theoretical and practical elements. Correct use of SI units and their applications. Physical and electrical quantities. Introduction to electricity. Introduction to electrical components such as the resistor, capacitor, inductor, transistors, colour code. Basic wiring skills, basic electromagnetics, transformer, basic DC and AC circuit theory. Network analysis on DC circuits and AC theory. An investigation of the magnetic lines of force and the application of magnetic fields. Inductance in DC circuits. RLC circuits and phase differences. Capacitors, their operation and applications. The practical sessions cover soldering, resistor circuits and advanced resistor networks, transistor and capacitor applications and the application of electromagnetism. (Total Tuition time: ± 80 hours)

ELECTRONICS I (ELC111B) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Introduction to electronic components, analysis and design using measuring instruments, diodes and rectification, simple power supplies, DC operating point of single-stage bipolar junction- and field-effect transistor amplifiers and basic operational amplifier configurations. Theory supported by assessed practical experiments in a laboratory, including soldered and proto-board projects. (Total tuition time: ± 70 hours)

ELECTRONICS (EXTENDED) I (FPELC02) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Basic concepts of electronics, such as current, voltage, resistance, electrical power, capacitance, and inductance. Mathematical model of currents and voltage through and across basic electrical elements such as resistors, capacitors and inductors. Ohm’s law; The venin’s theorem, and Kirchhoff’s law. Ac and dc circuit theory. The basic concepts of electronics, such as the use of measuring instruments, the semi-conductor theory, the P-N junction, diodes and rectification, simple power supplies, the bipolar junction transistor, the field-effect transistor and operational amplifiers are studied. The theoretical presentations are supported by practical experiments in a laboratory. (Total Tuition time: ± 80 hours)

ELECTRONICS II (ELC211B) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Modelling of electronic components and their application in circuit analysis and design. Unregulated and regulated linear power supplies with transistor and operational amplifier error correction, short-circuit protection and heat sink principles. Small-signal modelling of transistor amplifiers. Theory is supported by assessed project and practical experiments in a laboratory. (Total tuition time: ± 80 hours)
EXPERIENTIAL LEARNING I (EXP1ECS)  
EXPERIENTIAL LEARNING II (EXP2ECS)  

(Subject custodian: Department of Computer Systems Engineering)

Students experience the IT- or engineering-related industry by becoming involved in its day-to-day operations.  
(Total tuition time: not available)

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F

FOUNDATION ACADEMIC AND LANGUAGE SKILLS (FPALS01)  1 X 3-HOUR PAPER  
(Subject custodian: ICT First Years’ and Foundation Unit)

AIM/PURPOSE: To provide a sound foundation for, and to enhance basic language proficiency and academic skills necessary for reading, writing and studying in an ICT environment. OBJECTIVES: Analyse, adjust and improve study skills. Apply research skills in assignments. Interpret and reflect on all available and relevant resource material in proper English. Communicate in a comprehensible and clear manner in both a general and subject-specific manner showing cultural sensitivity. Demonstrate intermediate-level proficiency in oral and written English. KEY TOPICS: Managing adjustment problems: student life, coping with diversity and change, time management, setting goals and note taking, summarising techniques, English vocabulary and grammar, reading and writing skills. (Total tuition time: ± 84 hours)

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FOUNDATION ICT MATHEMATICAL SKILLS (FPITM01)  1 X 3-HOUR PAPER  
(Subject custodian: ICT First Years’ and Foundation Unit)

AIM/PURPOSE: The focus of the subject is to ensure students have the necessary mathematical and numeracy skills needed for ICT. Students will also be introduced to abstract logical reasoning and computational thinking skills. These skills are further developed through practical exercises relating to various day-to-day problem-solving activities. OBJECTIVES: To develop the problem solving skills as well as the computational thinking skills of the student and therefore prepare the student for the programming subjects to follow. KEY TOPICS: The Number System and Basic Arithmetic; Introduction to Algebra: Expressions and Equations; Fractions and Decimals, Algebraic Fractions; Percentages; Ratio and Rate; Perimeter, Area and Volume; Measuring Systems and Units; Time, distance and speed; Cartesian Plane and Coordinates; Algebraic functions; Matrices. (Total tuition time: ± 96 hours)

