NUS School of Computing

Master of Science in Digital Financial Technology (MSc DFinTech)

Core/Essential Courses (28 units)

FT5001 to FT5011 are new courses designed to instil core FinTech competencies covering *Artificial Intelligence, Blockchain, and Data Analytics*. Students are required to choose 12 units out of 24 units.

Courses	*Units*	*Available in Semester 1*	*Available in Semester 2*
FT5001 Fintech Innovations for Consumers	2	✓	
FT5002 Digital Transformation at Financial Institutions	2	✓	
FT5003 Blockchain Innovations	2		✓
FT5004 Programming for Blockchain Applications	2		✓
FT5005 Machine Learning for Finance	4		✓
FT5008 Contemporary Topics in Blockchain Applications	2		✓
FT5009 Contemporary Topics in Financial Data Analytics	2	✓	
FT5010 Algorithmic Trading Systems Design and Deployment	4		✓
FT5011 Deep Learning for Finance	4		✓

Among the 28 units essential courses, BMD5301 and BMD5302 cover the basics of finance and are offered by the NUS Business School. IT5001 and IT5003 cover the basics of computing. The objective is to ensure all students graduate with solid training in both *computing* and *finance* foundation.

Courses	*Units*	*Available in Semester 1*	*Available in Semester 2*
BMD5301 Introduction to Finance for FinTech Professionals	4	✓	
BMD5302 Financial Modelling for FinTech Professionals	4		✓
IT5001 Software Development Fundamentals	4	✓	✓
IT5003 Data Structures and Algorithms	4	✓	✓

Students who have taken courses similar to BMD5301, IT5001, and IT5003 can replace these courses by taking the following replacement courses*:

Courses	*Units*	*Available in Semester 1*	*Available in Semester 2*
IT5004 Enterprise Systems Architecture Fundamentals	4	✓	
IT5005 Artificial Intelligence	4	✓	
IT5006 Fundamentals of Data Analytics	4		✓

***Note**: Students who wish to take replacement courses are required to submit their request to the School of Computing for prior approval. All other core courses are required for all students.

Course Descriptions (Core Courses)

FT5001 - Fintech Innovations for Consumers (2 units)

The objective of this course is to provide a technological overview of the eco-system of FinTech innovations for consumers. Particularly, this course will cover important business models and innovations in payment solutions, crowd-funding platforms, investment and robo-advisors, and other important FinTech innovations that affect the personal finance of individual consumers.

FT5002 - Digital Transformation at Financial Institutions (2 units)

The objective of this course is to provide a technological overview of the business functions of modern banking, insurance, and investment sectors. Students will learn how FinTech is transforming the business operations in these financial firms. Particularly, this course covers smart credit analytics, RegTech, InsurTech, AI and banking, and other new topics of FinTech at large financial institutions. This course also serves the purpose to teach students about the basics of banking and insurance.

FT5003 - Blockchain Innovations (2 units)

Blockchain technologies could be the most disruptive FinTech technologies. This course covers the important topics of blockchain innovations. Students will learn the architecture of blockchain, the history and evolution of blockchain applications, and the case studies of state-of-art blockchain applications in the industry.

FT5004 - Programming for Blockchain Applications (2 units)

This course provides an overview of the essential concepts of blockchain protocol. Students will learn programming skills for developing blockchain applications. Students will learn the knowledge needed to create nodes on a personal blockchain, create accounts, unlock accounts, mine, transact, and check balances. Students will also learn the decentralized peer-to-peer network.

FT5005 - Machine Learning for Finance (4 units)

This course covers foundation knowledge in machine learning and data mining for solving practical analytics problems or building AI applications at FinTech firms. Some topics covered including supervised learning models, time series forecasting methods, basics of sentiment analysis and text mining, and reinforcement learning.

FT5008 - Contemporary Topics in Blockchain Applications (2 units)

The objective of this course is to provide students with a more in-depth discussion of technological advances in blockchain applications. Students will learn contemporary programming knowledge for blockchain applications, such as smart contract applications. Students will also learn how to design and write use cases of novel blockchain applications and blockchain technologies that are developed and deployed in start-ups or financial institutions.

