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4.1 Fundamentals of programming

		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Appendix
4.1.1	Programming	✓							✓					
4.1.2	Programming paradigms	✓	✓										✓	

4.2 Fundamentals of data structures

		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Appendix
4.2.1	Data structures and abstract data types	✓												
4.2.2	Queues							✓						
4.2.3	Stacks							✓						
4.2.4	Graphs							✓						
4.2.5	Trees							✓						
4.2.6	Hash tables							✓						
4.2.7	Dictionaries							✓						
4.2.8	Vectors							✓						

4.3 Fundamentals of algorithms

		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Appendix
4.3.1	Graph-traversal							✓	✓					
4.3.2	Tree-traversal							✓	✓					
4.3.3	Reverse Polish								✓	✓				
4.3.4	Searching algorithms								✓					
4.3.5	Sorting algorithms								✓					
4.3.6	Optimisation algorithms								✓					

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		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Appendix
4.4	**Theory of computation**													
4.4.1	Abstraction and automation		✓											
4.4.2	Regular languages		✓							✓				
4.4.3	Context-free languages									✓				
4.4.4	Classification of algorithms								✓	✓				
4.4.5	A model of computation									✓				
4.5	**Fundamentals of data representation**													
4.5.1	Number systems			✓										
4.5.2	Number bases			✓										
4.5.3	Units of information			✓										
4.5.4	Binary number system			✓										✓
4.5.5	Information coding systems			✓										
4.5.6	Representing images, sound and other data			✓										
4.6	**Fundamentals of computer systems**													
4.6.1	Hardware and software				✓									
4.6.2	Classification of programming languages				✓									
4.6.3	Types of program translator				✓									
4.6.4	Logic gates				✓									✓
4.6.5	Boolean algebra				✓									

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		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Appendix
4.7	**Fundamentals of computer organisation and architecture**													
4.7.1	Internal hardware components of a computer					✓								
4.7.2	The stored program concept					✓								
4.7.3	Structure and role of the processor and its components					✓								
4.7.4	External hardware devices					✓								
4.8	**Consequences of uses of computing**													
4.8.1	Individual (moral), social (ethical), legal and cultural issues and opportunities						✓							
4.9	**Fundamentals of communication and networking**													
4.9.1	Communication						✓							
4.9.2	Networking						✓							
4.9.3	The Internet										✓			
4.9.4	The Transmission Control Protocol/Internet Protocol (TCP/IP) protocol										✓			
4.10	**Fundamentals of databases**													
4.10.1	Conceptual data models and entity relationship modelling											✓		
4.10.2	Relational databases											✓		
4.10.3	Database design and normalisation techniques											✓		
4.10.4	Structured Query Language (SQL)											✓		
4.10.5	Client server databases											✓		

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	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Appendix
4.11 Big Data													
4.11 Big data												✓	
4.12 Fundamentals of functional programming													
4.12.1 Functional programming paradigm												✓	
4.12.2 Writing functional programs												✓	
4.12.3 Lists in functional programming												✓	
4.13 Systematic approach to problem solving													
4.13.1 Aspects of software development		✓									✓		