**NANYANG TECHNOLOGICAL UNIVERSITY**
**NANYANG BUSINESS SCHOOL**
**BC3402**
**FINANCIAL SERVICE PROCESSES AND ANALYTICS**

| | | | | |
|---|---|---|---|---|
| **Academic Year** | : | 2023/2024 | **Semester** | : 2 |
| **Course Coordinator** | : | Assoc Prof Goh Kim Huat | | |
| **Pre-requisites** | : | AB1201 | | |
| **No. of AUs** | : | 4 | | |
| **Contact Hours** | : | 39 hours | | |

## A) Course Aims

This course traces the trade cycle and outline the front, middle and back office processes in financial services industry. For each of the key operational process, the course provides an overview of the process as well as the use of technology and analytics. Through the course, students are expected to develop the knowledge and skills in the managing, utilizing and leveraging of information technologies and analytics to support daily operations in financial institutions. Knowledge of programming languages is not required.

The course is intended to prepare undergraduates for careers in Finance, MIS and management consulting, who will need to have a firm grasp of technology concepts as they relate to the financial services context.

## B) Intended Learning Outcomes (ILO)/Objectives

By the end of this course, you should be able to:

1. search, collate, process and synthesis information on information systems used in financial services

2. develop good interpersonal skills and able to work in team settings

3. describe the various technological concepts in financial services, including financial networks, algorithm trading, trading and settlement systems.

## C) Course Content

The course builds on three key modules. The first module covers the strategic drivers of information technology in financial sector and the ways technology is used in this sector. The second module focuses on the technologies employed in financial institutions at various stages of the trading process (pre-trade, trade, post trade and post settlement). Specifically, it examines the various types of software systems used within the financial services as well as the financial information systems

infrastructure in general. The final module examines commonly used trading algorithms employed in electronic based trading.

**D) Assessment (includes both continuous and summative assessment)**

| Component | ILO Tested | NBS Learning Goal (Refer to Annex E for list) | Weighting | Team/Individual | Assessment Rubrics (Please insert rubrics as Appendix) |
|---|---|---|---|---|---|
| 1. Group Project (written report & in-class presentation – all members must present) | ILO1, ILO2, ILO3, | Critical Thinking, Acquisition of knowledge | 25% | Group<br><br>Presentation will consist of 10% and is assessed individually | Critical thinking Rubric<br><br>Teamwork and Interpersonal Skills Rubric |
| 2. Class participation | ILO2 ILO3 | Critical Thinking, Acquisition of knowledge | 15% | Individual | Class participation rubric |
| 3. Mid-term Quiz | ILO1, ILO3, | Critical Thinking, Acquisition of knowledge | 20% | Individual | N.A |
| 4. Final Quiz | ILO1, ILO3, | Critical Thinking, Acquisition of knowledge | 40% | Individual | N.A. |
| Total | | | 100% | | |

All members are required to present in the final presentation of the group project.

The peer evaluation will be conducted using the proposed sample form.

There will be a group based mark for the written component of the project (15%), the presentation part of the project (10%) can be assessed individually.

Peer evaluation is mandatory. Peer evaluation done at the end of the project using the proposed sample form for all members.

Every individual student will get a total score from his/her peers which is the sum of all rating scores received from peers. A mean will be computed across all group members.

1. If a member's average rating is ≥ 4, the member will receive **100%** of the overall mark awarded to the team project.
2. If a member's average rating is < 4 but ≥ 3, the member will receive **80%** of the overall mark awarded to the team project.
3. If a member's average rating is < 3 but ≥ 2, the member will receive **50%** of the overall mark awarded to the team project.
4. If a member's average rating is < 2, the member will receive **30%** of the overall mark awarded to the team project.

### E) Formative feedback

You will receive both written and verbal feedback from me about your presentations. You will receive verbal feedback for the in-class presentation and written feedback for the group project.

Feedback will be provided for the mid-term quiz as well in terms of the overall performance.

