EUROMONEY LEARNING

KFAS

مؤسسـة الكويت للتقـدم العـلمي
Kuwait Foundation for the Advancement of Sciences

Blockchain Essentials
a 3-Day Programme for KFAS
by Duncan Hughes

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Course Description

This foundational programme has been designed to provide delegates with a robust understanding of blockchain technologies and their principal applications in finance and more generally in socio-economic systems. Building from first principles, the course develops deep knowledge and understanding through critical examination of blockchain vis-à-vis incumbent technologies and systems as well as assessing the regulatory and legal requirements required for blockchain systems to flourish.

The programme commences by looking at the fundamental technological nature of distributed ledger systems and reviews the vision of the creators of the seminal bitcoin and Ethereum blockchains as well as the supporting technologies and regulatory environment required for blockchain applications to fulfil their potential. The individual technologies that comprise blockchain are covered in detail throughout the programme, building from the fundamentals of block formation and cryptographic primitives through to the different consensus protocol types used in different blockchains and to the role and technological nature of smart contracts.

The programme also covers the principal blockchain architectures and their design purposes and exemplifies the deployment of distributed ledger technology (DLT) via a number of use cases, including currency systems as well as real economy applications in supply chains and provenance assurance.

The programme concludes with perspectives on blockchain's potential role in economies of the future including those based on microtransactions as well as the potential for DLT to support circular economies.

Course Objectives

At the end of this programme, delegates will be able to:

- Appreciate the functional and technological nature of blockchain systems
- Understand the original objectives of blockchain architects
- Assess the continuing evolution of Distributed Ledger Technologies (DLT)
- Identify the key technologies comprising blockchain
- Recognise the key legal and regulatory measures to support blockchain deployment
- Specify the different types of blockchain architecture
- Identify use cases in which DLT can uniquely provide solutions
- Assess the potential role for blockchain in the economies of the future

Target Audience

- IT professionals
- Business strategists
- System architects
- Legal professionals
- Product designers
- System integrators
- Financial services regulators

Agenda

Day One

Session 1: What is a blockchain?

- Overview: blockchain – not just about Bitcoin!
- Functionally
  - Distributed ledger
  - Immutable transaction database
- Technically
  - Cloud-based system
  - Cryptographically linked list

Session 2: The history & evolution of blockchain

- The vision of Satoshi Nakamoto's bitcoin blockchain
- From bitcoin to permissioned blockchains
  - First generation simple distributed ledger technology (DLT)
  - Second generation: the advent of smart contracts
  - Third generation: moving away from Proof-of-Work consensus protocols
  - Fourth generation: private & permissioned blockchains

Session 3: Blockchain technologies I: block formation & chaining processes

- Selection of transactions
  - Transaction verification by nodes
  - Inclusion of transactions from mempool etc within blocks
- Other data included in blocks
- Chaining processes: how blocks are linked together

Session 4: Blockchain, financial systems and the real economy

- Overview: the infrastructural nature of blockchain systems
- Conditions required for blockchain systems to thrive
    - Technological
    - Internet of Things (IoT)
    - Tokenisation
    - Supportive legislation & regulation
    - Microtransactions
    - Smart Contract terms enforcement
- Potential applications of blockchain beyond finance
    - Immutable, trusted asset registers, including land
    - Digital asset registers, including Non-Fungible Tokens

Day Two

Session 5: Blockchain architectures

- Key objectives
    - Overview: building viable alternatives to traditional systems, e.g. clearing & settlement
    - Preventing "double spending"
    - System integrity: solving the "Byzantine Generals" problem
- Fully decentralised systems
    - Trustless networks
    - Roles of native tokens
- Permissioned systems and participant hierarchies

Session 6: Blockchain use cases I: Cryptocurrencies & Central Bank Digital Currencies

- Benefits and drawbacks of cryptocurrencies
    - Native Tokens: Bitcoin, Ether & XRP
    - Stablecoins: Tether, Terra Luna and Diem
- Central Bank Digital Currencies (CBDC) and monetary management

Session 7: Blockchain technologies II: cryptographic primitives

- Encryption techniques and application in public-private keypairs
- Hashing functions and application in blockchain security

Session 8: Blockchain applications: a critical review

- Blockchain: "a solution looking for a problem"?

- What can blockchain do / offer above a traditional RDBMS?

Day Three

Session 9: Regulation of blockchain and associated products

- Current regulatory focus on cryptoassets
- Fundamental issues with decentralised blockchains for financial services
    - Pseudonymity of participants
    - Identifying regulated entities
- Data protection issues on permissioned blockchain systems

Case study: Meta's Diem and regulatory opposition

Session 10: Use cases II: Blockchain in the real economy

- Supply chain use cases
- Provenance assurance

Session 11: Blockchain technologies III

- Consensus protocols
- "Forking"
- Merkle trees
- Smart Contracts

Session 12: Blockchain's role in the economies of the future

- Blockchain and ESG
    - Legacy issues
    - Power usage for blockchain mining processes
    - Facilitation of criminal activity
    - Potential for ESG-positive use cases
- Micro-transactions: e.g. Smart Grid use cases and PlasticBank case study
- Circular economies
- Cybersecurity in the age of quantum computing

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