FT5009 - Contemporary Topics in Financial Data Analytics (2 units)

The objective of this course is to provide students with an overview of recent advances in financial data analytics. In addition, the lecturer may provide an in-depth discussion of selected important topics in financial data analytics that is the focus of industry-oriented research at financial institutions or start-ups. From this course, students will learn advanced data mining algorithms, financial statistical models, fintech programming knowledge, and business cases or academic papers on modern financial applications.

FT5010 - Algorithmic Trading Systems Design and Deployment (4 units)

The course teaches students financial market fundamentals and best practices in systematic trading, covering the distinction between discretionary and systematic methods. It emphasizes designing and developing rule-based trading strategies and systems, utilizing financial trading and app development concepts. It focuses on best practices for backtesting and hypothesis testing for different trading strategies derived from technical analysis, fundamental analysis, and machine learning. The course also addresses investor biases and ways to overcome them through data-driven decision-making and risk management.

FT5011 - Deep Learning for Finance (4 units)

This course will introduce the foundational concepts and applications of major deep learning algorithms. This course aims to bridge the gap between the rapidly evolving world of deep learning technologies and the unique challenges presented by the financial industry. Through a combination of theoretical lessons, practical case studies, hands-on exercises, and discussions, students will explore the potential, limitations, and implications of employing deep learning solutions in various financial scenarios. By the end of this course, participants will have hands-on experience in designing, training, and implementing deep learning models for financial applications.

BMD5301 - Introduction to Finance for FinTech Professionals (4 units)

This course aims to provide students with the foundation to understand the key concepts and tools used in Finance, which are necessary for managers and analysts to make sound financial decisions. Topics covered include discounted cash flow models, risk and return, capital budgeting, valuation of stocks and other financial securities, as well as an overview of financial markets and financial institutions.

BMD5302 - Financial Modelling for FinTech Professionals (4 units)

This course introduces Finance models used in corporate finance, portfolio management, derivatives and bonds. It takes an applied approach by implementing through Excel, VBA and Python.

IT5001 - Software Development Fundamentals (4 units)

This course aims to introduce non-computing students to the principles and concepts of software development at an accelerated pace. Students will be introduced to the basics of programming (control flow, code and data abstraction, recursion, types, OO), development methodology (ensuring correctness, testing, debugging), simple data structures and algorithms (lists, maps, sorting), and software engineering principles. Through hands on assignments and projects, students will learn good software development practices (documentation, style) and experience a typical software engineering cycle.

IT5003 - Data Structures and Algorithms (4 units)

This course introduces non-computing students to efficient computational problem solving in an accelerated pace. Students will learn to formulate a computational problem, identify the data required and come up with appropriate data structures to represent them, and apply known strategies to design an algorithm to solve the problem. Students will also learn to quantify the space and time complexity of an algorithm, prove the correctness of an algorithm, and the limits of computation. Topics include common data structures and their algorithms (lists, hash tables, heap, trees, graphs), algorithmic problem solving paradigms (greedy, divide and conquer, dynamic programming), and NP-completeness.

IT5004 - Enterprise Systems Architecture Fundamentals (4 units)

This course aims to equip non-computing students with fundamental knowledge in architecting and designing modern Enterprise Systems in organisations that can be reasonably complex, scalable, distributed, component-based and mission critical. Students will develop an understanding of high-level concepts such as enterprise architecture and software architecture. They will them move on to acquire fundamental systems analysis and design techniques such as object-oriented requirements analysis and design using the Unified Modelling Language.

IT5005 - Artificial Intelligence (4 units)

The study of artificial intelligence, or AI, aims to make machines achieve human-level intelligence. This course provides a comprehensive introduction to the fundamental components of AI, including how problem-solving, knowledge representation and reasoning, planning and decision making, and learning. The course prepares students without any AI background to pursue advanced courses in AI.

IT5006 - Fundamentals of Data Analytics (4 units)

This course introduces students to the fundamental concepts in business analytics. They can learn how to apply basic business analytics tools (such as R), and how to effectively use and interpret analytic models and results for making informed business decisions. The course prepares students without any analytics background to pursue advanced courses in business and data analytics.

****Important: Courses in this list may be subject to change as decided by the Schools/Departments.***