The Certificate in Finance and Technology

Level 1 syllabus

ABOUT THE CFT

The Certificate in Finance and Technology was created to address the need for a qualification designed for the large number of people who work in technology roles within the financial services sector. The flagship product, the Certificate in Finance and Technology (CFT), combines financial and technology subjects in a syllabus designed by senior staff within the financial services industry.

The CFT is composed of three levels.

OBJECTIVE OF THE LEVEL 1 EXAMINATION

The objective of Level 1 of the CFT is to ensure that candidates have a thorough grounding in the workings of the financial services industry and the main debt and equity products. In addition, the last three modules of Level 1, cover fundamental topics within the technology space of the financial services industry.

The six modules of Level 1 provide anyone entering a technology role within financial services, or anyone already in such a role, looking to broaden and update their skillset a targeted solution.

The Level 1 examination consists of 210 multiple choice questions with 35 questions from each of the six modules. Further details can be found in the Exam Structure section below. The examination will test candidates' knowledge and understanding of the following subject areas:

1. The financial services industry
2. Debt
3. Equity
4. Project management
5. Business analysis
6. Software engineering

SYLLABUS STRUCTURE

The syllabus is divided into two high level subjects, finance and technology. Each one is broken into three modules, each module into several sections and each of these into a series of learning objectives.

Each learning objective begins with one of a number of specific words. These words enable candidates to appreciate the level at which they will be tested.

Learning objective prefixes, with clarification:

- Know - Demonstrate ability to recall a discrete fact or principle
- Identify – Be able to select the most appropriate solution when presented with a number of alternatives
- Understand – Demonstrate comprehension of a fact or principle. This is a higher level of knowledge than required for Know objectives
- Apply – The highest level of comprehension, must be able to adapt facts to a scenario
- Calculate – Compute the numerical answer to a problem, task or scenario, using formulae

EXAMINATION STRUCTURE

Time allowed: 4 hours total

Structure: 2 hour exam covering modules 1-3, followed by a 30 minute break and a 2 hour exam covering module 4-6

All questions are multiple choice with four possible answers and a single correct answer

210 multiple choice questions consisting of 35 questions for each of the 6 modules detailed above

LEVEL 1 SYLLABUS

Module 1 - The financial services Industry

1.1   Global financial market participants

   1.1.1   Understand the roles of the main players in financial markets
- Global investment banks
- Asset managers
- Hedge funds
- Insurance companies
- Private wealth managers
- Brokers
- Stock exchanges
- Regulators

   1.1.2   Understand the roles that an investment bank takes in the markets
- Pricing securities
- Trading Securities
- Research
- Advice
- Prime Services

1.2   Regulation in the markets

   1.2.1   Know the key regulators in the global markets

   1.2.2   Understand the role of a regulator within financial markets
- market confidence
- financial stability
- consumer protection and reduction of financial crime

   1.2.3   Identify the reasons for regulations and frameworks in the market place

   1.2.4   Know Dodd Frank and Volcker rule

   1.2.5   Know EMIR

   1.2.6   Know Capital adequacy and Basel III requirements

1.3   Introduction to economics

   1.3.1   Know the definition of economics

   1.3.2   Understand the reasons for the study of economic data

1.4   Microeconomics

   1.4.1   Understand the supply vs demand curve

   1.4.2   Identify the factors that affect market equilibrium

   1.4.3   Know the effect of extreme cases on the curve

   1.4.4   Apply an understanding of diminishing marginal utility

   1.4.5   Understand the need to maximise profits

   1.4.6   Identify the key costs in a firm

1.5   Macroeconomics
1.5.1   Know GDP as a measure of growth
1.5.2   Understand the components of GDP
  - C – Consumer spending
  - I – Private Domestic Investment
  - G – Government Spending
  - X – Exports
  - M – imports
1.5.3   Identify the difference between nominal GDP and real GDP
1.5.4   Understand the terms aggregate demand and supply
1.5.5   Identify the key sources of economic growth
  - Labour supply
  - Human capital
  - Physical capital
  - Technology
  - Natural resources
1.5.6   Identity the phases and terms of the business cycle:
  - Peak
  - Trough
  - Contraction
  - Expansion
  - Growth
  - Trend
1.5.7   Understand inflation, deflation and disinflation
1.5.8   Know how to measure inflation using price indexes such as:
  - RPI
  - CPI
1.5.9   Know the measures of unemployment
1.5.10   Identify the key economic indicators