### F) Learning and Teaching approach

| **Approach** | **How does this approach support you in achieving the learning outcomes?** |
|---|---|
| Seminars | The interactive seminar session where there is ample opportunities for open discussion on the conceptual questions raised in the class allows you to think critical and share their ideas and concept with the class. This also allows me to get the concepts clearly through the entire class by involving you and ensure that the targeted learning outcomes are being achieved |
| Group projects | The projects require you to generate, analyze and deliver materials in a guided manner. |

### G) Reading and References

Main Texts

The content delivered in this course is based mainly on three textbooks from the "Complete Technology Guides for Financial Services" by Elsevier:

- Financial Services Technology: Processes, Architecture, and Solutions (2012). Randell E. Duran. Cengage Learning Asia.
- Barry Johnson (2010). Algorithmic Trading and DMA: An Introduction to Direct Access Trading Strategies. 4Myeloma Press.
- Data Mining for Business Analytics: Concepts, Techniques and Applications (2019) (in R, Python, XLMiner). Galit Shmueli, Nitin R. Patel and Peter C. Bruce

## H) Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned pre-class readings and activities, attend all seminar classes punctually and take all scheduled assignments and tests by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for seminar sessions they have missed. You are expected to participate in all seminar discussions and activities.

(2) Absenteeism

Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a lecture, you must inform the course instructor via email prior to the start of the class.

## I) Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

## J) Course Instructors

| Instructor | Office Location | Phone | Email | Consultation Hours |
|---|---|---|---|---|
| Prof. Goh Kim Huat | S3-B2A-34 | 67904808 | akhgoh@ntu.edu.sg | By prior appointment via email |

## K) Planned Weekly Schedule

| Week | Topic | ILO | Readings/ Activities |
|---|---|---|---|
| 1 | Introduction | ILO 3: Course overview/definition and background of financial technology<br>ILO 3: Overview of Financial Instruments | See list of assigned case studies above. |

| | | | |
|---|---|---|---|
| 2 | IT & Financial Services Industry | ILO 1,2: Role and impact of IT on markets, exchanges and brokerage industry (delivery through case studies)<br>ILO 1: Web-enable financial services | Cases to be provided. |
| 3 | IT in the Trade Cycle (I) | ILO 3: Straight Through Processing<br>ILO 3: Automation in the trade cycle | Randell E. Duran Chapters 1 and 2 |
| 4 | IT in the Trade Cycle (II) | ILO 3: Examining the technologies involved in the following stages<br>• Pre-trade<br>• Trade<br>• Post-trade<br>Post Settlement | Cases to be provided. |
| 5 | IT in the Trade Cycle (III) | ILO 2,3: Understanding technologies in light of STP | Cases to be provided. |
| 6 | E-Money and Financial Networks I | ILO 1: Infrastructure of financial services: financial objects and protocols | Notes provided |
| 7 | Financial Networks II: (Electronic Trading Networks)<br><br>Settlement System in Action | ILO 3: ECNs/ ATS/ Crossing Networks<br>ILO 3: Technology supporting trading networks | Notes provided |
| 8 | Quiz<br><br>Financial Networks III: (Electronic Trading Networks) | ILO2, 3:<br>Cont'd from previous session<br>Lab Session | Notes provided |
| 9 | Algorithm Trading and Trade Analytics<br>I | ILO 3: Overview & Market Significance<br>ILO3: Developments and Common Uses | Barry Johnson, Chapters 1,2 |
| 10 | Algorithm Trading and Trade Analytics<br>II | ILO 3: Algorithm Strategies<br>ILO 1: Emerging Issues<br>ILO 3: Algorithm for different asset classes<br>ILO 3: Algorithm trading implementation options | Barry Johnson Chapters 3,4 |

| | | | |
|---|---|---|---|
| 11 | Algorithm Trading and Trade Analytics III | ILO 3: Pre-Trade transaction cost analytics | Notes provided |
| 12 | Analytics & Applications | ILO 3: Application of analytics to financial services | Shmueli et al. Chapters 1 and 2 |
| 13 | Project Presentation | ILO 2: Presentation of projects | |

**ANNEX B: ASSESSMENT CRITERIA FOR _____**

**Term project for BC3410/BC3402: Financial Service Processes and Analytics**

This is a team assignment. Each team may have up to 4 members, and all members of a team may NOT get the same grade. Each member will be assessed on the basis of her / his contribution to the project. Individual contribution may be determined by peer evaluations, wherein each member rates the others in terms of their contribution to the project. This is to mitigate the free-rider problem common in group projects.

**Background**

Assume you have just joined a software company that develops off-the-shelf software for financial institutions. Your first assignment on this job is to put together materials for a presentation to one of your major potential client, NTUBank. NTUBank is a fully licensed bank in Singapore that provides a wide variety of financial services ranging from wealth management, to commercial lending, to investment banking. The business model of NTUBank is that of a "Financial Supermarket" which is adopted by financial institutions such as Citibank.

