### Students Learn About:

- 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

### Students Learn To:

- 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

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**Teaching and Learning Strategies:**

- Teacher introduces Project Management, including the project triangle to reinforce the purpose of project management and the general nature of project management tasks during system development.
- Students in groups discuss the differences between information system development compared to other product development. (Group Task p.4)
- Whole class discussion of roles and problems encountered during the above Group Task as an introduction to communication skills and teams.
- Students split into pairs to read about active listening and then role play active listening. (Group Task p.7)
- Students in small groups discuss the differences between information system development compared to other product development. (Group Task p.4)
- Whole class discussion of roles and problems encountered during the above Group Task as an introduction to communication skills and teams.
- Students in small groups identify causes of conflict and suitable resolution strategies. (Group Task p.8).
- Students in small groups identify negotiation issues, parties and techniques. (Group Task p.10).
- Whole class discussion reflecting on interviews where students were the interviewee. Consider positive and negative attributes. (Group Task p.11).
- Students in small groups discuss advantages of teams and disadvantages of groups that do not function as teams. (Include Group Task p.12).
- Students in small groups reflect on how teams are formed. (Including Group Task p.13). Students identify Belbin team roles that apply to them and others comment. (Group Task p.14). Groups then research using Internet to find alternatives to the Belbin model that are in use. (Group Task p.14).
- Students write summaries of Project Management Tools including (but not limited to) Gantt charts, journals and diaries, funding management plans and communication management plans. (p.15-Group Task p.18).
- Students in small groups discuss social and ethical issues related to project management. (Including Group Tasks p.18).
## Students Learn About:

- *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

## Students Learn To:

- *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

## Teaching and Learning Strategies:

- Teacher introduces the traditional approach and briefly outlines alternative approaches. Including discussion why the traditional approach is often less suited to information system development. (Includes Group Tasks p21 and 22).

- Whole class discussion of different version of the traditional approach and their similarities (and differences) compared to the IPT version. (Group Tasks p23).

- Teacher outlines tasks and deliverables for each stage of the IPT system development lifecycle. (Group Task p24).

- Whole class discussion to introduce Pet Buddies scenario. (Group Tasks p25).

- Teacher outlines Understanding the Problem stage. (Includes Group Tasks p26,27).

- Students in small groups read information on interviewing/surveying users/participants of existing system and complete Group Tasks (p27-33). Whole class summary session to share results.

- Class discussion on the nature and role of requirements prototypes. How they assist development personnel (Group Task p35).

- Students create a simple (single screen) requirements prototype using a screen generator. Screen could developed from an existing paper form, such as a question from a Centrelink or other government department’s paper application form.

- Teacher describes the purpose and content of a requirements report and how it is used throughout the SDLC. (includes Group Tasks p36-39).

- Teacher demonstrates an automated requirements definition application, such as Objectiver. (Group Task p40) Students then research other examples of requirements engineering software (Group Task p40).

- Students in small groups analyse the example pages from the Pet Buddies requirements report on p41-42. (Group Tasks p41,42).
## Students Learn About:

* 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

* 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

## Students Learn To:

* 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
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* clarifying with users the benefits of the new information system</td>
<td>* develop a solution to a problem from a prototype</td>
</tr>
<tr>
<td>* designing the information system for ease of maintenance</td>
<td>* use a guided process in an application to create all or part of a solution</td>
</tr>
<tr>
<td>* clarifying each of the relevant information processes within the system</td>
<td>* use system design tools to:</td>
</tr>
<tr>
<td>* detailing the role of the participants, the data and the information technology used in the system</td>
<td>– better understand the system</td>
</tr>
<tr>
<td>* refining existing prototypes</td>
<td>– assist in explaining the operation of the new system</td>
</tr>
<tr>
<td>* tools used in designing, including:</td>
<td>– document the new system</td>
</tr>
<tr>
<td>– context diagrams</td>
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<tr>
<td>– data flow diagrams</td>
<td></td>
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<tr>
<td>– decision trees</td>
<td></td>
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<tr>
<td>– decision tables</td>
<td></td>
</tr>
<tr>
<td>– data dictionaries</td>
<td></td>
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<tr>
<td>– storyboards</td>
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</tbody>
</table>

**Teaching and Learning Strategies:**

Teacher outlines activities occurring during the Designing stage of the SDLC. This includes differences as a consequence of the selected system development approach and how user/participant needs/concerns will be determined/addressed.

Teacher presents context diagrams, including symbols and strategy for creation using example questions. (Includes Group Task p66).

Students create context diagrams by answering Exercise 1D Question 13.

Teacher presents Data Dictionaries including all columns within the Course Specifications (Refer p14 of Course Specifications). Note that some columns are not relevant to current study of design tools, but will be relevant to database design. (Include Group Tasks p67).

Students create a data dictionary for the Context Diagrams created in Exercise 1D Q13.

Teacher presents DFDs including the symbols used, rules, levels and creation strategy. Refer to Widget examples on page 69 and Pet Buddies example on page 70. (Includes Group Tasks p69,71).

Students in small groups complete Exercise 1D Q14 (a) and (b). Each group in turn shares their DFD with the class. Class critically analyses each DFD.

Teacher presents Decision Trees and Decision Tables using (and creating) examples.

Students in groups identify conditions and actions for the ATO tables on page 72 and create a decision table or tree. As a class, analyse each group's result and compare to the solutions on page 30 of the IPT HSC TRK.

Teacher introduces Storyboards, including the example within the Course Specifications (page 15).

Students in small groups are allocated an application or website. Each group creates a storyboard, including links, based on their allocated application or website and comments on strengths and weaknesses of the design.

Teacher outlines factors related to the design of hardware and software (Information Technology). Includes Group Tasks p75-78.

Students identify issues associated with the refinement and distribution of prototypes and strategies for obtaining ongoing user feedback. (Group Task p80).

Students use a guided process (such as a Wizard) to build part of a system. Possible examples are listed at the bottom of page 80.
### Students Learn About:
- * 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

### Students Learn To:
- * 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
**Teaching and Learning Strategies:**

Teacher introduces testing and evaluation. Includes distinguishing between and describing the purpose of volume, simulated and live tests. Also reinforcing and identifying when and why testing/evaluation occurs throughout the SDLC. (Includes Group Tasks p90,92).

Students use a volume test data generator to populate a simple prepared database, such as an address book.

Students understand that operation manuals are specific to the individual system/organisation and reasons for trialing operation manuals. Students read pages 93,94 and complete Group Tasks on page 94.

Students understand the need for and variety of ongoing evaluation. Students read and summarise pages 95-98 and respond to the included Group Tasks on p95,98.

Teacher introduces common maintenance activities using a variety of existing known systems as examples. For instance maintenance of school network, library, banks, mobile phone, email systems, etc.

Students understand that ongoing evaluation/maintenance tasks often uncover areas that require modification. Modifications should follow the stages of the SDLC. Students complete Group Tasks p99.