1.6   Central banks
1.6.1   Know the main central banks
1.6.2   Understand the role of a central bank
1.6.3   Identify interest rates globally
1.6.4   Identify the key causes of inflation
1.6.5   Apply knowledge of interest rates as a means to controlling inflation

1.7   Financial mathematics
1.7.1   Understand the time value of money
1.7.2   Understand compounding affect
1.7.3   Calculate the Future Value of a single sum invested for a number of years at a given rate of return
1.7.4   Calculate the Present Value of a single sum received a number of years in the future given a discount rate

1.7.5   Calculate the IRR/Yield/Return on an investment over a one year period given the present value and the future value

1.8   Life cycle of a trade
  1.8.1   Know the details entered for a trade
  1.8.2   Identify the key roles involved in the trade life cycle
  1.8.3   Know the key settlement periods for global securities
  1.8.4   Understand protocols for transferring information between finance organisations
  1.8.5   Understand delivery vs. payment methodology
  1.8.6   Identify the key risks during the life cycle of a trade
  1.8.7   Understand how to build an order book from a set of trades
  1.8.8   Calculate the realised and unrealised profit and loss from a set of trades

Module 2 – Debt

2.1   Debt market overview

2.1.1   Understand the function of debt markets

2.1.2   Know the main debt market products:
- Loans
- Bonds
- Money market instruments

2.1.3   Know the main debt market participants
- Government and public sector issuers
- Corporate issuers
- Traders
- Investors

2.1.4   Know the main debt market sectors
- Domestic bond market
- Foreign bond market
- International securities (Eurobond) market

2.2   Market rates

2.2.1   Calculate present and future values using interest rates at different compounding frequencies

2.2.2   Calculate the effective annual rate that corresponds to a given nominal interest rate, and vice versa

2.2.3   Know the definition of a forward interest rate

2.2.4   Understand the difference between spot and forward interest rates

2.2.5   Calculate the implied forward rate that corresponds to given spot interest rates at different compounding frequencies

2.3   Money market instruments

2.3.1   Know the definition of a money market instruments

2.3.2   Know the main types of money market instruments and how they are used
- Cash deposits
- Certificates of deposit
- Treasury bills
- Bankers' acceptances
- Commercial paper
- Sale and repurchase agreements (repo)

2.3.3   Calculate interest on a simple interest or money market basis

2.3.4   Calculate the redemption amount at maturity on a cash deposit

2.3.5   Understand the difference between true discount instruments and discount-to-yield instruments

2.3.6   Calculate the settlement amount on a true discount instrument such as a Treasury bill for a given discount rate

2.3.7   Calculate the settlement amount on a discount-to-yield instrument such as a bankers' acceptance or commercial paper that is trading at a given yield

2.3.8	Calculate the yield on a true discount instrument
2.3.9	Calculate the yield that corresponds to a given discount rate and the discount rate that corresponds to a given yield
2.3.10	Understand the definition, calculation method, uses and limitations of the following money market interest rates

- LIBOR
- Euribor
- EONIA
- SONIA

2.4	Bond prices and accrued interest
2.4.1	Know how bond prices are quoted
2.4.2	Understand the relationship between the clean and dirty price of a bond
2.4.3	Know the main market day count conventions used to calculate accrued interest in bonds

- Actual/Actual
- 30E/360
- 30/360
- Actual/365

2.4.4	Calculate the accrued interest and dirty price of a bond, given its clean price, coupon rate, maturity date, settlement date and day count convention
2.4.5	Calculate the settlement amount that will be paid for a given nominal amount of a bond, given its dirty price

2.5	Sale and repurchase agreements (repo)
2.5.1	Know the definition of a sale and repurchase agreement (repo)
2.5.2	Understand the main uses of repo