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FOUNDATION INFORMATION AND SOFTWARE DEVELOPMENT SKILLS (FPIDS01)  1 X 3-HOUR PAPER  
(Subject custodian: ICT First Years’ and Foundation Unit)

AIM/PURPOSE: To prepare students for computer programming by developing logical, critical and lateral thinking skills. OBJECTIVES: To develop the students' logical thinking and problem-solving skills as preparation for programming. Abstract logical reasoning and computational thinking skills will therefore be used to solve problems. KEY TOPICS: Brain teasers as introduction to problem-solving; analysis and solving of word problems; solving of various day-to-day problems; introduction to algorithmic problem solving - sequence, basic selection, basic repetition steps; statistics; financial matters. (Total tuition time: ± 96 hours)

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FOUNDATION PRESENTATION AND REPORTING SKILLS (FPPRS01)  1 X 3-HOUR PAPER  
(Subject custodian: ICT First Years’ and Foundation Unit)

AIM/PURPOSE: To provide a sound foundation for, and to enhance basic language proficiency skills necessary for reading and writing in an ICT environment with specific reference to presentations and reports. OBJECTIVES: Preparation of effective and professional reports and Powerpoint presentations. Interpret, relate and reflect on all available and relevant resource material in proper English. Communicate orally in a comprehensible and clear manner specifically when presenting various IT topics, demonstrate intermediate-level proficiency in written English. KEY TOPICS: Conflict management; Problem solving; Interpersonal relationships; Stress management; Communication theory; Listening skills; Public speaking and Presentation skills; and Report writing. (Total tuition time: ± 84 hours)

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FUNCTIONAL MANAGEMENT (FUM101T)  1 X 3-HOUR PAPER  
(Subject custodian: Department of Informatics)

This subject provides concepts and frameworks for understanding the potential impact of information technology (IT) on business strategy and performance. The subject focuses on the implications of increased digitisation for defining business strategies and operating models, and explores the roles of both general managers and IT executives in using IT to achieve operational excellence and business agility. On successful completion of this subject, the student will be able to develop an IT Strategy for a digital enterprise; evaluate how IT will shape future businesses and the contribution of enterprise architecture; evaluate the risk and benefits of digitised processes and compare strategically whether to perform those processes internally or externally; assess the impact of globalisation; motivate why some firms are better able to convert their IT investments into business value; and implement steps to ensure effective IT decision making. (Total tuition time: ± 54 hours)
GAMES PROGRAMMING IIA (GPM20AT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Students are introduced to games programming techniques and learn how to apply them practically. The emphasis is placed on the design and integration of artificial intelligence engineering for the purpose of controlling virtual-world objects. (Total tuition time: ± 80 hours)

GAMES PROGRAMMING IIB (GPM20BT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Advanced games programming techniques are applied practically. The application of concepts such as 3D graphics and network synchronisation is explored. The focus is on 3D virtual-world object AI manipulation and more advanced AI techniques. (Total tuition time: ± 80 hours)

HARDWARE DESIGN IV (HWD401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
An introduction to the methodology of computer hardware design. The problems of current computer hardware design, as well as possible solutions to these problems, are discussed. The focal points are embedded design, PC design and interfacing, the design of logic devices and the use of software support tools for design. (Total tuition time: ± 20 hours)

HUMAN COMPUTER INTERFACE DESIGN IV (HCI401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Science)
Students gain knowledge and skills required for designing interactive products to support the way they communicate and interact in their everyday and working life. Students should know how to generate user requirements, design, evaluate and implement interactive computing systems for human use with other human factors and ergonomics. The subject's main topics include: the use of general HCI principles to design screens for Windows application and for the Web; understanding users and user-centered design; identifying needs and establishing requirements; doing conceptual design, prototyping and construction of human computer interfaces for different types of users. (Total tuition time: ± 40 hours)

INDUSTRIAL PROJECT IV (IPR410B) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Computer Systems Engineering)
The first month's contact hours are dedicated to principles of research. Subsequent sessions are followed by the planning, design and implementation of an industrial-related project in which the knowledge acquired in other subjects is applied. (Total tuition time: ± 100 hours).