<table>
<thead>
<tr>
<th>Students Learn About:</th>
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<tbody>
<tr>
<td>* testing and evaluating the solution with test data such as</td>
</tr>
<tr>
<td>– volume data</td>
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<tr>
<td>– simulated data</td>
</tr>
<tr>
<td>– live data</td>
</tr>
<tr>
<td>* checking to see that the original system requirements have been achieved</td>
</tr>
<tr>
<td>* trialling and using the operation manual</td>
</tr>
<tr>
<td>* reviewing the effect on users of the information system, participants and people within the environment</td>
</tr>
<tr>
<td>* modifying parts of the system where problems are identified</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* compare the new system to the old and evaluate whether the requirements have been met</td>
</tr>
<tr>
<td>* update system documentation</td>
</tr>
</tbody>
</table>

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Information Processes and Technology Program (page 6 of 48)
**Program Topic: Examples of Information Systems and Databases**

Syllabus Topic: 9.2 Information Systems and Databases

**Teaching and Learning Strategies:**

Teacher introduces information systems and databases, including examples to illustrate their widespread usage within a broad range of information systems. For example, banks, search engines, CMS, LMS, and virtually every business and government organisation. (Includes Group Tasks p107).

Students study the school timetable system described in the text (p108-112) and complete the included Group Tasks. Students compare the example in the text to the timetable system within the school.

Students study the RTA system described within the text (p113-115) and complete the included Group Tasks.

Students study the Video Store information system described as part of the HSC Style Question (p116-117) and complete the included Group Tasks. Based on the suggested solution, students create a context diagram and create a procedure (sequence of steps) for sales staff as when processing sales.

<table>
<thead>
<tr>
<th><strong>Students Learn About:</strong></th>
<th><strong>Students Learn To:</strong></th>
</tr>
</thead>
</table>
| * the characteristics of an information system, namely:  
  – the organisation of data into information  
  – the analysing of information to give knowledge | * identify the type and purpose of a given information system  
  
| * 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 | * 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  

| * 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 |

Information Processes and Technology Program (page 7 of 48)  
Class: ___________________  Teacher: ___________________  Date Completed: ___________________
### Students Learn About:

- 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

### Students Learn To:

- 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
- create a data dictionary for a given set of data
- demonstrate an awareness of issues of privacy, security and accuracy in handling data
**Program Topic: Relational Databases**

Syllabus Topic: 9.2 Information Systems and Databases

**Teaching and Learning Strategies:**

Teacher briefly outlines the general organisation of network, hierarchical and relational databases to illustrate alternative methods of organisation. (Refer first Group Task p127). Teacher provides multiple examples of systems where relational databases are critical. (Refer second Group Task p127)

Teacher demonstrates the relationship between applications, DBMS and relational databases using an actual example. For instance, using the school's admin system, CMS or LMS where access to the underlying relational DBMS is possible.

Teacher guides and stops to formally present relational databases and schemas to students whilst they explore the organisation of the completed Library database described in the text. Refer pages 128-136 and complete the included Group Tasks.

Students recreate the Library database from scratch based on the revised schema (Fig 2.17 p133).

<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
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</thead>
<tbody>
<tr>
<td>* the logical organisation of relational databases, including:</td>
<td>* identify situations where one type of database is more appropriate than another</td>
</tr>
<tr>
<td>- schemas as consisting of:</td>
<td>* represent an existing relational database in a schematic diagram</td>
</tr>
<tr>
<td>- entities</td>
<td>* create a schematic diagram for a scenario where the data is to be organised into a relational database</td>
</tr>
<tr>
<td>- attributes</td>
<td>* modify an existing schema to meet a change in user requirements</td>
</tr>
<tr>
<td>- relationships</td>
<td>* choose and justify the most appropriate type of database, flat-file or relational, to organise a given set of data</td>
</tr>
<tr>
<td>* one to one</td>
<td>* create a simple relational database from a schematic diagram and data dictionary</td>
</tr>
<tr>
<td>* one to many</td>
<td>* populate a relational database with data</td>
</tr>
<tr>
<td>* many to many</td>
<td>* describe the similarities and differences between flat-file and relational databases</td>
</tr>
<tr>
<td>- tables as the implementation of entities consisting of:</td>
<td>* create a data dictionary for a given set of data</td>
</tr>
<tr>
<td>- attributes</td>
<td>* create documentation, including data modelling, to indicate how a relational database has been used to organise data</td>
</tr>
<tr>
<td>- records</td>
<td></td>
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<tr>
<td>- linking tables using primary and foreign keys</td>
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<tr>
<td>- user views for different purposes</td>
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<tr>
<td>* data modelling tools for organising databases, including:</td>
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<tr>
<td>- data dictionaries to describe the characteristics of data</td>
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<tr>
<td>- field name</td>
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<tr>
<td>- data type</td>
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<td>- data format</td>
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<td>- field size</td>
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<tr>
<td>- description</td>
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<tr>
<td>- example</td>
<td></td>
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<tr>
<td>- schematic diagrams that show the relationships between entities</td>
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<tr>
<td>- normalising data to reduce data redundancy</td>
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</table>

Information Processes and Technology Program (page 9 of 48)  
Class: ___________________  Teacher: ___________________  Date Completed: ___________________
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* data modelling tools for organising databases, including:</td>
<td>* create a schematic diagram for a scenario where the data is to be organised into a relational database</td>
</tr>
<tr>
<td>- data dictionaries to describe the characteristics of data including:</td>
<td>* modify an existing schema to meet a change in user requirements</td>
</tr>
<tr>
<td>- field name</td>
<td>* create a simple relational database from a schematic diagram and data dictionary</td>
</tr>
<tr>
<td>- data type</td>
<td>* populate a relational database with data</td>
</tr>
<tr>
<td>- data format</td>
<td>* create documentation, including data modelling, to indicate how a relational database has been used to organise data</td>
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<td>- field size</td>
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<td>- schematic diagrams that show the relationships between entities</td>
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<tr>
<td>- normalising data to reduce data redundancy</td>
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</tbody>
</table>

**Teaching and Learning Strategies:**

Teacher describes the purpose of normalisation and outlines the normalisation process and normal forms. Includes Group Task p139.

Teacher formally presents normalising to 1NF and demonstrates using the initial Invoicing database within the text. Including Group Task p141.

Students normalise the initial Invoicing database to 1NF.

Teacher formally presents normalising from 1NF to 2NF and demonstrates beginning with the 1NF Invoicing database within the text.

Students normalise the 1NF Invoicing database to 2NF.

Teacher formally presents normalising from 2NF to 3NF and demonstrates an example using the 2NF Invoicing database within the text. Includes Group Task p145.

Teacher leads discussion of advantages of normalised databases. Based on "Consider the following" p145,146. Includes Group Tasks p146.

