

## Subject Description Form

<b>Subject Code</b>	COMP5565
<b>Subject Title</b>	Decentralized Apps Fundamentals and Development
<b>Credit Value</b>	3
<b>Level</b>	5
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<p>The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. introduce the motivation of decentralized application (DApp) and how it can be realized by blockchain and smart contracts;</li> <li>2. present a systematic approach to planning, designing, implementing and testing DApps in various use cases with proper blockchain network configuration;</li> <li>3. introduce common blockchain frameworks and how they can be applied in appropriate settings.</li> </ol>
<b>Intended Learning Outcomes</b>  <i>(Note 1)</i>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a) understand the architecture and components of a DApp, including the front-end interface and back-end processing, supported by blockchain and smart contracts;</li> <li>b) plan, design, implement and test end-to-end DApps with proper blockchain network configuration in enterprise scale;</li> <li>c) critically review the newly emerging blockchain standards and architectures, and apply them in various use cases.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>  <i>(Note 2)</i>	<ol style="list-style-type: none"> <li>1. Introduction to permission-less and permissioned blockchains, and smart contracts</li> <li>2. Ethereum architecture, gas, rewards, PoS, running a local instance</li> <li>3. DApps development environments (Truffle) and development lifecycle</li> <li>4. Solidity programming language, writing smart contracts, software engineering best practices, and the Ethereum Virtual Machine</li> <li>5. Development with frameworks and libraries, deployment and upgrades, troubleshooting</li> <li>6. Hyperledger Fabric architecture, chaincode basics and lifecycle</li> </ol>

	<p>7. Identity management and Membership Service Provider (MSP), private data collection</p> <p>8. Other considerations in DApps development, token standards, hybrid/multi-chain, security concerns</p>																																						
<p><b>Teaching/Learning Methodology</b></p> <p><i>(Note 3)</i></p>	<p>This course will emphasize on both the theories and practical aspects of DApp fundamentals and development. The theories will be covered through lectures, whereas the practice aspects will be taught through a series of laboratories which are designed to help student understand the processing of designing and implementing decentralized applications using various blockchain frameworks.</p>																																						
<p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p> <p><i>(Note 4)</i></p>	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="3">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessment</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> <ul style="list-style-type: none"> <li>Individual Assignment(s)</li> </ul> </td> <td>20%</td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td> <ul style="list-style-type: none"> <li>Mid-term Test</li> </ul> </td> <td>15%</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td> <ul style="list-style-type: none"> <li>Project</li> </ul> </td> <td>25%</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>2. Examination</td> <td>40%</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>The individual assignments, mid-term test and examination are designed to evaluate the students' understanding on the theories of decentralized application. The project, on the other hand, are designed to evaluate the students' practical skills on developing DApps and setting up Blockchain networks.</p>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			a	b	c	1. Continuous Assessment					<ul style="list-style-type: none"> <li>Individual Assignment(s)</li> </ul>	20%	✓		✓	<ul style="list-style-type: none"> <li>Mid-term Test</li> </ul>	15%	✓	✓	✓	<ul style="list-style-type: none"> <li>Project</li> </ul>	25%		✓		2. Examination	40%	✓	✓	✓	Total	100%			
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<p><b>Reading List and References</b></p>	<p>Reference Books:</p> <p>1. D. Cawrey, L. Lantz, Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, O'Reilly Media 2020.</p>																																						

	<ol style="list-style-type: none"> <li>2. A. M. Antonopoulos, Mastering Ethereum: Building Smart Contracts and DApps, Mastering Ethereum: Building Smart Contracts and DApps, Sebastopol, CA: O'Reilly Media, Inc. 2019.</li> <li>3. N. Gaur, A. O'Dowd, P. Novotny, L. Desrosiers, V. Ramakrishna, S. A. Baset, Blockchain with Hyperledger Fabric: Build decentralized applications using Hyperledger Fabric 2, 2nd ed., Packt Publishing 2020.</li> <li>4. N. R. Thota, Mastering Hyperledger Fabric: Master The Art of Hyperledger Fabric on docker, docker swarm and Kubernetes, 2020.</li> <li>5. S. Karkeraa, Unlocking Blockchain on Azure: Design and Develop Decentralized Applications, Berkeley, CA: Apress 2020.</li> </ol>
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Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.