



The Certificate in Finance and Technology

Level 2 syllabus

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Version 2.3

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 comprised of three levels.

OBJECTIVE OF THE LEVEL 2 EXAMINATION

The objective of Level 2 of the CFT is to ensure that candidates have a thorough understanding of financial services relating to derivatives, foreign exchange and alternative investments. In addition, Level 2 covers the technology topics of payments and cryptocurrency, system architecture and UX design; these are all quintessential aspects of technology present in the financial services industry today.

The six modules of Level 2 build upon the foundation taught in Level 1 and is for those who wish to have a comprehensive understanding of FinTech. It will benefit those who are considering, or about to undertake, technology roles within financial services, or anyone already in such a role, looking to broaden and update their skillset with an advanced professional qualification solution.

The Level 2 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. Derivatives
2. Foreign exchange
3. Alternative investments
4. Payments and cryptocurrency
5. System architecture
6. UX design

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 60-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 in total (105 per exam paper) consisting of 35 questions for each of the 6 modules detailed above

LEVEL 2 SYLLABUS

Module 1 – Derivatives

- 1.1 Derivative securities
 - 1.1.1 **Understand** what makes a security a derivative
 - 1.1.2 **Know** the main derivative security types:
 - Forwards
 - Futures
 - Swaps
 - Options

- 1.2 Forwards
 - 1.2.1 **Know** the definition of a forward contract
 - 1.2.2 **Understand** how forward prices are related to spot prices by carry
 - 1.2.3 **Know** the definitions of backwardation and contango
 - 1.2.4 **Calculate** a forward price for a bond, given its spot clean price and accrued interest, the accrued interest for the forward period, and the repo rate
 - 1.2.5 **Understand** how forward prices are used to calculate breakeven levels for bond trades
 - 1.2.6 **Calculate** a forward exchange rate, given the spot exchange rate and money-market interest rates in the two currencies
 - 1.2.7 **Understand how** forward foreign exchange contracts are used to hedge foreign exchange risk in international transactions and in internationally diversified portfolios

- 1.3 Futures
 - 1.3.1 **Know** the definition of a futures contract
 - 1.3.2 **Know** the main futures markets in the USA, Europe and Asia and the most important contracts traded on them
 - 1.3.3 **Understand** the role of the clearinghouse as a central counterparty in futures markets
 - 1.3.4 **Understand** the functions of the following margining systems in the futures markets:
 - initial and variation
 - initial and maintenance
 - 1.3.5 **Calculate** the forward interest rate implied by a given Eurodollar or Euribor futures contract price
 - 1.3.6 **Calculate** the initial margin, profit and loss based on daily marking to market, and variation margin on a Eurodollar or Euribor futures position given the necessary margin levels
 - 1.3.7 **Calculate** the settlement amount in a bond futures contract, given the futures settlement price and the conversion factor of the delivered bond
 - 1.3.8 **Understand** how a bond futures price is related to the forward prices of bonds that are deliverable into the contract
 - 1.3.9 **Understand** how to identify the bond that is cheapest to deliver into a bond futures contract and why this matters
 - 1.3.10 **Understand** how bond futures are used to hedge interest rate risk

- 1.3.11 **Calculate** and assess the performance of strip and stack interest rate futures hedges for a loan
 - 1.3.12 **Understand** how stock index futures can be used to express views about equity prices
 - 1.3.13 **Calculate** and assess the performance of a stock index futures position used as a tactical hedge for an equity portfolio
 - 1.3.14 **Understand** how physical settlement affects the pricing of commodities futures contracts
 - 1.3.15 **Calculate** and assess the performance of producer and consumer futures hedges for commodities such as gold, copper, crude oil and natural gas
 - 1.3.16 **Understand** the origin and significance of seasonality and other features of forward commodity prices
- 1.4 Swaps
- 1.4.1 **Know** the payment conventions for interest rate swaps in major currencies
 - 1.4.2 **Understand** why paying or receiving fixed in a swap creates exposure to interest rates
 - 1.4.3 **Understand** how swap dealers use interest rate futures and bonds to hedge interest rate risk in swaps
 - 1.4.4 **Know** factors that drive swap spreads
 - 1.4.5 **Know** how interest rate swaps are quoted
 - 1.4.6 **Know** how payments on forward starting swaps and constant maturity swaps are calculated and how these swaps are used
 - 1.4.7 **Know** how payments on overnight index swaps (OIS) are calculated and how these swaps are used
 - 1.4.8 **Know** how tenor basis swaps and cross-currency basis swaps are quoted and how these swaps are used
 - 1.4.9 **Understand** why tenor basis swaps and cross-currency basis swaps do not trade flat
 - 1.4.10 **Know** how cross-currency swaps are constructed from fixed-for-floating interest rate swaps and cross-currency basis swaps, considering the FX basis
 - 1.4.11 **Understand** how cross-currency swaps are used in swap-linked bond issuance and in assessing cross-border relative value
 - 1.4.12 **Understand** how interest rate swaps are used to manage interest rate risk in fixed-income assets and liabilities
 - 1.4.13 **Understand** how asset swap margins are calculated and used
 - 1.4.14 **Understand** how swaps can be used to trade views on interest rates
 - 1.4.15 **Know** how fixed-for-floating commodity swaps and commodity basis swaps are structured and used
 - 1.4.16 **Know** how zero-coupon inflation swaps are structured and used
 - 1.4.17 **Know** how variance swaps are structured and
- 1.5 Swap Valuation: LIBOR and OIS Discounting
- 1.5.1 **Understand** why swap rates can be interpreted as LIBOR-credit-quality par yields when swaps are priced and re-valued under LIBOR discounting
 - 1.5.2 **Calculate** swap discount factors from quoted swap rates under LIBOR discounting
 - 1.5.3 **Calculate** projected forward LIBORs under LIBOR discounting