INDUSTRY EXPOSURE IIIA (IDC30AT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Informatics)
This subject enables students to gain insight into organisational characteristics and behaviour, personal and technological entrepreneurship; other issues include ethical and professional conduct in the workplace. The subject will also increase their knowledge of individual behavioural aspects, namely biographical characteristics, values attitudes, job satisfaction and personality and emotions, perceptions and individual decision making; broaden their understanding of the administrative structures of organisations, bureaucratic behaviour in global and diverse context; and develop interpersonal skills in applying and integrating contemporary theories of motivation. (Tuition time: ± 60 hours)

INDUSTRY EXPOSURE IIIB (IDC30BI) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Computer Systems Engineering)
Industry Exposure IIIB is career-orientated and is aimed at integrating academic training with practical skills, as demanded by industry. Students work in industry for six months. (No formal tuition)
INFORMATION AND TECHNOLOGY MANAGEMENT IV (ITA401T) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Informatics)*
This subject provides concepts and frameworks for understanding the potential impact of information technology (IT) on business strategy and performance. The subject focuses on the implications of increased digitisation for defining business strategies and operating models, and explores the roles of both general managers and IT executives in using IT to achieve operational excellence and business agility. On successful completion of this subject, the student will be able to develop an IT Strategy for a digital enterprise; evaluate how IT will shape future businesses and the contribution of enterprise architecture; evaluate the risk and benefits of digitised processes and compare strategically whether to perform those processes internally or externally; assess the impact of globalisation; motivate why some firms are better able to convert their IT investments into business value; and implement steps to ensure effective IT decision making. (Total tuition time: ± 54 hours)

INFORMATION SECURITY IV (ITU401T) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Information Technology)*
Encryption and decryption algorithms, protocols, operating systems, databases and network security. (Total tuition time: ± 40 hours)

INFORMATION SYSTEMS IA (ISY13AT) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Computer Science)*
Students are introduced to the fundamentals of computers and information systems, computer organisation and data processing. This subject covers a vast spectrum of information, information systems and technology which includes teaching students to become computer literate, understanding parts of the computer, the Use of Internet, building Application Software, Networking and security in the business world. (Total tuition time: ± 60 hours)

INFORMATION SYSTEMS IB (ISY13BT) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Computer Science)*
The basic concepts of system development, data management, management information systems, ethics, privacy and security, purchasing and maintaining microcomputers, number systems and binary logic. (Total tuition time: ± 54 hours)

INFORMATION TECHNOLOGY SKILLS IA (ITS11AT) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Informatics)*
Thinking skills, learning styles, study skills, research skills, presentation skills, legal issues in IT, communication skills, cultural sensitivity. (Total tuition time: ± 36 hours)

INFORMATION TECHNOLOGY SKILLS IB (ITS11BT) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Informatics)*
Personality types, emotional intelligence, self-management, stress and time management, team dynamics, conflict, negotiation and assertiveness, dealing with change, relationship management. (Total tuition time: ± 54 hours)

INTELLIGENCE PROGRAMMING IV (ITB401T) CONTINUOUS ASSESSMENT  
*(Subject custodian: Department of Computer Science)*
A study of language assessment, artificial intelligence programming and new trends. (Total tuition time: ± 40 hours)

INTELLIGENT INDUSTRIAL SYSTEMS IIA (IIS20AT) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Computer Systems Engineering)*
A study of system software assembly language and practical projects, using the printer port as PLC. (Total tuition time: ± 80 hours)

INTELLIGENT INDUSTRIAL SYSTEMS IIB (IIS20BT) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Computer Systems Engineering)*
A more detailed study of the factory process to determine the controls regarding efficiency and safety of the environment that will have to be placed in the process. (Total tuition time: ± 20 hours)

INTELLIGENT INDUSTRIAL SYSTEMS III (IIS301T) 1 X 3-HOUR PAPER  
*(Subject custodian: Department of Computer Systems Engineering)*
Students are introduced to the world of mobile robotics by implementing behaviour-based concepts to control an autonomous vehicle. (Total tuition time: ± 80 hours)
INTELLIGENT INDUSTRIAL SYSTEMS IV (IIS401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
A study of advanced PLC concepts. (Total tuition time: ± 20 hours)

