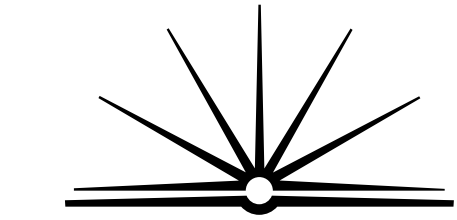

Information Processes and Technology

Stage 6

Syllabus

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Contents

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1 The Higher School Certificate Program of Study

The purpose of the Higher School Certificate program of study is to:

- provide a curriculum structure which encourages students to complete secondary education;
- foster the intellectual, social and moral development of students, in particular developing their:
  - knowledge, skills, understanding and attitudes in the fields of study they choose
  - capacity to manage their own learning
  - desire to continue learning in formal or informal settings after school
  - capacity to work together with others
  - respect for the cultural diversity of Australian society;

- provide a flexible structure within which students can prepare for:
  - further education and training
  - employment
  - full and active participation as citizens;

- provide formal assessment and certification of students' achievements;

- provide a context within which schools also have the opportunity to foster students' physical and spiritual development.

2 Rationale for Information Processes and Technology in the Stage 6 Curriculum

Information systems and the role they play in society have increased in significance in recent years. The raw ingredients — information, information technology and participants — combine to form information processes within information systems. The area of information systems has provided major jobs growth for both women and men in recent years. Moreover, fields which have not traditionally been associated with computers — but in which processing information is a vital function — are emerging as exciting new areas of employment. These include music, the arts, science and technology as well as new and fast-growing industries that use multimedia.

The Information Processes and Technology Stage 6 course, teaches students about information-based systems. It covers the processes of collecting, organising, analysing, storing and retrieving, processing, transmitting and receiving, and displaying, as well as the technologies that support them. With this background, students will be well placed to adapt to new technologies as they emerge.

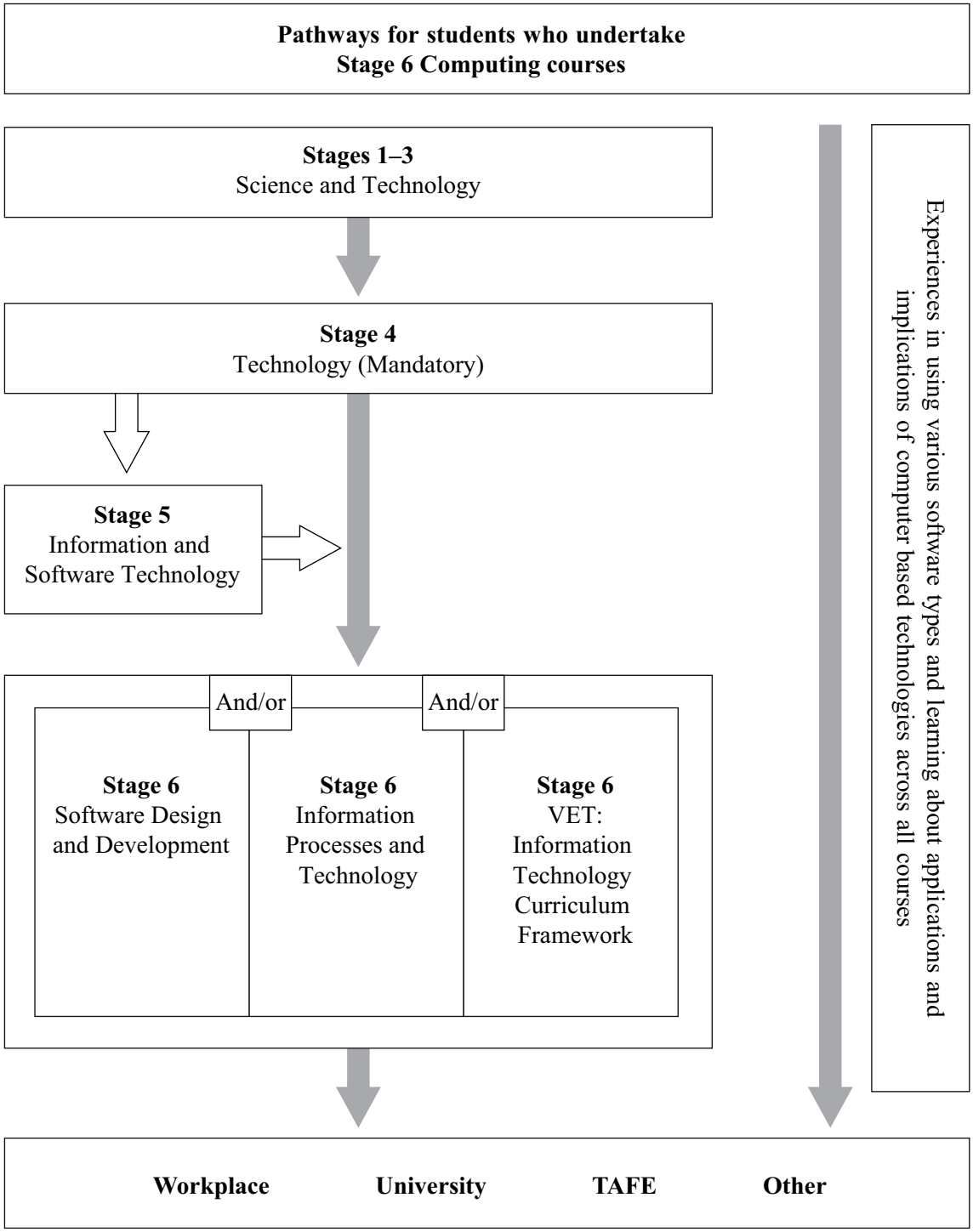
Through this course, students will gain a good working knowledge of:
- the key concepts of data, information and systems
- the interactive nature of effective information-based systems
- available and emerging information technologies
- the social and ethical issues associated with the use of information technology and information systems, such as equity and access, privacy, freedom of information and copyright
- the communication, personal and team skills necessary to ensure that an information systems solution is appropriate for the needs of the users
- related issues such as project management, documentation and user interfaces.

On successful completion of this course, students will be able to:
- select the most appropriate technology for a given situation
- design and implement an information-based system using a creative and methodical approach.

This course complements another Stage 6 course, Software Design and Development, which focuses on the design and development of software solutions.

Students who successfully complete Information Processes and Technology will be confident, competent and discriminating users of information processes and information technology. They will appreciate the nature of information, its ethical use and its impact on many aspects of life. As such, they will be well prepared to pursue further education and employment across an especially wide range of contexts.

3 Continuum of Learning for Information Processes and Technology Stage 6 Students



4 Aim

Information Processes and Technology Stage 6 is designed to enable students to become confident, competent, discriminating and ethical users of information technologies, to possess an understanding of information processes and to appreciate the effect of information systems on society.

5 Objectives

Students will develop:

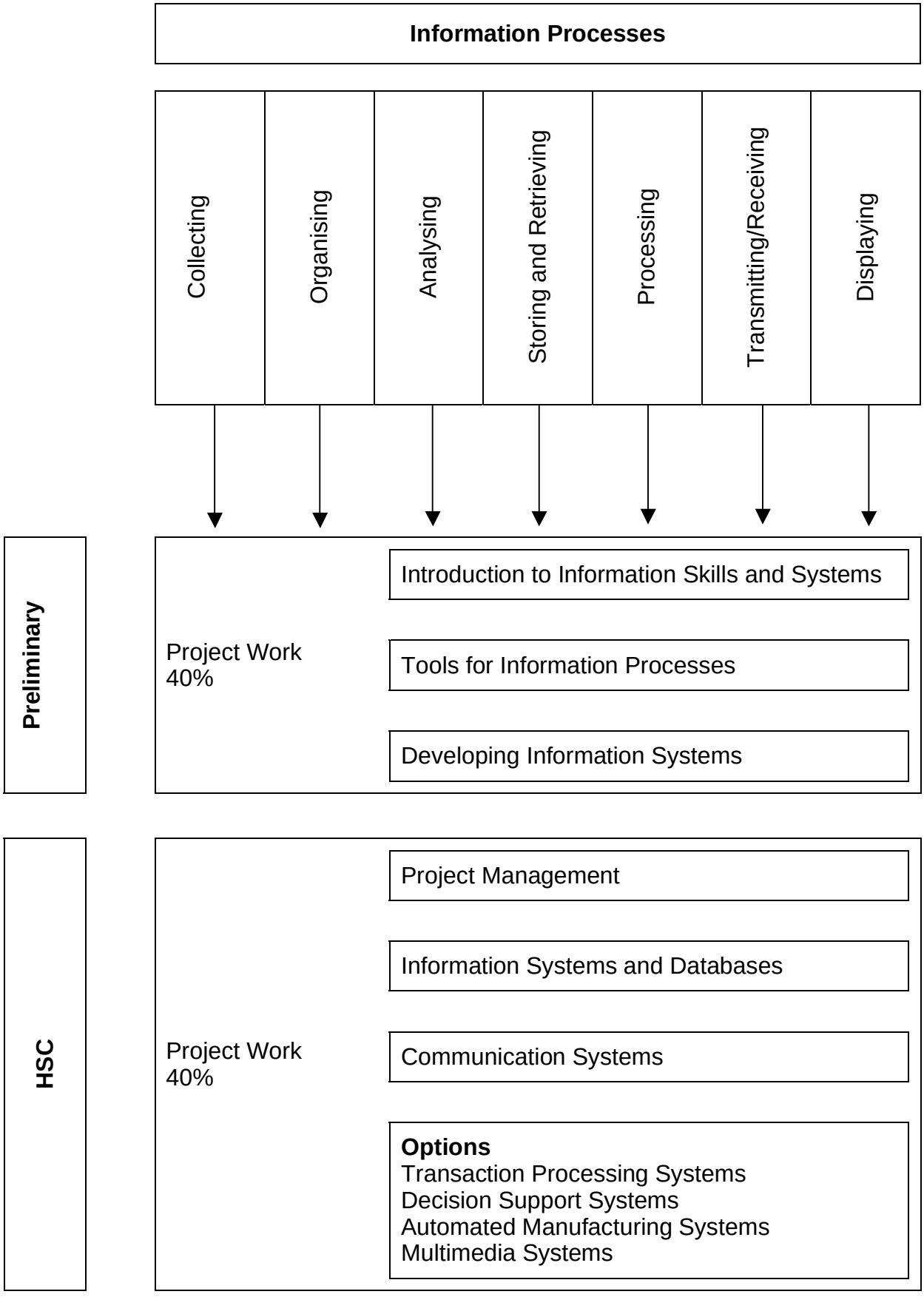
1. knowledge and understanding of the nature and function of information systems
2. knowledge and understanding of interrelationships among information processes
3. an understanding and appreciation of social and ethical issues pertaining to information systems, technologies and processes
4. an understanding and appreciation of the emerging nature of information systems, technologies and processes within a historical context
5. skills in the discriminatory selection and ethical use of appropriate resources and tools to support information systems
6. skills and techniques to creatively and methodically plan, design and implement information systems to address needs
7. skills in management, communication and teamwork in relation to individual and group activities.