**Requirements**

In this project, you are required to develop the *sales presentation materials*, keeping in mind the following:

- You are free to choose the company you wish to represent; however, it has to be an actual company and not some fictitious entity.
- You can choose any type of software that you which to present and they can be, but not limited to the following categories:
    - Retail banking
    - Credit card processing
    - Financial fraud detection
    - Financial risk management
    - Loan servicing
    - Mobile banking
    - Algorithm trading
    - Clearing and settlement
    - Order management
    - Products pricing

- Before embarking on your project, do consult your tutor pertaining to the company as well as the software you have selected for the project.

**Deliverables**

*Part I:* A sales presentation that will be held either during regular lesson time on *Week 13 or Week 14* of the semester. You have the freedom of choice pertaining to the multimedia used for the presentation but keep in mind the presentation should last about 15 minutes. The sales presentation should be formal – liken that of an actual commercial sales presentation. All members of the group are expected to present. A softcopy of the multimedia used during the presentation has to be emailed to the instructor after the presentation for grading purposes.

Allocation of marks:
Presentation (individual basis): 10%

*Part II:* A written report detailing the software proposed – including all additional materials communicated in the sales presentation. The written reported should be handed in during the usual lesson time in *Week 13.* **Both** hardcopies and softcopies of the report are to be submitted. Softcopies are to submitted via TurnitIn in edveNTUre.

Allocation of markets:
Quality of report: 15%

**Critical Thinking Rubric**

**Learning Objective: The ability to define, examine, evaluate, analyze and synthesize various arguments and knowledge to form independent judgment. This rubric is for both the report as well as the individual presentation .**

| **Traits** | **Performance**<br>Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed | |
|---|---|---|
| | **Not Yet** | **Substantially Developed** |
| Identifies and summarizes the issue at hand. (20%) | Does not identify and summarize the issue, is confused or represents the issue inaccurately. | Identifies the main issue and its implicit aspects, addresses their relationships to each other and recognizes nuances of the issue. |
| Identifies and considers other theoretical perspectives that are important to the analysis of the issue. (20%) | Deals only with a single perspective and fails to discuss other possible perspectives, especially those salient to the issue. Fails to identify or hastily dismisses strong, relevant counter-arguments. | Addresses perspectives noted previously, and additional diverse perspectives drawn from outside information.<br>Identifies the salient arguments (reasons and claims) pro and con. |
| Identifies and assesses the quality of supporting data/evidence and provides additional data/evidence related to the issue. (20%) | Merely repeats information provided, taking it as truth, or denies evidence without adequate justification. Confuses associations and correlations with cause and effect. | Examines the evidence and source of evidence; questions its accuracy, precision, relevance, and completeness. Observes cause and effect and addresses existing or potential consequences. |
| Identifies and considers key assumptions and the influence of the context on the issue. (20%) | Does not surface the assumptions of the author and does not examine the contexts, e.g., cultural, and political. | Identifies and questions the validity of the assumptions and analyzes the issue with a clear sense of scope and context. |
| Identifies and assesses conclusions, implications and consequences. (20%) | Fails to identify conclusions, implications, and consequences of the issue or the key relationships among the various elements such as context, evidence or assumptions. | Identifies and discusses conclusions, implications, and consequences, considering context, assumptions, data, and evidence. Objectively reflects upon own assertions. Draws |

| | | |
|---|---|---|
| | Regardless of the evidence or reasons, maintains or defends views based on self-interest or preconceptions. | warranted, judicious, non-fallacious conclusions. |

## Peer Evaluation

**Peer Evaluation Instructions**

All members are required to complete a peer evaluation for each member of the team (i.e., including a self-assessment). The completed peer evaluation form must be submitted individually to the instructor immediately after the team project has been submitted for grading. Identity of appraisers will be kept **confidential** and will not be revealed to other team members.

We will use a member's ratings (on a scale ranging from 1 to 7) to award marks for the team project to other members by computing the average rating that a member receives from other members (i.e., excluding each member's self-rating). Each member will be informed of his/her average rating. A member's mark for the team project will be computed as follows:

1. If a member's average rating is ≥ 4, the member will receive **100%** of the overall mark awarded to the team project.

2. If a member's average rating is < 4 but ≥ 3, the member will receive **80%** of the overall mark awarded to the team project.

3. If a member's average rating is < 3 but ≥ 2, the member will receive **50%** of the overall mark awarded to the team project.