Students create and populate the relational database for the HSC Style Question and Suggested Solution p147,148. Includes Group Tasks p148.
### Program Topic: Hypertext, Hypermedia

Syllabus Topic: 9.2 Information Systems and Databases

#### Students Learn About:

- **the logical organisation of hypermedia, including:**
  - nodes and links
  - uniform resource locators
  - metadata such as HTML tags

#### Students Learn To:

- * 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

#### Teaching and Learning Strategies:

- Teacher introduces the terms hypermedia and hypertext, including its organisation (nodes and links) and its broader meaning (not just HTML). Refer p150-151 including Group Tasks.

- Students in small groups investigate a variety of different hypermedia systems. For example, games, education and help systems. Examples should not be limited to websites. Students analyse the screen layout and navigation with particular focus on how this assists the system to achieve its purpose.

- Students create a storyboard for a simple hypertext/hypermedia system that is appropriate for implementation using basic HTML.

- Teacher presents examples of HTML code, defines the term metadata and describes the components of URLs.

- Students use a text editor to write HTML code to create a simple web containing 3 or 4 screens. The web should include text, images and videos.

- Students use a web page creation application to create a simple web based on an existing template.
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Teaching and Learning Strategies:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* database management systems (DBMS) including:</td>
<td>Teacher describes the operation and role of DBMS software in relation to applications and databases. Refer p162-164 and included Group Tasks.</td>
</tr>
<tr>
<td>– the role of a DBMS in handling access to a database</td>
<td>Students summarise text information on storage hardware and define syllabus terms. Refer p164-169, includes Group Tasks.</td>
</tr>
<tr>
<td>– the independence of data from the DBMS</td>
<td>Students in small groups are assigned one of the techniques for securing data from Fig 2.57 on page 170. Each group reads and researches their technique and plans a 5-10 minute presentation.</td>
</tr>
<tr>
<td>* direct and sequential access of data</td>
<td>Each group of students presents their technique for securing data to the class. Teacher adds any missing details as required after each presentation.</td>
</tr>
<tr>
<td>* on-line and off-line storage</td>
<td>Teacher directs class discussion of suitable security measures (including combination of measures) using a variety of scenarios. (Group Task bottom of p176).</td>
</tr>
<tr>
<td>* storage media including:</td>
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<tr>
<td>– hard discs</td>
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<tr>
<td>– CD-ROMs</td>
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<tr>
<td>– cartridge and tape</td>
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</tr>
<tr>
<td>* encryption and decryption</td>
<td></td>
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<tr>
<td>* backup and security procedures</td>
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</tr>
</tbody>
</table>
## Students Learn About:

- 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`

## Students Learn To:

- 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
- calculate the storage requirements for a given number of records (given a data dictionary for a database)
Program Topic: Centralised and Distributed Databases

Syllabus Topic: 9.2 Information Systems and Databases

Teaching and Learning Strategies:
Teacher presents centralised and distributed databases, including a range of common distributed database strategies (p.192-197). Includes Group Tasks p197).

Students Learn About:
* centralised and distributed databases

Class: _______________  Teacher: _______________  Date Completed: _______________
**Teaching and Learning Strategies:**

Students are assigned a search engine, they research the operation of this search engine. Include examples of web directories and those that use search robots or crawlers.

Teacher presents the detailed operation of the search engine described in the text (p198-201). Including comparison with the operation of search engines researched by students.

Class discussion of how to improve ranking of individual search results. (Group Tasks p201).

<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* tools for hypermedia search and retrieval, including:</td>
<td>* summarise, extrapolate and report on data retrieved from the Internet</td>
</tr>
<tr>
<td>– free text searching</td>
<td>* use search engines to locate data on the World Wide Web</td>
</tr>
<tr>
<td>– operation of a search engine</td>
<td>* describe the principles of the operation of a search engine</td>
</tr>
<tr>
<td>- indexing and search robots</td>
<td></td>
</tr>
<tr>
<td>- metadata</td>
<td></td>
</tr>
<tr>
<td>* reporting on data found in hypermedia systems</td>
<td></td>
</tr>
</tbody>
</table>

**Class:** ___________________  **Teacher:** ___________________  **Date Completed:** ___________________
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* displaying</td>
<td>* design and create screens for interacting with selected parts of a database and justify their appropriateness</td>
</tr>
<tr>
<td>– reporting on relevant information held in a database</td>
<td></td>
</tr>
<tr>
<td>– constructing different views of a database for different purposes</td>
<td>* design and generate reports from a database</td>
</tr>
</tbody>
</table>

**Teaching and Learning Strategies:**

- Teacher presents and evaluates examples of data entry screens and reports to illustrate aspects of good and poor design (Refer p204-212).
- Teacher demonstrates the operation and features of the form and report design tools in the software to be used to complete the practical tasks that follow.
- Students design and create data entry screens for an existing database using the design principles described in the text (p204-212).
- Students design and create reports (for printing) from an existing database using the design principles described in the text (p204-212).
**Teaching and Learning Strategies:**
Teacher leads discussion on the reasons for acknowledging data sources. Including justifying and verifying outputs, auditing and tracking the accuracy of data and complying with requirements of the data source organisation/individual. (Includes Group Tasks p25, 216).
Class discussion of Freedom of Information and Privacy legislation. Focus on what is covered, reasons for the legislation and also how it can be enforced. Refer text p26-219 (Including Group Tasks).
Class discussion of the importance of data integrity, including validation and verification (p219, 220). Also data quality, refer p443 of TPS chapter.
Teacher outlines the general nature of data warehouses, data mining (refer text p222-223 and also 435,468-472), OLAP and OLTP (refer text p224, 472-475).
Students research examples of organisations that use data warehouses and determine how they are mined. They also use a simple online OLAP tool using the Internet. (If not studying TPS and DSS then this is particularly critical).

**Students Learn About:**
- 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

**Students Learn To:**
- 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

- current and emerging trends in the organisation, processing, storage and retrieval of data, such as:
  - data warehousing and data mining
  - Online Analytical Processing (OLAP) and Online Transaction Processing (OLTP)
**Students Learn About:**

- Communication systems as 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

**Students Learn To:**

- 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

**Teaching and Learning Strategies:**

Teacher presents the Communication System Framework diagram using non-computer (e.g., conversation) and simplified computer examples. (p229 and Group Task p229).