6 Course Structure

The arrangement and relationship between components of the Preliminary course and the HSC course for Information Processes and Technology Stage 6 are outlined below. The percentage values refer to indicative course time. A minimum of 40% course time is to be devoted to the integration of content into project work in both the Preliminary and HSC courses. It is also expected that a significant proportion of time will be devoted to integrated practical activities.

Preliminary Course	HSC Course
Introduction to Information Skills and Systems (20%) • Information systems in context • Information processes • The nature of data and information • Reasons for digital data representation • Social and ethical issues **Tools for Information Processes (50%)** • Collecting • Organising • Analysing • Storing and Retrieving • Processing • Transmitting and Receiving • Displaying • Integration of processes **Developing Information Systems (30%)** • Traditional stages in developing a system • Complexity of systems • Roles of people involved in systems development • Social and ethical issues	**Project Management (20%)** • Techniques for managing a project • Understanding the problem • Planning • Designing solutions • Implementing • Testing, evaluating and maintaining **Information Systems and Databases (20%)** • Information systems • Database information systems • Organisation • Storage and retrieval • Other information processes • Issues related to information systems **Communication Systems (20%)** • Characteristics of communication systems • Examples of communication systems • Transmitting and receiving in communication systems • Other information processes in communication systems • Managing communication systems • Issues related to communication systems **Option Strands (40%)** Students will select TWO of the following options: • Transaction Processing Systems • Decision Support Systems • Automated Manufacturing Systems • Multimedia Systems

Conceptual Model of the Preliminary and HSC Courses



7 Objectives and Outcomes

7.1 Table of Objectives and Outcomes

Objectives Students will develop:	**Preliminary Outcomes** A student:	**HSC Outcomes** A student:
1. knowledge and understanding of the nature and function of information systems	P1.1 describes the nature of information processes and information technology P1.2 classifies the functions and operations of information processes and information technology	H1.1 applies and explains an understanding of the nature and function of information technologies to a specific practical situation H1.2 explains and justifies the way in which information systems relate to information processes in a specific context
2. knowledge and understanding of interrelationships among information processes	P2.1 identifies and describes the information processes within an information system P2.2 recognises and explains the interdependence between each of the information processes	H2.1 analyses and describes a system in terms of the information processes involved H2.2 develops and explains solutions for an identified need which address all of the information processes
3. an understanding and appreciation of social and ethical issues pertaining to information systems, technologies and processes	P3.1 identifies and describes social and ethical issues	H3.1 evaluates and discusses the effect of information systems on the individual, society and the environment H3.2 demonstrates and explains ethical practice in the use of information systems, technologies and processes

Objectives Students will develop:	**Preliminary Outcomes** A student:	**HSC Outcomes** A student:
4. an understanding and appreciation of the emerging nature of information systems, technologies and processes within a historical context	P4.1 describes the historical development of information systems and relates these to current and emerging technologies	H4.1 proposes and justifies ways in which information systems will meet emerging needs
5. skills in the discriminatory selection and ethical use of appropriate resources and tools to support information systems	P5.1 selects and ethically uses computer based and non-computer based resources and tools to process information	H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects H5.2 assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices
6. skills and techniques to creatively and methodically plan, design and implement information systems to address needs	P6.1 analyses and describes an identified need P6.2 generates ideas, considers alternatives and develops solutions for a defined need	H6.1 analyses situations, identifies needs, proposes and then develops solutions H6.2 selects, justifies and applies methodical approaches to planning, designing or implementing solutions
7. skills in management, communication and teamwork in relation to individual and group activities	P7.1 recognises, applies and explains management and communication techniques used in individual and team-based project work P7.2 uses and justifies technology to support individuals and teams	H7.1 implements and explains effective management techniques H7.2 uses methods to thoroughly document the development of individual and team projects

7.2 Key Competencies

Information Processes and Technology Stage 6 provides a context within which to develop general competencies considered essential for the acquisition of effective, higher-order thinking skills necessary for further education, work and everyday life. Key competencies are embedded in the *Information Processes and Technology Stage 6 Syllabus* to enhance student learning. The key competencies of

- ***collecting, analysing and organising information***
- ***communicating ideas and information***
- ***using technology***

reflect core processes of information systems inquiry and are explicit in the objectives and outcomes of the syllabus.

The other key competencies are developed through the methodologies of the syllabus and through classroom pedagogy. Students work as individuals and as members of teams in both Preliminary and HSC projects, to conduct investigations on information systems, and through this, the key competencies of

- ***planning and organising activities***
- ***working with others and in teams***

are developed. When students construct Gantt charts or analyse statistical evidence, they are developing the key competency

- ***using mathematical ideas and techniques.***

Finally, the exploration of issues and investigation of the nature of problems associated with information systems contributes towards the students' development of the key competency of

- ***solving problems.***

8 Content: Information Processes and Technology – Preliminary Course

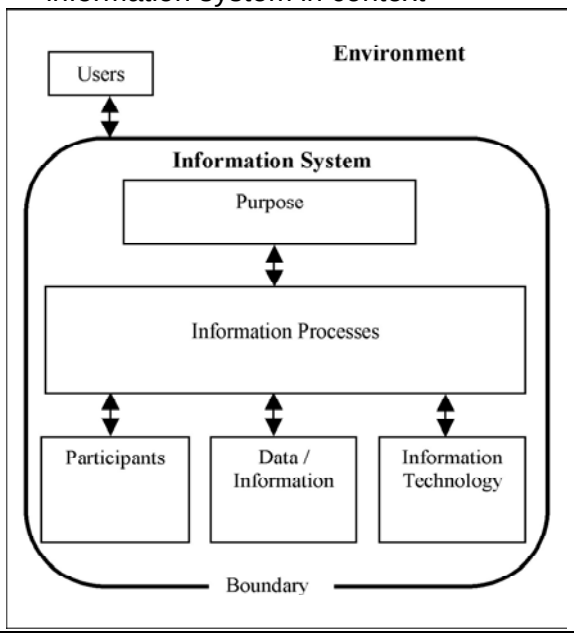
8.1 Introduction to Information Skills and Systems

An information system has a purpose in that it addresses the need(s) of a group or an individual. It performs the information processes of collecting, organising, analysing, storing/retrieving, processing, transmitting/receiving and displaying. Information processes involve computer and non-computer activities. For the processes to occur, participants (people), data/information and information technologies (hardware and software) are required. The purpose for an information system defines who it is for and what they need. Information systems give rise to ethical issues for people directly and indirectly involved with them. They have a social impact on the environment in which they operate.

Outcomes

A student:

P1.1 describes the nature of information processes and information technology
P1.2 classifies the functions and operations of information processes and information technology
P2.1 identifies and describes the information processes within an information system
P2.2 recognises and explains the interdependence between each of the information processes
P3.1 identifies and describes social and ethical issues
P4.1 describes the historical developments of information systems and relates these to current and emerging technologies.

Students learn about:	**Students learn to:**
information systems in context • diagrammatic representation of an information system in context  	• diagrammatically represent a given scenario that involves an information system

Students learn about:	**Students learn to:**
• the environment – everything that influences and is influenced by the information system • the purpose – a statement identifying who the information system is for and what it needs to achieve • who the information system is for includes individuals and organisations • the information system – a set of information processes requiring participants, data/information and information technology built to satisfy a purpose • information processes – computer based and non-computer based activities • information technology – hardware and software used in information processes • data – the raw material used by information processes • information – the output displayed by an information system • user – a person who views or uses the information output from an information system • participant – a special class of user who carries out the information processes within an information system	• explain how an information system impacts on its environment and how it in turn impacts on the information system • describe the environment and purpose of an information system for a given context • explain how a given need can be supported by an information system • describe an information system in terms of its purpose • for a given scenario, identify the people who are: – in the environment – users of the information system – participants in the information system
information processes • collecting – the process by which data is entered into or captured by a computer system, including: – deciding what data is required – how it is sourced – how it is encoded for entry into the system • organising – the process by which data is structured into a form appropriate for the use of other information processes such as the format in which data will be represented • analysing – the process by which data is interpreted, transforming it into information • storing and retrieving – the process by which data and information is saved and accessed later • processing – a procedure that manipulates data and information	• distinguish between, and categorise, the activities within an information system in terms of the seven information processes • use an existing information system to meet a simple need • manually step through a given information system identifying the information process • for a given information system, describe how the following relate to the information processes: – participants – data/information – information technology • schematically represent the flow of data and information through a given information system, identifying the information processes

Students learn about:	Students learn to:
• transmitting and receiving – the process that sends and receives data and information within and beyond information systems • displaying – the process that controls the format of information presented to the participant or user	
the nature of data and information	
• data – the input to an information system	• distinguish between data and information in a given context
• data representation – the different types of media, namely: – images – audio – video – text – numbers	• categorise data as image, audio, video, text and/or numbers • identify the data and the information into which it is transformed, for a given scenario
• information – the output which has been processed by an information system for human understanding	
• the generation of information from data via the information processes • how information from one information system can be data for another information system	• identify examples of information systems that use information from another information system as data
reasons for digital data representation	
• the need for quality data, including: – accuracy – timeliness – accessibility	
• current data digitising trends, for example: – newspapers on the Internet – telephone system – video on DVD – facsimile – media retrieval management	• explain why information technology uses digital data • describe advantages and disadvantages for the digital representation of data
social and ethical issues	
• social and ethical issues arising from the processing of information, including: – privacy of the individual – security of data and information – accuracy of data and information – data quality – changing nature of work – appropriate information use – health and safety – copyright laws	
• the people affected by social and ethical issues, including: – participants within the information system	• describe social and ethical issues that relate to: – information system users – participants

Students learn about:	**Students learn to:**
– users of the information system – those in the environment • the ethical and social responsibility of developers • current government legislation to protect the individual and organisations • the use of information systems in fields such as manufacturing as well as the traditional fields of observation and recording • global information systems: – where the purpose involves international organisations, or – where the data and processes are distributed across national boundaries	• ensure that relevant social and ethical issues are addressed • identify and explain reasons for the expansion of information systems, including: – advances in technology – suitability of information technology for repetitive tasks

8.2 Tools for Information Processes

In order to understand and build information systems, information processes must be understood. This topic examines each of the information processes by focusing on some of the tools used to carry them out. The tools include information technology and non-computer procedures. In this topic, tools are categorised and presented according to a particular information process. In reality, however, one tool may overlap several processes. One tool cannot operate in isolation; therefore, demonstrations of particular tools will involve additional tools and processes. Information processes and tools affect participants within the information system and people beyond it, giving rise to social and ethical issues. Additional tools for specific types of information systems will be examined in the HSC course.