4. If a member's average rating is < 2, the member will receive **30%** of the overall mark awarded to the team project.

*A member who has concerns with the ratings given by other team members and/or his/her average rating should immediately consult his/her instructor upon receiving his/her peer evaluation feedback.*

**CONFIDENTIAL PEER EVALUATION FORM FOR TEAM PROJECT**

Member's name: _____

Seminar group and team number: _____

Please use the attached Peer Evaluation Rubric to evaluate yourself and your team members on each of the 5 stated attributes (on a scale of 1 to 7). State your ratings for yourself and each of your team members in the table below. For your self-assessment, insert "(Self)" after your name in the table below.

| **Index #** | **Name of team members** | **1 - RR** | **2 - CM** | **3 - CR** | **4 - CT** | **5 - RS** | **Average Rating** |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |

If any of your ratings above is **< 4**, please provide a brief explanation to justify the ratings.

| Index # | Brief explanation to justify a rating of **< 4** |
|---|---|
| | |
| | |
| | |

*You may attach supporting documents (like emails and screen shots), if any, to support your explanations above.*

**Teamwork & Interpersonal Skills Rubric (For Peer Rating)**

**Learning Objective: The ability to work effectively with others in a group setting. Your ratings will not be revealed to your team members.**

**Program:** _____ **Date:** _____

**Name of Rater:** _____ **Group Name:**

| Traits | Performance | | *Fill in your members' names below (excluding self) and Rate on a scale of "1" to "6" for each trait* | | | |
|---|---|---|---|---|---|---|
| | | | **Name 1** | **Name 2** | **Name 3** | **Name 4** |
| **Roles and Responsibility**<br>Behaves professionally by upholding responsibility and assuming accountability for self and others in progressing towards the team's goal. | **Scant**<br>Unclear about his/her own role; refuses to take a role in the group; insists to work individually and has limited coordination or communication with others. | **Substantially Developed**<br>Always fulfills responsibilities; performs his/her role within the group with enthusiasm and demonstrates willingness to work collaboratively. | | | | |
| | **Evaluation:**<br>**Scant 1 2 3 4 5 6 Substantially Developed** | | | | | |
| **Communication**<br>Identifies appropriate mechanisms to coordinate and correspond with team members. | **Scant**<br>Modes of communication are not appropriate, causing confusion and miscommunication among team members. | **Substantially Developed**<br>Modes of communication are appropriate, and maintains timely communication and correspondence with team members. | | | | |
| | **Evaluation:**<br>**Scant 1 2 3 4 5 6 Substantially Developed** | | | | | |
| **Conflict Resolution**<br>Resolves conflicts using a variety of approaches. | **Scant**<br>Does not recognize conflicts or is unwilling to resolve conflicts. | **Substantially Developed**<br>Consistently resolves conflicts through facilitating open discussion and compromise. | | | | |
| | **Evaluation:**<br>**Scant 1 2 3 4 5 6 Substantially Developed** | | | | | |
| **Contributions** | **Scant**<br>Largely disinterested in | **Substantially Developed**<br>Actively attends and participates in all | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Contributes positive input for the team; effectively utilizes one's knowledge and expertise. | working in a group and refuses to participate; observes passively or is unwilling to share information with other team members. | activities and provides meaningful contribution in articulating ideas and opinions. | | | | |
| | **Evaluation:**<br>**Scant 1 2 3 4 5 6**<br>**Substantially Developed** | | | | | |
| **Relationship**<br>Maintains cooperative interaction with other team members regardless of individual /cultural differences and respects diverse perspectives. | **Scant**<br>Rarely listens to others and does not acknowledge the opinions that differ from his/her own. | **Substantially Developed**<br>Engages in respectful relationships with all other members in the team. Embraces and accepts diverse points of view without prejudice. | | | | |
| | **Evaluation:**<br>**Scant 1 2 3 4 5 6**<br>**Substantially Developed** | | | | | |

**Class Participation**

| Traits | Performance | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| **Engagement (20%)** | Hardly focuses in class (e.g. using mobile phone, unnecessary chatting) | Occasionally engages in distracting activities (e.g. using mobile phone, unnecessary chatting) in class. | Engages fully in class |
| **Contribution frequency (30%)** | Does not speak up/contribute in class | Occasionally speaks up/contributes in class | Speaks up/contributes in all classes |
| **Contribution quality (50%)** | No contributions/Contributions lack substance | Contributions demonstrate knowledge of subject matter | Contributions are constructive and insightful |