- Financing long positions in bonds
- Borrowing bonds to deliver into short positions
- Secured lending and borrowing
- Central bank use of repo in open market operations

2.5.3	Understand the nature and timing of the payments made in a repo
2.5.4	Calculate the purchase price, price differential and repurchase price in a repo used to finance a bond, given the bond's clean price and accrued interest and the repo rate and term
2.5.5	Understand why a haircut or initial margin is usually applied to repo collateral
2.5.6	Calculate the purchase price in a repo, given the haircut or initial margin
2.5.7	Know the different maturity terms on which repos may be traded

- Overnight
- Term
- Open

2.5.8	Understand the difference between general collateral (GC) and special collateral repo

2.6   Bonds

  2.6.1   Bond features

    2.6.1.1   Understand the fundamental features of bonds
- Issuer
- Maturity
- Currency
- Nominal amount outstanding (issue size)
- Coupon
- Seniority and security
- Price
- Yield

    2.6.1.2   Know other features of bonds
- Covenants
- Embedded options (e.g. callable, putable, convertible)

  2.6.2   Bond types

    2.6.2.1   Understand the main bond types:
- Fixed coupon
- Zero coupon
- Floating rate note (FRN)
- Inflation-linked
- Bonds with embedded options (e.g. callable, putable, convertible)

  2.6.3   Bond price and yield

    2.6.3.1   Understand why bonds of similar credit quality and remaining maturity may trade at very different prices

    2.6.3.2   Know the definition of yield to maturity

    2.6.3.3   Understand the relationship between the price of a bond and its yield to maturity

  2.6.4   Credit risk and credit spreads

    2.6.4.1   Know the definition of credit risk

    2.6.4.2   Know the factors on which credit risk depends

    2.6.4.3   Understand the relationship between credit spreads and expected loss

    2.6.4.4   Know the main benchmarks relative to which credit spreads are measured

    2.6.4.5   Know the main credit spread measures that are used in debt markets
- Nominal spreads
- Zero-volatility spreads (Z-spreads)
- Option-adjusted spreads (OAS)
- Asset swap margins
- Credit default swap (CDS) spreads

  2.6.5   Credit analysis and credit ratings

    2.6.5.1   Know the main factors considered in credit analysis
- Current and forecast macroeconomic and market environment
- Competitive situation and financial health of the company
- Special contractual features of the obligation being analyzed

2.6.5.2   Understand how key financial ratios related to cash flow and indebtedness (leverage) may affect credit risk

2.6.5.3   Understand how subordination affects expected recovery rates

2.6.5.4   Know the difference between affirmative and negative covenants

2.6.5.5   Understand how and why an issuer may obtain a credit rating

2.6.5.6   Know the long-term obligation ratings categories used by the main ratings agencies

2.6.5.7   Understand the relationship between an issuer rating and an obligation rating

2.6.5.8   Know when a ratings agency may issue a ratings outlook or place a rating on ratings watch

2.6.5.9   Know the main steps in the process by which ratings agencies assign ratings
- Analysis of risk factors relevant to the companies in the issuer's industry
- Assigning and combining factor scores to give a preliminary rating
- Adjustments based on qualitative assessment to arrive at a final rating

2.6.5.10   Know the definition of investment grade debt

2.6.5.11   Know the main ways in which high yield debt is different from investment grade debt

2.6.6   Convertible bonds

2.6.6.1   Understand the key convertible bond terminology
- Conversion ratio
- Conversion price
- Parity (conversion value)
- Conversion premium
- Investment value
- Investment value premium

2.6.6.2   Calculate one of the terms given in the previous learning objective when given relevant values for the others

2.6.6.3   Understand how risk and reward in a convertible bond is affected by changes in the stock price, interest rates and issuer credit quality

2.6.6.4   Understand why issuers issue convertible bonds

2.6.7   Securitisation

2.6.7.1   Know the motives for securitisation

2.6.7.2   Understand the elements and structure of a simple securitisation
- Originator
- Receivables to be securitised (collateral pool)
- Special Purpose Vehicle (SPV)
- Investors