- 1.5.4 **Calculate** the mark-to-market value of a swap position under LIBOR discounting
- 1.5.5 **Understand** why LIBOR discounting is not appropriate for derivatives positions that are strongly collateralized, whether bilaterally or through central clearing, and why OIS discounting is used for collateralized swaps
- 1.5.6 **Calculate** swap discount factors from OIS rates under OIS discounting
- 1.5.7 **Calculate** projected forward LIBORs under OIS discounting
- 1.5.8 **Calculate** the mark-to-market value of a swap position under OIS discounting

- 1.6 Option Basics
 - 1.6.1 **Know** the payoffs to long and short positions in call and put options
 - 1.6.2 **Understand** the implications of put-call parity
 - 1.6.3 **Calculate** breakeven prices for long and short positions in call and put options
 - 1.6.4 **Understand** how moneyness, volatility and time to expiry affect option values
 - 1.6.5 **Know** the definitions of the option 'Greeks', namely
 - delta
 - gamma
 - vega
 - theta
 - rho
 - 1.6.6 **Understand** the role of delta in hedging options
 - 1.6.7 **Understand** the relationship between option prices and expected delta hedging costs
 - 1.6.8 **Understand** how the option 'Greeks' are affected by changes in the degree of moneyness of the option, its time to expiry and the volatility of the underlying asset
 - 1.6.9 **Understand** how the option 'Greeks' can be used to explain the sources of profit and loss when using options to trade views on volatility
 - 1.6.10 **Understand** how implied volatility is calculated and used
 - 1.6.11 **Understand** how the implied volatility smile or skew is measured and used

- 1.7 Option Pricing Models
 - 1.7.1 **Understand** how and why market participants use option pricing models
 - 1.7.2 **Calculate** option prices implied by expected hedging costs in a one-period model
 - 1.7.3 **Understand** the principles used to construct binomial option pricing models
 - 1.7.4 **Understand** the basic features of the Black-Scholes option pricing model

- 1.8 Using Options
 - 1.8.1 **Know** how payoffs to stock index options are calculated
 - 1.8.2 **Understand** how stock index options can be used to construct a protective put for an equity portfolio
 - 1.8.3 **Know** how payoffs to options on single stocks are calculated
 - 1.8.4 **Understand** how options on single stocks can be used to construct a covered call and an equity collar
 - 1.8.5 **Know** how payoffs to options on foreign currency are calculated
 - 1.8.6 **Understand** how options on foreign currency can be used to construct contingent hedges for foreign exchange risk

- 1.8.7 **Know** how payoffs to swaptions (i.e. options on forward starting interest rate swaps) are calculated
- 1.8.8 **Understand** how swaptions can be used to construct straddles and strangles that express views about volatility but are approximately delta neutral
- 1.8.9 **Understand** how swaptions can be used to construct risk reversals that express views about the shape of the implied volatility smile or skew

- 1.9 Credit Derivatives
 - 1.9.1 **Know** the counterparties and possible cash flows in a credit default swap (CDS)
 - 1.9.2 **Understand** how buying or selling protection in a CDS creates exposure to credit risk
 - 1.9.3 **Know** the main contractual features of CDS traded under standard documentation, including standard maturity and coupon dates, fixed coupons, and full first coupon
 - 1.9.4 **Know** the definition of par spread for a CDS
 - 1.9.5 **Understand** why an upfront payment is exchanged between the protection seller and the protection buyer in a CDS for which the par spread differs from the contractually fixed coupon
 - 1.9.6 **Know** the credit events traded in Standard North American Corporate (SNAC), European, Standard Emerging Market (STEM) and sovereign CDS
 - 1.9.7 **Understand** the cash settlement process for CDS
 - 1.9.8 **Understand** how CDS on single names can be used to hedge or trade views on credit risk
 - 1.9.9 **Understand** how CDS trades are marked to market
 - 1.9.10 **Know** the main credit indices on which CDS are traded
 - 1.9.11 **Understand** the cash settlement and notional principle adjustment mechanisms for CDS indices
 - 1.9.12 **Understand** how CDS indices can be used to hedge or trade views on credit risk

