SENIOR SECONDARY INFORMATION TECHNOLOGY

As is the case across all States of Australia, many secondary courses of study within the education system of Queensland incorporate computer technology to varying degrees.

A number of subject areas contain within their syllabus (optional) units of work which relate to the use of specialised software packages to promote the teaching and learning of subject specific skills and concepts.

A number of subject areas also make use of computer technology and computer assisted learning packages to extend and enrich the teaching learning process.

Over recent years, initiatives by the Queensland Department of Education, has realised the establishment of Business Education Centres and Electronic Learning Centres in a large number of State High Schools. Extensive use is also made of a host of administrative programs which are accessed State-wide using distributive communications facilities.

Students undertaking senior Secondary courses of study at Years 11 and 12 are also able to elect to study one of two dedicated computing courses. These are called:

1. Practical Computer Methods, and
2. Information Processing and Technology.

The prime purpose of this article is to provide readers with an overview of each of these specialised computing courses.

Detailed information booklets on these two courses of study may be obtained from:

1. Library & Resources Services Branch
   Department of Education, Queensland
   P.O. Box 33
   North Quay
   Queensland, 4002

2. The Board Of Senior Secondary School Studies
   P.O. Box 307
   Spring Hill
   Queensland, 4001

Practical Computer Methods (PCM)

PCM is a two year, school based course of study for secondary students in Years 11 and 12. In general terms PCM investigates the nature and use of application packages as personal productivity tools.

PCM is vocationally oriented and provides the opportunity for students to develop important information and communication skills; skills which they will need in their future employment, professional or business careers.

PCM also acts as a service subject with application for every student. It develops important, transportable skills which assist with a student's learning in all subject areas.

The global aims of PCM are to:
• enable students to acquire judgement and discipline to use computers responsibly, to gather, store, retrieve, use and communicate information;
• encourage students to appreciate effective, efficient and creative use of computing power; and to
• develop in students the imagination to apply computing power in appropriate and novel ways.

The PCM syllabus is organised into the following nine topic areas:

1. Basic Operations: This topic deals with the skills, knowledge, understanding and attitudes which are relevant to most practical applications of computers including communications and ergonomics.

2. Word Processing and Desktop Publishing: Wordprocessing enables a process development approach to written communication which involves the cyclic development of quality written material.

3. Communications: The use of microcomputers for exploiting the medium of data communications including electronic mail and public access message services.

4. Spreadsheets: Spreadsheets as software tools designed for performing tabular calculations including the design and implementation of pre-defined templates.

5. File Management Systems: File management systems are appropriate tools for a range of
information storage tasks such as record keeping, the production of reports and the sorting and retrieval of group records quickly and easily.

6. Database Systems and Theory:
The relational model of a database is the principal subject matter of this topic. Students understand and gain some basic skills in conceptual schema design using diagrammatic forms. In order to retrieve information from a relational database, a structured query language is used.

7. Graphics:
This topic is divided into three sub-topics which reflect the different broad categories of graphics software of Business Graphics, Computer Aided Design and Utility Graphics.

8. Application Systems and Expert Systems:
Interactive exchange between people and computers has become a new medium for communication. This interaction can take a very simple form or it can be more sophisticated and approach 'expert' levels of performance.

9. Interfacing and Control Technology:
This topic recognises the increasing role of microcomputers in monitoring and controlling the environment and the equipment which surrounds us.

There are no pre-requisites for the study of PCM. Keyboard skills, while advantageous, are not necessary. The course does provide opportunities for students to develop basic keyboard skills.

These nine topic areas correspond, approximately, to different types of software applications and, by extension, to different general forms of computable information. This topic listing does not prescribe any order of treatment.

As the current tendency toward 'integrated' software packages would indicate, most information processing tasks do not use just one form of information. This syllabus recognises the importance of an integrated approach to information handling and suggests an approach which will integrate the topics, along with the different forms of information, into a series of themes.

The following themes are suggested as suitable for a four semester work program:

- Computers in the School and Home;
- Computers in Business, Commerce and Industry;
- Computers in the Community and
- Computers as Information Tools.

These themes are not intended to be prescriptive and schools are free to develop their own themes in work programs. The themes are intended to be suggestive of the scope of the information handling work which students might be expected to experience in a course of study in PCM.

A theme provides a source of examples, and a context in which students can engage in learning experiences based on all or most of the topics. This is a dynamic subject area whereby the relevance and relative importance of the topics will change. The thematic approach enables the content or emphasis of any topic to be adapted without necessarily altering the basic structure of the school's work programme.

Programmes may vary widely in form and in purpose, but the basic reason for using computers in most applications is to assist in the production of some end product. End products which are typically produced with the assistance of computers include:

- Reports, which might include text, tables and graphics;
- Correspondence;
- Decision support tools or printed information;
- Datafiles;
- Database structures;
- Interactive applications and presentations.