2.6.7.3   Understand how economic interest in the collateral is transferred to the SPV and why the SPV must be insolvency remote

2.6.7.4   Know the main credit enhancement techniques used in securitisation
- Over-collateralization
- Retained spread

- Insurance
- Tranching

 2.6.7.5 Know the main asset classes that may be securitised
- Mortgage loans
- Automobile loans and leases
- Credit card receivables
- Student loans

 2.6.7.6 Know the difference between a whole business securitisation and a standard securitization

2.6.8 Bond issuance

 2.6.8.1 Know the definition of a primary market

 2.6.8.2 Understand the key stages in the auction process by which sovereign debt is typically issued
- Announcement
- Non-competitive and competitive bids
- Pricing
- Issuance

 2.6.8.3 Understand the difference between a single-price auction and a multiple-price auction

 2.6.8.4 Know the difference between a private placement and a public issue

 2.6.8.5 Understand how medium-term note (MTN) programmes are used to issue debt securities

 2.6.8.6 Know the definition of underwriting

 2.6.8.7 Understand the structure of a traditional underwriting syndicate
- Lead manager(s)/Bookrunner(s)
- Co-lead manager(s)/Co-manager(s)
- Selling group

 2.6.8.8 Understand the main distribution methods used in syndication
- Retention
- Pot system

 2.6.8.9 Know the definition of a bought deal

 2.6.8.10 Understand the purpose of a fixed price re-offer agreement

 2.6.8.11 Understand the key stages in the underwriting and issuance of debt securities based on a fully negotiated price
- Mandate
- Roadshow
- Launch date
- Closing

2.6.9 Bond trading

 2.6.9.1 Understand the operation of the bond secondary market

 2.6.9.2 Understand why secondary market liquidity is important

 2.6.9.3 Understand why bonds have traditionally been traded in an over-the-counter (OTC) market in which dealers quote bid and offer prices at which they are willing to buy and sell securities

2.6.9.4   Know the definitions of pre-trade transparency and post-trade transparency

2.6.9.5   Understand why some market participants may prefer less transparency

2.6.9.6   Understand the factors underlying the migration of bond trading to multi-user electronic trading platforms

Module 3 – Equity

3.1   Equity market overview

  3.1.1   Understand the fundamental features of equity
- Nominal Value
- Issued share capital
- Ownership
- Dividends
- Voting rights
- Market value

  3.1.2   Calculate the market capitalization for a company from the number of shares and current share price

  3.1.3   Calculate the return on an equity investment

  3.1.4   Know the key parties in the equity markets
- Issuers
- Investors
- Brokers
- Dealers
- Market makers/Specialists
- Exchanges
- Settlement organisations

  3.1.5   Understand the differences between the main equity types
- Ordinary/Common
- Preferred
- Depositary receipts

  3.1.6   Depositary receipts

    3.1.6.1   Know the key features of the depositary receipt structure

    3.1.6.2   Understand the benefits of using depositary receipts as opposed to common equity for both the issuer and investor

    3.1.6.3   Know the difference between sponsored and unsponsored depositary receipts

    3.1.6.4   Know the major markets in which depositary receipts are issued and traded

3.2   Equity valuation

  3.2.1   Understand the difference between book, market and fair value of an equity

  3.2.2   Know the main absolute and relative methods of equity valuation
- Dividend discount models
- Discounted free cash flow (DCF) models
- Multiple valuation methods (comparables)
- Asset based valuation methods

  3.2.3   Calculate the equity value of a company given the enterprise value and other relevant information

  3.2.4   Understand the steps in undertaking a DCF valuation
- Forecast cash flows for the initial period
- Calculate the terminal value for cash flows after the initial period

- Calculate the weighted average cost of capital (WACC)
- Value the equity

3.2.5   Understand the steps in undertaking a comparable company valuation
- Identify the comparable companies
- Collect comparable data
- Select multiple(s)
- Value the equity