- 1.10 Counterparty Risk in Derivatives
 - 1.10.1 **Know** the definition of counterparty risk
 - 1.10.2 **Understand** how credit limits and Credit Value Adjustment (CVA) are used to manage counterparty risk
 - 1.10.3 **Understand** how netting and collateralization are used to manage counterparty risk
 - 1.10.4 **Know** the key differences between bilateral netting and collateralization under an ISDA Master Agreement and Collateral Support Annex (CSA) and multilateral netting and collateralization under central clearing
 - 1.10.5 **Understand** why market and regulatory forces are moving much of the derivatives market to exchange-based trading and central clearing

Module 2 – Foreign exchange

2.1 Foreign Exchange: An Introduction

- 2.1.1 **Understand** the concept of foreign exchange and the significance of the market
- 2.1.2 **Know** the size of the FX market and the major products
- 2.1.3 **Understand** the main players in the global foreign exchange market
- 2.1.4 **Know** the ISO codes for the major currencies
- 2.1.5 **Know** the five most active currency pairings and key global locations for FX
- 2.1.6 **Calculate** the quantity of foreign currency received in a trade give a rate and a second currency amount

2.2 Foreign Exchange Regimes

- 2.2.1 **Understand** the types of foreign exchange regimes
- 2.2.2 **Understand** the differences between a floating and a pegged foreign exchange system
- 2.2.3 **Understand** the different types of pegged exchange rate systems
- 2.2.4 **Understand** how dollarization works as a foreign exchange regime
- 2.2.5 **Know** the role of a currency board

2.3

- 2.3.1 **Understand** transaction risk
- 2.3.2 **Understand** translation risk
- 2.3.3 **Understand** economic risk, with respect to FX
- 2.3.4 **Understand** contingent risk, with respect to FX
- 2.3.5 **Understand** how the risks can be managed or reduced

2.4 Foreign Exchange Settlement

- 2.4.1 **Understand** Herstatt Risk and the current convention of FX settlement
- 2.4.2 **Know** the role of the Continuous Linked Settlement bank
- 2.4.3 **Know** the purpose of Non-Deliverable Forwards (NDFs) and their uses

2.5 Foreign Exchange Calculations

- 2.5.1 **Calculate** a foreign currency received or paid using a bid offer spread
- 2.5.2 **Calculate** a foreign exchange quote using a cross rate

2.6 Drivers of a Foreign Exchange Quote

- 2.6.1 **Know** the fundamental macroeconomic drivers of a foreign exchange quote
- 2.6.2 **Understand** how each of the following effects the FX rate:
 - Economic health of a country
 - Interest rate changes
 - Inflation changes
 - Budget deficit
 - Trade deficit

- 2.6.3 **Know** the technical drivers of a foreign exchange quote, and explain the effect of support and resistance lines
- 2.6.4 **Know** the features of a channel or trading range and the signal provided by a breakout from the channel
- 2.6.5 **Know** the features of the following technical analysis tools:
 - Moving averages
 - MACD
 - Candlestick charts
 - Head and shoulders top

- 2.7 Foreign Exchange Forwards
 - 2.7.1 **Understand** the features of an FX Forward and when it would be required
 - 2.7.2 **Calculate** a forward rate using covered interest rate parity
 - 2.7.3 **Calculate** a forward rate using premiums and discounts
 - 2.7.4 **Understand** how an arbitrage opportunity is identified using covered interest rate parity and forward rates
 - 2.7.5 **Understand** the features of a carry trade, and the risks involved
 - 2.7.6 **Understand** the mechanism of hedging through FX forwards

- 2.8 FX Swaps and Cross Currency Swaps
 - 2.8.1 **Know** the mechanics and uses of a FX swap
 - 2.8.2 **Know** the mechanics and uses of a cross currency swap

Module 3 – Alternative investment

- 3.1 Overview of Alternative Investments
 - 3.1.1 **Know** the definition of Alternative Investments
 - 3.1.2 **Understand** why people invest in Alternatives
 - 3.1.3 **Know** how Alternatives are traded