Teacher outlines both the OSI model layers and IPT levels of protocols. Includes identifying common protocols operating at each of the IPT Levels. (p230-231)

Teacher presents how messages pass from sender to receiver. A web browser retrieving then displaying a particular single HTML page would be a good example to use as the class works through pages 232-237 of the text. Teacher demonstrates the processes performed by each protocol using command line tools. For example, perform an HTTP GET, DNS lookup, TRACERT, netstat and examine MAC addresses of devices as different parts of the exchange are described.
### Program Topic: Protocols

**Syllabus Topic:** 9.3 Communication Systems

**Students Learn About:**
- the roles of protocols in communication
  - handshaking and its importance in a communications link
  - functions performed by protocols at different levels
- communication protocols, including:
  - application level protocols
    - http
    - smtp
    - SSL
  - communication control and addressing level protocols
    - TCP
    - IP
  - transmission level protocols
    - Ethernet
    - Token ring
- 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)

**Students Learn To:**
- 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
- use a communication system to transmit and receive audio, video and text data
- justify the need to encode and decode data
- describe the structure of a data packet

### Teaching and Learning Strategies:

- Students individually read through introduction to protocols and HTTP on pages 237-239.
- Students use telnet (or similar) to execute HTTP commands directly. Students view a simple HTML file using a browser and then the same file using telnet.
- Students study TCP and IP on pages 239-243.
- Students investigate and track the route of an actual TCP/IP exchange using command line tools. For example, ping, Tracert, nslookup, etc.
- Students study the Ethernet protocol on pages 243-244.
  Students investigate the Ethernet standard used within the classroom. Students identify MAC (physical) addresses of NICs and connection devices.
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* characteristics of media in terms of speed, capacity, cost and security</td>
<td>* justify the need to encode and decode data</td>
</tr>
<tr>
<td>* processing, including:</td>
<td>* identify where in a communication system signal conversion takes place</td>
</tr>
<tr>
<td>– encoding and decoding analog and digital signals</td>
<td></td>
</tr>
<tr>
<td>– formation of data packets</td>
<td></td>
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<td>– routing</td>
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<td>– encryption and decryption</td>
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<td>– error checking</td>
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<tr>
<td>- parity bit check</td>
<td></td>
</tr>
<tr>
<td>- check sum</td>
<td></td>
</tr>
<tr>
<td>- cyclic redundancy check (CRC)</td>
<td></td>
</tr>
</tbody>
</table>
### Students Learn About:

- Strategies for error detection and error correction
- 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)

### Students Learn To:

- Describe methods to check the accuracy of data being transmitted

---

**Teaching and Learning Strategies:**

Teacher presents the operation of parity bit checks using simple examples of odd and even parity. Teacher explains applications that use parity bits and the limitations of parity checks compared to other error checking methods. (Refer p249-250).

Students calculate the value of parity bits for a number of given examples. Students analyse different types of corruption that will and will not be detected by parity checks.

Teacher introduces checksums using an example calculated in both decimal and binary. (Refer p251-253). Teacher identifies protocols that include checksums.

Students calculate checksums in both decimal and binary using a limited number of 8-bit numbers. Whilst working, students attempt to identify corruptions that would not be detected using checksums.

Teacher presents the operation of CRCs using a numeric example. (Refer p253-256). Teacher identifies applications (mostly hardware) that utilise CRCs.

Students calculate CRC values for given simple examples. Students identify the general nature of corruptions that would not be detected using CRCs.
### Teaching and Learning Strategies:
Teacher outlines the differences between the Internet, PSTN, intranets and extranets. Including limitations of each and how the underlying digital infrastructure is often shared.

Students in small groups work through the two example teleconferencing systems outlined in the text. Each group discusses and compiles written responses to each of the included group tasks. (Refer p261-272).

Students participate in a brief teleconference (including initial setup) within the classroom using available technology. Class discussion outlining the difficulties encountered during setup and during the conference.

### Students Learn About:
- * teleconferencing systems
- * similarities and differences between the Internet, intranets and extranets
- * changing nature of work

### Students Learn To:
- * 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
- * compare and contrast traditional communication systems with current electronic methods
- * represent a communication system diagrammatically
- * identify the issues associated with the use of communication systems, including:
  - teleconferencing systems
  - messaging systems
  - e-commerce
  - EFTPOS
  - electronic banking
## Program Topic: Messaging Systems

### Syllabus Topic: 9.3 Communication Systems

**Students Learn About:**
- messaging systems, including:
  - email
  - voice mail
  - Voice Over Internet Protocol (VOIP)
- collecting, such as
  - the phone as the collection device with voice mail
  - EFTPOS terminal as a collection device for electronic banking
- displaying, such as
  - the phone as the display device with voice mail
  - EFTPOS terminal as a display device for electronic banking
- interpersonal relationships

**Students Learn To:**
- 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
- compare and contrast traditional communication systems with current electronic methods
- represent a communication system diagrammatically
- identify the issues associated with the use of communication systems, including:
  - teleconferencing systems
  - messaging systems
  - e-commerce
  - EFTPOS
  - electronic banking

### Teaching and Learning Strategies:

- Class discussion of the operation of traditional telephone/fax and advantages/disadvantages over other computer-based means of communication. (refer p275-276).

- Students study voice mail and phone information systems (p276-282, including Group Tasks).

- Students create a basic phone information system (as a simulation) using available software such as IVM Answering attendant.

- Students study the operation of VoIP, including identifying the underlying protocols and hardware used.

- Class discussion comparing traditional PSTN with VoIP. (Refer p284, includes Group Task).

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Information Processes and Technology Program (page 23 of 48)
### Students Learn About:

- **messaging systems**, including:
  - email
  - voice mail
  - Voice Over Internet Protocol (VOIP)

- **communication protocols**, including:
  - application level protocols
    - http
    - smtp
    - SSL
  - communication control and addressing level protocols
    - TCP
    - IP
  - transmission level protocols
    - Ethernet
    - Token ring

- **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)

- **security**

### Students Learn To:

- **identify client processing and server processing**
- **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**
- **represent a communication system diagrammatically**
- **describe the structure of a data packet**

---

**Teaching and Learning Strategies:**

Teacher presents the organisation of email messages. Teacher describes and demonstrates the role and operation of SMTP and POP during the transmission of email messages.

Students identify the fields within the email contents component and data added as part of the envelope component using examples of received email messages.

Students send and receive email messages using each of the destination address fields and observe and confirm their effect.

Students send and receive email messages that include attachments and that include formatted messages (including those that include images). Students examine the raw received text data and compare with the formatted message displayed by the email client.