Outcomes

A student:

P1.1 describes the nature of information processes and information technology
P1.2 classifies the functions and operations of information processes and information technology
P2.1 identifies and describes the information processes within an information system
P2.2 recognises and explains the interdependence between each of the information processes
P3.1 identifies and describes social and ethical issues
P4.1 describes the historical developments of information systems and relates these to current and emerging technologies
P5.1 selects and ethically uses computer based and non-computer based resources and tools to process information
P6.1 analyses and describes an identified need
P6.2 generates ideas, considers alternatives and develops solutions for a defined need
P7.1 recognises, applies and explains management and communication techniques used in individual and team-based project work
P7.2 uses and justifies technology to support individuals and teams

Students learn about:	Students learn to:
collecting	
• collecting – the process by which data is captured or entered into a computer system, including: – deciding what data is required – how it is sourced – how it is encoded for entry into the system	• for a given scenario, identify alternatives for data collection and choose the most appropriate one • use a range of hardware collection devices to collect different data types • describe the operation of a range of hardware collection devices
• hardware used for collection ***(See Course Specifications Document)***	• make predictions about new and emerging trends in data collection based on past practices
• software used for collection ***(See Course Specifications Document)***	• choose the most appropriate combination of hardware, software and/or non-computer tools to collect data from a given source
• non-computer procedures in collecting – literature searches – surveys and interviews – form design for data collection – manual recording of events – existing non-computer data	• use the Internet to locate data for a given scenario • design forms that allow data to be accurately recorded and easily input into software applications
• social and ethical issues in collecting – bias in the choice of what and where to collect data – accuracy of the collected data – copyright and acknowledgment of source data when collecting – the rights to privacy of individuals on whom data is collected – ergonomic issues for participants entering large volumes of data into an information system	• select and use appropriate communication skills to conduct interviews and surveys so that data can be accurately collected • identify existing data that can be collected for an information system for a given scenario • recognise personal bias and explain its impact on data collection • identify the privacy implications of particular situations and propose strategies to ensure they are respected • predict errors that might flow from data inaccurately collected • predict issues when collecting data that might arise when it is subsequently analysed and processed
organising	
• organising – the process by which data is structured into a form appropriate for use by other information processes	• choose the most appropriate format for a given set of data and identify and describe the most appropriate software and method to organise it
• how different methods of organising affect processing, for example: – letters of the alphabet represented as images rather than text – numbers represented as text rather than numeric	
• the way in which the hardware used for collection organises data by digitising images, audio, video, numeric and text	• describe how different types of data are digitised by the hardware that collects it
• software for organisation ***(See Course Specifications Document)***	• compare and contrast different methods of organising the same set of data using existing software applications • use software to combine data organised in different formats

Students learn about:	**Students learn to:**
• non-computer tools for organising – hard copy systems such as phone books, card catalogues and pen and paper forms – pen and paper methods for organising data • social and ethical issues associated with organising, including: – current trends in organising data, such as: - the increase in hypermedia as a result of the World Wide Web - the ability of software to access different types of data - a greater variety of ways to organise resulting from advances in display technology – the cost of poorly organised data, such as redundant data in a database used for mail-outs	• use data dictionaries to describe the organisation of data within a given system • assess future implications when making decisions about the way data is organised
analysing	
• analysing – the process by which data can be represented and summarised so that humans can better understand it • hardware requirements for analysing, including: – large amounts of primary and secondary storage allowing for fast processing – fast processors allowing many rapid calculations	• identify hardware requirements to carry out a particular type of analysis • describe the best organisation for data for a particular type of analysis
• software features for analysis, including: – searching/selecting data – sorting – modelling/simulations – what-if scenarios – charts and graphs to identify trends – file comparison	• use software analysis features in a range of software applications to analyse image, audio, video, text and numeric data
• non-computer tools, for analysing, including: – searching manual filing systems – non-computer models and simulations • social and ethical issues associated with analysis, including: – unauthorised analysis of data – data incorrectly analysed – erosion of privacy from linking databases for analysis	• compare and contrast computer and non-computer tools for analysis on the basis of speed, volume of data that can be analysed, and cost • analyse data on individuals for the purpose it was collected
storing and retrieving	
• storing and retrieving – the two-step process by which data or information can be saved and reloaded to allow for: – other processing to take place	• document the storage and retrieval process in an information system • describe the characteristics and operation of hardware devices used for

Students learn about:	Students learn to:
– a temporary halt in the system – backup and recovery – the transfer of data or information • hardware for storing and retrieving – hardware devices ***(See Course Specifications Document)*** – the characteristics of hardware, including: - random or sequential access - volatile or non-volatile - permanent or non-permanent • the trend to faster and greater storage capacity over time	storage and retrieval • use a range of hardware devices and associated software to store and retrieve information and data • store and retrieve data using a network
• software for storing and retrieving – hardware interface software – file management software – database management systems – file formats for different data types – Internet browser - used to access a machine-independent data store - using search engines to access data – encryption/password protection – security of stored data whether stored centrally or distributed	• compare different file formats for storing the same data, explaining the features and benefits of each • use software features to secure stored data and information
• non-computer tools, including: – paper based storage systems – microfiche – libraries • social and ethical issues, including: – the security of stored data – unauthorised retrieval of data – advances in storage and retrieval technologies and new uses such as data matching	• retrieve and use data in an ethical way
processing • processing – a method by which data can be manipulated in different ways to produce a new value or result (eg calculating a total, filtering an email, changing the contrast of an image, changing the volume of a wave file) • hardware in processing – hardware with fast processors, a lot of RAM and large storage capacity for image, video and audio processing – increased processing speed, by: - increased clock speeds - increased bus capacity	• select appropriate hardware configurations for a specified type of processing • edit text data using word processors, desktop publishing, hypertext and database management systems • edit numeric data using spreadsheets and database management systems • edit image data using paint, draw and animation packages

Students learn about:	**Students learn to:**
– historical and current trends in CPU development	
• software for processing text, numeric, image, video and audio data	• edit video data using animation packages
• non-computer tools and processing	• edit audio data using mixing software
– documenting procedures to be followed when processing	• diagrammatically represent data processing
• social and ethical issues associated with processing	
– ownership of processed data	
– bias in the way participants in the system process data	
transmitting and receiving	
• transmitting and receiving – the process that transfers information and data within and between information systems	• identify examples of potential human bias in data processing
• hardware for transmitting and receiving	
– communications within a computer between peripheral devices and the CPU via buses	• differentiate between the requirements for a local area network and a wide area network
– the role of modems, including modulation and demodulation	• transfer numeric, text, image, audio and video data and discuss the time to transfer and required bandwidth
– local area networks and wide area networks	• describe concepts of downloading, uploading and streaming
• software for transmitting and receiving	
– communications packages	
– transmitting and receiving text, numeric, image, audio and video	
– electronic mail and its operation	
• non-computer tools for transmitting and receiving, such as mail, phone, fax and radio and television (transmit only)	• demonstrate sending and receiving mail, with attachments, over an e-mail system
• social and ethical issues associated with transmitting and receiving	• select a relevant technology for a given situation to allow computers to transmit and receive data or information
– accuracy of data received from the Internet	• compare and contrast computer and non-computer based communication systems
– security of data being transferred	
– net-etiquette	• describe and employ net-etiquette when using the Internet
– acknowledgment of data source	
– global network issues, time zones, date fields, exchange rates	• predict and discuss possible future trends in communications and the impact they are likely to have on the transmitting and receiving of data/information
– changing nature of work for participants, such as work from home and telecommuting	
– current developments and future trends in digital communications, radio and television	
– the impact of the Internet on traditional business	

Students learn about:	Students learn to:
displaying	
• displaying – the method by which information is output from the system to meet a purpose • hardware for displaying ***(See Course Specifications Document)*** • software for display – interfaces for hardware display devices – display features in applications packages, including: - reporting - formatting - spacing - merging - tables - charts • non-computer tools: – traditional methods for displaying the different types of data	• choose and justify the most appropriate method for displaying information given a particular set of circumstances • describe the operation of display hardware • use a range of hardware and software combinations to display different types of information • format a text document with appropriate use of fonts, spacing and layout for printed and screen displays • design and develop a simple web page • generate reports for display within a database • mail-merge information from a database into another application for display • create audio, image and video displays with presentation software • compare and contrast displays created without a computer to those created with a computer • identify, discuss and appreciate the widespread use of non-computer methods of displaying information
• social and ethical issues associated with displaying – communication skills of those presenting displays – past, present and emerging trends in displays – appropriate displays for a wide range of audiences, including: - standards for display for the visually impaired - displays suitable for young children	• design a display for a wide variety of users
integration of processes	
• the interrelationships between the processes in a given system • one tool (such as software to develop a multimedia presentation) may involve several processes	• recognise that processes can overlap, be concurrent or independent or not significant in a specific system

8.3 Developing Information Systems

New information systems are created when existing systems do not adequately meet the needs of users of the information system, or when there is a need that could be met by an information system. The success of a new system depends upon how well the problem is understood, how the system is designed, how it is tested, evaluated and maintained over time. This topic introduces students to the traditional method for developing systems. Students must engage in project work, both individually and in teams, which supports this understanding by planning, designing and implementing a series of discrete information systems. Alternatives to this model are presented in the HSC course.