- 3.2 Hedge Funds
 - 3.2.1 **Know** the definition of a hedge fund
 - 3.2.2 **Know** the history of hedge funds
 - 3.2.3 **Understand** key features of hedge fund trading:
 - Leverage
 - Short selling
 - Role of a prime broker
 - Directional trading versus arbitrage/relative-value
 - 3.2.4 **Know** the main hedge fund service providers and understand their roles:
 - Lawyers
 - Platforms
 - Prime broker
 - Administrator
 - 3.2.5 **Know** the main terms and conditions involved in hedge fund investing:
 - Management and performance fees
 - High watermarks
 - Thresholds
 - Gates
 - Side-pockets
 - Lock-ins
 - 3.2.6 **Understand** the attractions of hedge funds as an alternative asset class
 - 3.2.7 **Understand** risks and potential problems of hedge fund investing
 - 3.2.8 **Know** key details of hedge fund failure case studies: LTCM, Madoff

- 3.3 Hedge Fund Strategies
 - 3.3.1 **Understand** directional strategies:
 - Global macro
 - Long/short equity
 - Emerging Markets
 - Managed Futures/Systematic
 - 3.3.2 **Understand** relative value strategies:
 - Convertible Arbitrage
 - Fixed Income Arbitrage
 - Equity Market Neutral
 - 3.3.3 **Understand** event-driven strategies:
 - Merger arbitrage

- Distressed
- 3.3.4 **Understand** issues involved in interpreting hedge fund indices
- 3.4 Private Equity
 - 3.4.1 **Know** the definition of Private Equity
 - 3.4.2 **Understand** the different stages of investment in each case:
 - Venture Capital
 - Growth
 - LBO
 - Special situations
 - 3.4.3 **Understand** the LBO process:
 - Requirements for an LBO
 - Detailed steps from funding to exit
 - Sources and uses of funds in an LBO
 - 3.4.4 **Understand** how a manager creates value in an LBO:
 - Increase earnings
 - Multiple expansion
 - Pay down debt
 - 3.4.5 **Understand** the mechanics of private equity investing:
 - Committed capital and drawdown
 - Valuations mean little
 - Low or negative IRR in early years (J curve)
 - Fee structure and the importance of manager selection
 - 3.4.6 **Know** key details of private equity case studies: Apple (venture capital) and TXU Energy (LBO)
- 3.5 Commodities
 - 3.5.1 **Identify** the broad categories of commodities (Metals, Energy, Agricultural)
 - 3.5.2 **Understand** the portfolio characteristics of commodities
 - Low correlation
 - Potentially high volatility
 - Zero income
 - 3.5.3 **Know** the methods of investing in commodities:
 - Physical
 - Derivatives (futures, index products, structured products)
 - Equities (in producers)
 - 3.5.4 **Understand** the relationship between futures price and spot price
 - 3.5.5 **Identify** backwardation and contango
 - 3.5.6 **Understand** the decomposition of commodity futures returns:
 - Total yield = collateral yield + roll yield/cost + spot return
 - 3.5.7 **Understand** key drivers of commodity prices and alternative methods of analysis
 - 3.5.8 **Know** the major products traded in energy markets
 - 3.5.9 **Know** the major producers and consumers of crude oil globally
 - 3.5.10 **Understand** price relationships between related commodities

- 3.5.11 **Know** the major products traded in metals markets
 - 3.5.12 **Understand** LME warrants and related data releases
 - 3.5.13 **Know** the major products traded in agricultural and livestock markets
 - 3.5.14 **Know** the major commodity data reports in the United States
- 3.6 Real Estate
- 3.6.1 **Know** the definition of real estate and identify key investable sectors
 - 3.6.2 **Know** the key features of real estate investment
 - 3.6.3 **Understand** the benefits and drawbacks of real estate investment
 - 3.6.4 **Understand** the risk and return of real estate investment
 - 3.6.5 **Know** the impact of the economic cycle on real estate
 - 3.6.6 **Know** methods of investing in real estate and understand relative transaction costs, liquidity, equity mkt correlation, real estate market correlation:
 - Direct i.e. buy real estate
 - Indirect
 - Equities
 - Real estate company shares
 - REIT
 - ETF
 - Derivatives
 - Funds
 - Open ended
 - Closed ended
 - Private Equity
- 3.7 Other Alternatives
- 3.7.1 **Know** the definition of infrastructure investment
 - 3.7.2 **Know** the key features of infrastructure investment
 - 3.7.3 **Understand** the benefits and drawbacks of infrastructure investment
 - 3.7.4 **Know** methods of investing in infrastructure
 - 3.7.5 **Know** the definition of collectible investments
 - 3.7.6 **Identify** the major categories of collectible investments
 - 3.7.7 **Understand** the benefits and drawbacks of collectible investments
 - 3.7.8 **Know** methods of investing in collectible investments