Students send and receive email messages from an email client and also using a command line utility such as telnet. (Refer p290-291).
Program Topic: Electronic Commerce
Syllabus Topic: 9.3 Communication Systems

Teaching and Learning Strategies:

- Class discussion to identify the collection and display devices used within typical ATMs. How ATMs connect to the bank or EFTPOS network.
- Class discussion of crimes associated with ATMs and how the security features within the design of ATMs. (Group Task p295).
- Students research examples of EFTPOS terminals. Including their integration into retail POS systems.
- Teacher presents how EFTPOS terminals communicate with a variety of different financial institutions via a host system.
- Students construct a DFD to expand the DFD on page 297. (Group Task p297).
- Teacher describes the operation of Internet banking with particular emphasis on SSL and public key encryption. (Refer p298-299). Students use a simulation/tutorial from an Internet banking site.
- Class discussion of illegal access to Internet banking sites. (Group Tasks p299).
- Class discussion to brainstorm examples of Internet trading and its effects on traditional retailers.
- Class discussion of Internet trading opening up a global market where retailers are often virtual organisations (in particular eBay and PayPal). Includes Group Tasks p303

Students Learn About:

- other systems dependent on communication technology such as:
  - e-commerce
  - EFTPOS
  - electronic banking
- communication protocols, including:
  - application level protocols
  - http
  - smtp
  - SSL
  - communication control and addressing level protocols
  - TCP
  - IP
  - transmission level protocols
  - Ethernet
  - Token ring
- collecting, such as
  - the phone as the collection device with voice mail
  - EFTPOS terminal as a collection device for electronic banking
- displaying, such as
  - the phone as the display device with voice mail
  - EFTPOS terminal as a display device for electronic banking
- security
- globalisation
- e-crime
- virtual communities

Students Learn To:

- 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
- compare and contrast traditional communication systems with current electronic methods
- represent a communication system diagrammatically
- simulate activities involved with communication in areas such as
  - e-commerce
  - EFTPOS
  - Internet banking
- 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
Students Learn About:

- 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

Students Learn To:

- identify client processing and server processing
- describe the advantages and disadvantages of client–server architecture

Teaching and Learning Strategies:

Teacher presents the underlying basis of the client-server architecture, including how one server can authenticate users and then is trusted by other servers.

Teacher distinguishes between thin clients and fat clients by describing and demonstrating examples of each. Note that OASIS in many DET schools now uses thin clients.
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* communication protocols, including:</td>
<td>* diagrammatically represent the topology</td>
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<td>– application level protocols</td>
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<tr>
<td>– http</td>
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<td>– smtp</td>
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<td>– SSL</td>
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<td>– communication control and addressing level protocols</td>
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<td>– TCP</td>
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<td>– IP</td>
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<tr>
<td>– transmission level protocols</td>
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<tr>
<td>– Ethernet</td>
<td></td>
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<tr>
<td>– Token ring</td>
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<tr>
<td>* network topologies, including:</td>
<td>* design and implement a communication system to meet an individual need</td>
</tr>
<tr>
<td>– star</td>
<td></td>
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<tr>
<td>– bus</td>
<td></td>
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<tr>
<td>– ring</td>
<td></td>
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<tr>
<td>– hybrid</td>
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<tr>
<td>– wireless networks</td>
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<tr>
<td>* processing, including:</td>
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<tr>
<td>– encoding and decoding analog and digital signals</td>
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<tr>
<td>– formation of data packets</td>
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<td>– routing</td>
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<td>– encryption and decryption</td>
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<td>– parity bit check</td>
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<td>– check sum</td>
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<tr>
<td>– cyclic redundancy check (CRC)</td>
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</tr>
</tbody>
</table>

Teaching and Learning Strategies:
Teacher defines the term "topology" and distinguishes between physical and logical topology.

Students read about physical topologies (p307-311) and construct a diagram of the school network.

Teacher presents how data collisions are dealt with or avoided on logical bus, ring and star topologies. Includes description of CSMA/CD, CSMA/CA and token ring protocol.

Students in small groups work through the logical topology section of the text and complete each of the group tasks. (Refer p311-316).
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* processing, including:</td>
<td>* distinguish between data in analog and digital form</td>
</tr>
<tr>
<td>– encoding and decoding analog and digital signals</td>
<td></td>
</tr>
<tr>
<td>– formation of data packets</td>
<td>* justify the need to encode and decode data</td>
</tr>
<tr>
<td>– routing</td>
<td></td>
</tr>
<tr>
<td>– encryption and decryption</td>
<td>* identify where in a communication system signal conversion takes place</td>
</tr>
<tr>
<td>– error checking</td>
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<tr>
<td>- parity bit check</td>
<td></td>
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<tr>
<td>- check sum</td>
<td></td>
</tr>
<tr>
<td>- cyclic redundancy check (CRC)</td>
<td></td>
</tr>
</tbody>
</table>
### Program Topic: Transmission Media

**Syllabus Topic:** 9.3 Communication Systems

**Teaching and Learning Strategies:**
Teacher led class discussion and student research of each of the specified wired and wireless transmission media. Includes Group Tasks p327-336.

**Students Learn About:**
- Transmission media, including:
  - Wired transmission
  - Twisted pair
  - Coaxial cable
  - Optic fibre
  - Wireless transmission
  - Microwave
  - Satellite
  - Radio
  - Infrared

- Characteristics of media in terms of speed, capacity, cost and security

**Students Learn To:**
- For a given scenario, choose and justify the most appropriate transmission media

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Information Processes and Technology Program (page 29 of 48)

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Class:          Teacher:          Date Completed:
### Students Learn About:
- functions performed by the following hardware components used in communication systems:
  - hubs and switches
  - routers
  - modems
  - bridges and gateways
  - Network Interface Cards (NIC)
  - mobile phones
  - cables
  - wireless access points
  - bluetooth devices

### Students Learn To:
- describe the location and role of hardware components on the network
- compare the functions of different hardware components

---

**Teaching and Learning Strategies:**
Teacher describes the functions performed and shows examples of different network connection devices and/or demonstrates configuration screens (where appropriate). Includes Group Tasks p343-346.

Students create summaries of the significant features and processes for each of the network connection devices.

Teacher provides a number of scenarios where multiple nodes need to be connected into a LAN. Students suggest suitable methods and devices for connection, protocols required and length of transmission media.
### Students Learn About:

* 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

### Students Learn To:

* identify client processing and server processing
* describe the advantages and disadvantages of client–server architecture

---

Teaching and Learning Strategies:

Teacher describes and demonstrates the servers present within the school (both hardware and software). Including any performance, fault tolerance and security features.

Students list and summarise the processes performed by each type of server.
### Program Topic: Network Software

**Syllabus Topic:** 9.3 Communication Systems

#### Teaching and Learning Strategies:

- Teacher describes the role of network operating systems using the school network as an example.
- Teacher demonstrates network administration tasks from the syllabus using the school network.
- Students investigate the file system used on their home (or school) computers and identify the access rights that are or can be assigned.
- Students research different examples of NOS to determine how users are authenticated and permissions are assigned.

<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* characteristics of network operating software</td>
<td>* identify the main characteristics of network operating software</td>
</tr>
<tr>
<td>* network administration tasks, such as:</td>
<td>* detail the network management software in a given network</td>
</tr>
<tr>
<td>– adding/removing users</td>
<td>* describe the role of the network administrator and conduct network administration tasks</td>
</tr>
<tr>
<td>– assigning users to printers</td>
<td>* demonstrate logon and logoff procedures, and justify their use</td>
</tr>
<tr>
<td>– giving users file access rights</td>
<td>* adopt procedures to manage electronic mail</td>
</tr>
<tr>
<td>– installation of software and sharing with users</td>
<td></td>
</tr>
<tr>
<td>– client installation and protocol assignment</td>
<td></td>
</tr>
<tr>
<td>– logon and logoff procedures</td>
<td></td>
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<tr>
<td>– network-based applications</td>
<td></td>
</tr>
</tbody>
</table>

**Information Processes and Technology Program (page 32 of 48)**
### Program Topic: Issues Related to Communication Systems

**Syllabus Topic: 9.3 Communication Systems**

#### Teaching and Learning Strategies:

Students work in small groups. Each group researches and prepares a presentation for the class on one area. Areas may include: Internet fraud, power and control, removal of physical boundaries, interpersonal issues, work and employment issues or current and emerging trends.

