NEW ZEALAND INSTITUTES OF TECHNOLOGY AND POLYTECHNIC QUALIFICATIONS IN INFORMATION & COMMUNICATIONS TECHNOLOGY

PRESCRIPTION: FS600 FILE STRUCTURES

AIM OF MODULE:	To enable students to identify appropriate physical file structures in a given application, and be able to implement these in a representative exercise.
CREDITS:	7
STUDENT LEARNING HOURS:	70
CONTENT REVISED:	1998
PRESCRIPTION EXPIRY DATE:	Nov 2011 (not currently offered by an ITP)

Level and Assessment Schedule

	Highest Skill Level				Suggested Assessment Percentage
TOPICS	R	C	A	P	
1. Fundamentals of File Recording		*			10
2. Fundamental File Types		*			10
3. Recording Blocking			*		5
4. Complex Direct Access			*		70
5. Multi-User Access		*			5
					100

The student will:

1 FUNDAMENTALS OF FILE RECORDING

C 1.1 Logical vs Physical Files

Describe the concept of mapping from the logical view of the "record" to the Stored Record Address(es) of the element(s) and relate this to the structures and techniques noted below. [SRA after Codd et al.]

C 1.2 Management of sets of files

Describe how each of the following is established and utilised:

- Directories e.g. for disk volumes
- File Allocation Tables (FATs)
- File Headers

2 FUNDAMENTAL FILE TYPES

C 2.1 Simple Serial Files

Explain the relevance of:

- Contiguous data elements
- Implementation of variable length records
- Economy of storage
- Requirement for sequencing (sorting)
- Full file re-write for update

C 2.2 Simple Relative/ Direct Access

Explain the relevance of:

- Requirement for fixed length
- SRA calculation from the relative record number (RRN)
- "Hit rate" (a measure of file activity based on the percentage of records accessed in a single processing cycle)
- "In situ" update of single records

3 RECORD BLOCKING

C 3.1 Describe the justification for and the mechanisms of record blocking.

A 3.2 Given the relevant facts, correctly select an appropriate blocking factor for several different applications, eg.

- real time
- master file create / update

4 COMPLEX DIRECT ACCESS

Explain and illustrate each of the following:

C 4.1 Using keys to locate records

- Translation to SRA, Hashing algorithms, pointer lists, indexes, direct mapping
- Collisions/synonyms

C 4.2 Concepts of overflow

C 4.3 Methods of catering for overflow

C 4.4 Indexing

4.4.1 Relate various indexing techniques to the compromise between search efficiency and update efficiency.

- Single-index
- Multi-level single-key index
- Binary balanced tree
- Multiple indexes for a single base file

4.4.2 Index Management

- Static Index - re-index periodically after batch update
- Dynamic Index - the indexes are continually revised to reflect the updates transaction by transaction.
- Virtual Storage Index Sequential
- Describe the working characteristics of 2 specific indexing implementations.

C 4.5 Inverted Files

- Partially inverted files
- Fully inverted files
- Relationship between inverted file structures and third normal form

C 4.6 Lists (also known as Linked Lists, Pointer Lists or Chained Data sets)

4.6.1 Single linked lists

- Forward chained
- Backward chained

4.6.2 Double linked lists (both ways)

Illustrate the use of these in the following "service" applications.

- "free space" management e.g. directories, FAT's
- binary trees
- indexing
- sorting

C 4.7 Briefly illustrate the main technical features of file structures within a particular DBMS.

A 4.8 Demonstrate one of the complex direct access methods outlined in Section 4.

5 MULTI-USER ACCESS

C Describe the reasons for, the problems associated with, and the main techniques involved in:

- Record locking
- Field Locking
- Contention Avoidance