Module 4 – Payment and cryptocurrency

- 4.1 Overview of the Payments Industry
 - 4.1.1 **Understand** the importance and the impact of the payments industry
 - 4.1.2 **Understand** the basic terminology used in the payments industry
 - Payment
 - Payment System
 - 4.1.3 **Identify** the participants in a payment transaction
 - Debtor
 - Creditor
 - Debtor Agent
 - Creditor Agent
 - 4.1.4 **Understand** the classification of payment systems
 - Operator
 - Settlement Method
 - Frequency and Timing of Settlement
 - Settlement Date
 - Payment Value
 - Settlement Asset
 - 4.1.5 **Identify** the different types of payment transactions
 - Push transactions
 - Pull transactions
 - 4.1.6 **Identify** the payment system models
 - Open Loop Model
 - Closed Loop Model
 - 4.1.7 **Apply** knowledge about the processes in payment systems
 - Payment Instruction
 - Clearing
 - Settlement
 - Authentication
 - Authorization
 - 4.1.8 **Know** the types of biometrics authentication
 - Facial Recognition
 - Fingerprint Identification
 - Retinal Pattern Recognition
 - Iris-Based Identification
 - Voice Recognition
 - 4.1.9 **Know** the origins of settlement risk
 - 4.1.10 **Identify** the different types of settlement risk
 - Credit Risk
 - Liquidity Risk
 - Systematic Risk

- Legal Risk
- Operational Risk
- 4.1.11 **Understand** the exposure to settlement risk
 - Settlement Amount
 - Time Lag
- 4.2 Electronic Funds Transfers
 - 4.2.1 **Know** the characteristics of payment systems
 - Designated-Time Net Settlement (DTNS)
 - Real-Time Gross Settlement (RTGS)
 - Hybrid System
 - Integrated Systems
 - 4.2.2 **Identify** the type and the characteristics of specific payment systems
 - 4.2.3 **Know** the mechanisms of advanced payment systems
 - Frequent Netting and Continuous Processing
 - Partial Netting
 - Offsetting
 - Searching and Matching Facility
 - Queue Management
 - Reordering
 - Prioritization
 - Timed Payment
 - Optimization
 - 4.2.4 **Identify** the different types of electronic funds transfers
 - Credit Transfer
 - Direct Debit
 - 4.2.5 **Know** the definition of a credit transfer
 - 4.2.6 **Know** the roles in a credit transfer
 - Originator
 - Originator Bank
 - Beneficiary
 - Beneficiary Bank
 - Intermediary Banks
 - Clearing and Settlement Mechanisms
 - 4.2.7 **Understand** the relationships between the actors in a credit transfer
 - 4.2.8 **Apply** knowledge on the basic processing flow of a credit transfer transaction
 - 4.2.9 **Know** the different types of exception handling of credit transfer
 - Reject
 - Return
 - Recall
 - 4.2.10 **Apply** knowledge on the basic processing flow of a credit transfer exception
 - 4.2.11 **Know** the definition of a direct debit
 - 4.2.12 **Know** the roles in a direct debit
 - Creditor

- Creditor Bank
 - Debtor Bank
 - Debtor
 - Intermediary Banks
 - Clearing and Settlement Mechanisms
- 4.2.13 **Understand** the relationships between the actors in a direct debit
- 4.2.14 **Apply** knowledge on the basic processing flow of a direct debit transaction
- 4.2.15 **Know** the different types of exception handling of direct debit
- Reject
 - Refusal
 - Returns
 - Reversal
 - Revocations
 - Requests for cancellation
 - Refund
- 4.2.16 **Apply** knowledge on the basic processing flow of a direct debit exception
- 4.3 Card Payments
- 4.3.1 **Know** the different types of payment cards
- Credit cards
 - Debit cards
 - Pre-paid cards
- 4.3.2 **Understand** the term timing of funding
- 4.3.3 **Know** the card products
- Charge Cards
 - Corporate Cards/Purchasing Cards
 - Cashback Card
 - Co-branded Card/Loyalty Card
 - Combo Card
 - Companion Card
 - Fleet Cards
 - Premium Cards
 - Private Label Cards
- 4.3.4 **Identify** the characteristics of the card products
- 4.3.5 **Know** the acceptance environments
- Card-present
 - Card-not-present
- 4.3.6 **Identify** the card technologies
- Magnetic/Swipe Cards
 - Chip EMV Cards
 - Contactless Cards
- 4.3.7 **Identify** the card transaction participants
- Cardholder
 - Merchant