3.3   Equity issuance

3.3.1   Know the role of ECM in an initial public offer (IPO)

3.3.2   Understand the main reasons a company may go public
- Raise capital
- Allow investors to exit
- Motivate employees
- Facilitate acquisitions with stock

3.3.3   Know key reasons against going public
- Loss of control
- Increased disclosure
- Increased compliance costs

3.3.4   Understand each of the stages involved in an IPO
- The pitch
- Bank(s) selected by company as book runner(s)
- Co-manager banks selected
- Kick-off meeting
- Develop equity story
- Due diligence
- Pre-marketing
- Roadshow
- Bookbuild
- Pricing
- Allocation
- Aftermarket support including Greenshoe

3.3.5   Calculate the total number of shares issued given a market scenario using a Greenshoe

3.4   Follow on equity issuance

3.4.1   Rights issue

3.4.1.1   Understand the key features of a rights issue
- Right subscription ratio
- Rights issue discount

3.4.1.2   Know the alternatives for an investor whose stock holding is subject to a rights issue

3.4.1.3   Know why a company would use a rights issue as a follow on offering

3.4.1.4 Calculate the following for a rights issue
- Theoretical ex-rights price (TERP)
- Nil-paid price
- Discount to TERP
- Dilution under various investor decisions

3.4.1.5 Know there are a variety of different national requirements for a rights issue

3.4.2 Understand the features, limitations (including geographical) and benefits of the following alternative follow on equity issue methods
- Accelerated book build
- Block trade
- Open offer
- Placing
- Cash box

3.5 Equity markets

3.5.1 Exchanges

3.5.1.1 Understand the purpose and function of a stock exchange

3.5.1.2 Know the major stock exchanges in the following countries
- United States
- Japan
- Europe
- United Kingdom
- Hong Kong
- China
- Canada
- India

3.5.1.3 Understand the differences between order and quote driven markets

3.5.1.4 Understand the relative advantages of open outcry versus electronic exchange trading

3.5.1.5 Understand the growth in alternatives trading venues such as dark pools and competing exchanges and the impact this has had on the global equity market

3.5.1.6 Understand the process of algorithmic trading including high frequency trading and the impact it has had on the global equity market

3.5.2 Indices

3.5.2.1 Know the main uses of equity indices

3.5.2.2 Understand the difference between market, price and equal weighted indices

3.5.2.3 Understand the mechanics of an equity index in terms or rebalancing and stock splits

3.5.2.4 Know which markets are represented by the following stock indices
- MSCI World
- S&P Global 100
- S&P 500
- EURO STOXX 50
- FTSE 100

- CNX Nifty
- Hang Seng
- SSE Composite Index
- Nikkei 225

Module 4 - Project Management

4.1   Project fundamentals

   4.1.1   Understand the various natures of a project
              - Time based
              - Product based
   4.1.2   Understand the benefits of using project management techniques
              - Quantitative benefits
              - Qualitative benefits
   4.1.3   Understand the goal types of a project
              - Project goals
              - Product goals
   4.1.4   Understand the difference between top down and bottom up approaches to setting
              product goals
   4.1.5   Understand the key documents used in project management and the purpose of each
              document
              - Project charter
              - Business case
              - Market requirements
              - Product requirements
              - Project plan
   4.1.6   Understand the elements present in a project plan

4.2   Project and development frameworks
   4.2.1   Know the key features and differences of the following popular project management
              frameworks
              - PMP
              - PRINCE2
              - Hybrid
   4.2.2   Understand the value of a project management framework
   4.2.3   Know the processes associated with traditional Software Development Life Cycles
              (SDLCs)
              - Waterfall
              - V Model
   4.2.4   Know the processes associated with agile SDLCs
              - Scrum
              - eXtreme Programming
   4.2.5   Understand how SDLCs integrate with project management frameworks

4.3   Scope, stakeholders, and project teams
   4.3.1   Understand the development process of project scope
   4.3.2   Know the five steps in formally defining the business problem
   4.3.3   Understand the structure of the scope statement

