**SGUS Blockchain Talent Programme**

**Blockchain (Intermediate)**

**Course Outline**

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This course is designed for participants to learn intermediate-level concepts in blockchain and join the ranks of the blockchain professionals in the financial services industry. At the end of the 120-hour course, participants will learn how to issue an Initial Coin Offering (ICO) for DeFi and NFT tokens, apply Design Thinking in blockchain projects, create and set up a Permissioned Blockchain for Enterprise projects using tools and frameworks such as Reactjs, Nodejs, Hyperledger Fabric, openethereum, [Bingyang, may add: SmartMesh Spectrum],CrunchDB and IPFS.

The 120 hours of total time is divided into 60 hours of F2F lecture, through Zoom, and 60 hours of a group project.

The 60 hours of F2F lecture is outlined as follows.

* Topic 1: Forks, Hard & Soft
* Understand the concepts of hard fork and soft fork
* Topic 2: Consensus Beyond Proof of Work
* Describe different consensus mechanisms
* Topic 3: Initial Coin Offerings (ICOs) with DeFi and NFT
* Understand DeFi’s development History
* Describe Major DeFi Frameworks
* Use opensource github repos to fork uniswap
* Issuing NFT on Opensea
* Topic 4: Enterprise Blockchains
* Describe the enterprise level blockchain solutions
* Be able to deploy a permissoned Blockchain using Openethereum
* Introduction to Hyperledger Fabric
* Experience how to compose a Hyperledger Fabric network
* Experience Docker and Docker Compose
* Experience Chain Code
* Experience CrunchDB and other HyperLedger Tools
* Topic 5: Architecting a Blockchain Solution
* Describe Blockchain Application Design Thinking
* Experience Nodejs
* Experience Reactjs
* Experience Reactjs Web3 Interaction
* Experience IPFS

Course Project

The 60 hours of Group Project is tentatively planned as follows.

* At the conclusion of the recent SmartMesh SUSS Blockchain Challenge (BC) in summer of 2020, several projects were developed at the Concept level for BC Phase 1.
* The BC project web pages can be accessed here: **https://eco.meshbox.io/projects/**
* The groups will be given an opportunity to present to you, for your consideration to work on for the Intermediate Blockchain Course project.
* You may choose to join one of these BC projects, or create a topic on your own.
* If you choose a BC project, please form a group of 2 to 3 persons (from within this Intermediate Blockchain Course), and request to join the BC project group.
* Through the project participation, you will apply the knowledge from this course, delve deeper into blockchain related business models, experience blockchain technology including token minting on a blockchain and cross-chain architectures, and Decentralized Application (DAPP) implementation on IOS/Android smartphones.

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| **Day 1 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Course Introduction & Evaluation |
| **BCI Lecture :** Blockchain Technology trends  - Blockchain Technology History  - Blockchain Technology Trends  - DeFi, Governance, Private (permissioned) blockchains, Cross-Chain Solutions, Sharding |
| **BCI Lecture :** Typical Components of a Enterprise Blochchain Solution  - A Typical Blockchain Application Diagram  - A Typical Web Application Diagram  - Difference  - What is Software Archtecture?  - Solutions |
| **BCI Lecture :** Developer Roadmap  - Frontend Path  - Backend Path  - Devop Path |

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| **Day 2 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Introduction to Hard fork and Soft Fork  - What are Hard Fork and Soft Fork  - Major Ethereum Forks  - EIP Explaination  - Soft Fork: EIP Demo |
| **BCI Demo :** Do a hard fork using Openethereum  - What is Open Ethtereum  - Chain Specifications  - Permissioning  - Hard Fork Code Demo |

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| **Day 3 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** SUSS Blockchain Challenge Project Introduction |

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| **Day 4 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** POW  - What is Consensus  - Byzantine General's Problem  - The Enlightenment of BGP and POW |
| **BCI Lecture :** POS  - What is POS?  - POS Mechanism  - POW VS POS  - Ethereum 2.0 |
| **BCI Lecture :** Spectrum Consensus |
| **BCI Lecture :** POA Permissioning Demo  - What is POA?  - POA Permissioning Layers  - POA VS POW  - Code Demo |

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| **Day 5 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** ICO and DeFi |
| **BCI Lecture :** Fork Uniswap on Spectrum  - Introduction to Uniswap App  - Overview of Uniswap’s Contracts  - Liqudity Pool  - Uniswap Fork Process  - Uniswap Smart Contracts Deployment  - Uniswap Frontend |

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| **Day 6 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :**  Opensea and ERC721  - What is ERC721  - Code Demo: mint a new token and transfer assets  - Code Demo: How to use opensea js |

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| **Day 7 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Understand Atmosphere Cross-Chain Solution |
| **BCI Lecture :** Understand Photon Layer2 |
| **BCI Lecture :** Understand Smartmesh NFT |

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| **Day 8 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Introduction to Hyperledger Fabric  - What is Hyperledger Fabric  - The Infrastructure Component  - Component Explanation  - The Architecture  - Architecture Explanation  - The Transaction Process  - Process Explanation |
| **BCI Lecture :** Dive into Hyperledger Network  - Network Composing Process  - The Important Files  - Docker Overview  - Docker Compose overview |

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| **Day 9 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Demo :** Hyperledger Chain Code Development  - Go Language Basic  - Fabcar Demo  - Deployment |
| **BCI Demo :** Introduction to CrunchDB  - Insertion, Update, Delete, Set |

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| **Day 10 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** HyperLedger Tools |
| **BCI Demo :** Hyperledger Chain Code API Interaction |

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| **Day 11 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Blockchain Application Design Thinking |
| **BCI Lecture :** Introdution to Nodejs and Expressjs  - MVC  - Routes  - Control  - Model (SQlite)  - View |

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| **Day 12 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Introduction to Reactjs |
| **BCI Demo :** Reactjs Class Component |
| **BCI Demo :** ReactjsProps and State |

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| **Day 13 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Demo :** Reactjs Functional Component |
| **BCI Demo :** ReactjsContext |
| **BCI Demo :** Reactjs Hooks |

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| **Day 14 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Dive into Web3js |
| **BCI Lecture :** Dive into ethersjs |

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| **Day 15 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Demo:** Reactjs Web3 Interaction |
| **BCI Demo:** Metamask Interactionweb3reactprovider |

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| **Day 16 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Demo:** Put all picecs together project - On Chain Data verification |

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| **Day 17 Agenda (3.5 hours; 09:00 - 12:30; 15 mins Break)** |
| **BCI Lecture :** Introduction to IPFS |
| **BCI Demo :** IPFS Demo |