- Issuer
 - Acquirer
 - Card Scheme/Network
 - 4.3.8 **Apply** an understanding of the card value chain
 - 4.3.9 **Identify** the main components of the card industry
 - Issuing
 - Acquiring
 - 4.3.10 **Understand** the types of value chain models
 - Open loop network
 - Closed loop network
 - 4.3.11 **Know** the functions of the value chain participants
 - 4.3.12 **Know** the expenses and revenues of the value chain participants
 - 4.3.13 **Understand** the difference between tiered and stepped fees
 - 4.3.14 **Calculate** the relevant rate of a tiered or a stepped fee
 - 4.3.15 **Understand** the three-party-model and the four-party-model
 - 4.3.16 **Apply** knowledge of the card transaction cycle
 - 4.3.17 **Understand** the need of an interchange fee
 - 4.3.18 **Understand** the need of assessment fees
 - 4.3.19 **Calculate** the interchange fee and the discount rate
 - 4.3.20 **Calculate** the effect of a transaction on the card payment participants
 - 4.3.21 **Know** the transaction types
 - 4.3.22 **Understand** the need of regulation
- 4.4 Alternative Payments
- 4.4.1 **Know** the definition of Alternative Payments
 - 4.4.2 **Understand** the drivers for change in the payments industry
 - Enabling Technology
 - Drive for Integration
 - New Entrants: Retailers
 - Increased Security
 - 4.4.3 **Identify** the types of Alternative Payments
 - Online (Real-Time) Bank Transfers
 - Offline Bank Transfers
 - Direct Debits
 - Preloaded Digital Wallet
 - Pass-Through Digital Wallet
 - Mobile Payments
 - Pre-Paid Vouchers
 - Post-Pay
 - 4.4.4 **Understand** the success factors for Alternative Payments
 - Real-Time
 - Free/Low Cost
 - Mobility
 - Multi-Channel

- Ease of Use
- Secure
- Anonymity
- Flexibility and Specialization
- Returns/Refunds
- 4.4.5 **Identify** the three domains of Alternative Payments
 - Pre-Payment
 - Payment
 - Post-Payment
- 4.4.6 **Identify** the layers in the infrastructure of Alternative Payments
 - Settlement
 - Processing
 - Instruments
 - Services
- 4.4.7 **Apply** an understanding of the relationships and the processing flow of different types of Alternative Payments
 - Online Bank Transfers
 - Preloaded Digital Wallets
 - Pass-Through Digital Wallet
- 4.4.8 **Apply** knowledge on the categories of Mobile Payments
- 4.4.9 **Identify** the processes in Mobile Payments
- 4.4.10 **Identify** the technology used in Mobile Payments
 - Radio Frequency Identification (RFID)
 - Near Field Communication (NFC)
 - Quick Response Codes (QR codes)
 - Bluetooth Low Energy (BLE)
 - Host Card Emulation (HCE)
- 4.5 Financial Messaging
 - 4.5.1 **Understand** the need of financial messaging standards
 - 4.5.2 **Know** how financial messages are structured
 - 4.5.3 **Identify** different types of financial messages
 - 4.5.4 **Identify** specific information in financial messages
 - 4.5.5 **Apply** knowledge of the differences between standards for financial messages
 - 4.5.6 **Know** the characteristics of a financial messaging standard
 - Syntax
 - Semantic
 - 4.5.7 **Identify** the layers of the Three-Layered Approach of ISO 20022
 - Business Model
 - Logical Model
 - Syntax
 - 4.5.8 **Know** what Unified Modeling Language (UML) is used for
 - 4.5.9 **Understand** the difference between business components and business elements
 - 4.5.10 **Understand** the difference between message components and message elements

- 4.5.11 **Identify** specific information in the business model
 - 4.5.12 **Identify** specific information in the logical model
 - 4.5.13 **Understand** the advantages of eXtensible Markup Language (XML)
 - 4.5.14 **Apply** an understanding of the business domains of ISO 20022
 - 4.5.15 **Identify** the business area codes of ISO 20022
 - 4.5.16 **Know** what interoperability in the context of financial messaging means
 - 4.5.17 **Apply** knowledge of mapping of financial messages
 - 4.5.18 **Know** the characteristics of International Bank Account Number (IBAN)
 - 4.5.19 **Know** the characteristics of Business Identifier Code (BIC)
- 4.6 Cryptocurrencies and Blockchain
- 4.6.1 **Know** the basic characteristics of cryptocurrencies
 - 4.6.2 **Know** the functions of a bitcoin client
 - 4.6.3 **Identify** different types of bitcoin clients
 - Full Client
 - Lightweight Client
 - Web Client
 - Mobile Client
 - 4.6.4 **Know** the functions of a bitcoin wallet
 - 4.6.5 **Identify** different types of bitcoin wallets
 - Desktop Wallets
 - Web Wallets
 - Mobile Wallets
 - Hardware Wallets
 - Paper Wallets
 - 4.6.6 **Know** the functions of a bitcoin address
 - 4.6.7 **Know** the functions of digital keys
 - Private Key
 - Public Key
 - 4.6.8 **Understand** the relation between digital keys and bitcoin addresses
 - 4.6.9 **Know** the definition of a bitcoin transaction
 - 4.6.10 **Understand** the term Unspent Transaction Output
 - 4.6.11 **Apply** knowledge about the cryptocurrency transaction lifecycle
 - 4.6.12 **Understand** the term Digital Signature
 - 4.6.13 **Identify** the different types of bitcoin transactions
 - 4.6.14 **Know** the characteristics of the bitcoin network architecture
 - 4.6.15 **Understand** the difference between centralized and distributed database
 - 4.6.16 **Know** the characteristics of the blockchain
 - 4.6.17 **Understand** the blockchain processes
 - 4.6.18 **Know** the functions of mining
 - 4.6.19 **Identify** the mining rewards and their importance
 - 4.6.20 **Understand** the term Decentralized Consensus
 - 4.6.21 **Apply** knowledge about the Proof-of-Work
 - 4.6.22 **Identify** different types of consensus mechanisms

