1. Core Programming

	Object Oriented Programming with C++		Programming in C
	Principles of Object-Oriented Programming		**Introduction: Some Fundamentals**
01	Software Crisis	01	Programming
02	Software Evolution	02	Higher-Level Languages
03	A Look at Procedure-Oriented Program	03	Integrated Development Environments
04	Object-Oriented Programming Paradigm	04	Operating System
05	Basic Concepts of Object-Oriented Programming	05	Compiling Programs
06	Benefits of OOP	06	Language Interpreters
07	Object-Oriented Languages		**Compiling and Running Your First Program**
08	Applications of OOP	07	Compiling Your Program
	Beginning with C++	08	Running Your Program
09	What is C++	09	Understanding Your First Program
10	Applications of C++	10	Displaying the Values of Variables
11	A Simple C++ Program	11	Comments
12	More C++ Statements		**Variables, Data Types, and Arithmetic Expressions**
13	An Example with Class	12	Working with Variables
14	Structure of C++ Program	13	Understanding Data Types and Constants
15	Creating the Source File	14	Working with Arithmetic Expression
16	Compiling and Linking	15	The Assignment Operators
	Tokens, Expression and Control Structures	16	Types _Complex and _Imaginary
17	Introduction		**Program Looping**
18	Tokens	17	The (for) Statement and Relational Operators
19	Keywords	18	The (While) Statement
20	Identifiers and Constants	19	The (do) Statement
21	Basic Data Types	20	The (break) Statement
22	User-Defined Data Types	21	The (continue) Statement
23	Storage Classes		**Making Decisions**
24	Derived Data Types	22	The (if) Statement
25	Symbolic Constants	23	The (switch) Statement
26	Type Compatibility	24	Boolean Variables
27	Declaration of Variables	25	The Conditional Operators
28	Dynamic Initialization of Variables		**Working with Arrays**
29	Reference Variables	26	Defining an Array
30	Operators in C++	27	Initializing Arrays
31	Scope Resolution Operator	28	Character Arrays
32	Member Dereferencing Operators	29	Multidimensional Arrays
33	Memory Management Operators	30	Variable-Length Arrays
34	Manipulators		**Working with Functions**
35	Type Cast Operator	31	Defining a Function
36	Expressions and Their Types	32	Arguments and Local Variables
37	Special Assignment Expressions	33	Returning Function Results
38	Implicit Conversions	34	Functions Calling Functions Calling
39	Operator Overloading	35	Top-Down Programming
40	Operator Precedence	36	Functions and Arrays
41	Control Structures	37	Global Variables
	Functions in C++	38	Automatic and Static Variables
42	Introduction	39	Recursive Functions

134	Introduction		
135	Basics of Exception Handling		
136	Exception Handling Mechanism		
137	Throwing Mechanism		
138	Catching Mechanism		
139	Re-throwing an Exception		
140	Specifying Exceptions		
141	Exceptions in Constructors and Destructors		
142	Exceptions in Operator Overloaded Functions		
	Introduction to the Standard Template Library		
143	Introduction		
144	Components of STL		
145	Containers		
146	Algorithms		
147	Iterators		
148	Applications		
149	Of Container Classes		
150	Function Objects		
	Manipulating Strings		
151	Introduction		
152	Creating (string) Objects		
153	Manipulating String Objects		
154	Relational Operations		
155	String Characteristics		
156	Accessing Characters in Strings		
157	Comparing and Swapping		
	New Features of ANSI C++ Standard		
158	Introduction		
159	New Data Types		
160	New Operators		
161	Class Implementation		
162	Namespace Scope		
163	Operator Keywords		
164	New Keywords		
165	New Headers		
	Object-Oriented Systems Development		
166	Introduction		
167	Procedure-Oriented Paradigm		
168	Procedure-Oriented Development Tools		
169	Object-Oriented Paradigm		
170	Object-Oriented Notations and Graphs		
171	Steps in Object-Oriented Analysis		
172	Steps in Object-Oriented Design		