IT ELECTRONICS IIA (IIE20AT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Basic components of digital circuits, such as NOT, AND and OR gates. The more complex gate and logic functions are built by using these basic components. Boolean algebra and Karnaugh maps are used to simplify functions. Combination logic circuits, including adders, multi-vibrators, comparators, decoders, encoders, multiplexers and de-multiplexers, are discussed. Binary, octal, decimal and hexadecimal number systems are included. Theoretical presentations are supported by practical experiments in a laboratory. (Total tuition time: ± 80 hours)

IT ELECTRONICS IIB (IIE20BT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
Basic components of sequential circuits, namely latches and flip-flops. More complex memory components, such as adders and registers, are derived from the basic components. Different analogue-to-digital and digital-to-analogue converters are discussed. In the introduction to microprocessor systems, the central processor, memory, ports and interrupts are dealt with. (Total tuition time: ± 80 hours)

IT ELECTRONICS IIIA (IIE30AT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
The student should show a conceptual understanding of microcomputer systems, including microprocessors, microcomputers, microcontrollers and the MCS-51 family. Memory devices and design. Microcomputer programming. The MCS-51 instruction set, the use of serial and parallel ports, interrupts and timers (counters). The student should be able to perform a variety of tasks relating to the theoretical aspect of the subject, such as operating equipment, programming the 8031 and representing findings in a report. (Total tuition time: ± 80 hours)

IT ELECTRONICS IIIB (IIE30BT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Computer Systems Engineering)
The development of logic circuits using VHDL. The student is guided through the complete design cycle of a logic circuit using the prescribed development environment. This involves the development of the logic circuit in VHDL and the implementation onto target hardware. The development of software consists of problem setting, state diagrams, timing diagram analysis and the writing of the VHDL. The next phase is the simulation of the program. The final phase consists of the downloading onto silicon and de-bugging of the software. (Total tuition time: ± 80 hours)

IT MATHEMATICS IA (ITT10AT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)
Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 90 hours)

IT MATHEMATICS IB (ITT10BT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)

KNOWLEDGE MANAGEMENT IV (KNM401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Informatics)
This subject is aimed at extending the skills of the students by introducing students to the various Knowledge Management concepts, design, implementation and management of KNM systems, as well as an overview of challenges that organisations face during the implementation of KNM initiatives. As the economy increasingly moves towards a knowledge-based economy, the ability to manage knowledge becomes a matter of competitive survival for organisations. Principles and practice of knowledge management in organisations, therefore, become the focal point of this subject. On completion of the subject, students will be able to identify and apply the theoretical and practical knowledge management principles to address management pitfalls, manage these knowledge management challenges; and implement the relevant knowledge management steps to ensure success within the context of the organisation. (Total tuition time: ± 54 hours)
LOGIC DESIGN III (LOD311B) 1 X 3-HOUR PAPER

(Subject custodian: Department of Computer Systems Engineering)

The development of logic circuits using VHDL. The student is guided through the complete design cycle of a logic circuit using the prescribed development environment. This involves the development of the logic circuit in VHDL and the implementation onto target hardware. The development of software consists of problem setting, state diagrams, timing diagram analysis and the writing of the VHDL. The next phase is the simulation of the program. The final phase consists of the downloading onto silicon and de-bugging of the software. (Total tuition time: ± 80 hours)

M

MATHEMATICAL APPLICATIONS III (MMA301T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Mathematics and Statistics)


MATHEMATICAL APPLICATIONS IV (MMA401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Mathematics and Statistics)


MATHEMATICS I (MAT141F) 1 X 3-HOUR PAPER

(Subject custodian: Department of Mathematics and Statistics)

Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 90 hours)

MATHEMATICS (EXTENDED) I (FPMAT04) 1 X 3-HOUR PAPER

(Subject custodian: Department of Mathematics and Statistics)


MATHEMATICS II (MAT251F) 1 X 3-HOUR PAPER

(Subject custodian: Department of Mathematics and Statistics)


N

NETWORK SYSTEMS II (NSY211T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Information Technology)

This subject covers various aspects and technologies involved in data communications and networking. Students are introduced to topics, such as network topologies, transmission fundamentals, contention protocols, data compression techniques, data security and integrity, flow-control protocols and the various IEEE standards. The subject is aimed at giving students a solid understanding of local area networks (LANs), although aspects of wide area networks (WANs) are also covered briefly. (Total tuition time: ± 80 hours)

NETWORK SYSTEMS III (NSY311T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Information Technology)

