**SGUS Blockchain Talent Programme**

**Blockchain (Intermediate)**

**Course Outline**

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 Non-Fungible-Tokens (NFT), 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, 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.

# Face-to-Face Lectures

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
* Mint a Debt NFT using ERC721 on Spectrum Blockchain
* 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/**
* Some of the groups’ project concept will be given an opportunity to present to you, for your consideration to work on for your Blockchain Intermediate Course project.
* You may choose to work on one of these BC projects, or create a topic on your own.
* In either case, please form groups of 2 to 3 persons per group.
* If you choose a BC project, and haven’t yet formed a group, you may form a group with the others who selected the same BC project. Then, your group will communicate and potentially collaborate with the BC project group.
* If you don’t choose a BC project, then try to contact other students in the BCI course and form groups of 2 to 3 persons.
* Through the project participation, you will apply the knowledge from this BCI 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.

# Course Time-Table and Agenda

***All F2F Days are scheduled at 3.5 hours; 09:00 - 12:30; 15 mins Break), with the exception of Day 18 which is only 1 hour.***

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| **Day 1 – Wed 30 December 2021** |
| **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 Blockchain Solution  - A Typical Blockchain Application Diagram  - A Typical Web Application Diagram  - Difference  - What is Software Architecture?  - Solutions |
| **BCI Lecture :** Developer Roadmap  - Frontend Path  - Backend Path  - Devop Path |

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| **Day 2 – Mon 04 January 2021** |
| **BCI Lecture :** Introduction to Hard forks and Soft forks in Blockchains  - What are Hard and Soft Forks  - Major Ethereum Forks  - Ethereum Improvement Proposals (EIP) Explanation  - Soft Fork: EIP Demo |
| **BCI Demo :** Do a hard fork using Openethereum  - What is Open Ethereum  - Chain Specifications  - Permissioning  - Hard Fork Code Demo |

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| **Day 3 – Wed 06 January 2021** |
| **BCI Lecture :** Course Project Guidelines  **BCI Lecture:** Optional: Can consider, as your project concept: SUSS-SmartMesh Blockchain Challenge Projects |

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| **Day 4 -- Fri 08 January 2021** |
| **BCI Lecture :** Proof of Work consensus (POW)  - What is Consensus  - Byzantine General's Problem  - The Enlightenment of BGP and POW |
| **BCI Lecture :** Proof of Stake consensus **(**POS)  - What is POS?  - POS Mechanism  - POW VS POS  - Ethereum 2.0 |
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| **BCI Lecture :** Proof of Authority **(**POA) Permissioning Demo  - What is POA?  - POA Permissioning Layers  - POA VS POW  - Code Demo |

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| **Day 5 – Tue 12 January 2021** |
| **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 – Thu 14 January 2021** |
| **BCI Lecture :**  Opensea and Ethereum Request for Comments (ERC) 721  - 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 – Mon 18 January 2021** |
| **BCI Lecture :** Spectrum Consensus |
| **BCI Lecture :** Spectrum and Atmosphere Cross-Chain Solution |
| **BCI Lecture :** Photon Layer2 Off-Chain State-Channel for Spectrum |
| **BCI Lecture :** SmartMesh NFT |

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| **Day 8 – Wed 20 January 2021** |
| **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 – Fri 22 January 2021** |
| **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 – Tue 26 January 2021** |
| **BCI Lecture :** HyperLedger Tools |
| **BCI Demo :** Hyperledger Chain Code API Interaction |

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| **Day 11 – Thu 28 January 2021** |
| **BCI Lecture :** Blockchain Application Design Thinking |
| **BCI Lecture :** Introdution to Nodejs and Expressjs  - MVC  - Routes  - Control  - Model (MongoDB)  - View |

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| **Day 12 – Tue 02 February 2021** |
| **BCI Lecture :** Introduction to Reactjs |
| **BCI Demo :** Reactjs Class Component |
| **BCI Demo :** ReactjsProps and State |

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| **Day 13 – Thu 04 February 2021** |
| **BCI Demo :** Reactjs Functional Component |
| **BCI Demo :** ReactjsContext |
| **BCI Demo :** Reactjs Hooks |

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| **Day 14 – Fri 05 February 2021** |
| **BCI Lecture :** Dive into Web3js |
| **BCI Lecture :** Dive into ethersjs |

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| **Day 15 – Wed 10 February 2021** |
| **BCI Demo:** Reactjs Web3 Interaction |
| **BCI Demo:** Metamask Interactionweb3reactprovider |

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| **Day 16 – Mon 15 February 2021** |
| **BCI Demo:** Put all pieces together project - On Chain Data verification |

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| **(OLD) Day 17 – Wed 17 February 2021** |
| **BCI Lecture :** Introduction to IPFS **[Bingyang, need to move IPFS to another day, or delete]** |
| **BCI Demo :** IPFS Demo |

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| **Day 17 -- Wed 17 February 2021** |
| **BCI Lecture :** Project Presentation and Demo by each BCI Group |

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| **Day 18 – Fri 19 February 2021**  **(1 hour; 09:00 – 10:00)** |
| **BCI Lecture :** Wrap-Up |

# Trainers’ Profiles

**Bingyang LI**

* SmartMesh Training Officer
* Oumi Blockchain CTO
* Blockchain Early Investor

**Peter YAN**

* MeshBox CEO
* SmartMesh Advisor
* Ph.D Electrical Engineering, Washington University in St. Louis
* Former Senior Staff Engineer, America Wireless Access Labs Huawei Technologies;
* Former Principle-Scientist, Enterprise Switching Business-Unit Broadcom;
* Former Systems Architect, Business Development and Strategy Group Freescale Semiconductor.

**Henry WANG Qiheng**

* Founder Smartmesh CEO
* MeshBox Advisor
* Masters in Computer Science, Washington University in St. Louis
* President of the International Blockchain Application Federation
* Cofounder of SmartMesh-SUSS Blockchain Living Lab
* Extensive background in offline networking and social communications.