2. Database Management System

	Fundamental of Database System
	Part-1: Introduction to Database
	Databases and Database Users
01	Introduction
02	An Example
03	Characteristics of the Database Approach
04	Actors on the Scene
05	Workers behind the Scene
06	Advantages of Using the DBMS Approach
07	A Brief History of Database Applications
08	When Not to Use a DBMS
	Database System Concepts and Architecture
09	Data Models, Schemas, and Instances
10	Three-Schema Architecture and Data Independence
11	Database Languages and Interfaces
12	The Database System Environment
13	Centralized and Client/Server Architectures for DBMS
14	Classification of Database Management Systems
	Part-2: The Relational Data Model and SQL
	The Relational Data Model and Database Constraints
15	Relational Model Concepts
16	Relational Model Constraints and Relational Database Schemas
17	Update Operations, Transactions, and Dealing with Constraint Violations
	Basic SQL
18	SQL Data Definition and Data Types
19	Specifying Constraints in SQL
20	Basic Retrieval Queries in SQL
21	INSERT, DELETE, and UPDATE Statements in SQL
22	Additional Features of SQL
	More SQL: Complex Queries, Triggers, and Schema Modification
23	More Complex SQL Retrieval Queries
24	Specifying Constraints as Assertions and Actions as Triggers
25	Views (Virtual Tables) in SQL
26	Schema Change Statements in SQL
	The Relational Algebra and Relational Calculus
27	Unary Relational Operations: SELECT and PROJECT
28	Relational Algebra Operations from Set Theory
29	Binary Relational Operations: JOIN and DIVISION
30	Additional Relational Operations
31	Examples of Queries in Relational Algebra
32	The Tuple Relational Calculus
33	The Domain Relational Calculus
	Part-03: Conceptual Modeling and Database Design
	Data Modeling Using the Entity-Relationship (ER) Model
34	Using High-Level Conceptual Data Models for Database Design
35	A Sample Database Application
36	Entity Types, Entity Sets, Attributes, and Keys
37	Relationship Types, Relationship Sets, Roles, and Structural Constraints

38	Weak Entity Types
39	Refining the ER Design for the COMPANY Database
40	ER Diagrams, Naming Conversions, and Design Issues
41	Example of Other Notation: UML Class Diagrams
42	Relationship Types of Degree Higher than Two
	The Enhanced Entity-Relationship (EER) Model
43	Sub-classes, Super-classes, and Inheritance
44	Specialization and Generalization
45	Constraints and Characteristics of Specialization and Generalization Hierarchies
46	Modeling of UNION Types Using Categories
47	A Simple UNIVERSITY EER Schema, Design Choices, and Formal Definitions
48	Example of Other Notation: Representing Specialization and Generalization in UML Class Diagram
49	Data Abstraction, Knowledge Representation, and Ontology Concepts
	Relational Database Design by ER- and EER-to-Relational Mapping
50	Relational Database Design Using ER-to-Relational Mapping
51	Mapping EER Model Constructs to Relations
	Practical Database Design Methodology and Use of UML Diagrams
52	The Role of Information Systems in Organizations
53	The Database Design and Implementation Process
54	Use of UML Diagrams as an Aid to Database Design Specification
55	Retional Rose: A UML-Based Design Tool
56	Automated Database Design Tools
	Part-4: Object, Object-Retational, and XML: Concepts, Models, Languages, and Standards
	Object and Object-Relational Database
57	Overview of Object Database Concepts
58	Object-Relational Features: Object Database Extensions to SQL
59	The ODMG Object Model and the Object Definition Language ODL
60	Object Database Conceptual Design
61	The Object Query Language OQL
62	Overview of the C++ Language Binding in the ODMG Standard
	XML: Extensible Markup Language
63	Structured, Semi structured, and Unstructured Data
64	XML Hierarchical (Tree) Data Model
65	XML Documents, DTD, and XML Schema
66	Storing and Extracting XML Documents from Databases
67	XML Languages
68	Extracting XML Documents from Relational Databases
	Part-5: Database Programming Techniques
	Introduction to SQL Programming Techniques
69	Database Programming: Techniques and Issues
70	Embedded SQL, dynamic SQL, and SQLI
71	Database Programming with Function Calls: SQL/CLI and HDBC
72	Database Stored Procedures and SQL/PSM
73	Comparing the Three Approaches
	Web Database Programming Using PHP
74	A Simple PHP Example
75	Overview of Basic Features of PHP
76	Overview of PHP Database Programming
	Part-6: Database Design Theory and Normalization
	Basics of Functional Dependencies and Normalization for Relational Databases
77	Information Design Guidelines for Relation Schemas