Students may begin their project work at any time during the Preliminary course.

Project work requirements are described in the Course Structure on page 9.

Outcomes

A student:

P1.1 describes the nature of information processes and information technology
P1.2 classifies the functions and operations of information processes and information technology
P2.1 identifies and describes the information processes within an information system
P2.2 recognises and explains the interdependence between each of the information processes
P3.1 identifies and describes social and ethical issues
P4.1 describes the historical developments of information systems and relates these to current and emerging technologies
P5.1 selects and ethically uses computer based and non-computer based resources and tools to process information
P6.1 analyses and describes an identified need
P6.2 generates ideas, considers alternatives and develops solutions for a defined need
P7.1 recognises, applies and explains management and communication techniques used in individual and team-based project work
P7.2 uses and justifies technology to support individuals and teams

Students learn about:	Students learn to:
traditional stages in developing a system • understanding the problem • planning • designing • implementing • testing, evaluating and maintaining	• recognise and apply appropriate stages in their project work • read and interpret the requirements for a new system in terms of: – the needs of the users of the information system – who the participants are – the data/information to be used – required information technology – information processes • use a variety of design tools to help plan the structure of an information system • use an information system to generate information
complexity of systems • systems for individuals • systems for organisations • systems developed by individuals • systems developed by teams	• read a set of specifications • understand the need for a time schedule • interpret Gantt charts • understand the need for journals and diaries • recognise the resources that are relevant, available and required for use in developing the system • modify or extend an existing system according to specifications • test and evaluate an existing system to see if it meets requirements and specifications
roles of people involved in systems development • different roles played by individuals in the team and communication between them • strengths and weaknesses of individual team members – communication – interpersonal – technical – organisational	• recognise different roles of people and how they communicate throughout different stages of the project • produce a report stating the need, and how an information system will meet it • diagrammatically represent the information system in context • document the relationship between the new system, user of the information system and their need(s) • analyse and customise user interfaces and other tasks in applications software forming part of the solution • identify the training needs of users of the information system • document the procedures to be followed by participants

Students learn about:	Students learn to:
social and ethical issues • machine-centred systems simplify what computers do at the expense of participants • human-centred systems as those that make participants' work as effective and satisfying as possible • how the relationships between participants change as a result of the new system • ensuring the new system provides participants with a safe work environment • awareness of the impact the system may have on the participants, including: – opportunities to use their skills – meaningful work – need for change – opportunities for involvement and commitment	• implement systems that pay as much attention to the needs of participants as they do to information technology

9 Content: Information Processes and Technology – HSC Course

9.1 Project Management

This topic is intended to give students an understanding of the underlying theory of project management as well as an opportunity to plan, design and implement an information system that has a purpose. The chosen information system implemented in project work should be drawn from:

- a database information system
- a communication system
- a transaction processing system
- a decision support system
- an automated manufacturing system
- a multimedia system.

The construction of the information system will follow the stages detailed in the Preliminary topic Developing Information Systems. Other system development methods have been included beyond the traditional methods. One large project or a number of smaller projects may be undertaken in the course. If smaller projects are undertaken, they need to occur over a significant amount of time and involve sustained work. Project(s) should allow students to see the information system in its full context. Students should identify the purpose for the information system, the participants, data/information and information technology that work with the information processes.

Project work requirements are described in the Course Structure on page 9.

Outcomes

A student:

H1.1 applies and explains an understanding of the nature and function of information technologies to a specific practical situation

H1.2 explains and justifies the way in which information systems relate to information processes in a specific context

H2.1 analyses and describes a system in terms of the information processes involved

H2.2 develops and explains solutions for an identified need which address all of the information processes

H3.1 evaluates and discusses the effect of information systems on the individual, society and the environment

H3.2 demonstrates and explains ethical practice in the use of information systems, technologies and processes

H4.1 proposes and justifies ways in which information systems will meet emerging needs

H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects

H5.2 assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices

H6.1 analyses situations, identifies needs, proposes and then develops solutions
H6.2 selects, justifies and applies methodical approaches to planning, designing or implementing solutions
H7.1 implements and explains effective management techniques
H7.2 uses methods to thoroughly document the development of individual and team projects.

Students learn about:	**Students learn to:**
techniques for managing a project • communication skills necessary for dealing with others • the consequences for groups that fail to function as a team, including: – financial loss – employment loss – missed opportunities • project management tools, including: – Gantt charts – scheduling of tasks – journals and diaries – funding management plan – communication management plan • identifying social and ethical issues	• understand the communication skills required to manage a system development project, such as: – active listening – conflict resolution – negotiation skills – interview techniques – team building • understand the need to apply project management tools to develop a system using a team approach • appreciate the advantages of groups that function as a team, including: – increased productivity – enhanced job satisfaction – the development of a quality system • appreciate the need for complete documentation throughout all aspects of the system • assess the social and ethical implications of the solution throughout the project
understanding the problem • approaches to identify problems with existing systems, including: – interviewing/surveying users of the information system – interviewing/surveying participants – analysing the existing system by determining: - how it works - what it does - who uses it • requirements reports • requirements prototype – a working model of an information system, built in order to understand the requirements of the system – used when the problem is not easily understood – repetitive process of prototype modification and participants' feedback until the problem is understood – can be the basis for further system development	• apply appropriate techniques in understanding the problem • interpret a requirements report which includes: – the purpose of the systems – an analysis of an existing system – definition of extra requirements • diagrammatically represent existing systems using context diagrams and data flow diagrams • identify, communicate with and involve participants of the current system • create a requirements prototype from applications packages that provide: – screen generators – report generators • use a prototype to clarify participants' understanding of the problem

Students learn about:	Students learn to:
planning • a feasibility study of proposed solutions, including: – economic feasibility – technical feasibility – operational feasibility – scheduling • choosing the most appropriate solution • choosing the appropriate development approaches – traditional – outsourcing – prototyping – customisation – participant development – agile methods • the requirements report that: – details the time frame – details the subprojects and the time frame for them – identifies participants – identifies relevant information technology – identifies data/information – identifies the needs of users	• conduct a feasibility study and report on the benefits, costs and risks of the project • compare traditional, iterative and agile system development approaches • create Gantt charts to show the implementation time frame • investigate/research new information technologies that could form part of the system
designing • clarifying with users the benefits of the new information system • designing the information system for ease of maintenance • clarifying each of the relevant information processes within the system • detailing the role of the participants, the data and the information technology used in the system • refining existing prototypes • participant development, when people within the information system develop the solution – participant designed solutions – tools for participant development such as guided processes in application packages • tools used in designing, including: – context diagrams – data flow diagrams – decision trees – decision tables – data dictionaries – storyboards	• develop a solution to a problem from a prototype • use a guided process in an application to create all or part of a solution • use system design tools to: – better understand the system – assist in explaining the operation of the new system – document the new system

Students learn about:	Students learn to:
implementing • acquiring information technology and making it operational – hardware – software, customised or developed • an implementation plan that details: – participant training – the method for conversion - parallel conversion - direct conversion - phased conversion - pilot conversion – how the system will be tested – conversion of data for the new system • the need for an operation manual detailing procedures participants follow when using the new system	• determine training needs arising from the creation of a new system • compare and contrast conversion methods • justify the selected conversion method for a given situation • convert from the old system to the new • implement the appropriate information technology • develop an implementation plan for the project
testing, evaluating and maintaining • testing and evaluating the solution with test data such as – volume data – simulated data – live data • checking to see that the original system requirements have been achieved • trialling and using the operation manual • reviewing the effect on users of the information system, participants and people within the environment • modifying parts of the system where problems are identified	• compare the new system to the old and evaluate whether the requirements have been met • update system documentation

9.2 Information Systems and Databases

Information systems are computer systems that support end users, giving them access to the information. For a large number of information systems, the data is held in databases and access is via database management systems. Information systems perform a variety of tasks and these are considered in the following topics in the HSC course. While all of the information processes are represented in information systems, the emphasis in this topic is on the processes of organising, storing and retrieving with database systems and hypermedia.

Outcomes

A student:

H1.1 applies and explains an understanding of the nature and function of information technologies to a specific practical situation
H1.2 explains and justifies the way in which information systems relate to information processes in a specific context
H2.1 analyses and describes a system in terms of the information processes involved
H2.2 develops and explains solutions for an identified need which address all of the information processes
H3.1 evaluates and discusses the effect of information systems on the individual, society and the environment
H3.2 demonstrates and explains ethical practice in the use of information systems, technologies and processes
H4.1 proposes and justifies ways in which information systems will meet emerging needs
H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects
H5.2 assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices
H6.1 analyses situations, identifies needs, proposes and then develops solutions
H6.2 selects, justifies and applies methodical approaches to planning, designing or implementing solutions
H7.1 implements and explains effective management techniques
H7.2 uses methods to thoroughly document the development of individual and team projects.