4.6.23 **Know** the advantages and disadvantages of cryptocurrencies

Module 5 – System Architecture & Design

5.1 Introduction to Architecture

- 5.1.1 **Understand** the purpose and challenges of Enterprise Architecture
- 5.1.2 **Know** how to apply Agile Values & Principles to EA
- 5.1.3 **Know** the components of TOGAF
 - Architecture Development Method (ADM)
 - Architecture Content Framework
 - Enterprise Continuum
- 5.1.4 **Know** the structure and approach of Zachman
 - Communication Interrogatives
 - Reification Transformations
- 5.1.5 **Know** the components of FEAF
 - 6 Architecture Sub-domains & Artifacts
 - Reference Models
 - Collaborative Planning Methodology (CPM)
- 5.1.6 **Understand** Business Architecture
- 5.1.7 **Understand** Data or Information Architecture
- 5.1.8 **Understand** Application Architecture
- 5.1.9 **Know** the components of a Technical Architecture

5.2 Application Types

- 5.2.1 **Understand** different characteristics of applications
 - Interactive & non-interactive
 - Stateful & stateless
 - Transactional & non-transactional
 - Concurrent user & single user
 - Connected & isolated
 - Synchronous & asynchronous
- 5.2.2 **Identify** different types of application
 - On-line Transaction Processing (OLTP)
 - On-line Analytical Processing (OLAP)
 - Service
 - Daemon
 - Batch
 - Command Line

5.3 Architectural Patterns

- 5.3.1 **Understand** the Monolithic Architecture pattern
- 5.3.2 **Understand** Layered Architectures
- 5.3.3 **Know** the difference between Layers and Tiers
- 5.3.4 **Understand** the common Web Architectures

- 5.3.5 **Understand** Component Driven Architectures
 - Pipeline
 - Service Oriented Architecture & Microservices
 - Event-driven Architecture
- 5.3.6 **Understand** Distributed & Shared Nothing architectures
- 5.3.7 **Know** the difference between Cluster & Grid computing
- 5.3.8 **Know** approaches to delivering a Cloud-based Architecture
 - Infrastructure as a Service
 - Platform as a Service
 - Software as a Service
- 5.3.9 **Know** different presentation architectures
 - MVC
 - MVP
 - MVVM

5.4 The Unified Modeling Language (UML)

- 5.4.1 **Understand** the benefits of using models
- 5.4.2 **Know** the scope and purpose of the Unified Modeling Language (UML)
- 5.4.3 **Know** the components of UML
 - Metamodel
 - Semantics for each concept
 - Diagram notation
 - Diagram interchange format
- 5.4.4 **Know** the main shared structures of UML
 - Multiplicity
 - Constraints
 - Comments
 - Instances
 - Stereotypes
 - Generalization
 - Realization
- 5.4.5 **Understand** the UML Class Diagram
- 5.4.6 **Understand** the UML Component Diagram
- 5.4.7 **Know** the UML Composite Structure Diagram
- 5.4.8 **Understand** the UML Use Case Diagram
- 5.4.9 **Understand** the UML Sequence Diagram
- 5.4.10 **Understand** the UML Activity Diagram
- 5.4.11 **Understand** the UML State Machine Diagram

5.5 Design Patterns

- 5.5.1 **Understand** what a Design Pattern is
- 5.5.2 **Know** when to use Design Patterns
- 5.5.3 **Understand** the main creational patterns of Object Oriented programming (OOP)
 - Abstract factory