PCM addresses some of the processes and tools involved with the computer assisted production of various forms of information containing products. The processes will typically include planning, gathering and input of data, storage and retrieval of data, performing various operations on the stored data, producing printed output and using the output to communicate information.

Integrated tasks using a variety of software types are often unitised and, if appropriate, may be linked to a project in another subject, the school's work experience program, or the school's community service program.

Information Processing and Technology (IPT)
IPT is a 2 year, Board approved course of study, for secondary students in Years 11 & 12. IPT investigates the nature and functions of information processing and associated technology.

Within IPT students are exposed to a variety of intellectual challenges involving distinctive approaches to problem-solving, while developing a range of associated language and practical skills.

Within IPT the subject matter has been organised into the following five topics, which may be addressed in any order or integrated. Core material is mandatory and occupies 75% of total time. Extension material is to occupy the other 25% of the total time.

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<thead>
<tr>
<th>Topic</th>
<th>Min</th>
<th>Max</th>
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<tbody>
<tr>
<td>Information Systems</td>
<td>30%</td>
<td>50%</td>
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<tr>
<td>Algorithms and Programming</td>
<td>20%</td>
<td>35%</td>
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<tr>
<td>Artificial Intelligence</td>
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Computer Systems

1. Information Systems:
The aim of this topic is to introduce a formal model to describe the architecture of information systems, present a methodology for the development of these systems, and allow students to implement these to produce working information systems. The subject matter is organised as follows:

- Architecture and Systems including a study of data, information, knowledge and wisdom; physical and logical data independence; system security and integrity; logical and physical views of information systems; a classification system for different types of information systems; a systems architecture such as the Three Schema Architecture.

- Relational Perspectives of Information Systems including a study of relational systems in contrast to and in comparison with other systems; relations (tables) including rows and columns, keys, nulls, and views; producing optimised tables for example by use of the Optimal Normal Form algorithm; retrieving data (querying) and presenting information in a system using a relational language; logical joins, subqueries and correlated subqueries; relational algebra.

- Design and Implementation. The development cycle for the production of an information system is to be embodied in the following framework:

  - Identification
  - Conceptualisation
  - Formalisation
  - Implementation
  - Testing
  - Evaluation
  - Documentation

2. Algorithms and Programming:
The aim of this topic is to develop software development expertise and programming skills in students. This topic focuses on the software development cycle, defined as:

- Define the problem
- Specify the solution
- Design the algorithm
- Implement the algorithm
- Document the program
- Test the program
- Evaluate the solution for the solution of practical problems.

The subject matter spans the standard algorithm control structures of sequence, selection, iteration and modularity, and common data structures including simple variables, arrays, records, sets, files, lists and trees.

3. Artificial Intelligence:
The following areas have been identified as some elements of Artificial Intelligence:

- Concepts of Artificial Intelligence: philosophical issues, intelligent systems, attempts to model a human and a brief history of artificial intelligence systems.
- Expert Systems: design, for example decision trees, components, such as inference engine, knowledge base, use of an expert system, development of an expert system, databases and their link with information systems.
- Natural Language Processing: traditional grammar, structural grammar and lexical meaning.
- Emulating Human Attributes: vision, speech synthesis, voice recognition, movement, robotics, machine architectures that imitate biological systems, for example neural networks.
- Search Techniques: casting a problem in terms of search for an answer rather than derivation of an answer, game playing strategies, map colouring, minimax, alpha-beta pruning.
- Specialised Programming Languages: such as LISP and Prolog, syntax, semantics, formal natural language, comparison with and contrast to procedural languages.

4. Social and Ethical Implications:
The aim of this topic is to develop in students an appreciation and understanding of the effects that developments in Information Technology have on themselves and communities world-wide.

In order to make valid judgments about social and ethical implications of computers, students will need to be able to collect information from a variety of stimulus material, analyse it and use it as a basis to form opinions. Opinions need to be critically evaluated, compared with other opinions, and expressed in a variety of ways. Communication of ideas and information is critical to an effective coverage of this topic. A consequence of this is that good speaking, writing and listening skills must be developed.

5. Computer Systems:
The aim of this topic is to develop in students an understanding of the complex interactions between humans, software and hardware.

Based upon a layered environment, the subject matter is organised around the:

- Human Interface
- Software System
- Hardware System

Resources

Printed Materials

*Artificial Intelligence Unit of Work CEU 068, NSW Department of School Education 1989.*


Videos


*Bits and Bytes*, Canada, TV Ontario, VHS A10280146.

*Computer Aided Design*, Great Britain VHS A10282386.


*Goodbye Gutenberg*, BBC VHS A10264574.

*Making the Most of the Micro*, BBC A10274626.

*Robotic Revolution*, USA National Geographic Society 1986.

*Robotics: The Future is Now*, USA VHS A10283226.

*Robots: The Computer at Work*, Japan VHS A10278303.

*Short Circuit*, Roadshow Home Video.

*Telecom Telememo*, VHS A10282467.


*The Electronic Office*, BBC Education & Training VHS A10278052.