Students learn about:	Students learn to:
information systems • the characteristics of an information system, namely: – the organisation of data into information – the analysing of information to give knowledge • the different types of and purposes for information systems, including systems used to: – process transactions – provide users with information about an organisation – help decision-making – manage information used within an organisation	• identify the type and purpose of a given information system • represent an information system using a systems representation tool – identify the purpose, information processes, information technology and participants within a given system – represent diagrammatically the flow of information within an information system
database information systems • school databases holding information on teachers, subjects, classrooms and students • the Roads and Traffic Authority holding information on automobiles and holders of drivers licences • video stores holding information on borrowers and videos	• identify participants, data/information and information technology for the given examples of database information systems • describe the relationships between participants, data/information and information technology for the given examples of database information systems
organisation • non-computer methods of organising including: – telephone books – card based applications • computer based methods of organising, including: – flat-file systems – database management systems – hypermedia • the advantages and disadvantages of computer based and non-computer based organisation methods • the logical organisation of flat-file databases, including: – files – records – fields, key fields – characters • the logical organisation of relational databases, including: – schemas as consisting of: - entities - attributes	• choose between a computer based or non-computer based method to organise data, given a particular set of circumstances • identify situations where one type of database is more appropriate than another • represent an existing relational database in a schematic diagram • create a schematic diagram for a scenario where the data is to be organised into a relational database • modify an existing schema to meet a change in user requirements

Students learn about:	**Students learn to:**
- relationships ▪ one to one ▪ one to many ▪ many to many – tables as the implementation of entities consisting of: - attributes - records – linking tables using primary and foreign keys – user views for different purposes • data modelling tools for organising databases, including: – data dictionaries to describe the characteristics of data including: - field name - data type - data format - field size - description - example – schematic diagrams that show the relationships between entities – normalising data to reduce data redundancy	• choose and justify the most appropriate type of database, flat-file or relational, to organise a given set of data • create a simple relational database from a schematic diagram and data dictionary • populate a relational database with data • describe the similarities and differences between flat-file and relational databases • create a data dictionary for a given set of data • create documentation, including data modelling, to indicate how a relational database has been used to organise data • demonstrate an awareness of issues of privacy, security and accuracy in handling data
• the logical organisation of hypermedia, including: – nodes and links – uniform resource locators – metadata such as HTML tags • tools for organising hypermedia, including: – storyboards to represent data organised using hyperlinks – software that allows text, graphics and sounds to be hyperlinked	• compare and contrast hypermedia and databases for organising data • design and develop a storyboard to represent a set of data items and links between them • construct a hypertext document from a storyboard • use software that links data, such as: – HTML editors – web page creation software
storage and retrieval • database management systems (DBMS) including: – the role of a DBMS in handling access to a database – the independence of data from the DBMS • direct and sequential access of data • on-line and off-line storage • centralised and distributed databases • storage media including: – hard discs – CD-ROMs – cartridge and tape • encryption and decryption • backup and security procedures	• search a database using relational and logical operators • output sorted data from a database • generate reports from a database • construct an SQL query to select data from a given database, matching given criteria

Students learn about:	**Students learn to:**
• tools for database storage and retrieval, including: – extracting relevant information through searching and sorting a database – selecting data from a relational database using Query by Example (QBE) and Structured Query Languages (SQL) commands, including: - select - from - where - order by • tools for hypermedia search and retrieval, including: – free text searching – operation of a search engine - indexing and search robots - metadata • reporting on data found in hypermedia systems	• calculate the storage requirements for a given number of records (given a data dictionary for a database) • summarise, extrapolate and report on data retrieved from the Internet • use search engines to locate data on the World Wide Web • describe the principles of the operation of a search engine
other information processes for database information systems • displaying – reporting on relevant information held in a database – constructing different views of a database for different purposes	• design and create screens for interacting with selected parts of a database and justify their appropriateness • design and generate reports from a database
issues related to information systems and databases • acknowledgment of data sources • the Freedom of Information Act • privacy principles • quality of data • accuracy of data and the reliability of data sources • access to data, ownership and control of data • data matching to cross link data across multiple databases • current and emerging trends in the organisation, processing, storage and retrieval of data ***(See Course Specifications Document)***	• identify and apply issues of ownership, accuracy, data quality, security and privacy of information, data matching • discuss issues of access to and control of information • validate information retrieved from the Internet

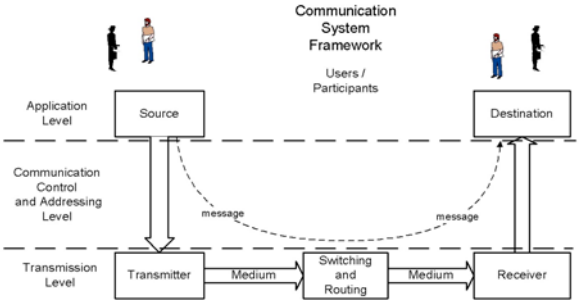
9.3 Communication Systems

When participants within the information system have a need to transmit and receive data or information, the type of system required is a communication system. Communication systems support people who are working together, by enabling the exchange of data and information electronically. In this topic, the information processes of transmitting and receiving are featured, with the other processes considered when relevant because all information processes play a role in communication systems.

Outcomes

A student:

- H1.1 applies and explains an understanding of the nature and function of information technologies to a specific practical situation
- H1.2 explains and justifies the way in which information systems relate to information processes in a specific context
- H2.1 analyses and describes a system in terms of the information processes involved
- H2.2 develops and explains solutions for an identified need which address all of the information processes
- H3.1 evaluates and discusses the effect of information systems on the individual, society and the environment
- H3.2 demonstrates and explains ethical practice in the use of information systems, technologies and processes
- H4.1 proposes and justifies ways in which information systems will meet emerging needs
- H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects
- H5.2 assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices
- H6.1 analyses situations, identifies needs, proposes and then develops solutions
- H6.2 selects, justifies and applies a methodical approach to planning, designing or implementing a solution
- H7.1 implements and explains effective management techniques
- H7.2 uses methods to thoroughly document the development of individual and team projects.

Students learn about:	Students learn to:
characteristics of communication systems • communication systems as being those systems which enable users to send and receive data and information • the framework in which communication systems function, demonstrated by the following model  • the functions performed within the communication systems in passing messages between source and destination, including: – message creation – organisation of packets at the interface between source and transmitter – signal generation by the transmitter – transmission – synchronising the exchange – addressing and routing – error detection and correction – security and management • the roles of protocols in communication – handshaking and its importance in a communications link – functions performed by protocols at different levels • the client–server model – the role of the client and the server – thin clients and fat clients – examples of clients such as web browsers and mail clients – examples of servers such as print servers, mail servers and web servers	• use applications to create and transmit messages • establish a communications link and describe the steps that take place in its establishment • identify and describe specified protocols at different stages of the communication • identify client processing and server processing • describe the advantages and disadvantages of client–server architecture

Students learn about:	Students learn to:
examples of communication systems • teleconferencing systems • messaging systems ***(See Course Specifications Document)*** • other systems dependent on communication technology such as: – e-commerce – EFTPOS – electronic banking	• use a communication system to transmit and receive audio, video and text data • for given examples, identify the participants, information/data, information technology, need and purpose • for given examples explain how data is transmitted and received • for given examples, identify the advantages and disadvantages of the system
transmitting and receiving in communication systems • transmission media, including: – wired transmission ***(See Course Specifications Document)*** – wireless transmission ***(See Course Specifications Document)***	• compare and contrast traditional communication systems with current electronic methods • represent a communication system diagrammatically
• characteristics of media in terms of speed, capacity, cost and security	• predict developments in communication systems based on current trends
• communication protocols, including: – application level protocols - http - smtp - SSL – communication control and addressing level protocols - TCP - IP – transmission level protocols - Ethernet - Token ring	• simulate activities involved with communication in areas such as – e-commerce – EFTPOS – Internet banking • for a given scenario, choose and justify the most appropriate transmission media
• strategies for error detection and error correction	
• network topologies, including: – star – bus – ring – hybrid – wireless networks	• diagrammatically represent the topology
• the functions performed by the following hardware components used in communication systems ***(See Course Specifications Document)*** • characteristics of network operating software • similarities and differences between the Internet, intranets and extranets	• describe the location and role of hardware components on the network • compare the functions of different hardware components • identify the main characteristics of network operating software • compare and contrast the Internet, intranets and extranets

Students learn about:	Students learn to:
other information processes in communication systems • collecting, such as – the phone as the collection device with voice mail – EFTPOS terminal as a collection device for electronic banking • processing, including: – encoding and decoding analog and digital signals – formation of data packets – routing – encryption and decryption – error checking - parity bit check - check sum - cyclic redundancy check (CRC) • displaying, such as – the phone as the display device with voice mail – EFTPOS terminal as a display device for electronic banking	• distinguish between data in analog and digital form • justify the need to encode and decode data • identify where in a communication system signal conversion takes place • describe the structure of a data packet • describe methods to check the accuracy of data being transmitted
managing communication systems • network administration tasks, such as: – adding/removing users – assigning users to printers – giving users file access rights – installation of software and sharing with users – client installation and protocol assignment – logon and logoff procedures – network-based applications	• detail the network management software in a given network • describe the role of the network administrator and conduct network administration tasks • demonstrate logon and logoff procedures, and justify their use • adopt procedures to manage electronic mail
issues related to communication systems • security • globalisation • changing nature of work • interpersonal relationships • e-crime • legal • virtual communities	• describe and justify the need for ethical behaviour when using the Internet • discuss the social and ethical issues that have arisen from use of the Internet, including: – the availability of material normally restricted – electronic commerce – domination of content and control of access to the Internet – the changing nature of social interactions • identify the issues associated with the use of communication systems, including: – teleconferencing systems – messaging systems

Students learn about:	**Students learn to:**
• current and emerging trends in communications ***(See Course Specifications Document)***	– e-commerce – EFTPOS – electronic banking • design and implement a communication system to meet an individual need • predict developments in communication systems based on current trends

9.4 Option Strands

There are FOUR options and students must study TWO of these. The topics are:
- Transaction Processing Systems
- Decision Support Systems
- Automated Manufacturing Systems
- Multimedia Systems.

9.4.1 Option 1: Transaction Processing Systems

Information systems that collect, store, modify and retrieve records of transactions are transaction processing systems. A transaction is an event that generates or modifies data that is eventually stored in an information system. Transaction processing systems meet record keeping and event tracking needs. In addition, analysing data stored in transaction processing systems may meet the information needs of end user(s). This option focuses on the information process of storing/retrieving. Other information processes are important in transaction processing and these are also considered.

Outcomes

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H6.2 selects, justifies and applies methodical approaches to planning, designing or implementing solutions
H7.1 implements and explains effective management techniques
H7.2 uses methods to thoroughly document the development of individual and team projects.