4.3.4   Understand product scope
         - Features and functionality
         - Use cases
4.3.5   Know the types of project constraints
4.3.6   Understand the process of stakeholder analysis
         - Defining a project stakeholder
         - Setting and managing stakeholder goals and expectations
         - Identify stakeholders
         - Producing a stakeholder matrix
4.3.7   Understand the impact of missed stakeholders
4.3.8   Understand the project team as a stakeholder
4.3.9   Know the characteristics of a team
4.3.10   Understand the importance of effective communication
4.3.11   Calculate the number of communication channels for a project with a given number of stakeholders.
4.3.12   Understand the different types of project communication
4.3.13   Know the importance of creating a communication plan

4.4   Creating the project plan
4.4.1   Know the tasks for the work breakdown structure (WBS)
         - Three step process
         - Organizing the WBS
4.4.2   Estimating work effort
    4.4.2.1 Understand the process of a Fermi estimate
    4.4.2.2 Calculate an estimated value using a simple three point estimation
    4.4.2.3 Know the main causes of unreliable estimates
4.4.3   Network dependencies
    4.4.3.1 Understand the purpose of a network precedence diagram
    4.4.3.2 Know how to move from a WBS to a network diagram
    4.4.3.3 Understand critical path analysis
    4.4.3.4 Understand the four different dependency relationships
4.4.4   Understand the challenges of resource allocation
4.4.5   Understand the need for, and structure of, test plans
4.4.6   Understand the difference between white box vs. black box testing
4.4.7   Understand different methods of testing
         - Unit testing
         - Integration testing
         - System testing
         - Regression testing
         - User acceptance testing

4.5   Managing to the plan
4.5.1   Understand the role of a project manager during execution

4.5.2   Understand the important monitoring points during project execution
- Scope
- Change management
- Milestones
- Releases
- Risks

4.5.3   Know the importance of monitoring risks, assumptions, issues, and dependencies (RAID) during execution

4.5.4   Know the main risk mitigation strategies

4.5.5   Managing and motivating a team during project execution

4.5.5.1 Understand team roles and responsibilities

4.5.5.2 Understand the five stages in team development

4.6   Closing the project

4.6.1   Know when to close a project

4.6.2   Identify the 8 steps involved in closing a project

4.6.3   Know key post implementation metrics

4.6.4   Understand the importance of documenting lessons learned from the project

4.6.5   Understand the factors behind the success or failure of a project
- Project success factors
- Project challenged factors
- Project impaired factors

Module 5 - Business Analysis

5.1   The Business analysis framework

  5.1.1   Understand the role of the business analyst
- Features and functionality
- Job titles and skills
- Project manager and project team roles
- Business analysis flow chart