Each small group presents their research to the whole class. Presentations may include web demonstrations, role playing, handouts and class discussions.

Teacher presents a range of current issues and trends relating to communication systems sourced from recent news and media. Students predict the effects and likely acceptance of the new trend.

<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* security</td>
<td>* describe and justify the need for ethical behaviour when using the Internet</td>
</tr>
<tr>
<td>* globalisation</td>
<td>* discuss the social and ethical issues that have arisen from use of the Internet, including:</td>
</tr>
<tr>
<td>* changing nature of work</td>
<td>– the availability of material normally restricted</td>
</tr>
<tr>
<td>* interpersonal relationships</td>
<td>– electronic commerce</td>
</tr>
<tr>
<td>* e-crime</td>
<td>– domination of content and control of access to the Internet</td>
</tr>
<tr>
<td>* legal</td>
<td>– the changing nature of social interactions</td>
</tr>
<tr>
<td>* virtual communities</td>
<td>* identify the issues associated with the use of communication systems, including:</td>
</tr>
<tr>
<td>* current and emerging trends in communication systems, including:</td>
<td>– teleconferencing systems</td>
</tr>
<tr>
<td>– blogs</td>
<td>– messaging systems</td>
</tr>
<tr>
<td>– wikis</td>
<td>– e-commerce</td>
</tr>
<tr>
<td>– RSS feeds</td>
<td>– EFTPOS</td>
</tr>
<tr>
<td>– podcasts</td>
<td>– electronic banking</td>
</tr>
<tr>
<td>– online radio, TV and video on demand</td>
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</tr>
<tr>
<td>– 3G technologies for mobile communications</td>
<td>* predict developments in communication systems based on current trends</td>
</tr>
</tbody>
</table>

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Information Processes and Technology Program (page 33 of 48)
### Program Topic: Characteristics of Transaction Processing Systems

#### Syllabus Topic: 9.4.1 Option 1: Transaction Processing Systems

#### Teaching and Learning Strategies:
- **Teacher** presents examples of transactions and then describes and formulates a definition of the term "transaction".
- **Class discussion** to brainstorm common transactions and identify their component events and actions. Including discussion of issues should one or more events fail whilst others succeed. (Group Task p365).
- **Students** read about the history of transaction processing and create a timeline as a summary. (Refer p366-368).
- **Students** in small groups read about the automation of manual transaction processing (p368-371) and respond to group tasks at top of p369 and p371.
- **Teacher** presents and describes a case study of a TPS that includes a transaction processing monitor. Teacher details the components of this TPS. Teacher details the role of the transaction log and transaction processing monitors, in terms of committing and rolling back transactions using the case study as an example. (Refer p371-375, including Group Tasks).
- **Teacher** introduces techniques for improving/ensuring data integrity with particular detail with regard to the ACID properties of transactions. (Refer p375-379).

#### Students Learn About:
- 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
- The significance of data validation in transaction processing
- The historical significance of transaction processing as the first type of information systems
- Storage of digital data in databases and files
- Changing nature of work and the effect on participants, including:
  - automation of jobs once performed by clerks
  - shifting of workload from clerks to members of the public
- The importance of data in transaction processing, including:
  - data security
  - data integrity
  - data quality

#### Students Learn To:
- Recognise and describe a transaction
- 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
- For a scenario diagrammatically represent transaction processing using data flow diagrams
- 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
- 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
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* real time transaction processing – the immediate processing of data</td>
<td>* identify, describe and use a real time transaction processing system</td>
</tr>
<tr>
<td>* web-based</td>
<td>* identify participants, data/information and information technology for the given types of transaction processing systems</td>
</tr>
<tr>
<td>* non web-based</td>
<td>* describe the relationships between participants, data/information and information technology for the given types of transaction processing systems</td>
</tr>
<tr>
<td>* on-line real time</td>
<td>* distinguish between the different types of transaction processing systems</td>
</tr>
<tr>
<td>* updating in on-line real time systems:</td>
<td>* document, including diagrammatical representations, steps in real time transaction processing</td>
</tr>
<tr>
<td>– relevance and impact</td>
<td>* create and use a transaction processing system</td>
</tr>
<tr>
<td>– technology required</td>
<td>* design user friendly screens for on-line data collection</td>
</tr>
<tr>
<td>– hardware requirements – large secondary storage</td>
<td></td>
</tr>
<tr>
<td>– software requirements (on-line database) with user friendly interface</td>
<td></td>
</tr>
<tr>
<td>– steps in on-line real time processing</td>
<td></td>
</tr>
<tr>
<td>– suitable applications</td>
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</tr>
</tbody>
</table>

Teaching and Learning Strategies:

Teacher outlines distinguishing between real time and batch transaction processing.

Students in small groups read about reservation systems and complete the included group tasks. (Refer p382-387).

Students use an online reservation system and document the data collected and the implied events occurring to complete a reservation transaction.

Students in small groups read about POS systems and complete the included group tasks. (Refer p387-392).

Each student observes a POS system used by a retailer in their local area. Students document the sequence of events used to process a sale and the hardware/software used. Students create a context diagram and DFD to describe the data movements present in their observed system.

Teacher leads students through the library loans system described in the text, including group tasks. (Refer p392-397).

Students research and document the check-in and check-out transactions within the school or local library. Students identify the underlying rules and events present and the IT used.

Students research a variety of applications of RFID tags and the operation of these tags and associated RFID readers. For example, within retail stores, warehouses and animal identification.
### Program Topic: Batch Transaction Processing Systems

**Syllabus Topic:** 9.4.1 Option 1: Transaction Processing Systems

#### Students Learn About:
- *batch transaction processing – the collection and storage of data for processing at a scheduled time or when there is sufficient data*
- *batch*
- *systems that appear real time, responding as the transactions occur, but where the actual updating is batch processed, such as credit card transactions*
- *retrieval of stored data to conduct further transaction processing such as printing invoices*
- *systems to store paper records of transactions*
- *updating in batch systems:*
  - historical significance
  - limitations of batch processing
  - technology required
  - steps in a batch update
  - suitable applications