Students learn about:	Students learn to:
characteristics of transaction processing systems • a transaction – a series of events important to an organisation that involve a request, an acknowledgement, an action and an outcome • the components of a transaction processing system, including: – purpose – data – information technology – processes – participants • batch transaction processing – the collection and storage of data for processing at a scheduled time or when there is sufficient data • real time transaction processing – the immediate processing of data • the significance of data validation in transaction processing • the historical significance of transaction processing as the first type of information systems	• recognise and describe a transaction • identify, describe and use a batch transaction processing system • distinguish between the storage of collected data and the storage of processed data in a batch system • identify, describe and use a real time transaction processing system • compare and contrast batch and real time transaction processing • analyse an existing transaction processing system to determine its strengths and weaknesses • design and implement procedures for validating entered data • assess the work routine of a clerk in a manual transaction system to determine its suitability for automation • identify participants, data/information and information technology for the given types of transaction processing systems • describe the relationships between participants, data/information and information technology for the given types of transaction processing systems
types of transaction processing systems • web-based • non web-based • on-line real time • batch • systems that appear real time, responding as the transactions occur, but where the actual updating is batch processed, such as credit card transactions	• for a scenario diagrammatically represent transaction processing using data flow diagrams • distinguish between the different types of transaction processing systems
storing and retrieving in transaction processing systems • storage of digital data in databases and files • retrieval of stored data to conduct further transaction processing such as printing invoices • systems to store paper records of transactions • data backup and recovery, including: – grandfather, father, son – off-site storage – secure on-site storage – full and partial backups	• store digital data in databases and other files in such a way that it can be retrieved, modified and further processed • implement systems to store paper transactions

Students learn about:	**Students learn to:**
– recovery testing – suitable media – specialised backup software – transaction logs – documenting backup and recovery procedures – mirroring – rollback	• select and apply backup and recovery procedures to protect data
• updating in batch systems: – historical significance – limitations of batch processing – technology required – steps in a batch update – suitable applications	• document, including diagrammatical representations, the steps in batch processing • document, including diagrammatical representations, steps in real time transaction processing
• updating in on-line real time systems: – relevance and impact – technology required – hardware requirements – large secondary storage – software requirements (on-line database) with user friendly interface – steps in on-line real time processing – suitable applications	• identify systems for which batch is appropriate and is not appropriate • distinguish between on-line real time and batch systems • create and use a transaction processing system
other information processes in transaction processing systems	
• collecting in transaction processing: – hardware ***(See Course Specifications Document)*** – collection from forms – screen design for on-line data collection – web forms for transaction processing (real time and batch)	• describe the operation of relevant hardware and how each is used to collect data for transaction processing • design and justify paper forms to collect data for batch processing • design user friendly screens for on-line data collection • identify existing procedures that may provide data for transaction processing
• analysing data, in which output from transaction processing is input to different types of information systems, such as: – decision support – management information systems – data warehousing systems (for data mining) – enterprise systems	• create user interfaces for on-line real time and batch updating, and distinguish between them • identify situations where data warehousing and data mining would be an advantage
issues related to transaction processing systems	
• changing nature of work and the effect on participants, including: – the automation of jobs once performed by clerks – shifting of workload from clerks to members of the public • the need for alternative procedures to	• assess the impact on participants involved in transaction processing • identify jobs that have changed and/or jobs that have been created as a result of transaction processing, and report on the implications of these changes for participants in the system

Students learn about:	**Students learn to:**
deal with transactions when the TPS is not available • bias in data collection: – when establishing the system and deciding what data to collect – when collecting data • the importance of data in transaction processing, including: – data security – data integrity – data quality • control in transaction processing and the implications it has for participants in the system • current and emerging trends in transaction processing	• discuss alternatives for when the transaction processing system is not available and explain why they need to be periodically tested • identify security, bias and accuracy problems that could arise from the actions of participants • recognise the significance of data quality

9.4.2 Option 2: Decision Support Systems

When the task that end user(s) need to perform involves decision-making, the information system required is a decision support system. They can be used in situations that are unstructured, where there is no clear-cut path to the decision, or semistructured, where there is some indication of the path to take. Decision support systems use combinations of models, analytical tools, databases and automated processes to assist decision-making.

Automated processing is achieved via intelligent systems that either focus on rules, such as expert systems, or pattern detection in data, such as neural networks. The interactive nature of decision support systems requires that user(s) have an understanding of analytical tasks. Decision support and intelligent systems make use of all information processes. This topic focuses on organising, analysing and processing.

Outcomes

A student:

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H1.2 explains and justifies the way in which information systems relate to information processes in a specific context
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H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects
H5.2 assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices
H6.1 analyses situations, identifies needs, proposes and then develops solutions
H6.2 selects, justifies and applies methodical approaches to planning, designing or implementing solutions
H7.1 implements and explains effective management techniques
H7.2 uses methods to thoroughly document the development of individual and team projects.

Students learn about:	Students learn to:
characteristics of decision support systems • decision support systems – those that assist user(s) in making a decision • the interactive nature of decision support systems • the nature of decision support systems which model, graph or chart situations to support human decision making	• select and recommend situations where decision support systems could be used
categories of decision making • structured: – decisions are automated – decision support systems are not required • semistructured: – there is a method to follow – requirements are clear cut • unstructured: – there is no method to reach the decision – judgements are required – requires insights into the problem	• classify situations which are structured, semistructured or unstructured
examples of decision support • semistructured situations, such as: – a bank officer deciding how much to lend to a customer – fingerprint matching • unstructured situations, such as: – predicting stock prices – disaster relief management • the use of systems to support decision making, including: – spreadsheets – databases – expert systems – neural networks – data warehouses – group decision support systems – Geographic Information Systems (GIS) – Management Information Systems (MIS)	• identify participants, data/information and information technology for an example of a decision support system • describe the relationships between participants, data/information and information technology for an example of a decision support system • analyse trends and make predictions using an existing spreadsheet model • extract data, based on known criteria, from an existing database to help make a decision • recognise appropriate decision support systems for a given situation
organising and decision support • designing spreadsheets: – creating a pen and paper model – identifying data sources – planning the user interface – developing formulas to be used	• design spreadsheets by: – linking multiple sheets to extract data and create summaries – use absolute and relative references in formulae • implement spreadsheets by: – entering data – naming ranges

Students learn about:	Students learn to:
	– creating templates – organising data for easy graphing – using formulae to link and organise data in cells
• the knowledge base of if-then rules in an expert system	• design a set of if-then rules for a particular situation • diagrammatically represent the if-then rules
processing and decision support	
• structure of expert systems – knowledge base – database of facts – inference engine – explanation mechanism – user interface • types of inference engines, including: – forward chaining – backward chaining • certainty factors as a means of dealing with unclear situations	• enter rules and facts into an expert system shell and use it to draw conclusions or make a diagnosis • describe situations better suited to forward chaining and those better suited to backward chaining • create a simple macro in a spreadsheet
• pattern matching in neural networks • the use of macros to automate spreadsheet processing	• compare and contrast processing methods used by databases, neural networks and expert systems
analysing and decision support	
• data mining • extracting summary data from a spreadsheet • comparing sequences of data for similarities and differences • spreadsheet analysis, including: – what-if models – statistical analysis – charts • On-line Analytical Processing (OLAP) – data visualisation – drill downs	• describe the process of data mining to search large databases for hidden patterns and relationships and use these to predict future behaviour • analyse alternatives using ‘what-if’ scenarios • make predictions based on the analysis of spreadsheets • use a simple neural network to match patterns • extract information from a database for analysis using a spreadsheet, including charting relevant data • distinguish between neural networks and expert systems • describe tools used for analytical processing
other information processes	
• collecting – identification of data for decision support systems – the role of the expert in the creation of expert systems – the role of the knowledge engineer in the creation of expert systems • storing and retrieving using intelligent agents to search data	• determine the sources of data for a decision support system for a given scenario • describe the operation of intelligent agents in situations such as search engines for the Internet

Students learn about:	Students learn to:
issues related to decision support • the reasons for decision support systems, including: – preserving an expert's knowledge – improving performance and consistency in decision-making – rapid decisions – ability to analyse unstructured situations • responsibilities of those performing data mining, including: – erroneous inferences – privacy • responsibility for decisions made using decision support systems • current and emerging trends of decision support systems ***(See Course Specifications Document)***	• describe the impact on participants in decision support systems when some of their decision-making is automated and recommend measures to reduce negative impacts • identify situations where user(s) of decision support systems also require knowledge in the area • determine whether the decisions suggested by intelligent decision support systems are reasonable • demonstrate responsible use of a decision support system by using its findings for the intended purpose only • identify situations where decision support systems are of limited value • recognise the importance of business intelligence based on enterprise systems

9.4.3 Option 3: Automated Manufacturing Systems

Manufacturing is the process of producing a product that meets a specific purpose. Manufacturing information systems support the production process in a number of ways, including the tracking of inventory, record keeping, the scheduling of production and carrying out production. Automated manufacturing systems have computerised controls built into the manufacturing equipment. Data is gathered through sensors and following some processing, a signal is sent to an actuator, a device that performs some mechanical action. While such information systems carry out all of the information processes, the information process focused on in this topic is collecting.

Outcomes

A student:

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H1.2 explains and justifies the way in which information systems relate to information processes in a specific context
H2.1 analyses and describes a system in terms of the information processes involved
H2.2 develops and explains solutions for an identified need which address all of the information processes
H3.1 evaluates and discusses the effect of information systems on the individual, society and the environment
H3.2 demonstrates and explains ethical practice in the use of information systems, technologies and processes
H4.1 proposes and justifies ways in which information systems will meet emerging needs
H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects
H5.2 assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices
H6.1 analyses situations, identifies needs, proposes and then develops solutions
H6.2 selects, justifies and applies methodical approaches to planning, designing or implementing solutions
H7.1 implements and explains effective management techniques
H7.2 uses methods to thoroughly document the development of individual and team projects.