- Builder
 - Factory method
 - Singleton
- 5.5.4 **Know** the Prototype creational pattern
- 5.5.5 **Understand** the main structural patterns of OOP
- Adapter
 - Composite
 - Decorator
 - Facade
- 5.5.6 **Know** the following structural patterns:
- Bridge
 - Flyweight
 - Front Controller
 - Marker
 - Proxy
- 5.5.7 **Understand** the main behavioral patterns of OOP
- Command
 - Observer
 - Strategy
 - Template method
- 5.5.8 **Know** the following behavioral patterns
- Chain of responsibility
 - Data Access Object
 - Interpreter
 - Iterator
 - Mediator
 - Memento
 - Null object
 - Specification
 - State
 - Visitor
- 5.5.9 **Understand** these Functional programming patterns
- Recursion
 - Currying
 - Monad

Module 6 - User Experience

6.1 Fundamentals of User Experience

- 6.1.1 **Understand** what is meant by the term user experience
- 6.1.2 **Understand** the difference between UI and UX
- 6.1.3 **Know** that UX impacts users' feelings and emotions
- 6.1.4 **Identify** the characteristics of a great user experience
 - Value
 - Usability
 - Adoptability
 - Desirability
- 6.1.5 **Know** how UX has evolved over the last several decades
- 6.1.6 **Understand** the importance and impact of UX in business

6.2 The Terminology of User Experience

- 6.2.1 **Identify** the difference between usable and useful
- 6.2.2 **Understand** the term user interface
- 6.2.3 **Know** the definition of graphic or visual design
- 6.2.4 **Understand** the role of user research in the UX process
- 6.2.5 **Understand** user research methods:
 - Personas
 - Interviews
 - Contextual Interviews
 - Focus Groups
 - Surveys
 - Card Sorting
 - Wireframes
 - Prototyping
 - Usability Testing
 - A/B testing
- 6.2.6 **Identify** the differences between UX and human-computer interaction (HCI)
- 6.2.7 **Know** the definition of interaction design
- 6.2.8 **Know** the definition of information architecture
- 6.2.9 **Identify** the key benefits of usability testing
- 6.2.10 **Know** the definition of content strategy

6.3 How User Experience Works in the Real World

- 6.3.1 **Identify** the key responsibilities of different roles within user experience
 - User Researcher
 - Information Architect
 - Interaction Designer
 - Visual/Graphic Designer
 - Front-End Developer

- Project Manager
- 6.3.2 **Understand** the key focus areas of company and industry research in the UX process
- 6.3.3 **Identify** three activities that occur during user research
 - Usability tests
 - Personas
 - Interviews
- 6.3.4 **Identify** five activities that occur as part of defining information architecture
 - Inventory of content
 - Content audit
 - Architecture design
 - Architecture test
 - Iterate and gather feedback
- 6.3.5 **Understand** the output of wireframing
- 6.3.6 **Understand** the difference between wireframing and visual design
- 6.3.7 **Understand** the iterative nature of usability testing in the design process
- 6.3.8 **Apply** knowledge of the UX process to recommend steps based on a real-world scenario

- 6.4 Visual Design Tips and Tricks
 - 6.4.1 **Know** that proper alignment can visually connect elements of a design
 - 6.4.2 **Identify** two visually strong alignments
 - Left
 - Right
 - 6.4.3 **Identify** four ways to effectively show contrast in design
 - Color
 - Shapes
 - Size
 - Position/orientation
 - 6.4.4 **Know** what is meant by the term visual hierarchy
 - 6.4.5 **Understand** that proximity implies a relationship or lack thereof
 - 6.4.6 **Understand** common page layouts used in software
 - 6.4.7 **Know** what the phrase "above the fold" means
 - 6.4.8 **Know** the definition of whitespace
 - 6.4.9 **Understand** the importance of whitespace in design
 - 6.4.10 **Identify** best practices for combining colors
 - 6.4.11 **Know** the differences between hues, tints and shades
 - 6.4.12 **Identify** a serif and sans serif font
 - 6.4.13 **Understand** the benefits of using consistency in design
 - 6.4.14 **Know** the definition of data visualization
 - 6.4.15 **Understand** best practices for data visualization (presenting data using graphs and tables)

- 6.5 Usability Heuristics for User Interface Design
 - 6.5.1 **Know** the definition of heuristic as it relates to UX

- 6.5.2 **Identify** ways that a user knows the status of the system
- 6.5.3 **Understand** the importance of matching the system to the real world, including the concept of shared references
- 6.5.4 **Identify** common techniques to provide user control and freedom
- 6.5.5 **Know** the importance of consistency and standards in UX design
- 6.5.6 **Understand** that error prevention is preferable to error messages
- 6.5.7 **Identify** when a design correctly supports recognition rather than recall
- 6.5.8 **Identify** how accelerators can increase flexibility and efficiency of use
- 6.5.9 **Understand** the importance of aesthetic and minimalist design, including the Pareto Principle
- 6.5.10 **Identify** techniques to help users recognize, diagnose and recover from errors
- 6.5.11 **Understand** how help and documentation can lead to a good user experience