This subject covers the TCP/IP protocol suite in detail, including protocols such as IPv4, IPv6, TCP, UDP, ICMP, DNS, FTP. Other networking concepts like packet addressing, forwarding, and routing are also covered. The student will be equipped with skills to plan IP addresses using VLSM and to configure networks. The practical component concentrates on basic design of data networks, IP address planning, creating VLANs, configuration of routers using dynamic protocols like RIP, OSPF, etc. (Total tuition time: ± 80 hours)
NETWORK SYSTEMS IV (NSY401T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Information Technology)  
Wireless networks, which include spread-spectrum analyses, roaming and hand-over.  
(Total tuition time: ± 36 hours)

NETWORKS IV (NWS421T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Information Technology)  
A study of advanced network management. (Total tuition time: ± 36 hours)

NEW TECHNOLOGY PROGRAMMING IV (NTP401T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
AIM/PURPOSE: To expose students to a programming paradigm not covered by typical application design strategies. OBJECTIVE: The student must be able to identify mobile agents from similar technologies, create a mobile agent solution, understand the privacy and security concerns related to mobile agents and theorise on improvements which can be brought to bear on this paradigm. KEY TOPICS: Software agents, Intelligent Agents, AI, Relocatable code, RPC’s, RMI’s, Process Migration, Execution environments, Killer Apps. (Total tuition time: ± 40 hours)

OPERATING SYSTEMS III (OSY301T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
The development of the operating system as a control programme and resource manager. Principles to take into consideration when designing a modern operating system, such as memory management, process management, scheduling and input/output. The LINUX operating system. CPU scheduling, parallelism, secondary memory management, LINUX applications. (Total tuition time: ± 80 hours)

OPERATING SYSTEMS IV (OSY431T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
The main objective of this subject is to design and program a simple operating system (using layered technology), programmed in Assembler, C or C++ programming languages. The simple operating system will have a programmed boot process (written in Assembler only), a kernel (can be written in Assembler), C or C++ combination), file system (can be written in Assembler, C or C++ combination), and command interpreter or shell (can be written in Assembler, C or C++). Students should have prior (and solid) knowledge of operating systems and C or C++ programming language before embarking on this subject. The subject starts off with a revision of Assembler programming only. No revision of C or C++ is done, as this is required from students. When time permits, advanced concepts (in theory only), such as memory management, process management and process scheduling, as well as types of operating systems, such as distributed, parallel, embedded and/or real-time operating systems, are evaluated theoretically. (Total tuition time: ± 26 hours)

OPERATIONAL RESEARCH III (ORS311T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Systems Engineering)  
AIM/PURPOSE: To introduce students to the scientific approach to solving management science problems. OBJECTIVES: To be introduced to linear programming processes, Network modules, queuing and decision analysis, project scheduling, decision theory, forecasting, queuing models, simulation, inventory control. KEY TOPICS: Linear Programming, distribution and assignment problems, Network modules, project scheduling. (Total tuition time: ± 72 hours)

PRINCIPLES OF RESEARCH IV (PAJ411E) CONTINUOUS ASSESSMENT  
(Subject custodian: Department of Computer Systems Engineering)  
This subject prepares students to obtain the necessary skills in doing proper research to deliver a proper researched report. The subject also looks at the basics of paradigms, methodologies, and techniques of research in the behavioural sciences, and their application in information technology. On completion of the subject, students will be able to apply the basic paradigms, methodologies and techniques; apply different methodologies in different scenarios; recommend which data collection technique is necessary; apply correct research methods in the ICT environment, and apply the appropriate tools for collecting data in the ICT environment. Project topics and research questions in line with the department niche area. (Total tuition time: ± 54 hours)
PROGRAMMING I (PGG111T)  1 X 4-HOUR COMPUTER-BASED

(Subject custodian: Department of Computer Science)

This subject accommodates students from a broad spectrum of disciplines and interests. It includes a theoretical as well as a practical component. AIM: This subject provides overview coverage of introductory C++ programming. OBJECTIVE: This is a career-focused information and communication technology qualification that will enable a graduate to design and create ICT software solutions using basic object-orientated concepts and technologies. KEY TOPICS: Basic C++ programs, classes, problem solving, OOP, methods, data manipulation, arithmetic operators, decision structures, loop structures, functions. (Total tuition time: ± 72 hours)