Students learn about:	Students learn to:
characteristics of automated manufacturing systems • automated manufacturing systems as information systems involved in production, by inventory tracking, record keeping, production scheduling and actual production • the direct users of these systems as – supervisors overseeing operation – people whose task is dependent on the system for information • the ability of these systems to collect data from the environment through a wide range of sensors, process this data into information and use this information to complete a physical task • the use of microprocessors in these systems as the controller • block diagrams as a tool for describing the interactions between information technology items within these systems	• identify and describe the features of automated manufacturing systems • describe how participants within these systems interact with the information technology within the system • represent the information technology within an automated manufacturing system with a block diagram • within an automated manufacturing system evaluate and refine block diagrams to show more detail for a given situation and identify the sequence of steps that occur
examples of automated manufacturing systems • specific examples, including: – assembly line production such as the car industry – materials and production scheduling – automated warehouses – CAD/CAM such as: computing numerical control (CNC) systems – rapid prototyping – mail sorting • reasons for automation, including: – repetitive tasks – faster decision-making – safety – cost reduction – customisation – quality control – precision and acceptable tolerance range – productivity gains – gains through simulating and modelling, such as: - automated structural calculations - automated ordering of components	• identify participants, data/information and information technology for each example of automated manufacturing systems • discuss the relationships between participants, data/information and information technology for each example of automated manufacturing systems • outline the reasons for automation in each of the examples • diagrammatically represent the processing steps in automated manufacturing systems

Students learn about:	Students learn to:
collecting in automated manufacturing systems	
• systems that collect data and information from participants via computer aided design (CAD) software and directly link this to the rest of the system through computer aided manufacture (CAM)	• discuss the relationship between CAD and CAM in manufacturing systems • use a CAD software package to reproduce a given design
• identification of the data to be collected and the most appropriate input device	• identify data required by a manufacturing system • recommend the most appropriate device to collect data for a given scenario
• the physical operation and scientific principle(s) underlying sensors used to collect data, including: – temperature – pressure – motion – flow – light	• describe the physical operation and the scientific principle(s) underlying this for each sensor
• the integration of sensors into manufacturing machinery to automate processing, such as: – robotic arms – conveyor belts	• use a range of available sensors to collect data that could be used in an automated manufacturing system
• barcode readers, radio frequency identifiers tags (RFID) and inventory tracking and production	• describe the operation of barcode readers and RFID tags and how they can assist in inventory tracking and production
• the analog nature of the data collected by the sensors and its conversion to digital for use in the system	• describe the process of converting from analog to digital data and demonstrate this with available information technology
• damping as the process that modifies the signal to the output device based on the input signal	• describe a situation where changes in collected data lead to a requirement for damping
• types of damping, including: – underdamping – a quick response to change leading to rapid fluctuations – overdamping – a slow response to change without fluctuations – critical damping – a quick response to change and quick return to stability	• justify the type of damping for a given situation
other information processes in manufacturing systems	
• processing: – the trend to mass-production while meeting the needs of individuals – the different types of systems, including: - continuous - batch - discrete – the features of each type of system, the types of tasks they perform and the scheduling of these tasks	• identify manufacturing systems that quickly adapt to a particular need yet still mass produce, such as a car manufacturing plant that mass produces cars but in the colours required by customers • describe the features of each type of system • categorise and justify the categorisation of systems as either continuous, discrete or batch

Students learn about:	**Students learn to:**
• displaying: – actuators – specialised display devices that perform a mechanical action under the control of the system – types of actuators, including: - solenoid - motor - stepping motor - relay - hydraulic pumps – the conversion from digital to analog to control actuators	• recommend a suitable actuator for a given situation • distinguish between situations suitable for the use of each type of actuator • describe the process involved in converting a digital signal to an analog signal
• transmitting and receiving: – noise as the interference in a signal – the causes of noise – ways of correcting noise	• identify noise in relation to signals within the system and recommend techniques for reducing it • construct a simple automated manufacturing system
issues related to automated manufacturing systems	
• the changing nature at work resulting from automation in manufacturing technology • the advantages of semi-automation by utilising skills of people which leads to job satisfaction, including: – flexibility – common sense – ingenuity • the need to develop systems that are human-centred and assist participants to complete tasks, as opposed to machine-centred systems where humans assist machines • the reliability and quality of performing repetitive tasks such as: automatic painting, spot welding, newspaper production and computer embroidery • the improved safety as a result of automated manufacturing • current and emerging trends in automated manufacturing systems ***(See Course Specifications Document)***	• discuss the arguments for and against automation from society's perspective • investigate the effect of de-skilling on participants in the information system • describe the positive and negative impacts of working in an automated industry • classify systems as either machine-centred or human-centred and justify the classification • propose and develop human-centred information systems • describe situations where participants and automation functions work well together

9.4.4 Option 4: Multimedia Systems

Multimedia systems are information systems that combine the different types of media. Professional multimedia systems, especially when being created, involve many participants with a wide breadth of experience. Multimedia systems encompass the entire information process. This topic emphasises the information process of displaying.

Outcomes

A student:

H1.1 applies and explains an understanding of the nature and function of information technologies to a specific practical situation
H1.2 explains and justifies the way in which information systems relate to information processes in a specific context
H2.1 analyses and describes a system in terms of the information processes involved
H2.2 develops and explains solutions for an identified need which address all of the information processes
H3.1 evaluates and discusses the effect of information systems on the individual, society and the environment
H3.2 demonstrates and explains ethical practice in the use of information systems, technologies and processes
H4.1 proposes and justifies ways in which information systems will meet emerging needs
H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects
H5.2 assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices
H6.1 analyses situations, identifies needs, proposes and then develops solutions
H6.2 selects, justifies and applies methodical approaches to planning, designing or implementing solutions
H7.1 implements and explains effective management techniques
H7.2 uses methods to thoroughly document the development of individual and team projects.

Students learn about:	**Students learn to:**
characteristics of multimedia systems	
• multimedia systems – information systems that include combinations of the following media, including: – text and numbers – audio – images and/or animations – video – hyperlinks	• use multimedia systems in an interactive way and to identify how they control the presentation of information • identify multimedia software appropriate to manipulating particular types of data
• the differences between print and multimedia, including: – different modes of display – interactivity and involvement of participants in multimedia systems – ease of distribution – authority of document	• compare and contrast printed and multimedia versions with similar content

Students learn about:	**Students learn to:**
• the demands placed on hardware by multimedia systems, including: – primary and secondary storage requirements as a result of: - bit depth and the representation of colour data - sampling rates for audio data – processing as a result of: - video data and frame rates - image processing, including morphing and distorting - animation processing, including tweening – display devices as a result of: - pixels and resolution	• summarise current information technology requirements for multimedia systems • distinguish between different approaches to animation including path-based and cell-based through practical investigations
• the variety of fields of expertise required in the development of multimedia applications, including: – content providers – system designers and project managers – those skilled in the collection and editing of each of the media types – those skilled in design and layout – those with technical skills to support the use of the information technology being used	• describe the roles and skills of the people who design multimedia systems
examples of multimedia systems • the major areas of multimedia use, including: – education and training – leisure and entertainment – information provision, such as information kiosk – virtual reality and simulations such as flight simulator – combined areas such as educational games • advances in technology which are influencing multimedia development ***(See Course Specifications Document)***	• identify participants, data/information and information technology for one example of a multimedia system from each of the major areas • describe the relationships between participants, data/information and information technology for one example of a multimedia system from each of the major areas • discuss environmental factors that will influence the design of a multimedia system for a given context, and recommend ways of addressing them • critically evaluate the effectiveness of a multimedia package within the context for which it has been designed • interpret developments that have led to multimedia on the World Wide Web • discuss multimedia systems that address new technological developments • compare and contrast multimedia presentations

Students learn about:	Students learn to:
displaying in multimedia systems • hardware for creating and displaying multimedia ***(See Course Specifications Document)*** • software for creating and displaying multimedia ***(See Course Specifications Document)***	• describe how relevant hardware devices display multimedia and use a variety of devices • implement features in software that support the displaying of multimedia and explain their use • use available hardware and software to display multimedia and interact with it • summarise the techniques for collecting, storing and displaying different forms of media and implement these in practical work • create samples of the different media types suitable for use in a multimedia display
other information processes in multimedia systems • processing: – the integration of text and/or number, audio, image and/or video – compression and decompression of audio, video and images – hypermedia – the linking of different media to one another • organising presentations using different storyboard layouts, including: – linear – hierarchical – non-linear – a combination of these • storing and retrieving: – the different file formats used to store different types of data ***(See Course Specifications Document)*** – compression and decompression • collecting: – text and numbers in digital format – audio, video and images in analog format – methods for digitising analog data	• describe the process of analog to digital conversion • plan a multimedia presentation using a storyboard • diagrammatically represent an existing multimedia presentation with a storyboard • design and create a multimedia presentation • combine different media types in authoring software • design and create a multimedia World Wide Web site that includes text and numbers, hypertext, images, audio and video • identify standard file formats for various data types • recommend an appropriate file type for a specific purpose • describe the compression of audio, image and video data and information • decide when data compression is required and choose an appropriate technique to compress data and later retrieve it • capture and digitise analog data such as audio or video

Students learn about:	**Students learn to:**
issues related to multimedia systems • copyright: the acknowledgment of source data and the ease with which digital data can be modified • appropriate use of the Internet and the widespread application of new developments • the merging of radio, television, communications and the Internet with the increase and improvements in digitisation • the integrity of the original source data in educational and other multimedia systems • current and emerging trends in multimedia systems ***(See Course Specifications Document)***	• evaluate and acknowledge all source material in practical work • use Internet based multimedia presentations in a responsible way • predict and debate new technological developments based on advancements in multimedia systems • cross-reference material supplied in multimedia presentations to support its integrity

10 Course Requirements

The *Information Processes and Technology Stage 6 Syllabus* comprises a Preliminary course and a HSC course, each of 120 hours (indicative time).

The Preliminary course is organised around three topics that relate to Introduction to Information Skills and Systems, Tools for Information Processes, and Developing Information Systems, where students are involved in both individual and team projects. All topics and their related projects are based on the information processes and skills of collecting, organising, analysing, storing and retrieving, processing, transmitting/receiving and displaying.

The HSC course is organised around three core topics: Project Work, Information Systems and Databases, and Communication Systems, together with four optional strands. It is assumed students undertaking this course will have satisfied the required outcomes of the Preliminary course. The HSC course involves a core (60% total) and option topics (40% total).

Course Specifications prescribed for Information Processes and Technology Stage 6
The Course Specifications prescribed for Information Processes and Technology Stage 6 Preliminary and HSC courses are published on the Board of Studies' website (www.boardofstudies.nsw.edu.au).

