Content: Information Processes and Technology
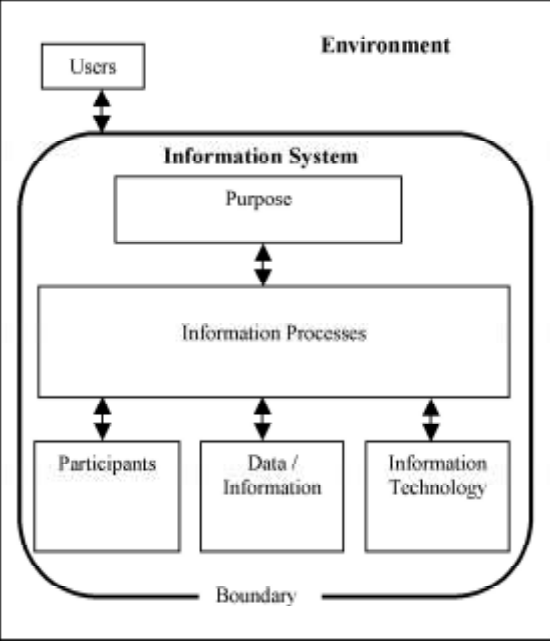
Preliminary Course (Year 11)

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 • data representation – the different types of media, namely: images audio video text numbers • 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 **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	 • distinguish between data and information in a given context • 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 • identify examples of information systems that use information from another information system as data • explain why information technology uses digital data • describe advantages and disadvantages for the digital representation of data

Students learn about:	Students learn to:

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
    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
	• describe social and ethical issues that
	    relate to:
	    information system users
	    participants
	• 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

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
• hardware used for collection
  (See Course Specifications Document)
• software used for collection
  (See Course Specifications Document)
• non-computer procedures in collecting
  literature searches
  surveys and interviews
  form design for data collection
  manual recording of events
  existing non-computer data
• 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
	• 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
	• make predictions about new and emerging trends in data collection based on past practices
	• choose the most appropriate combination of hardware, software and/or non-computer tools to collect data from a given source
	• 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
	• 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
• 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
• software for organisation
  (See Course Specifications Document)
• non-computer tools for organising
  hard copy systems such as phone
	• choose the most appropriate format for a given set of data and identify and describe the most appropriate software and method to organise it
	
	• describe how different types of data are digitised by the hardware that collects it
	• 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
	• use data dictionaries to describe the organisation of data within a given

Students learn about:	Students learn to:

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
 	
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
• software features for analysis, including:
    searching/selecting data
    sorting
    modelling/simulations
    what-if scenarios
    charts and graphs to identify trends
    file comparison
• 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
 	
storing and retrieving
• storing and retrieving – the two-step
	system
	• assess future implications when making decisions about the way data is organised
	
	• identify hardware requirements to carry out a particular type of analysis
	• describe the best organisation for data for a particular type of analysis
	
	use software analysis features in a range of software applications to analyse image, audio, video, text and numeric data
	
	• 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

Students learn about:	Students learn to:
process by which data or information can be saved and reloaded to allow for: other processing to take place 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	• document the storage and retrieval process in an information system • describe the characteristics and operation of hardware devices used for 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:	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:

increased clock speeds
    increased bus capacity
  historical and current trends in CPU
    development
software for processing text, numeric,
  image, video and audio data
non-computer tools and processing
  documenting procedures to be followed
    when processing
social and ethical issues associated with
  processing
  ownership of processed data
  bias in the way participants in the
    system process data
	edit video data using animation packages
	edit audio data using mixing software
	diagrammatically represent data processing

transmitting and receiving
transmitting and receiving – the process that
  transfers information and data within
  and between information systems
hardware for transmitting and receiving
  communications within a computer
    between peripheral devices and the
    CPU via buses
  the role of modems, including
    modulation and demodulation
  local area networks and wide area
    networks
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)
social and ethical issues associated with
  transmitting and receiving
  accuracy of data received from the
    Internet
  security of data being transferred
  net-etiquette
  acknowledgment of data source
  global network issues, time zones, date
    fields, exchange rates
  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
	identify examples of potential human bias in
	  data processing
	
	differentiate between the requirements for a
	  local area network and a wide area
	  network
	transfer numeric, text, image, audio and
	  video data and discuss the time to
	  transfer and required bandwidth
	describe concepts of downloading,
	  uploading and streaming
	
	demonstrate sending and receiving mail,
	  with attachments, over an e-mail system
	select a relevant technology for a given
	  situation to allow computers to transmit
	  and receive data or information
	compare and contrast computer and non-
	  computer based communication
	  systems
	describe and employ net-etiquette when
	  using the Internet
	predict and discuss possible future trends in
	  communications and the impact they are
	  likely to have on the transmitting and
	  receiving of data/information

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

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.

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