78	Functional Dependencies
79	Normal Forms Based on Primary Keys
80	General Definitions of Second and Third Normal Forms
81	Boyce-Codd Normal Form
82	Multivalued Dependency and Fourth Normal Form
83	Join Dependencies and Fifth Normal Form
	Relational Database Design Algorithms and Further Dependencies
84	Further Topics in Functional Dependencies: Inference Rules, Equivalence, and Minimal Cover
85	Properties of Relational Decompositions
86	Algorithms for Relational Database Schema Design
87	About Nulls, Dangling Tuples, and Alternative Relational Designs
88	Further Discussion of Multivalued Dependencies and 4NF
89	Other Dependencies and Normal Forms
	Part-7: File Structures, Indexing, and Hashing
	Disk Storage, Basic File Structures, and Hashing
90	Introduction
91	Secondary Storage Devices
92	Buffering of Blocks
93	Placing File Records on Disk
94	Operations on Files
95	Files of Unordered Records (Heap Files)
96	Files of Ordered Records (Sorted Files)
97	Hashing Techniques
98	Other Primary File Organizations
99	Parallelizing Disk Access Using RAID Technologies
100	New Storage Systems
	Indexing Structures for Files
101	Types of Single-Level Ordered Indexes
102	Multilevel Indexes
103	Dynamic Multilevel Indexes Using B-Trees and B+-Trees
104	Indexes on Multiple Keys
105	Other Types of Indexes
106	Some General Issues Concerning Indexing
	Part-8: Query Processing and Optimization, and Database Tuning
	Algorithms for Query Processing and Optimization
107	Translating SQL Queries into Relational Algebra
108	Algorithms for External Sorting
109	Algorithms for SELECT and JOIN Operations
110	Algorithms for PROJECT and Set Operations
111	Implementing Aggregate Operations and OUTER JOINs
112	Combining Operations Using Pipelining
113	Using Heuristics in Query Optimization
114	Using Selectivity and Cost Estimates in Query Optimization
115	Overview of Query Optimization in Oracle
116	Semantic Query Optimization
	Physical Database Design and Tuning
117	Physical Database Design in Relational Databases
118	An Overview of Database Tuning in Relational Systems
	Part-9: Transaction Processing, Concurrency Control, and Recovery
	Introduction to Transaction Processing Concepts and Theory
119	Introduction to Transaction Processing