11 Post-school Opportunities

The study of Information Processes and Technology Stage 6 provides students with knowledge, understanding and skills that form a valuable foundation for a range of courses at university and other tertiary institutions.

In addition, the study of Information Processes and Technology Stage 6 assists students to prepare for employment and full and active participation as citizens. In particular, there are opportunities for students to gain recognition in vocational education and training. Teachers and students should be aware of these opportunities.

Recognition of Student Achievement in Vocational Education and Training (VET)
Wherever appropriate, the skills and knowledge acquired by students in their study of HSC courses should be recognised by industry and training organisations. Recognition of student achievement means that students who have satisfactorily completed HSC courses will not be required to repeat their learning in courses in TAFE NSW or other Registered Training Organisations (RTOs).

Registered Training Organisations, such as TAFE NSW, provide industry training and issue qualifications within the Australian Qualifications Framework (AQF).

The degree of recognition available to students in each subject is based on the similarity of outcomes between HSC courses and industry training packages endorsed within the AQF. Training packages are documents that link an industry's competency standards to AQF qualifications. More information about industry training packages can be found on the National Training Information Service (NTIS) website (www.ntis.gov.au).

Recognition by TAFE NSW
TAFE NSW conducts courses in a wide range of industry areas, as outlined each year in the TAFE NSW Handbook. Under current arrangements, the recognition available to students of Information Processes and Technology Stage 6 in relevant courses conducted by TAFE is described in the HSC/TAFE Credit Transfer Guide. This guide is produced by the Board of Studies and TAFE NSW and is distributed annually to all schools and colleges. Teachers should refer to this guide and be aware of the recognition available to their students through the study of Information Processes and Technology Stage 6. This information can be found on the TAFE NSW website (www.tafensw.edu.au/mchoice).

Recognition by other Registered Training Organisations
Students may also negotiate recognition into a training package qualification with another Registered Training Organisation. Each student will need to provide the RTO with evidence of satisfactory achievement in Information Processes and Technology Stage 6 so that the degree of recognition available can be determined.

12 Assessment and Reporting

12.1 Requirements and Advice

The information in this section of the syllabus relates to the Board of Studies' requirements for assessing and reporting achievement in the Preliminary and HSC courses for the Higher School Certificate.

Assessment is the process of gathering information and making judgements about student achievement for a variety of purposes.

In the Preliminary and HSC courses those purposes include:
- assisting student learning
- evaluating and improving teaching and learning programs
- providing evidence of satisfactory achievement and completion in the Preliminary course
- providing the Higher School Certificate results.

Reporting refers to the Higher School Certificate documents received by students that are used by the Board to report both the internal and external measures of achievement.

NSW Higher School Certificate results will be based on:
- **an assessment mark** submitted by the school and produced in accordance with the Board's requirements for the internal assessment program
- **an examination mark** derived from the HSC external examinations.

Results will be reported using a course report containing a performance scale with bands describing standards of achievement in the course.

The use of both internal assessment and external examinations of student achievement allows measures and observations to be made at several points and in different ways throughout the HSC course. Taken together, the external examinations and internal assessment marks provide a valid and reliable assessment of the achievement of the knowledge, understanding and skills described for each course.

Standards Referencing and the HSC Examination

The Board of Studies will adopt a standards-referenced approach to assessing and reporting student achievement in the Higher School Certificate examination.

The standards in the HSC are:
- the knowledge, skills and understanding expected to be learned by students – the *syllabus standards*
- the levels of achievement of the knowledge, skills and understanding – the *performance standards*.

Both *syllabus* standards and performance standards are based on the aims, objectives, outcomes and content of a course. Together they specify what is to be learned and how well it is to be achieved.

Teacher understanding of standards comes from the set of aims, objectives, outcomes and content in each syllabus together with:

- the performance descriptions that summarise the different levels of performance of the course outcomes
- HSC examination papers and marking guidelines
- samples of students' achievement on assessment and examination tasks.

12.2 Internal Assessment

The internal assessment mark submitted by the school will provide a summation of each student's achievements measured at points throughout the course. It should reflect the rank order of students and relative differences between students' achievements.

Internal assessment provides a measure of a student's achievement based on a wider range of syllabus content and outcomes than may be covered by the external examination alone.

The assessment components, weightings and task requirements to be applied to internal assessment are identified on page 61. They ensure a common focus for internal assessment in the course across schools, while allowing for flexibility in the design of tasks. A variety of tasks should be used to give students the opportunity to demonstrate outcomes in different ways and to improve the validity and reliability of the assessment.

12.3 External Examination

In Information Processes and Technology Stage 6 the external examinations includes a written paper for external marking. The specifications for the examination in Information Processes and Technology Stage 6 are on page 63.

The external examination provides a measure of student achievement in a range of syllabus outcomes that can be reliably measured in an examination setting.
The external examination and its marking and reporting will relate to syllabus standards by:

- providing clear links to syllabus outcomes
- enabling students to demonstrate the levels of achievement outlined in the course performance scale
- applying marking guidelines based on established criteria.

12.4 Board Requirements for the Internal Assessment Mark In Board Developed Courses

For each course the Board requires schools to submit an assessment mark for each candidate.

The collection of information for the HSC internal assessment mark must not begin prior to the completion of the Preliminary course.

The Board requires that the assessment tasks used to determine the internal assessment mark must comply with the components, weightings and types of tasks specified in the table on page 62.

Schools are required to develop an internal assessment program which:
- specifies the various assessment tasks and the weightings allocated to each task
- provides a schedule of the tasks designed for the whole course.

The school must also develop and implement procedures to:
- inform students in writing of the assessment requirements for each course before the commencement of the HSC course
- ensure that students are given adequate written notice of the nature and timing of assessment tasks
- provide meaningful feedback on students' performance in all assessment tasks
- maintain records of marks awarded to each student for all assessment tasks
- address issues relating to illness, misadventure and malpractice in assessment tasks
- address issues relating to late submission and non-completion of assessment tasks
- advise students in writing if they are not meeting the assessment requirements in a course and indicate what is necessary to enable the students to satisfy the requirements
- inform students about their entitlements to school reviews and appeals to the Board
- conduct school reviews of assessments when requested by students
- ensure that students are aware that they can collect their Rank Order Advice at the end of the external examinations at their school.

12.5 Assessment Components, Weightings and Tasks

Preliminary Course

The suggested components, weightings and tasks for the Preliminary course are set out below. This table shows indicative time spent on each section. An example of assessment weightings is included in the Support document.

Component	Weighting	Tasks may include:
Introduction to Information Skills and Systems	20%	• project work • essays • tests • oral presentations • portfolios of students' work • structured interview • student–teacher discussion • student logs and journal • practical assignments • practical mastery tests • student explanation and demonstration
Tools for Information Processes	50%	
Developing Information Systems	30%	
Marks	**100%**	

There should be a balance between the assessment of:

- knowledge and understanding outcomes and course content; and
- skills outcomes and course content.

HSC Course

The internal assessment mark for Information Processes and Technology Stage 6 is to be based on the HSC course only. Final assessment should be based on a range and balance of assessment instruments. This table shows indicative time spent on each section. An example of assessment weightings is included in the Support document.

Component	Weighting	Tasks may include:
Project Management	20%	• project work • essays • tests • oral presentations • portfolios of students' work • structured interview • student–teacher discussion • student logs and journal • practical assignments • practical mastery tests • student explanation and demonstration
Information Systems and Databases	20%	
Communication Systems	20%	
Option Strands	40%	
Marks	**100**	

There should be a balance between the assessment of:

- knowledge and understanding outcomes and course content; and
- skills outcomes and content.

One task may be used to assess several components. It is suggested that 3–5 tasks are sufficient to assess the HSC course outcomes.

12.6 HSC External Examination Specifications

Time allowed: 3 hours (plus 5 minutes reading time)
This paper is divided into three sections

Section I (20 marks)

- This section will be based on the core topics: Project Management, Information Systems and Databases, and Communication Systems.
- There will be TWENTY multiple-choice questions.
- All questions are compulsory.

Section II (40 marks)

- This section will be based on the core topics: Project Management, Information Systems and Databases, and Communication Systems.
- There will be FOUR structured free response questions.
- All questions are compulsory.

Section III (40 marks)

- There will be FOUR questions, based on the options of Transaction Processing Systems, Decision Support Systems, Automated Manufacturing Systems, Multimedia Systems.
- Candidates must attempt TWO questions (20 marks each).
- All questions will be of equal value.

12.7 Summary of Internal and External Assessment

Internal Assessment	Weighting	External Assessment	Weighting
Project Management	20	Section I (20 multiple-choice questions) • Project Management • Information Systems and Databases • Communication Systems	20
Information Systems and Databases	20		
Communication Systems	20	Section II (four structured free response questions) • Project Management • Information Systems and Databases • Communication Systems	40
Option Strand • Transaction Processing Systems • Decision Support Systems • Automated Manufacturing Systems • Multimedia Systems	40	Section III (students attempt two questions from four optional questions) • Transaction Processing Systems • Decision Support Systems • Automated Manufacturing Systems • Multimedia Systems	40
Marks	**100**	**Marks**	**100**

12.8 Reporting Student Performance against Standards

Student performance in an HSC course will be reported against standards on a course report. The course report contains a performance scale for the course describing levels (bands) of achievement, an HSC examination mark and the internal assessment mark. It will also show, graphically, the statewide distribution of examination marks of all students in the course.

Each band on the performance scale (except for band 1) includes descriptions that summarise the attainments typically demonstrated in that band.

The distribution of marks will be determined by students' performances against the standards and not scaled to a predetermined pattern of marks.

13 Glossary

dash	When a dash '–' is used within a primary dot point, it is used to separate a term from its definition.
for example	Items in the list are examples used to help provide a context in which learning happens. They need not be the examples covered in a teaching program.
including	All items in the list should be covered and can be assessed. Additional items may also be added.
learn about	The theory and concepts the students are required to learn.
learn to	The experiences the students should undertake to assist in learning their theory.
namely	Only listed items should be covered. No other items should be added.
such as	Items in the list are only examples. They need not be the ones covered in a teaching program.