#### Students Learn To:
- *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*
- *compare and contrast batch and real time transaction processing*
- *analyse an existing transaction processing system to determine its strengths and weaknesses*
- *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*
- *for a scenario diagrammatically represent transaction processing using data flow diagrams*
- *distinguish between the different types of transaction processing systems*
- *implement systems to store paper transactions*
- *document, including diagrammatical representations, the steps in batch processing*
- *identify systems for which batch is appropriate and is not appropriate*
- *distinguish between on-line real time and batch systems*
Students Learn About:
* data backup and recovery, including:
  – grandfather, father, son
  – off-site storage
  – secure on-site storage
  – full and partial backups
  – recovery testing
  – suitable media
  – specialised backup software
  – transaction logs
  – documenting backup and recovery procedures
  – mirroring
  – rollback

Students Learn To:
* select and apply backup and recovery procedures to protect data
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* collecting in transaction processing:</td>
<td>* describe the operation of relevant hardware and how</td>
</tr>
<tr>
<td>– hardware, including:</td>
<td>each is used to collect data for transaction</td>
</tr>
<tr>
<td>- Automatic Teller Machines (ATM)</td>
<td>processing</td>
</tr>
<tr>
<td>- barcode readers</td>
<td>* design and justify paper forms to collect data for</td>
</tr>
<tr>
<td>- Radio Frequency Identification (RFID) tags</td>
<td>batch processing</td>
</tr>
<tr>
<td>– collection from forms</td>
<td>* design user friendly screens for on-line data</td>
</tr>
<tr>
<td>– screen design for on-line data collection</td>
<td>collection</td>
</tr>
<tr>
<td>– web forms for transaction processing (real time and</td>
<td>* identify existing procedures that may provide data</td>
</tr>
<tr>
<td>batch)</td>
<td>for transaction processing</td>
</tr>
<tr>
<td></td>
<td>* create user interfaces for on-line real time and</td>
</tr>
<tr>
<td></td>
<td>batch updating, and distinguish between them</td>
</tr>
</tbody>
</table>

Teaching and Learning Strategies:

- Students read about and describe the operation of MICR, barcode readers and magnetic stripe readers. Refer pages 425-428, including Group Tasks.
- Teacher outlines design principles for paper, online and web forms using examples of good and bad design (refer p429-434).
- Students use and analyse a variety of paper, online and web forms. Students suggest improvements.
- Students create data entry forms for an existing database.
Program Topic: Analysing Data Output from Transaction Processing Systems

Syllabus Topic: 9.4.1 Option 1: Transaction Processing Systems

<table>
<thead>
<tr>
<th>Teaching and Learning Strategies:</th>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher describes the organisation of data warehouses, function of MISs, the nature of DSSs and explains the role of enterprise systems.</td>
<td>* 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</td>
<td>* identify situations where data warehousing and data mining would be an advantage</td>
</tr>
<tr>
<td>Students read about tools used to analyse the data output from TPSs (p435-439).</td>
<td></td>
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<tr>
<td>Students in small groups complete the group tasks on pages 435-439.</td>
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</tr>
</tbody>
</table>

Information Processes and Technology Program (page 39 of 48)
**Teaching and Learning Strategies:**
Students read pages 441-444 with regard to general issues associated with TPSs and complete the included Group Tasks.

Teacher presents a variety of scenarios that present a range of relevant issues.

Students in small groups brainstorm issues present in each presented system and suggest techniques for correcting or protecting against problems.

If not studying the DSS option, students read about OLAP (p472-475) and then use a simple online demonstration of an OLAP system.

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**Students Learn About:**

- 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 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
  - data warehousing and data mining
  - Online Analytical Processing (OLAP) and Online Transaction Processing (OLTP)

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**Students Learn 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

- 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
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* decision support systems – those that assist user(s) in making a decision</td>
<td>* select and recommend situations where decision support systems could be used</td>
</tr>
<tr>
<td>* the interactive nature of decision support systems</td>
<td>* classify situations which are structured, semistructured or unstructured</td>
</tr>
<tr>
<td>* the nature of decision support systems which model, graph or chart situations to support human decision making</td>
<td></td>
</tr>
<tr>
<td>* structured:</td>
<td></td>
</tr>
<tr>
<td>– decisions are automated</td>
<td></td>
</tr>
<tr>
<td>– decision support systems are not required</td>
<td></td>
</tr>
<tr>
<td>* semistructured:</td>
<td></td>
</tr>
<tr>
<td>– there is a method to follow</td>
<td></td>
</tr>
<tr>
<td>– requirements are clear cut</td>
<td></td>
</tr>
<tr>
<td>* unstructured:</td>
<td></td>
</tr>
<tr>
<td>– there is no method to reach the decision</td>
<td></td>
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<tr>
<td>– judgements are required</td>
<td></td>
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<tr>
<td>– requires insights into the problem</td>
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</tbody>
</table>

Teaching and Learning Strategies:
Teacher outlines the nature of decisions (in particular the uncertainty present in many decision making processes) and the role of decision support systems to deal with and account for uncertainty. Includes Group tasks p449.

Teacher presents the continuum from structured, semi-structured to unstructured decisions. Teacher describes distinguishing features of each category using examples. Includes Group tasks p450.

Students summarise page 451 detailing characteristics of DSSs.
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
</table>
| * 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 | * 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  
* identify situations where decision support systems are of limited value |

**Teaching and Learning Strategies:**

- Students work through the "Approving bank loans" semi-structured situation and complete the Group Tasks (p452-454).
- Students work through the "Fingerprint Matching" semi-structured situation and complete the Group Tasks (p455-457).
- Students work through the "Predicting Stock Prices" unstructured situation and complete the Group Tasks (p457-459).
- Students work through the "Disaster Relief Management" unstructured situation and complete the Group Tasks (p459-462). Students should research disaster relief efforts occurring as part of a recent disaster.
### Program Topic: Tools that Support Decision Making

**Syllabus Topic: 9.4.2 Option 2: Decision Support Systems**

#### Students Learn About:
- 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)

- data mining
- On-line Analytical Processing (OLAP)
  - data visualisation
  - drill downs
- storing and retrieving using intelligent agents to search data
- responsibilities of those performing data mining, including:
  - erroneous inferences
  - privacy
- current and emerging trends of decision support systems
  - data warehousing and data mining
  - Online Analytical Processing (OLAP) and Online Transaction Processing (OLTP)
  - the emerging trend of group decision support systems and the communication it facilitates

#### Students Learn To:
- extract data, based on known criteria, from an existing database to help make a decision
- recognise appropriate decision support systems for a given situation
- describe the process of data mining to search large databases for hidden patterns and relationships and use these to predict future behaviour
- 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
- 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
- recognise the importance of business intelligence based on enterprise systems

#### Teaching and Learning Strategies:
- Teacher outlines and briefly describes each of the different Decision Support tools mentioned within the syllabus (p465).
- Students read through the outline of spreadsheets, expert systems, ANNs and databases and completes the included group tasks (p466-467).
- Students read and summarise the section on data warehouses, data marts and data mining. (Page 468-472, including Group Tasks)
- Students read about OLAP (p472-475, including Group Tasks).
- Students use an online OLAP system to illustrate data visualisation and drill downs.
- Students read and summarise the section on OLTP, GDSS, intelligent agents, GIS and MIS. (Page 475-479, including Group Tasks)