120	Transaction and System Concepts
121	Desirable Properties of Transactions
122	Characterizing Schedules Based on Recoverability
123	Characterizing Schedules Based on Serializability
124	Transaction Support in SQL
	Concurrency Control Techniques
125	Two-Phase Locking Techniques for Concurrency Control
126	Concurrency Control Based on Timestamp Ordering
127	Multi-version Concurrency Control Techniques
128	Validation (Optimistic) Concurrency Control Techniques
129	Granularity of Data Items and Multiple Granularity Locking
130	Using Locks for Concurrency Control in Indexes
131	Other Concurrency Control Issues
	Database Recovery Techniques
132	Recovery Concepts
133	NO-UNDO/REDO Recovery Based on Deferred Update
134	Recovery Techniques Based on Immediate Update
135	Shadow Paging
136	The ARIES Recovery Algorithm
137	Recovery in Multi-database Systems
138	Database Backup and Recovery from Catastrophic Failures
	Part-10: Additional Database Topics: Security and Distribution
	Database Security
139	Introduction to Database Security Issues
140	Discretionary Access Control Based on Granting and Revoking Privileges
141	Mandatory Access Control and Role-Based Access Control for Multilevel Security
142	SQL Injection
143	Introduction to Statistical Database Security
144	Introduction to Flow Control
145	Encryption and Public Key Infrastructures
146	Privacy Issues and Preservation
147	Challenges of Database Security
148	Oracle Label-Based Security
	Distributed Databases
149	Distributed Database Concepts
150	Types of Distributed Database Systems
151	Distributed Database Architectures
152	Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design
153	Query Processing and Optimization in Distributed Databases
154	Overview of Transaction Management in Distributed Databases
155	Overview of Concurrency Control and Recovery in Distributed Databases
156	Distributed Catalog Management
157	Current Trends in Distributed Databases
	Distributed Databases in Oracle
	Part-11: Advanced Database Models, Systems, and Applications
158	Active Database Concepts and Triggers
159	Temporal Database Concepts
160	Spatial Database Concepts
161	Multimedia Database Concepts
162	Introduction to Deductive Databases
	Introduction to Information and Web Search

3. Data Structure and Algorithm

	Classic Data Structure
	Introduction and Overview
01	Definitions
02	Concept of Data Structures
03	Overview of Data Structures
04	Implementation of Data Structures
	Arrays
05	Definition
06	Terminology
07	On-Dimensional Array
08	Multidimensional Arrays
09	Pointer Arrays
	Linked Lists
10	Definition
11	Single Linked List
12	Circular Linked List
13	Double Linked Lists
14	Circular Double Linked List
15	Application of Linked Lists
16	Memory Representation
17	Boundary Tag System
18	Deallocation Strategy
19	Buddy System
20	Compaction
	Stacks
21	Introduction
22	Definition
23	Representation of Stack
24	Operations on Stacks
25	Applications of Stacks
	Queues
26	Introduction
27	Definition
28	Representation of Queues
29	Various Queue Structures
30	Application of Queue
	Tables
31	Rectangular Tables
32	Jagged Tables
33	Inverted Tables
34	Hash Tables
	Trees
35	Basic Terminologies
36	Definition and Concepts
37	Representation of Binary Tree
38	Operations on Binary Tree
39	Types of Binary Trees
40	Trees and Forests

41	Trees
42	B+ Tree Indexing
43	Trie Tree Indexing
	Graphs
44	Introduction
45	Graph Terminologies
46	Representation of Graphs
47	Operations on Graphs
48	Application of Graph Structures
49	BDD and its Applications
	Sets
50	Definition and Terminologies
51	Representation of Sets
52	Operations of Sets
53	Applications of Sets
	Algorithm
	Introduction to Algorithm
	Part-1: Foundations
54	The Role of Algorithms in Computing
55	Getting Started
56	Growth of Functions
57	Divide-and-Conquer
58	Probabilistic Analysis and Randomized Algorithms
	Part-2: Sorting and Order Statistic
59	Heapsort
60	Quicksort
61	Sorting in Linear Time
62	Medians and Order Statistics
	Part-3: Data Structures
63	Elementary Data Structures
64	Hash Tables
65	Binary Search Trees
66	Red-Black Trees
67	Augmenting Data Structures
	Part-4: Advanced Design and Analysis Techniques
68	Dynamic Programming
69	Greedy Algorithms
70	Amortized Analysis
	Part-5: Advanced Data Structure
71	B-Trees
72	Fibonacci Heaps
73	Van Emde Boas Trees
74	Data Structures for Disjoint Sets
	Part-6: Graph Algorithms
75	Elementary Graph Algorithms
76	Minimum Spanning Trees
77	Single-Source Shortest Paths
78	All-Pairs Shortest Paths
79	Maximum Flow
	Part-7: Selected Topics
80	Multithreaded Algorithm