PROGRAMMING (EXTENDED) I (FPPGG01)  1 X 4-HOUR COMPUTER-BASED

(Subject custodian: Department of Computer Science)

AIM/PURPOSE: To enable students to understand and be able to solve problems with the help of the Object orientated C++ programming language. OBJECTIVE: The student must be competent in problem-solving skills using C++ as a tool. KEY TOPICS: Classes and objects, selection and looping structures, library functions, one-dimensional arrays, basic technical programming. An introduction to Object-Oriented Programming (OOP), basic control structures and stream manipulation. (Total Tuition time: ± 80 hours)

PROGRAMMING II (PGG211T)  1 X 4-HOUR COMPUTER-BASED

(Subject custodian: Department of Computer Science)

AIM/PURPOSE: To cover advanced OOP (Object Oriented Programming) principles, including inheritance and abstract programming, as well as other advanced concepts in C++. OBJECTIVES: To enable students to be able to create and manipulate one- and two-dimensional arrays, manipulate a collection of characters as strings; Read and write data from text files; Apply advanced class features. KEY TOPICS: One- and Two-Dimensional Arrays; Strings and Character Manipulation; Text Files, Additional Class Features; Inheritance; Polymorphism; Dynamic Memory Allocation. (Total tuition time: ± 72 hours)

PROGRAMMING III (PGG311T)  1 X 4-HOUR COMPUTER-BASED

(Subject custodian: Department of Computer Science)

AIM: The student is introduced to a modern C++ Rapid Application Development Tool for Win32 with the purpose of creating a human interface for pre-engineered C and assembly applications. OBJECTIVE: The student must be able to manipulate standard Windows components, graphical images, multiple forms, grid structures, selection structures, menu systems and dynamically created objects. The integration of C as well as assembly language routines including pre-manufactured as well as self-manufactured objects. A medium sized C++ GUI project is expected to be completed towards the end of the semester. KEY TOPICS: Advanced OOP, C++, C, ASM, dynamic object instantiation, event-driven programming, Back-end classes, strategic solution planning, systematic program design, flat file data handling. (Total tuition time: ± 72 hours)

PROJECT IV (PJG401C)  1 X 3-HOUR PAPER

(Subject custodian: Department of Informatics)

This subject aims to enhance students’ knowledge of Project Management. The student who successfully completes this subject must be able to apply project management skills to any IT related project. On completion of the subject, students will be able to define, facilitate, document, and manage the project requirements for information technology project, construct the relevant template based on industry-accepted standards, apply the appropriate techniques that are geared to significantly improve requirements, collection and documentation; and explore the roles of various players (project leaders, business analysts, client advocates, and customers) in determining the success of the requirements definition for IT projects. (Total tuition time: ± 54 hours)
PROJECTS I (PJT101B)  
CONTINUOUS ASSESSMENT  
(Subject custodian: Department of Computer Systems Engineering)  
Use of instruments and equipment, such as multimeter, oscilloscope, power supply and function generator. Measurement of alternating and direct current, voltage and frequency. Component identification, application, measurement and testing. Reading basic schematic diagrams. Construction and testing of an electronic project. Stripping and insulating conductors. Wiring and placing components. Basic health and safety. Laboratory policies and procedures. Basic hand skills such as soldering, metal working including drilling. Building of a project into an enclosure. Web programming using appropriate Web system engineering environment such as http/html/php/MySqL/FORMS, which includes direct socket connections. (Total tuition time: ± 70 hours)

SOFTWARE ENGINEERING III (SFE311T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
The purpose of this subject is to present the essential knowledge and skills needed to solve the customer and the user problems through the use of domain analysis which helps to have the background information as well as to gather and validate requirements. This subject enables students to learn how to apply software engineering skills into real life situation by understanding what constitutes a good requirement, applying fundamental design principles, gaining in-depth knowledge of object-oriented development using Unified Modeling Language, translating requirements and designs into good quality programs and to test the programs effectively. (Total tuition time: ± 60 hours)

SOFTWARE REQUIREMENTS AND DESIGN IV (SRN401T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
Software engineering subject that concentrate on software requirements, software design, software construction and software testing knowledge area in addition to software project management. (Total tuition time: ± 40 hours)