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Information Processes and Technology Program (page 43 of 48)
### Students Learn About:
- *designing spreadsheets:*
  - creating a pen and paper model
  - identifying data sources
  - planning the user interface
  - developing formulas to be used
- *extracting summary data from a spreadsheet*
- *comparing sequences of data for similarities and differences*

### Students Learn To:
- *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
  - creating templates
  - organising data for easy graphing
  - using formulae to link and organise data in cells
- *extract information from a database for analysis using a spreadsheet, including charting relevant data*
- *describe tools used for analytical processing*
<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* the use of macros to automate spreadsheet processing</td>
<td>* analyse trends and make predictions using an existing spreadsheet model</td>
</tr>
<tr>
<td>* comparing sequences of data for similarities and differences</td>
<td>* create a simple macro in a spreadsheet</td>
</tr>
<tr>
<td>* spreadsheet analysis, including:</td>
<td>* analyse alternatives using 'what-if' scenarios</td>
</tr>
<tr>
<td>– what-if models</td>
<td>* make predictions based on the analysis of spreadsheets</td>
</tr>
<tr>
<td>– statistical analysis</td>
<td></td>
</tr>
<tr>
<td>– charts</td>
<td>* describe tools used for analytical processing</td>
</tr>
</tbody>
</table>

**Teaching and Learning Strategies:**
- Teacher outlines the information emphasised by different types of charts and graphs using examples (refer p492-493).
- Teacher directs students as they record and modify a simple macro such as the ResetInputs or Zoom example in the text (refer p494-496).
- Teacher demonstrates "what-if" analysis and goal seeking using a prepared template.
- Students perform "what-if" and goal seeking using the ACB Spreadsheet as described within the text (refer p497-499).
- Teacher provides an unseen spreadsheet template to small groups of students. Students enter data into the template and perform "what-if" analysis and goal seeking as directed.
- Students summarise the statistical analysis techniques on page 501.
- Students reproduce Fred's spreadsheet described on page 502 using data collected from their peers. Includes Group Tasks on page 502.
- Students implement the spreadsheet from the HSC style question suggested solution on page 503-504.
### Teaching and Learning Strategies:

<table>
<thead>
<tr>
<th>Students Learn About:</th>
<th>Students Learn To:</th>
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<tbody>
<tr>
<td>* the knowledge base of if-then rules in an expert system</td>
<td>* design a set of if-then rules for a particular situation</td>
</tr>
<tr>
<td>* structure of expert systems</td>
<td>* diagrammatically represent the if-then rules</td>
</tr>
<tr>
<td>– knowledge base</td>
<td>* enter rules and facts into an expert system shell and</td>
</tr>
<tr>
<td>– database of facts</td>
<td>use it to draw conclusions or make a diagnosis</td>
</tr>
<tr>
<td>– inference engine</td>
<td>* describe situations better suited to forward chaining and</td>
</tr>
<tr>
<td>– explanation mechanism</td>
<td>those better suited to backward chaining</td>
</tr>
<tr>
<td>– user interface</td>
<td>* identify situations where user(s) of decision support</td>
</tr>
<tr>
<td>* types of inference engines, including:</td>
<td>systems also require knowledge in the area</td>
</tr>
<tr>
<td>– forward chaining</td>
<td></td>
</tr>
<tr>
<td>– backward chaining</td>
<td></td>
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<tr>
<td>* certainty factors as a means of dealing with unclear</td>
<td></td>
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<tr>
<td>situations</td>
<td></td>
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<tr>
<td>* collecting</td>
<td></td>
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<tr>
<td>– identification of data for decision support systems</td>
<td></td>
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<tr>
<td>– the role of the expert in the creation of expert</td>
<td></td>
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<tr>
<td>systems</td>
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<tr>
<td>– the role of the knowledge engineer in the creation of</td>
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<tr>
<td>expert systems</td>
<td></td>
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<tr>
<td>* the reasons for decision support systems, including:</td>
<td></td>
</tr>
<tr>
<td>– preserving an expert’s knowledge</td>
<td></td>
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<tr>
<td>– improving performance and consistency in decision-</td>
<td></td>
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<tr>
<td>making</td>
<td></td>
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<tr>
<td>– rapid decisions</td>
<td></td>
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<tr>
<td>– ability to analyse unstructured situations</td>
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</tbody>
</table>

- Teacher describes the major components and operation of expert systems. Includes comparison of human experts and expert systems. Refer pages 506-507.
- Teacher describes the detail of a typical knowledge base as they develop rules. Includes detail of the organisation of rules, attributes and facts within the expert system shell students will use. Refer p508-512.
- Students create and enter the rules for an expert system to create a knowledge base using an expert system shell.
- Teacher formally describes the operation of the inference engine and associated database of facts. Includes detailed explanation of backward and forward chaining. Refer pages 513-518.
- Students use their own and other larger prepared expert systems to perform inferencing - both backward and forward chaining.
- Students create and enter rules for an expert system to create a knowledge base using an expert system shell.
- Teacher formally describes the operation of the inference engine and associated database of facts. Includes detailed explanation of backward and forward chaining. Refer pages 513-518.
- Students use their own and other larger prepared expert systems to perform inferencing - both backward and forward chaining.
- Students read and summarise the steps performed to develop an expert system. Refer page 519-522.
- Students review the HSC Style Question and suggested solution and answer the included Group Tasks (refer p523-525).
### HSC Week 32

**Program Topic: Artificial Neural Networks**

Syllabus Topic: 9.4.2 Option 2: Decision Support Systems

**Teaching and Learning Strategies:**

- Teacher describes the structure of artificial neural networks, including comparison with biological neural networks within the brain (refer p527-529).
- Students study the example OCR and market price prediction neural networks and complete the included Group Tasks (refer p529-531).
- Students use an existing prepared neural network to make predictions.
- Teacher presentation describing how neural networks learn. Includes explanation of back propagation and genetic algorithms (refer p532-533).

**Students Learn About:**

- * unstructured:
  - there is no method to reach the decision
  - judgements are required
  - requires insights into the problem
- * pattern matching in neural networks
- * 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
- * responsibility for decisions made using decision support systems

**Students Learn To:**

- * recognise appropriate decision support systems for a given situation
- * compare and contrast processing methods used by databases, neural networks and expert systems
- * use a simple neural network to match patterns
- * distinguish between neural networks and expert systems

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Information Processes and Technology Program (page 47 of 48)  
Class: ___________________ Teacher: ___________________ Date Completed: ___________________
**Syllabus Topic:** 9.4.2 Option 2: Decision Support Systems

**Students Learn About:**
- 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:
  - Errorneous inferences
  - Privacy
- Responsibility for decisions made using decision support systems

**Students Learn To:**
- 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