4. Software Engineering and Maintenance

	Software Engineering: A Practitioner's Approach
	Software and Software Engineering
01	The Nature of Software
02	The Unique nature of WebApps
03	Software Engineering
04	The Software Process
05	Software Engineering Practice
06	Software Myths
07	How It All Starts
	Part-1: The Software Process
	Process Models
08	A Generic Process Model
09	Process Assessment and Improvement
10	Prescriptive Process Models
11	Specialized Process Models
12	The Unified Process
13	Personal and Team Process Models
14	Process Technology
15	Product and Process
16	Summary
	Agile Development
17	What is Agility
18	Agility and the Cost of Change
19	What Is an Agile Process
20	Extreme Programming (XP)
21	Other Agile Process Models
22	A Tool Set for the Agile Process
23	Summary
	Part-2: Modeling
	Principles That Guide Practice
24	Software Engineering Knowledge
25	Core Principles
26	Principles That Guide Each Framework Activity
27	Summary
	Understanding Requirements
28	Requirements Engineering
29	Establishing the Groundwork
30	Eliciting Requirements
31	Developing Use Cases
32	Building the Requirements Model
33	Negotiating Requirements
34	Validating Requirements
35	Summary
	Requirements Modeling: Scenarios, Information, and Analysis Classes
36	Requirements Analysis
37	Scenario-Based Modeling
38	UML Models That Supplement the Use Case
39	Data Modeling Concepts

40	Class-Based Modeling
41	Summary
	Requirements Modeling: Flow, Behavior, Patterns, and WebApps
42	Requirements Modeling Strategies
43	Flow-Oriented Modeling
44	Creating a Behavioral Model
45	Patterns for Requirements Modeling
46	Requirements Modeling for WebApps
47	Summary
	Design Concepts
48	Design within the Context of Software Engineering
49	The Design Process
50	Design Concepts
51	The Design Model
52	Summary
	Architectural Design
53	Software Architecture
54	Architectural Genres
55	Architectural Styles
56	Architectural Design
57	Assessing Alternative Architectural Designs
58	Architectural Mapping Using Data Flow
59	Summary
	Component-Level Design
60	What is a Component
61	Designing Class-Based Components
62	Conducting Component-Level Design
63	Component-Level Design for WebApps
64	Designing Traditional components
65	Component-Based Development
66	Summary
	User Interface Design
67	The Golden Rules
68	User Interface Analysis and Design
69	Interface Analysis
70	Interface Design Steps
71	WebApp Interface Design
72	Design Evaluation
73	Summary
	Pattern-Based Design
74	Design Patterns
75	Pattern-Based Software Design
76	Architectural Patterns
77	Component-Level Design Patterns
78	User Interface Design Patterns
79	WebApp Design Patterns
80	Summary
	WebApp Design
81	WebApp Design Quality
82	Design Goals
83	A Design Pyramid for WebApps

5. Basic Mathematics

	Pure Mathematics (A-Level)
	P1: Algebra
01	Background Algebra
02	Linear Equations
03	Changing the Subject of a Formula
04	Quadratic Equations
05	Solving Quadratic Equations
06	Equations that cannot be Factorized
07	The Graphs of Quadratic Function
08	The Quadratic Formula
09	Inequalities
	P2: Algebra
10	Operations with Polynomials
11	Solution of Polynomial Equations
12	The Modulus Function
	P3: Further Algebra
13	The General Binomial Expansion
14	Review of Algebraic Functions
15	Partial Functions
16	Using Partial Functions with The Binomial Expansion
	P1: Co-Ordinate Geometry
17	Co-Ordinates
18	Plotting, Sketching and Drawing
19	The Gradient of a Line
20	The Distance Between Two Points
21	The Mid-Point of a Line Joining Two Points
22	The Equation of a Straight Line
23	Finding the Equation of a Line
24	The Intersection of Two Line
25	Drawing Curves
26	The Intersection of A Line and A Curve
	P1: Sequences and Series
27	Definitions and Notation
28	Arithmetic Progressions
29	Geometric Progressions
30	Binomial Expansions
	P1: Functions
31	The Language of Functions
32	Composite Functions
33	Inverse Functions
	P1: Differentiation
34	The gradient of a Curve
35	Finding the Gradient of a Curve
36	Finding the Gradient from First Principles
37	Differentiating by Using Standard Results
38	Using Differentiation
39	Tangents and Normals
40	Maximum and Minimum Points