  5.1.2   Understand the components of requirements

  5.1.3   Understand the knowledge areas within the requirements processes
- Elicit
- Analyze
- Specify
- Validate

  5.1.4   Understand the roles of the BA in Software Development Life Cycles (SDLCs)

  5.1.5   Know the different standards for requirement types

  5.1.6   Know the four requirement categories

  5.1.7   Know the nine requirement types

5.2   Requirements elicitation

  5.2.1   Know the techniques used in stakeholder analysis

  5.2.2   Know how to prepare for elicitation activities

  5.2.3   Know the key questions used in elicitation

  5.2.4   Identify the techniques of information gathering

  5.2.5   Understand how to conduct elicitation interviews

  5.2.6   Know how to manage stakeholder concerns

5.3   Analysis and modelling

  5.3.1   Understand the analysis and modelling role of BAs

  5.3.2   Know the tools used in scope analysis
- Business Context Diagrams
- Functional Decomposition Diagrams

  5.3.3   Identify types of flow analysis
- Flow charts
- Process maps

  5.3.4   Understand types of use case analysis
- Use cases
- Use case diagrams

  5.3.5   Identify types of data analysis
- Data flow diagrams
- Entity relationship diagrams

  5.3.6   Identify types of prototype analysis
- Paper prototypes
- System created prototypes

5.4   Specifying, user stories and use cases

  5.4.1   Know the multiple styles of requirement structures

  5.4.2   Understand how to write text based requirements

  5.4.3   Understand how to create user stories

  5.4.4   Understand how to write use case narrative descriptions

  5.4.5   Know how to link requirement types to specifications

5.5   Verifying and validating

  5.5.1   Know the difference between verify and validate

  5.5.2   Identify standards of quality against which requirements are measured

    -    Standards of quality checklist

    -    Requirements checklist

    -    Peer Review

  5.5.3   Understand the process of validation testing

    -    Testing stages

    -    User acceptance test

    -    Test case template

Module 6 – Software engineering

6.1   Software Development Lifecycle

  6.1.1   Understand the role of Software Engineering in Financial Services

  6.1.2   Understand different types of SDLC

- Waterfall
- Iterative, RAD
- Agile

  6.1.3   Understand the main stages of a project lifecycle

- Initiation
- Requirements
- Design
- Development
- Testing
- Maintenance

  6.1.4   Know the key roles in the SDLC

- Architect
- Business Analyst
- Developer (or Programmer)
- Operations (or Support)
- Program (or Programme) Manager
- Project Manager
- Quality Management
- Stakeholder

6.2   Problem Solving and Algorithms

  6.2.1   Understand the key steps & techniques in Problem Solving

- Understand the problem
- Devise a plan
- Carry out the plan
- Check results
- Reflection and revision

  6.2.2   Apply core programming concepts

- Statements, Blocks
- Variables, Constants, Assignments
- Conditions
- Loops
- Methods, Functions, Subroutines
- Comments

  6.2.3   Understand key data structures

- Array
- List
- Stack, Queue
- Map, Hash Table
- Set
- Tree

- Graph

6.2.4　Know how to evaluate algorithms using Big O notation

6.3　　Programming Languages

6.3.1　Understand the key properties of object orientation
- Classes
- Encapsulation, scope
- Inheritance
- Sub-type polymorphism
- Coupling
- Composition & aggregation
- Delegation
- Abstract classes & Interfaces

6.3.2　Know how to interpret a UML class diagram
- Classes
- Associations

6.3.3　Understand the SOLID principles of Object Oriented Design
- Single Responsibility Principle
- Open Close Principle
- Liskov Substitution Principle
- Interface Segregation Principle
- Dependency Inversion Principle

6.3.4　Know the key features of Functional Programming
- First class functions
- Lambdas, closures

6.3.5　Understand the characteristics of mainstream computer languages
- Translation
- Declarative vs Imperative
- Domain-specific languages
- Type systems
- Scope

6.4　　Data Processing & Storage

6.4.1　Understand the Relational Model
- Types, Columns, Rows, Tables (Domains, Attributes, Tuples, Relations)
- Keys
- Transactionality, ACID
- Conceptual Modelling
- Logical Modelling
- Physical Modelling
- Normalization

6.4.2　Understand how to interpret Entity Relationship Diagrams (ERD)

6.4.3　Understand the core SQL syntax
- Data Definition Language (DDL)
- Data Control Language (DCL)
- Data Manipulation Language (DML)

- Transaction Control Language
6.4.4   Apply SQL syntax to basic data processing tasks
- Simple single table queries, SELECT
- Filtering data
- Column calculations
- Multiple table queries
6.4.5   Know the principles of Object Relational Mapping (ORM)
6.4.6   Know the characteristics of different types of NoSQL data store
- Eventual Consistency
- Column
- Document
- Key-value
- Graph
- Object
- Time series
- MapReduce
6.5   Quality Management
6.5.1   Understand the parts of Software Quality Management
- Quality Control
- Quality Assurance
6.5.2   Understand the motives for having robust SQM
- Cost of change
- Maintainability
6.5.3   Understand how Software Testing fits into the SDLC
6.5.4   Understand different types of testing
- Unit Test
- Integration Test
- Acceptance Test
- Pre-release Test
- Non-functional Test
- Regression Test
6.5.5   Know common testing techniques
- Continuous Integration
- Black Box and White Box Testing
- Test doubling
- Equivalence Partitioning & Boundary Value Analysis
- User interface testing
- Test databases