SOFTWARE SYSTEMS IV (SWS401T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
The subject focuses on the techniques for maintenance, software configuration management, and software engineering process and software quality. (Total tuition time: ± 40 hours)

SYSTEMS ANALYSIS II (SYA201T) 1 X 3-HOUR PAPER  
(Subject custodian: Department of Computer Science)  
A detailed study of the five phases of the systems development life cycle (SDLC), giving the student an in-depth understanding of how information technology supports operational and business requirements in today's competitive environment. The importance of communication, economic analysis and project planning skills in all phases of the SDLC is discussed. (Total tuition time: ± 60 hours)

SYSTEM SOFTWARE IA (SSF11AT) 1 X 3-HOUR PAPER  
(Subject custodians: Departments of Computer Systems Engineering)  
Basic functions of operating systems are dealt with by DOS and Windows platforms. (Total tuition time: ± 54 hours)

SYSTEM SOFTWARE IB (SSF11BT) 1 X 3-HOUR PAPER  
(Subject custodians: Departments of Information Technology)  
This subject deals with different aspects and technologies in data communication and networks, including concepts such as network architecture, transmission, protocols and a number of IEEE standards. (Total tuition time: ± 54 hours)

TECHNICAL PROGRAMMING I (TPG111T) 1 X 4-HOUR COMPUTER-BASED  
(Subject custodian: Department of Computer Science)  
AIM: To introduce students to object-orientated concepts and principles using the C++ programming language. OBJECTIVE: Students must be able to create programs that are in accordance with Object-Orientated Programming (OOP) principles, use their own and pre-defined classes in programs, use structures such as control and interactive, use iterative statements in a program, manipulate strings and characters in a program, use arrays in a program, use inheritance, polymorphism and exception handling mechanisms, and understand graphical user interface design. KEY TOPICS: Classes, methods, objects, selection structures, loops, strings, arrays, file manipulations, inheritance, polymorphism, exception handling. (Total tuition time: ± 140 hours)
TECHNICAL PROGRAMMING IA (TPG11AT) 1 X 4-HOUR COMPUTER-BASED

(Subject custodian: Department of Computer Science)

AIM/PURPOSE: Students should understand and be able to solve problems with the help of the Object Orientated C++ Programming language. OBJECTIVE: The student must be competent in problem-solving skills and apply the C++ language as a powerful problem-solving tool, have good knowledge of problem-solving skills and good programming style, create classes and objects, develop methods and functions using value parameters and reference parameters, include the selection structure and loop structures in programming, use library functions, especially mathematical library functions, and create personal library. Use one-dimensional array to organise memory while solving problems using the object orientated C++ programming language.

KEY TOPICS: Classes and objects, selection and looping structures, library functions, one-dimensional arrays.

(Total tuition time: ± 78 hours)

TECHNICAL PROGRAMMING IB (TPG11BT) 1 X 4-HOUR COMPUTER-BASED

(Subject custodian: Department of Computer Science)

AIM/PURPOSE: To cover advanced OOP (object-oriented programming) principles, including inheritance and abstract programming, as well as other advanced concepts in C++. OBJECTIVES: To enable students to create and manipulate one- and two-dimensional arrays, manipulate a collection of characters as strings, read and write data from text files, apply advanced class features. KEY TOPICS: One- and two-dimensional arrays, strings and character manipulation, text files, additional class features, inheritance, polymorphism, dynamic memory allocation.

(Total tuition time: ± 80 hours)

TECHNICAL PROGRAMMING II (TPG201T) 1 X 4-HOUR COMPUTER-BASED

(Subject custodian: Department of Computer Science)

AIM/PURPOSE: The student is introduced to a modern rapid application development tool for Win32. with the purpose of solving every day programming challenges. Analyse and design. OBJECTIVE: Analyse and design software solutions to industry related information technology problems, utilise the required technical skills to effectively implement the designed solutions in a distributed IT environment. KEY TOPICS: Advanced OOP, C#, dynamic object instantiation, event-driven programming, back-end classes, strategic solution planning, systematic programme design, flat file data handling. Relational database application development, defensive programming, SQL implementation, triggers, events, implementation of data structures, advanced methods in data aware application development.

(Total tuition time: ± 80 hours)