41	Increasing and Decreasing Functions
42	Points of Inflection
43	The Second Derivative
44	Applications
45	The Chain Rule
	P2: Differentiation
46	The Product Rule
47	The Quotient Rule
48	Differentiating Natural Logarithms and Exponentials
49	Differentiating Trigonometrical Functions
50	Differentiating Functions Defined Implicitly
51	Parametric Equations
52	Parametric Differentiation
	P3: Differential Equations
53	Forming Differential Equations from Rates of Change
54	Solving Differential Equations
	P1: Integration
55	Reversing Differentiation
56	Finding the Area Under A Curve
57	Area as The Limit of A Sum
58	Areas Below the X Axis
59	The Area Between Tow Curves
60	The Area Between A Curve and the Y Axis
61	The Reverse Chain Rule
62	Improper Integrals
63	Finding Volumes by Integration
	P2: Integration
64	Integrals Involving The Exponential Function
65	Integrals Involving The Natural Logarithm Function
66	Integrals Involving Trigonometrical Functions
67	Numerical Integration
	P3: Further Integration
68	Integration by Substitution
69	Integrals Involving Exponentials and Natural Logarithms
70	Integrals Involving Trigonometrical Function
71	The Use of Partial Fractions in Integration
72	Integration by Parts
73	General Integration
	P1: Trigonometry
74	Trigonometry Background
75	Trigonometrical Functions
76	Trigonometrical Functions for Angles of any Size
77	The sine and cosine Graphs
78	The tangent graph
79	Solving Equations using Graphs of Trigonometrical Functions
80	Circular Measure
81	The Length of An ARC of A Circle
82	The Area of A Sector of A Circle
83	Other Trigonometrical Functions
	P2: Trigonometry
84	Reciprocal Trigonometrical Functions

85	Compound-Angle Formulae
86	Double-Angle Formulae
87	The Forms rcos, rsin
88	The General Solutions of Trigonometrical Equations
	P1: Vectors
89	Vectors in Two Dimensions
90	Vectors in Three Dimensions
91	Vectors Calculations
92	The Angle Between Two Vectors
	P3: Vectors
93	The Vector Equation of a Line
94	The Intersection of Two Lines
95	The Angle Between Two Lines
96	The Perpendicular Distance from A Point to a Line
97	The Vector Equation of a Plane
98	The Intersection of A Line and A Plane
99	The Distance of A Point from A Plane
100	The Angle Between A Line and A Plane
101	The Intersection of Two Planes
	P2: Logarithms and Exponentials
102	Logarithms
103	Exponential Functions
104	Modelling Curves
105	The Natural Logarithm Functions
106	The Exponential Function
	P2: Numerical Solution of Equations
107	Interval Estimation – Change-of-Sign Methods
108	Fixed-Point Iteration
	P3: Complex Numbers
109	The Growth of the Number System
110	Working with Complex Numbers
111	Representing Complex Numbers Geometrically
112	Sets of Points in An Argand Diagram
113	The Modulus-Argument form of Complex Numbers
114	Sets of Points Using The Polar Form
115	Working with Complex Numbers in Polar Form
116	Complex Exponents
117	Complex Numbers and Equations

Each Day: 5 Subjects x 3 Topics = 15 Topics		
01	Programming in C	104
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